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EVALUATING THE WALKABILITY OF OLD TOWN IN SIBU, SARAWAK, MALAYSIA, THROUGH THE ASSESSMENT OF PEDESTRIAN WALKWAY QUALITY

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Abstract

Walkability is essential for healthy, sustainable cities and resident well-being. This study evaluates pedestrian walkway quality in Sibul town. In total, on-site observations, satellite maps, and photos were used to analyse the connectivity, comfort, and safety of 21 streets. The results based on the scale of walkability developed in this study showed that Sibul's old town has an average score of walkability, which may deter the use of pedestrian walkways. The findings revealed that pedestrian walkways in old town Sibul have an intermediate level of comfort and safety, but their connectivity exceeds 82%. Safety concerns plagued 20% of these streets being walkable. Although most pedestrian walkways were wide and clean, the pavement quality, shading, and resting spots remained problematic. Sibul's old town has a 65% walkability rating from our scale of study. These findings can help urban planners enhance pedestrian walkways' connectivity, comfort, and safety to improve walkability.

Keywords: Pedestrian Walkway, Pedestrian Walkability, Pedestrian Walkway Comfort, Pedestrian Walkway Connectivity, Pedestrian Walkway Safety

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INTRODUCTION

Walking is the primary means of transportation around the world. Lambert (2021) defines walkability as the “quality of walking situations” to determine the accessibility, safety, connectivity, comfort, and aesthetics of a city’s public walking infrastructure. Numerous researchers have examined walkability (Shamsuddin et al., 2012; Lo, 2009). Nevertheless, most of them were focused on observing the pedestrian rate. Hence, there is a demand for more stimulating research focused on evaluating the standard of pedestrian walkways. Walkways should be designed to be convenient, cost-effective, low-risk, and accessible to a broad demographic (as per Litman, 2018). Universally accessible pedestrian facilities and surrounding spaces exhibit attributes of continuity, connectivity, safety, and sustainability, aligning with the transportation-related interpretation of accessibility, as outlined by the Hong Kong Architectural Services Department in 2007. Good streets are safe from physical danger, where one is not likely to get hit by a car or a truck. Outstanding streets possess the attribute of providing physical comfort. Public roads are the most superior as they are universally accessible. They do not exclude anyone. These streets are also diverse and actively encourage the public to walk along the walkway.

Pedestrian pathways are critical for walkability. The existing state of information indicates that traveling by foot is more complicated and requires more planning than driving a car (Shay, 2003). Their research suggested that cities with automobiles overlook pedestrian pathways, displacing pedestrians from their designated zones (Barter, 2000). They may even vanish totally in other circumstances, with pedestrians barely integrating into transportation means (Grava, 2003; Southworth, 2005).

Sarawak, however, has not yet practised moving around with commuters, so getting from point A to point B would be slightly inconvenient for pedestrians, particularly in Kuching and Miri, if they are not using vehicular transportation. The point of one location to another is somewhat remote compared to the old town, Sibul, which is more conducive to pedestrian walkability due to its proximity and accessibility by a five-foot path connecting one shophouse to another. This is likely because Sibul has yet to have proper town planning. Global city centres across the globe now adopt sustainable urban transportation networks for resilient transformation and resilience (Adam, 2013).

LITERATURE REVIEW

In recent years, there has been a significant surge in interest in research on pedestrian walkability. Individuals’ behaviours have a positive and negative effect on walkability. Pedestrians maximise a utility function that predicts the trade-off between the benefits of performing activities in a different location and the benefits of performing activities in the current location (Fisher et al., 2017).

They should exercise caution when developing their chosen route to ensure that the positive outcomes of a walkable city are attractive and straightforward and solve community problems.

The observable physical attributes of pedestrian walkability have been simplified to provide guidance in the design of pedestrian walkways and the implementation of measures to assess their walkability score. The collected data help to generate built environment attribute mapping. This made it easier to understand the attributes involved, and a framework was prepared using attribute mapping. Pedestrian walkability branches out into three main attributes, namely comfort, connectivity, and safety (Adam & Bakar, 2016; Keat et al., 2016; Nasrudin et al., 2018; Ruslan et al., 2023), then further branches to their respective sub-attributes.

The walkability of the study area has a direct impact on the well-being of individuals, making it a crucial factor in the creation of sustainable and pedestrian-friendly cities. The study primarily focused on environmental outcomes of sustainable transportation. Currently available literature has conclusively demonstrated the advantages of walking as a means of transportation in relation to urban development, economic viability, and social viability (Adam, 2013). It is therefore important to change how society views the importance of walking as a mode of transport.

The walkability evaluation involves three main attributes and twelve secondary attributes. The main attributes include pedestrian walkway comfort, connectivity, and safety. Each of these has specific sub-attributes. For comfort, there are six sub-attributes: width, flat and easy walking surface, shade, lack of disruptions, cleanliness, and the availability of seating (Frank, 2010; Speck, 2018; Zakaria & Ujang, 2015; Akmar et al., 2011; Southworth, 2005; Nasrudin et al., 2018; Litman, 2012; Miyakoda, 2004). The second attribute, pedestrian walkway connectivity, has four sub-attributes: length, permanent obstructions, temporary obstructions, and the existence of walkways (Saito et al., 2017; Litman, 2012; Miyakoda, 2004; Adam & Bakar, 2016; Keat et al., 2016). Lastly, the third attribute is pedestrian walkway safety, focusing on street lighting and zebra crossings (Hamsa et al., 2009; Nasrudin et al., 2023). The lack of shaded areas on sidewalks contributes to the overall dullness of the cityscape, and the proximity of automobiles can negatively impact the walkability experience (Keat et al., 2016).

RESEARCH METHODOLOGY

Research suggests using a checklist for a qualitative analysis of pedestrian walkways, involving on-site observation, satellite maps, and images. The checklist, tailored to the study's context, required minimal validation testing due to the short study timeframe (less than one year). It served as a practical tool for

collecting primary data, aiding in the examination of specific pedestrian walkway characteristics in Sibul's old town. Researchers utilised the checklist as reference items for quality assessment and providing feedback.

The study focused on Sibul's old town precisely because of its limited urban planning, high pedestrian and vehicular density, especially during peak hours, making it the heart of Sibul. The research addressed public walking issues in Sibul, which necessitated active observation to understand its impact on pedestrians. The three research objectives were to determine comfort levels, assess connectivity and safety, and evaluate walkability in Sibul's old town. Table 1 provides a comprehensive overview of the 21 roads that were examined in the specified region.



Figure 1: Sibul old town 21 road names within study site coverage.

Source: <https://www.google.com/maps/place/Sibu,+>

In this study, two sets of criteria were used to quantify the degree to which each walkway is conducive to pedestrian traffic: Pedestrian Walkway Scoring Scale 1 and Pedestrian Walkway Scoring Scale 2. These scoring scales were used to measure the quality and level of pedestrian walkways in terms of effectiveness and convenience. Scale 1 of Table 1 illustrates the Pedestrian Walkway Scoring Scale 1, which was used to measure the scores for pedestrian walkability attributes upon using the checklist. It was used to identify some features (bad, acceptable, or sound), and it allowed for a more detailed description of the facilities offered to pedestrians in the remark section provided in the checklist. Scale 2 of Table 1 shows that Pedestrian Walkway Scoring Scale 2 was used to determine the overall Pedestrian Walkway Scoring Scale upon comparison with different pedestrian walkways, namely PW1 to PW21. These

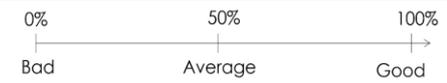
two pedestrian walkways were chosen at random from the overall 21 roads in the study area of Sibú’s old town.

Table 1: The coding of the 21 road names in Sibú’s old town and the randomly selected pedestrian walkway (PW).

No.	Road Name	PW
1	Jalan Sanyan	PW-1
2	Jalan Morshidi Sidek	PW-2
3	Jalan Ramin	PW-3
4	Jalan Wong Nai Siong	PW-4
5	Jalan Central	PW-5
6	Lebuh Tanah Mas	PW-6
7	Jalan Chambers	PW-7
8	Jalan Mission	PW-8
9	Jalan Bengkel	PW-9
10	Jalan Lembangan	PW-10
11	Jalan Tinggi	PW-11
12	Jalan Market	PW-12
13	Jalan Channel	PW-13
14	Jalan Lintang (Cross)	PW-14
15	Jalan Chew Geok Lin	PW-15
16	Jalan Temple	PW-16
17	Jalan Bank	PW-17
18	Jalan Wharf	PW-18
19	Jalan Power	PW-19
20	Jalan Pulau	PW-20
21	Jalan Tukang Besi	PW-21

Source: Author

Table 2: Pedestrian Walkway Scoring Scale

Scale 1	Scale 2
	
Used to measure diagram of attributes mapping	Used to measure pedestrian walkways comparative scoring chart

Source: Author

Pedestrian Walkways: PW4				Remarks: Jalan Wong Nai Siong
No.	Attributes	Walkability Score		
1.0	Pedestrians Comfort:			
1.1	The clear width must be at least 2m in order to accommodate two wheelchair users at the same time and must be entirely free of obstructions.	Unsuitable	Partially Suitable	Suitable
				✓
1.2	Pedestrian Walkway is relatively flat and easy to walk. (Steps with risers not exceeding 150 millimetres)	High Steps	Acceptable Steps	Flat
			✓	
1.3	There are trees/ shelters along walkway to provide shed	Non-Existence	Partially	Continuous
			✓	
1.4	Even PW without any disruptions	Disruptive Surfaces	Somewhat Acceptable	Continuous Material Use
			✓	
1.5	Cleanliness od PWs	PW is not Clean	PW is somewhat Clean	PW is Clear
		✓		
1.6	PWs seats (To rest)	Not Available	Somewhat Available	Well Provided
			✓	

Figure 2: Sample of pedestrian walkability checklist filled in.

Source: Author

Table 2 displays the checklist that was included in the document observations and evaluations of the selected pedestrian walkways. The respective columns pertain to the “bad, acceptable, or good” aspects of the walkability scoring section. Any remarks would be noted and recorded through other means such as voice recording, digital images, sketches, and video recording.

ANALYSIS AND DISCUSSION

The study thoroughly evaluates pedestrian walkways in Sibul’s old town, focusing on comfort and connectivity. The overall comfort level was reported at approximately 53%, with cleanliness being the most influential attribute, followed by width, flatness, ease of walking, shading, and seat availability. These findings underscored the importance of cleanliness and ample space in enhancing pedestrian comfort. In addition, the study investigated the level of connectivity, which yielded a rating of 82%. The scores considered attributes like walkway links, permanent obstructions, and temporary obstructions, which provided valuable insights into factors influencing both comfort and connectivity.

Safety scores slightly above average, with a 62% rating, attributed to street lighting and zebra crossings. Figure 3 indicates that improving connectivity, comfort, and safety could enhance the overall pedestrian walkway

quality, currently at 65%. Table 2 categorises pedestrian walkways as good, average, or bad, with Sibú’s old town achieving a favourable 69% rating, while only 9% indicate fewer desirable attributes. Specifically, PW-7 Jalan Chambers stands out with an 87.5% score, classifying it as a well-rated location. Detailed results for each pedestrian walkway are available in Table 3, focusing on individual ratings, and Table 4, provides attribute ratings based on the pedestrian walkability scoring scale.

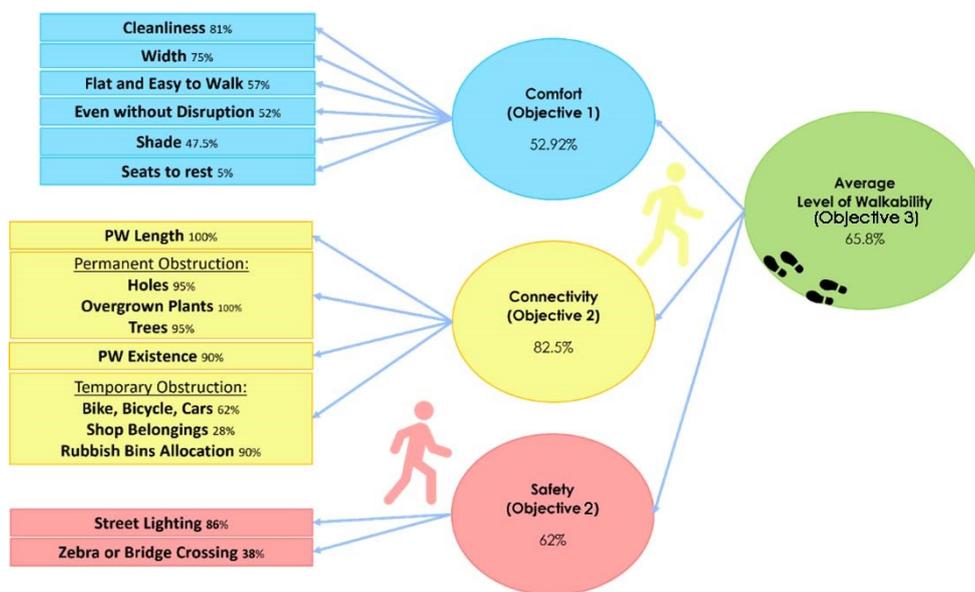


Figure 3: Pedestrian walkability attributes mapping
Source: Author

PW-10 Jalan Lembangan has the highest rate of poor scores compared to other pedestrian walkways. The bad scoring rates are due to width, flatness, ease of walking, seating availability, and shopping opportunities, which score 25%. With the width of the pedestrian walkway obviously sufficient to walk, it becomes narrower when the shops place their merchandise on the pedestrian pathway, thus blocking and interfering with the pedestrian walkway. As for the flatness of the walkway, it is inconsistent because some shops have upgraded the frontage of their shop to make them considerably higher while some of the original designs are still on a lower platform. Upon walking, pedestrians would have to go up and down the pedestrian walkway due to the inconsistency of the walkway. Lastly, PW-4 of Jalan Wong Nai Siong scores the highest percentage for the category of the average pedestrian walkways in Sibú’s old

town area. The pedestrian walkability score is rated at 56%, indicating a neutral or average performance across all attributes. This is classified and categorised under the average, referring to the Pedestrian Walkway Scoring Scale 2.

Tables display the percentage of walkability for each attribute. This data indicates that the attributes of overgrown plants and pedestrian walkway lengths have the highest scores among all other attributes, with a perfect score of 100% for both. No overgrown vegetation has been observed along the pedestrian walkways in the old town of Sibul. This is likely due to the diligent oversight of the Sibul Municipal Council, which ensures proper maintenance of these aspects across the town. Noticeably, certain buildings had vegetation that had grown excessively. In addition, the pedestrian walkway length does not exceed 100m, which limits access to other areas within walking distance. Sibul's old town was specifically designed to be pedestrian-friendly and encourage safe crossing. Places are in close proximity to each other, making them easily accessible by foot. In addition, the attributes of seats and rest receive the lowest scores. This is clearly due to a lack of public seating available in the studied areas. Presumably, this is intended to motivate pedestrians to continue walking and exploring Sibul old town. Based on these findings, we can readily identify the attributes that received the highest scores in this study area, which can serve as a benchmark, as well as the attributes that performed poorly and require improvement.

This study helps us learn more about how the built environment affects pedestrians' actions while walking. The literature reviews allow for the recording of opinions in an unbiased way. This study investigated both the qualitative and quantitative aspects of the design features and physical attributes of the area. The findings indicated that the interventions aimed at altering people's walking habits yielded positive results. Both the visual survey and the walkability checklist prioritised the objective evaluation of the physical characteristics that impact pedestrians' experiences along the PW. Based on this checklist analysis, it is clear that a high-quality PW requires the presence of a number of elements and attributes in order to establish a good score. The varied characteristics require design choices at various spatial dimensions, and they should all be taken into account by those working to make cities safer and more pleasant for pedestrians. The quality of the existing pedestrian walkways was scored 65.8% in average level of walkability, which is within the average scale for having a walkable walkway. The findings demonstrated the extent of the walkability of the existing pedestrian walkways in Sibul's old town b. The pedestrian walkway's comfort and safety scorings were 52.92% and 62%, respectively, which can be categorised as average in the pedestrian walkability scoring scale. The score for pedestrian walkway connectivity was 82.5%, which scored the highest among all 3 attributes. It was categorised as having good pedestrian walkway connectivity.

CONCLUSION

This research offers valuable knowledge about how the built environment influences the behaviour of pedestrians while they walk. Both the visual examination and the walkability assessment focus on objectively evaluating the physical aspects that affect pedestrians' experiences along the pedestrian walkway (PW). According to the checklist analysis, it is evident that a high-quality PW necessitates the inclusion of certain features and attributes to achieve a favourable score. The diverse characteristics necessitate design decisions across various spatial dimensions, and all of these factors should be considered by those working to create safer and more enjoyable urban environments for pedestrians. The overall quality of the existing pedestrian pathways achieved an average walkability score of 65.8%, falling within the typical range for a walkable walkway. These findings revealed the extent of walkability in the Sibu old town. Specifically, the comfort and safety of pedestrian pathways scored of 52.92% and 62%, respectively, classifying them as average according to the pedestrian walkability scale. In contrast, pedestrian walkway connectivity received the highest score of 82.5%, placing it in the category of excellent pedestrian walkway connectivity within the scoring scale.

REFERENCES

- Adam, M., & Bakar, A. A. (2016). INCORPORATING WALKING IN TRAVEL TO WORK: THE MEANING OF COMMUTING FOR KUALA LUMPUR COMMUNITY. *PLANNING MALAYSIA JOURNAL*, 5, 96–97. <https://doi.org/10.21837/pm.v14i5.195>
- Hamsa, A. a. K., Miura, M., Sakurai, O., & Seki, S. (2009). Analysis of streetlight illuminance in residential areas in Kuala Lumpur. *Journal of Asian Architecture and Building Engineering*, 8(2), 547–554. <https://doi.org/10.3130/jaabe.8.547>
- Harun, N. Z., Nashar, A., & Bachok, S. (2020). WALKABILITY FACTORS FOR A CAMPUS STREET. *PLANNING MALAYSIA JOURNAL*, 18(11). <https://doi.org/10.21837/pm.v18i11.708>
- Keat, L. K., Mohd Yaacob, N., & Hashim, N. R. (2016). Campus walkability in Malaysian public universities: a case-study of Universiti Malaya. *PLANNING MALAYSIA*, 5. <https://doi.org/10.21837/pm.v14i5.196>
- Lambert, R. (2021). Walkability in Asian cities. The city at eye level. Retrieved May 14, 2021 from <https://thecityateyelevel.com/stories/walkability-in-asian-cities/>
- Nasrudin, N., Sarimin, M., & Ibrahim, N. (2018). ASSESSING A WALKABLE ENVIRONMENT IN JALAN TUANKU ABDUL RAHMAN, KUALA LUMPUR, MALAYSIA. *PLANNING MALAYSIA JOURNAL*, 16(7), 261–273. <https://doi.org/10.21837/pm.v16i7.516>
- Nasrudin, N., Khalid, N. S., Abdullah, Y. A., Marzukhi, M. A., & Seng, L. B. (2023). MODEL OF PEDESTRIAN CROSSING BEHAVIOUR BASED ON ROAD TRAFFIC AND HUMAN FACTORS: A CASE STUDY OF MALAYSIA'S SHAH ALAM CITY. *PLANNING MALAYSIA JOURNAL*, 21.

Mohd Qhairuxy Shyakirinth Bin Ghadzlie, Molood Seifi, Chih Siong Wong
Evaluating The Walkability of Old Town in Sibu, Sarawak, Malaysia, Through the Assessment of Pedestrian Walkway Quality

<https://doi.org/10.21837/pm.v21i29.1354>

- Ruslan, N., Naharudin, N., Salleh, A. H. M., Halim, M. A., & Latif, Z. A. (2023). SPATIAL WALKABILITY INDEX (SWI) OF PEDESTRIAN ACCESS TO RAIL TRANSIT STATION IN KUALA LUMPUR CITY CENTER. *PLANNING MALAYSIA JOURNAL*, 21. <https://doi.org/10.21837/pm.v21i29.1368>
- Saito, K., Said, I., & Shinozaki, 4M. (2017). Evidence-based neighborhood greening and concomitant improvement of urban heat environment in the context of a world heritage site-Malacca, Malaysia. *Computers, Environment and Urban Systems*, 64, 356-372.
- Shamsuddin, S., Hassan, N. R. A., & Bilyamin, S. F. I. (2012). Walkable environment in increasing the liveability of a city. *Procedia - Social and Behavioral Sciences*, 50 (2012), 167–178. <https://doi.org/10.1016/j.sbspro.2012.08.025>
- Siti, F. I. B. (2014). Factors influencing the walkability of Kuala Lumpur City Centre. Masters thesis, Universiti Putra Malaysia. Unpublished Masters thesis, Universiti Teknologi Malaysia, Skudai, Johor Bahru, Johor.
- Southworth, M.F. (2005). Designing the Walkable City. *Journal of Urban Planning and Development-asce*, 131, 246-257.

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THE IMPLEMENTATION OF PUBLIC PARTICIPATION FOR SIA AND EIA IN MALAYSIA

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Abstract

Public participation is an essential element in the decision-making process of social impact assessments (SIA) for proposed developments that are located near to the community. It assists the panel of evaluators in deciding whether to approve the assessment through the information obtained from the affected community. This medium is also applied to other assessments, such as environmental impact assessments (EIA), and its implementation varies according to the nature of the assessment. However, the objective of public participation remains the same: to protect the interests of the public. Thus, this paper will analyse the implementation of public participation between SIA and EIA in Malaysia using qualitative methods, library research, and comparative analysis. The results show that EIA and SIA each have their own implementations in public participation.

Keywords: Public Participation, SIA, EIA, Process, Malaysia.

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INTRODUCTION

Public participation is a fundamental principle that must be adhered to in order to ensure the efficient operation of assessments. According to Stookes, the level of participation can be categorised into six levels: the right to be informed, the right to be consulted, the right to make representations, the right to be heard, the right to appeal, and the right to be in a position of direct control of certain decisions (Mohd. Anuar, 2015). The main concern here is whether citizens' participation in administrative procedures should be allowed or restricted.

In the context of SIA, it involves engaging with the affected community and stakeholders in assessing the feasibility of the proposed project. These groups are eligible to provide input and feedback on the proposed project. Interactivity is crucial in order to produce better outcomes in development planning (Shahwahid et al., 2023). It will also help avoid any negative perception among the public, who might feel that their opinions toward the proposed development project are meaningless (Maisarah et al., 2016). Maisarah also notes that developers often face challenges in fulfilling the element of public participation in their projects, leading them to perceive this element as a nuisance. However, with the relevant justifications, as stated within this article, there is potential for harmonisation and successful adaptation by all parties, including developers.

The requirement for public involvement in environmental legislation commenced in the late 1960s with the enactment of the National Environmental Policy Act of 1969 (NEPA) in the USA. This necessity has also been acknowledged through Principle 10 of the Rio Declaration and is pivotal in the environmental decision-making process. It plays a crucial role, especially in the scoping stage, where emerging issues are highlighted, necessitating public feedback to prepare the Environmental Impact Statement (EIS). The 1994 Draft Declaration and the Aarhus Convention emphasise the significance of providing early opportunities for public participation in decision-making for development planning (Mohd. Anuar, 2015).

Over time, these issues have extended beyond environmental concerns to impact social aspects, emphasising the need for significant public involvement in SIA (Rabert et al., 1990). Many developed and developing countries have implemented public participation as an integral part of the SIA and EIA processes (Momtaz, 2006). It can enhance decision-making and empower communities in resource development; however, its effectiveness varies depending on the specific project and country (C. Cagnon et al., 1993). Despite the challenges of implementation of public participation in Malaysia's planning system (Marlyana et al., 2022), enhanced public participation in the assessments will lead to improved project formulation, resulting in increased social benefits, reduced environmental costs, and greater economic and financial advantages (E. Kanu et al., 2018).

DISCUSSION
PUBLIC PARTICIPATION FOR SIA

The element of public participation has been specifically addressed in the SIA manual since 2018 in the 'Manual Preparation SIA for Development Project 2018.' This has been further updated by referencing the latest guidance, 'Guidance for the Implementation of SIA for Development Projects', found under Chapter 10 (PPSIA, 2023).

The implementation of SIA comprises various processes, from screening to auditing phases. Typically, public participation occurs during the project planning and implementation stages. However, this approach specifically commences during the second stage, known as the scoping level, aimed at identifying the issues and potential impacts of the proposed development. Therefore, it necessitates input from the affected community, experts, and stakeholders. Figure 1 illustrates the flow of the SIA process, highlighting the involvement of public participation (Manual,2023).

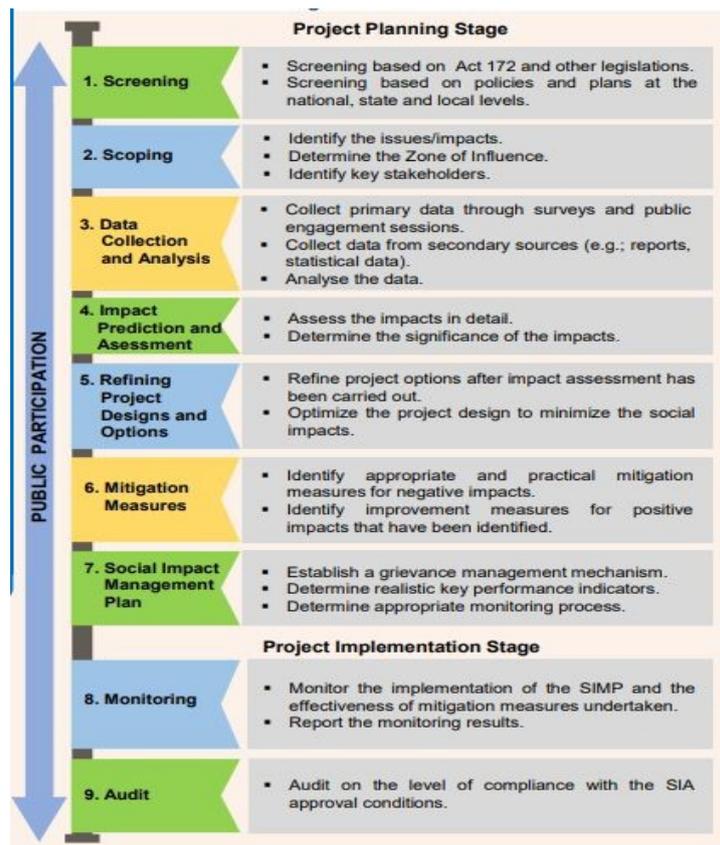


Figure 1: Flow of SIA process in Malaysia

The spectrum of public participation, as outlined in the guidance and adapted from the International Association for Public Participation, serves to bolster public involvement for project proponents and SIA consultants. This spectrum delineates various levels of public influence in decision-making processes for proposed developments, spanning from the informing level to the consulting, involvement, collaboration, and empowerment levels. This engagement will allow the public, particularly affected communities, to access information about the development and offer feedback based on the community's capacity. Effective communication between the project proponent and the community will significantly contribute to identifying relevant solutions for the area. Figure 2 in the guidance illustrates this spectrum of public participation (Manual, 2023).

		Level of Public Influence in Decision Making				
		Inform	Consult	Involve	Collaborate	Empower
Public Participation Goal		To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of the alternatives and the identification of the preferred solution.	To place final decision making in the hands of the public.
	Promise to the Public	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look for you to obtain advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to maximum extent possible.	We will implement what you decide.

Figure 2: Spectrum of public participation

Furthermore, participation also engages stakeholders through various qualitative and quantitative methods, including questionnaire surveys, focus group discussions (FGD), interviews, public forums, workshops, public displays, project information kits, and video-calling applications (Manual, 2023). These approaches aid in data collection and contribute to the effective management strategies of development projects.

PUBLIC PARTICIPATION FOR EIA

EIA also incorporates the element of public participation in its assessment. This aligns with its objective, which is to assure the public and other stakeholders that the project's benefits to society outweigh the environmental costs to society (Guideline,2016). However, this requirement is only mandatory for activities listed under the Second Schedule of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) (Amendment) Order 2015. There are discussions for potential future amendments to this Order, proposed under the Amendment of Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order. Presently, the regulations outlined in the 2015 Order remain in effect (Atheefa et al., 2023).

It is observed in the EIA process that there are two stages incorporating public participation, namely, the pre-submission stage and the submission stage for the prescribed activities under the Second Schedule. In the pre-submission stage, when the Terms of Reference (TOR) is submitted, a TOR Adequacy Check (TORAC) meeting is held to evaluate the TOR. In this meeting, a limited opportunity is given for a selected individual called the 'Appointed Individual' to represent the public in the said meeting. (Maisarah, et. al., 2020)

A week after the submission of the EIA report, it will be displayed for public review and feedback at relevant Department of Environment (DOE) offices, public libraries, and local authority offices. The project proponents will advertise the availability of the report in newspapers for public review, subject to approval by the DOE (Manual, 2016). Additionally, it will be accessible via the DOE website, with notifications provided to the public about the report's availability (DOE, 2023). The report will be displayed for 30 days, during which the public will have 45 days to submit their feedback and comments. Figure 3 illustrates an example of a notification for public display related to a project under the Second Schedule.



Figure 3: Public display of notification by DOE

The project proponent and the EIA consultant must address all written comments received from the public. Afterwards, the responses need to be submitted to the DOE for review, facilitating the prompt approval of the EIA report. It highlights the crucial role of public involvement in the decision-making process regarding the proposed project, as based on the assessment.

Examples of public participation within EIA have been observed in various countries. For instance, for development projects in Sri Lanka, public involvement is notably low, peaking at a maximum of 42%, with no involvement in scoping, indicating the imperative need for increased and improved public participation in national projects (N. Wijesekera, 2006). Conversely, although progress is evident in EIA legislation in China, more effort is required to overcome constraints and fully realize the benefits of public participation in environmental decision-making (Yuhong Zhao, 2010).

METHODOLOGY

This research utilised qualitative methods, including library research, content analysis, and comparative analysis. George (2008) defines library research as collecting, reviewing, and interpreting data from primary sources. Additionally, Zhang and M. Wildemuth (2009) describe content analysis as a research approach used to analyse and interpret textual data, encompassing written documents, interview transcripts, and various forms of communication. This study scrutinised the content of books, articles, related laws, manuals, and reports relevant to the research focus.

The research employed comparative analysis to explore the fundamental principle of public participation in both SIA and EIA. Norat Roig-Tierno et al. (2017) emphasise that this methodology is crucial for establishing causal relationships through systematic comparisons. It specifically utilised methods of agreement and difference between the two models. The data is presented in a matrix table, offering detailed information on public participation. This presentation facilitates a comparison of the similarities and differences in public participation principles employed by SIA and EIA.

ANALYSIS AND CONCLUSION

The findings indicate objective similarities in implementing public participation between SIA and EIA. The concept of 'public' mentioned within this process not only involves the community but also encompasses relevant associations, stakeholders, bodies, and organisations affected by a proposed development. Both SIA and EIA emphasise that integrating two-way communication in the public participation process effectively contributes to the ideal decision-making mechanism by ensuring continuous feedback throughout the entire process. SIA and EIA also have legal instruments for implementing public participation. The SIA Manual, released in 2023, specifies public participation requirements within the SIA process. Meanwhile, for EIA, the 2015 Order and EIA Guidelines mandate this element within the EIA process.

The primary distinction lies in their governance and the respective departments overseeing the assessments. The Town and Country Planning Department (PLANMalaysia) is responsible for overseeing public involvement in SIA implementation, while the DOE ensures public participation in EIA implementation. PLANMalaysia, whether Federal or State, has responsibilities to coordinate and monitor activities involved in the assessment. For instance, any project falling under SIA Category A will be processed by Federal PLANMalaysia, while projects under SIA Category B will be monitored by State PLANMalaysia. Both levels must involve the element of public participation.

Another notable difference between SIA and EIA is the mechanism for executing public participation. EIA has a longer history, dating back to the 1980s, whereas SIA is a more recent development since 2017. As previously mentioned, the public engagement mechanism in EIA is more efficient, with a systematic notification process for public displays announced on the DOE website. Conversely, SIA initiates its publication process in newspapers. Nowadays, not everyone buys newspapers and is aware of announcements made through them. Over time, technology has developed and has increasingly captured the public's attention. As a result, people's awareness may be influenced and heightened by obtaining information through websites or other more sophisticated mechanisms, as implemented by EIA. The advertisement has also been published on the electronic billboard, making people around it aware of the proposed development.

Moreover, methodologies within SIA are more detailed and diverse compared to EIA. SIA employs questionnaire surveys, FGD, interviews, public forums, workshops, public displays, project information kits, and video-calling applications, while EIA mainly relies on public displays. Various methodologies offer options for participants to express their opinions based on their availability and preferred mechanisms. Some participants may be unable to provide direct feedback, as in an interview session. However, after gathering with stakeholders and experts in a group discussion, they can offer necessary feedback regarding the proposed development project. These mechanisms provide alternatives for them and encourage more public engagement.

Other than that, through the EIA process, which consists of two stages in public participation (the pre-submission stage and the submission stage), differences from the SIA process emerge. In the EIA, certain Appointed Individuals representing the public are already involved in the TORAC meeting. In contrast, for SIA, public involvement commences in the second stage of its process, namely the scoping stage. Table 1 presents a summary of a comparison pertaining to the differences in the implementation of public participation between SIA and EIA.

Table 1: Distinctive features for public participation of SIA and EIA

Element	SIA	EIA	Significance
Requirement of public participation	Yes, for SIA Category A & B	Yes, for activity under the Second Schedule	Ensure the accountability of the project proponent and consultant to involve the public in preparing the report
Legal instrument/ Sources for public participation	Guidance for the Implementation of SIA for Development Projects (SIA Manual, 2023)	Environmental Quality (Prescribed Activities) (EIA) Order 2015, Handbook of Environmental Impact Assessment Guidelines' (EIA Guidelines)	To regulate the requirement of public participation in the assessment
Governance body	Town and Country Planning Department (PLANMalaysia)	Department of Environment (DOE)	Regulate and monitor activities under the assessment, including public participation
Notification system	NA	Yes (through website)	To ensure that the public is informed of the report's availability
Methodology	Survey, FGD, forum, interview, public display, workshop, video-calling application	Public display	Various mediums in collecting data from the public
Commencement	Scoping stage (second stage of the SIA process)	Pre-submission stage (during TORAC meeting)	To determine the commencement of public involvement within the assessments

Source: Policies and Frameworks in Malaysia

While the implementation of SIA is relatively recent compared to EIA, it is evident that it possesses a solid foundation for public involvement, aligning with the spirit of society-based assessment. Nevertheless, there is room for improvement over time to adapt to changes and enhance the overall implementation of SIA. Even though EIA is more comprehensive than SIA in Malaysia, it still lags behind other developed countries like Canada, New Zealand, and Australia in terms of the application of public participation (Maisarah et al., 2016) and thus requires improvement for a more effective application in the future. Furthermore, the power of education is also vital in creating awareness among the public, stakeholders, and others regarding the importance of public participation in assessments.

REFERENCES

- Burdge, R. J., & Robertson, R. A. (1990). Social impact assessment and the public involvement process. *Environmental Impact Assessment Review*, 10(1-2), 81-90.
- Department of Environment, Ministry of Natural Resources and Environment Malaysia (2016). *Environmental Impact Assessment Guideline in Malaysia*. 1-224.
- Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) (Amendment) Order 2015.
- Gagnon, C., Hirsch, P., & Howitt, R. (1993). Can SIA empower communities. *Environmental Impact Assessment Review*, 13, 229-253. [https://doi.org/10.1016/0195-9255\(93\)90034-9](https://doi.org/10.1016/0195-9255(93)90034-9).
- George, M. W. (2008). *The Elements of Library Research*. Princeton & Oxford: Princeton university press.
- Kanu, E., Tyonum, E., & Uchegbu, S. (2018). Public Participation in Environmental Impact Assessment (EIA): *A Critical Analysis*., 3, 7-12. <https://doi.org/10.23968/2500-0055-2018-3-1-7-12>.
- Loh, H., Kamarudin, M. K. A., Lian, C. J., Umar, R., & Yii, L. C. (2023). Public Participation in Environmental Impact Assessment (EIA) Law in Malaysia: A Critical Analysis. *Planning Malaysia*, 21.
- Maisarah et. al. (2020), Public participation assessment for EIA in Malaysia, Canada and New Zealand, *Journal of Architecture Planning and Construction Management*, Vol. 10, Issue 1, p.16-30.
- Makmor, M., & Ismail, Z. (2016). Improving environmental impact assessment (EIA) process in Malaysia. *Jurnal Teknologi*, 78(1), 93-107.
- Marzukhi, M. A., Abdullah, J., Leh, O. L. H., Zanudin, K., & Danial, M. H. (2022). THE Challenges of Public Participation in the Malaysian Planning System. *Planning Malaysia*, 20.
- Mohd Anuar, H. (2015). *Environmental rights in Malaysia: public participation under EIA* (Doctoral dissertation, Newcastle University).
- Momtaz, S. (2006). Public participation and community involvement in environmental and social impact assessment in developing countries. *The International Journal of Environmental, Cultural, Economic & Social Sustainability*, 2(4), 89-97.
- Norat Roig-Tierno, Tomas F. Gonzalez-Cruz, Jordi Llopis-Martinez, An overview of qualitative comparative analysis: A bibliometric analysis, *Journal of Innovation*

- & *Knowledge*, Volume 2, Issue 1, 2017,15-23, ISSN 2444-569X, <https://doi.org/10.1016/j.jik.2016.12.002>.
- Official Portal Department of Environment, Ministry of Natural Resources, Environment and Climate Change (2023). Notification of Public Display. (<https://www.doe.gov.my/en/category/eia-report/>).
- PLANMalaysia (2023). Panduan Pelaksanaan Penilaian Impak Sosial.
- Shahwahid, Jahara, Kuppusamy & Herlina. (2023). Social impact assessment practices and applications in Malaysia. *MSIA*, 1-484.
- Suaree, N. A. S. M., Kader, S. Z. S. A., Osman, M. M., Manaf, Z. I. A., & Jaffree, W. K. A. W. (2023). A Comparative Analysis of the Legal Frameworks for SIA and EIA in Malaysia. *Planning Malaysia Journal*, 21.
- Wijesekera, N., & Weerakkody, N. (2006). Public participation in environmental assessment of development projects: The Sri Lankan situation. *Engineer: Journal of the Institution of Engineers*, 39, 7. <https://doi.org/10.4038/ENGINEER.V39I2.7181>.
- Zhang, Y.; Wildemuth (2011) B.M. *Qualitative Analysis of Content*; The University of Texas School: Austin, TX, USA.
- Zhao, Y. (2010). Public Participation in China's EIA Regime: Rhetoric or Reality? *Journal of Environmental Law*, 22, 89-123. <https://doi.org/10.1093/JEL/EQP034>.

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URBAN WATER SECURITY PROTECTION: IDENTIFYING POLLUTION SOURCES IN JURU RIVER BASIN USING CHEMOMETRICS

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Abstract

The consumption of surface water is becoming increasingly significant as a main solution for Malaysia's issues with water supply, especially in urban areas. The study addresses the protection of urban water security by multivariate analysis, evaluating trends in the distribution of water quality parameters and identifies the primary sources and processes involved in water quality contamination in the Malaysian Juru River Basin. Conventional graphical and multivariate statistical methods HACA and PCA from chemometric techniques were used. The data collected in the Juru River was subjected to this investigation, which recorded 19 physical-chemical and microbiological characteristics at two sampling locations throughout the Juru River Basin. Consequently, the HACA was effectively split into the downstream and upstream areas. Six VFs are displayed by PCA in the high pollution source area (HPS), which represents 81.11% of the variance. The main cause of a decrease in water quality in the downstream areas of the Juru River Basin is anthropogenic pollution, or pollution caused by human activities. The study concludes by demonstrating how chemometric techniques can be used to identify significant details about their capacity to interpret complex data that determines the Juru River Basin's spatial and temporal variation in water quality distribution trends into MPS and HPS areas to ensure the urban water security protection.

Keywords: Urban Water Security; Water Security Protection; Water Quality; Principal Component Analysis (PCA); Chemometrics

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INTRODUCTION

River water pollution is widely known to be a global issue. Malaysia, as a member of The Rio Conventions in 1992, also looked seriously at the issue of river water pollution and made the same efforts to deal with this universal issue (Akhtar-Schuster et al., 2017). In order to respond to Agenda 21, which aims to preserve and conserve the environment, including taking care of river cleanliness, the river water quality monitoring programme is given more serious attention. There are two water quality indicator standard, namely the Water Quality Index (WQI) and National Water Quality Standard (NWQS) have been implement as one of monitoring programme since 1978 until now (Sulaiman et al., 2018).

Thereby, the Department of Environment (DOE) of Malaysia uses WQI and NWQS as standards in assessing the level of cleanliness and quality of water supply that can be used for domestic use, aquaculture, and irrigation (Hasib & Othman, 2020). There are six parameters of WQI, such as Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), alkalinity or acidity (pH), and Ammoniacal Nitrogen (NH₃-N), which have been used by the DOE in calculating WQI. These two indices are usually expressed in the form of classes: I, IIA, IIB, III, IV, and V. WQI and NWQS classifications range from class I, which refers to the best, to class V, which is the worst. Next, WQI is also used to determine the status of river water quality, which is classified into three categories: clean (B), Moderately Polluted (ST), and Polluted (T). These two indices have been used as a good water quality benchmarking tool to carry out river water quality monitoring programmes in this country (DEM, 1991; DEM, 2004).

River water pollution on the west coast of Peninsular Malaysia is very severe, especially in large urban and industrial areas. This is effects of the process of urbanisation and industrial activities due to rapid population growth, which directly increase the release of waste directly into the river without limits or controls. Many rivers that flow through this area are threatened by pollution, including erosion and sedimentation, to the extent that they are no longer suitable for drinking water supply, fishing, irrigation, recreation, and environmental habitat. Therefore, Juru River is no exception in this regard. Juru River is one of the rivers in Malaysia that was reported by DOE Malaysia to be severely polluted based on WQI in 1991 and 2004 (Rahmanian et al., 2015; Fitri et al., 2020).

According Toriman et al., (2011), the distribution trends of Class IV and V water quality have been identified in the Juru River Basin. Industrial waste, untreated home trash, and animal waste, such as pig faeces, are the main contributors to pollution. Additionally, it has been demonstrated that tide phenomena influence pollution in two-thirds of the river. Urbanization, which has the greatest impact on a region's hydrology and water quality of all land use changes, is one of the key causes. It decreases storage capacities and shortens the

time needed for concentration, resulting in high peak flows that could cause floods to occur more frequently and with greater intensity. The Juru River is in danger of becoming an open wastewater sewer as more land in the basin becomes urbanized (Karim et al., 2019).

Based on the Zali et al., (2011), for the major manufacturing enterprises at Prai Industrial Estate, the Juru River Basin continues to serve as the primary outflow destination for their effluent. Electronics, textiles, food processing, metal products, the rubber sector, chemical facilities, and transportation equipment make up the majority of the numerous sorts of industries that are still in operation throughout the Juru River Basin (Masturah et al., 2021).

In addition, the studies conducted by Zali et al. (2011) and Idriss & Ahmad (2012) also found that there was a discovery of agricultural waste and metal pollution in this river. Some examples from the DOE's annual report and previous studies show that the pollution of this river occurs continuously due to the higher development of cities and industries along the river. In other words, anthropogenic or human sources of pollution, especially those originating from point sources, are seen as having the potential to affect water quality chemically, biologically, or physically.

Accordingly, this study was conducted with the aim of determining water quality patterns spatially and temporally and identifying the source of water pollution in the Juru River Basin using multivariate analysis. Multivariate analysis using chemometric techniques was performed to analyse water quality data for the years 2009–2013 taken from two sampling stations. This study is expected to predict important differences in water quality after considering the long-term effects of anthropogenic and natural sources along the river.

RESEARCH METHODOLOGY

Juru River is one of the main rivers in the Seberang Perai Tengah district (SPT), which is located in the northern part of Malaysia in Penang. The entire length of the river is about 15.62 kilometres (Toriman et al., 2011). The source of this river starts from Kampung Paya, Kampung Desa Wawasan, Kampung Tanah Liat, Taman Suria Aman, and Taman Berapit nearby from Bukit Mertajam towards the west and ends in the area of Perindustrian Prai (Prai Industrial Estate), where this river flows out into the Straits of Melaka.

Most of the development areas along Juru River Basin have been upgraded into cities and centres of economic activity for urban and sub-urban residents, such as small and medium industries, businesses, and services, as well as government institutions, while some other areas have been maintained as agricultural areas and livestock farms.

A large part of this river basin range covers industrial areas and residential houses. The types of industries that operate include electronics,

textiles, metal-based goods and fabrication, food processing and canning, processing of agricultural products and chemical plants, rubber-based industries, wood products, paper products, printing, and transport equipment (MPSP, 2015).

Based on the background characteristics of the study area, there are two selected sampling stations shown in Table 1 and Figure 1, which represent the downstream and upstream areas of the river. 2JR01 (Prai Industrial Area) and 2J12 (Kampung Tanah Liat) are located next to industrial areas reclaimed from mangrove forests.

Table 1: Department of Environment (DOE)’s Sampling Station in Juru River Basin

River	Sampling Station	Sub River Area	Latitude	Longitude
Juru River	2JR01	Downstream	05°19'91.7	100°26'70.4
Juru River	2JR12	Upstream	05°30'86.5	100°24'96.3

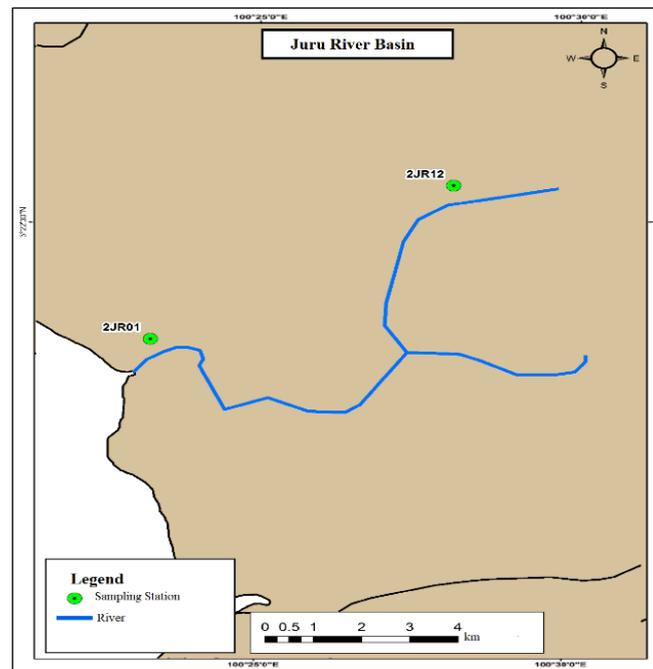


Figure 1: Map of Sampling Station of Department of Environment (DOE) in Juru River Basin, Malaysia

The water quality data in this study was taken from two sampling stations along the Juru River Basin, which are water quality monitoring stations operated by the Department of Environment (DOE), Malaysia. Although there are 30 water quality parameters available, only 19 consistent parameters were selected by focusing on the six main WQI parameters, some physico-chemical

and microbial parameters, as well as other heavy metal pollution parameters. Among these parameters are Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Suspended Solids (SS), alkali or acid (pH), Ammoniacal Nitrogen (NH₃-N), temperature (TEMP), conduction (COND), arsenic (As), Turbidity (TUR), salinity (SAL), nitrate (NO₃), phosphate (PO₄), mercury (Hg), cadmium (Cd), chromium (Cr), lead (Pb), Escherichia coli (E-coli), and coli While, for primary data collection, water sampling for COD and SS analysis was done in a laboratory based on American Public Health Association (APHA) standards, pH, NH₃-N, DO, and BOD parameters were measured in-situ in the field (Zin et al., 2017; Wahab et al., 2018; Hassan et al., 2022).

Then, the secondary data used involves the collection of water quality data by DOE through water sampling works in the field, which are carried out six times a year according to the specified justification. This study applied the multivariate analysis from the chemometric technique by using additional software, XLSTAT 2015. Basically, this software has various other statistical methods that can be used, but this study uses the chemometric technique, which only involves two analysis methods, namely HACA and PCA. Figure 2 shows a summary of the framework for analysing Juru River Basin distribution trends in water quality data from HACA and PCA.

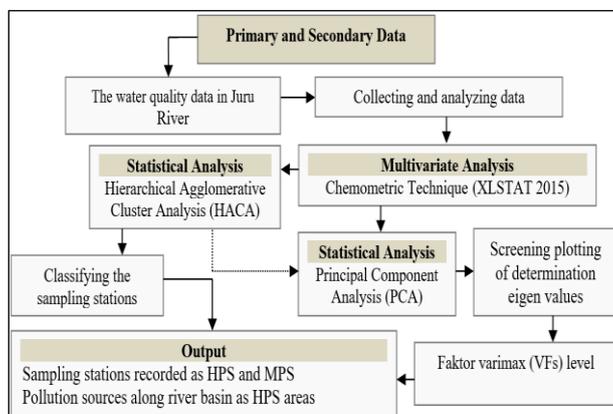


Figure 2: The study framework distribution trends in water quality data using HACA and PCA

The analysis of water quality data in this study basically started by using HACA to determine the pattern of water quality spatially and temporally. HACA is a commonly used method for classification (Hassan et al., 2022) into specific groups with a high level of homogeneity for each group member in a specific class based on pre-determined selection characteristics. Thus, in this study, HACA was used to classify sampling stations from certain groups (clusters)

based on homogeneity characteristics that were analysed using the data that had been collected. The use of this method can simplify and speed up the classification process and identify a set of observations that show significant homogeneity ($P < 0.05$) (Shafii et al., 2019). The results of HACA will be depicted through a tree diagram, also known as a dendrogram, to show clusters or similarities formed from this procedure (Forina et al., 2002; Shafii et al., 2019). Furthermore, PCA analysis was applied to identify the source type of water pollution for each variable. PCA is a method used to see the relationship between variables (Azhar et al., 2015) and how strong the relationship between each variable is after the HACA classification model is produced. The combination of HACA and PCA can provide information about the most important variables due to spatial and temporal variations that describe the entire set of data (Kamarudin et al., 2017; Juahir et al., 2018). Therefore, PCA also consists of the same data set but has been transformed (19 parameters) separately for different spatial regions. In order to achieve the maximum change in this data set, all the new variables, referred to as principal component scores (PCs), were calculated, while the variables that were not counted into the first new variable underwent a second calculation based on this new variable. If there is a new variable that has not been calculated from the first and second, a third calculation has to be done to get the maximum variable. This method is known as varimax rotation in PCA.

This varimax rotation was used to produce a good interpretation of the data because there are also weighting factor values given by PCA that are unclear and not available for interpretation. Thus, in this study, PCA and varimax rotation were used on new variables to produce new groups of variables with eigenvalues greater than 1 that are considered important. These new groups of variables are named varimax factors (VFs). Only factors with a strong weighting value (weighting factor > 0.7) are taken into account in the interpretation of the results (Azaman et al., 2015; Saad et al., 2023). The results of PCA will be illustrated through scree plots of eigenvalue analysis and factor loading tables after varimax rotation. The basic model for this method expressed in the following Equation 1:

$$z_{ij} = a_{f1}x_{1i} + a_{f2}x_{2i} + \dots + a_{fm}f_{mi} + e_{fi} \quad \text{Equation 1}$$

Where;

- z : the component score;
- a : the component loading;
- x : the measured value of variable;
- I : the component number;
- J : the sample number;
- M : is the total number of variables

RESULT AND DISCUSSION

This section discusses the results of the overall study on spatial and temporal water quality distribution patterns based on the classification of sampling stations using HACA analysis. The HACA performed on the water quality data set showed that the sampling station classification was successfully divided into two different clusters, such as cluster 2 and cluster 3, as shown through the Juru River Basin dendrogram in Figure 3 and the sampling station classification map in Figure 4. Cluster 3 from station 2JR01 shows HPS classified as the downstream area of the Juru River as an industrial area (Prai Industrial Area), which is growing rapidly, while station 2JR12 is in cluster 2 as MPS in the upstream area, which is heavily populated in the suburban (Bandar Bukit Mertajam) and is also an agricultural area that is maintained. The results obtained from these two clusters showed HACA is useful in classifying reliable sampling stations for the downstream and upstream areas of the Juru River Basin based on the background characteristics of the same area and water pollution.

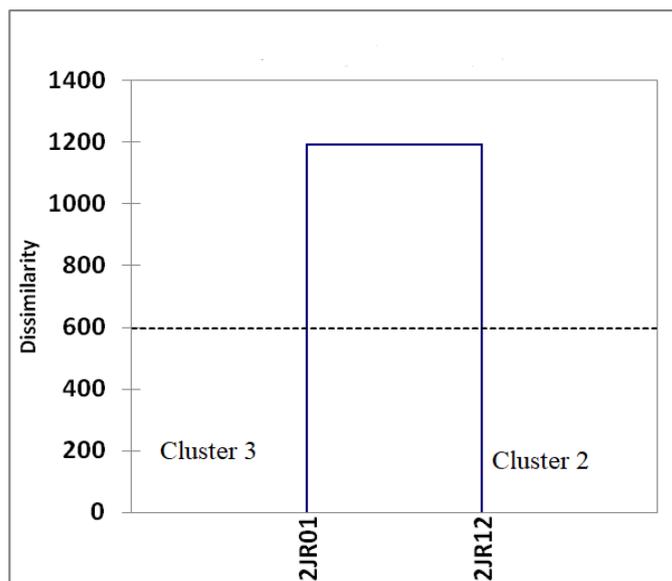


Figure 3: Sampling station classification based on HACA model

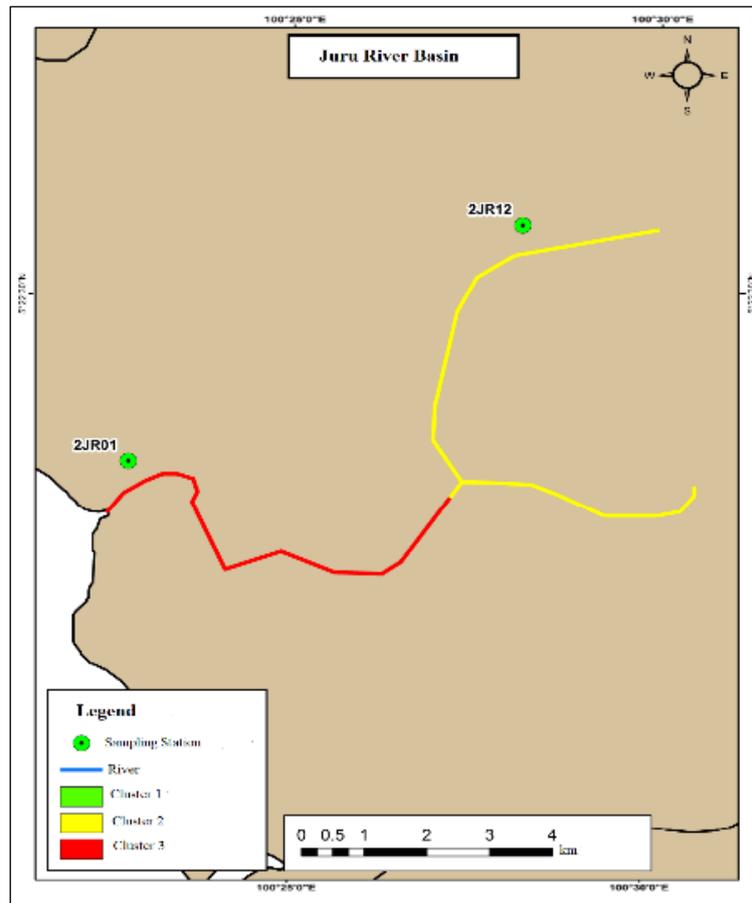


Figure 4: Map of sampling stations classification along downstream and upstream areas of Juru River Basin based on HACA model

Besides that, this section discusses the source of water pollution based on varimax rotation using PCA. The water quality data set was rotated using varimax rotation on new variables to produce groups of new variables with eigenvalues greater than one that are considered important and can be adopted, as shown in Figure 5. There are six VFs in the HPS produced after varimax rotation, contributing as much as 81.11% of the total variance in the water quality data set, as shown in Table 2. The first varimax factor (VF1) contributed 32.48% of the total variance with positive values strongly weighted against TEMP, COND, and SAL. Many physical characteristics of river water are affected by temperature and each other (Hua, 2015).

The main factor in the occurrence of high water temperatures in the downstream area of the river is likely to be related to pollution of inorganic

substances from the industrial area, leading to changes in conductivity in the river water. The increase in high SAL concentration was found to occur when the water temperature around the area also increased due to a high evaporation rate, and this area is also more prone to high tide events resulting in seawater salinity mixed with freshwater salinity as observed in other areas (Salam et al., 2019).

VF2 contributed 16.74% of the total variance, with a positive value strongly weighted to SS and TUR. The influence factor of a high concentration of SS is also the level that increases the turbidity of river water. This is because water turbidity caused by the presence of organic and inorganic substances such as mud and waste from certain surfaces causes river water to become cloudy (Wahab et al., 2018). All of these materials are suspended solids that flow into the water from areas that are open for development and upstream areas. The critical pollution of SS is actually related to anthropogenic or human and natural sources, among which are soil erosion due to unplanned land use development and natural processes such as bedrock erosion and river bank erosion (Rani et al., 2009; Suratman et al., 2013; Mustaffa et al., 2023).

However, in this area, there is an increase in high concentrations of SS, most likely related to the movement of suspended sediment from the upstream areas. As a result, river sedimentation also occurs due to the transport process of various types of loads from the upstream areas (Ata et al., 2016; Wahab et al., 2019). Furthermore, this area is an industrial sector region that is experiencing an increase in industrial areas through land reclamation. This uncontrolled development project caused problems such as sediment deposition, and this result is also consistent with what has been observed in the same area (Kamarudin et al., 2020). Then, VF3 contributed 10.08% of the total variance, with positive values strongly weighted against E. coli and Coliform. The source of Coliform bacteria is found in the faeces of all warm-blooded animals and humans.

According to Tururaja & Moge (2010), domestic waste is categorised as a source of high Coliform bacteria reproduction in densely populated areas. The high concentration of Coliform bacteria in this area indicates a critical pollution level due to the presence of domestic waste from factories or warehouses in addition to rural housing that also drains this waste into concrete ditches near the river (Ateshan et al., 2020) Next, biological pollution, such as animal faeces, causes the emergence of E. coli bacteria. The factor that increases E. coli bacteria is the release of animal faeces near the river, as observed in the same area (Wong et al., 2020).

VF4 contributed 7.96% of the total variance, with a strong positive value towards Cr. Factors that increase the high concentration of Cr metal in this area most likely occur as a result of industrial activities such as textile and paint factories, as observed in other areas (Muneer et al., 2010). The impact of industrial development housing more of these factories contributed industrial-

based waste such as chromium metal in uncontrollable amounts. This metal waste was believed to have been channelled into the river without being processed first or without exceeding the set quality standards (Ahmed et al., 2020). Then, VF5 contributed 7.37% of the total variance, with strong positive values for BOD and COD. An increase in BOD means that there is more organic matter that can be decomposed by microorganisms and more oxygen being used.

The increasing COD concentration occurs because the decomposition of organic matter also takes place through chemical factors. Therefore, the factor increasing the high BOD and COD concentrations in this area is most likely due to domestic sewage waste from factories or warehouses and rural housing. Another factor expected to contribute to the increase in COD concentration in water is agricultural waste processed in agriculture-based factories (Wahab et al., 2018; Maulud et al., 2021). VF6 contributed 6.47% of the total variance, with a strong positive weighted value towards NO₃. The presence of nitrates in water is usually caused by agricultural activities that use inorganic fertilisers and nitrogen fertilisers to increase yields. Therefore, the main factor expected to contribute to the increasing concentration of NO₃ in this area is the flow of agricultural crop waste processed in agriculture-based factories (Tavakoly Sany et al., 2019).

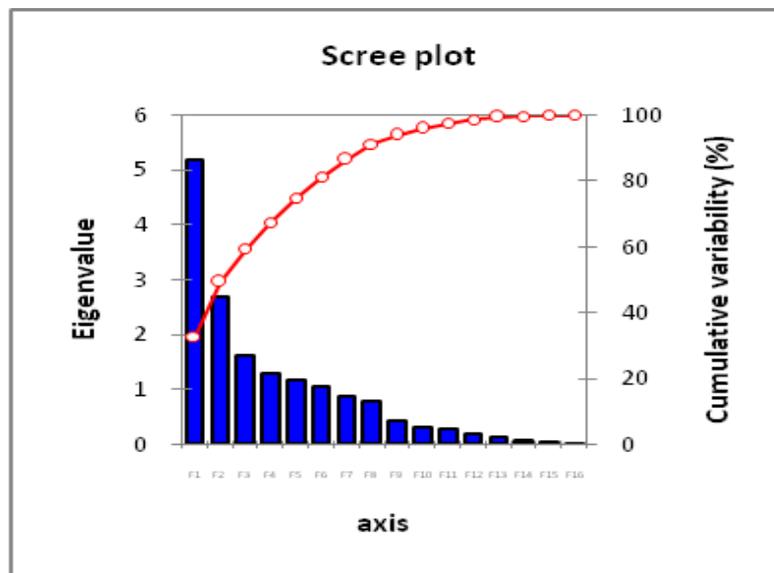


Figure 5: The screening plotting of determination eigenvalues based on PCA

Table 2: Varimax Factor (VF1) based on water quality parameters

Parameter	Higher Pollution Sources					
	VF1	VF2	VF3	VF4	VF5	VF6
DO (mg/l)	-0.115	0.447	-0.132	0.278	0.244	0.247
BOD (mg/l)	0.092	0.309	0.174	-0.147	0.835	0.052
COD (mg/l)	0.182	0.418	0.021	0.245	0.706	-0.016
SS (mg/l)	0.104	0.917	-0.034	0.063	0.155	-0.043
pH (unit)	0.683	0.063	0.051	0.278	0.198	-0.071
NH ₃ -N (mg/l)	0.655	0.049	-0.031	0.557	0.334	-0.131
TEMP (Deg C)	0.870	-0.037	0.140	-0.111	0.097	0.190
COND (uS)	0.938	0.026	-0.017	0.064	0.095	-0.163
SAL (ppt)	0.943	0.017	-0.025	0.050	0.057	-0.159
TUR (NTU)	-0.095	0.939	-0.071	-0.057	0.061	0.029
NO ₃ (mg/l)	-0.193	0.007	-0.096	-0.114	-0.094	0.885
PO ₄ (mg/l)	0.433	-0.116	-0.209	0.231	0.635	-0.289
As (mg/l)	0.560	-0.279	-0.186	-0.146	0.593	-0.202
Hg (mg/l)	0.000	0.000	0.000	0.000	0.000	0.000
Cd (mg/l)	0.000	0.000	0.000	0.000	0.000	0.000
Cr (mg/l)	0.052	0.010	-0.048	0.953	-0.043	-0.070
Pb (mg/l)	0.000	0.000	0.000	0.000	0.000	0.000
<i>E-coli</i> (cfu/100ml)	-0.059	-0.111	0.738	-0.008	0.057	0.399
<i>Coliform</i> (cfu/100ml)	0.069	-0.056	0.885	-0.064	-0.002	-0.285
Eigenvalue	5.197	2.678	1.613	1.274	1.180	1.036
Variance (%)	32.483	16.738	10.079	7.961	7.373	6.472
Cumulatif (%)	32.483	49.222	59.301	67.262	74.635	81.107

CONCLUSION

This study discussed the overall assessment of water quality distribution trends in the Juru River Basin using multivariate analysis adapted to chemometric techniques. Based on the data analysis, HACA has successfully classified the sampling stations into two different clusters by showing the HPS for the downstream area and the MPS for the upstream area. Then, PCA, which is also responsible for the spatial and temporal variation of Juru River water quality, determines the sources of pollution in the HPS area.

The main source of this pollution problem is more exposed to anthropogenic or human effects that come from point sources such as industrial waste, domestic sewage, and agricultural waste, which are mostly produced in factories. The results of this analysis are very useful as a reference and guide for the Department of Environment (DOE) in collecting physico-chemical data and water quality indices, in addition to being able to identify the source of pollutants. These data are also expected to help other government departments and agencies, such as the Department of Irrigation and Drainage (JPS), the Town and Country Planning Department (JPBD), and the National Water Services Commission (SPAN), carry out river and water resource management work in the future.

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REFERENCES

- Ahmed, M. F., Mokhtar, M. B., Alam, L., Mohamed, C. A. R., & Ta, G. C. (2020). Investigating the status of cadmium, chromium and lead in the drinking water supply chain to ensure drinking water quality in Malaysia. *Water*, 12(10), 2653.
- Akhtar-Schuster, M., Stringer, L. C., Erlewein, A., Metternicht, G., Minelli, S., Safriel, U., & Sommer, S. (2017). Unpacking the concept of land degradation neutrality and addressing its operation through the Rio Conventions. *Journal of environmental management*, 195, 4-15.
- Ata, F. M., Kamarudin, M. K. A., Toriman, M. E., Zin, M. S. M., Sulaiman, N. H., Abd Wahab, N., ... & Saad, J. M. (2016). Klasifikasi sedimen menggunakan teknik envirometrik: Satu kajian kes di Sungai Pahang, Malaysia. *Malaysian Journal of Analytical Sciences*, 20(5), 1171-1180.
- Ateshan, H. M., Misnan, R., Sinang, S. C., & Koki, I. B. (2020). Evaluation of water pollution and source identification in Merbok River Kedah, Northwest Malaysia. *Malaysian Journal of Fundamental and Applied Sciences*, 16, 458-463.
- Azaman, F., Juahir, H., Yunus, K., Azid, A., Kamarudin, M. K. A., Toriman, M. E., ... & Saudi, A. S. M. (2015). Heavy metal in fish: Analysis and human health-a review. *Jurnal Teknologi*, 77(1), 61-69.
- Azhar, S. C., Aris, A. Z., Yusoff, M. K., Ramli, M. F., & Juahir, H. (2015). Classification of river water quality using multivariate analysis. *Procedia Environmental Sciences*, 30, 79-84.
- DEM. 1991. Environment Water Quality Report. Ministry of Natural Resources and Environment, Kuala Lumpur, pp: 119-123.
- DEM. 2004. Environment Water Quality Report. Ministry of Natural Resources and Environment, Kuala Lumpur, pp: 32-115.
- Fitri, A., Maulud, K. N. A., Pratiwi, D., Phelia, A., Rossi, F., & Zuhairi, N. Z. (2020). Trend Of Water Quality Status In Kelantan River Downstream, Peninsular Malaysia. *Jurnal Rekayasa Sipil*, 16(3), 178-184.
- Forina, M., Armanino, C. & Raggio, V. 2002. Clustering with dendograms on interpretation variables. *Analytica Chimica Acta*, 454, 13-19.
- Hasib, N. A., & Othman, Z. (2020). Assessing the relationship between pollution sources and water quality parameters of Sungai Langat basin using association rule mining. *Sains Malaysiana*, 49(10), 2345-2358.
- Hassan, M.A. A., Kamarudin, M. K. A., Samah, M.A.A, Toriman, M. E., Gasim, M.B., Hanafiah, M.M., Alubyad, L.O.M., Saudi, A. S. M., Maulud, K. N., Wahab, N. A., Bati, S. N. A. M., Erhayem, M. (2022). Spatial and temporal variations of river water quality using multivariate statistical techniques. *Desalination and Water Treatment*, (269), 106-122.
- Hua, A. K. (2015). Kualiti sumber air di Malaysia: Satu analisis (The quality of water resources in Malaysia: An analysis). *Geografia*, 11(6),1-12.

- Idriss, A. A., & Ahmad, A. K. (2012). Concentration of selected heavy metals in water of the Juru River, Penang, Malaysia. *African Journal of Biotechnology*, 11(33), 8234-8240.
- Juahir, H., Gasim, M. B., Kamarudin, M. K. A., Azid, A., Hairoma, N. S., Saad, M. H. M., & Mokhtar, M. (2018). Assessment by multivariate analysis of groundwater between low and high tides interactions in east coast of Terengganu. *Int J Eng Technol*, 7(3.14), 80-84.
- Kamarudin, M. K. A., Wahab, N. A., Samah, M. A. A., Baharim, N. B., Mostapa, R., Umar, R., Abdul, K. N. (2020). Potential of field Turbidity measurements for computation of Total Suspended Solid in Tasik Kenyir, Terengganu, Malaysia. *Desalination and Water Treatment*, (187), 11-16.
- Kamarudin, M. K. A., Toriman, M. E., Wahab, N.A., Juahir, H., Endut, A., Umar, R., Gasim, M.B. (2017). Development of stream classification system on tropical areas with statistical approval in Pahang River Basin, Malaysia. *Desalination and Water Treatment*, (96), 237-254.
- Karim, B. A., Sharif, S., Zakaria, H., & Azis, T. M. F. (2019). Influential water quality parameter in Juru River Basin using PCA. *Test Engineering and Management*, 81, 819-825.
- Masthurah, A., Juahir, H., & NB, M. Z. (2021). Case study Malaysia: Spatial water quality assessment of Juru, Kuantan and Johor River Basins using environmetric techniques. *Journal of Survey in Fisheries Sciences*, 19-40.
- Maulud, K. N. A, Fitri, A., Wan Mohtar, W. H. M., Wan Mohd Jaafar, W. S., Zuhairi, N. Z., & Kamarudin, M. K. A. (2021). A study of spatial and water quality index during dry and rainy seasons at Kelantan River Basin, Peninsular Malaysia. *Arabian Journal of Geosciences*, 14, 1-19.
- Muneer, M., Bhatti, I. A., & Shahid, A. (2010). Removal of Zn, Pb and Cr in textile wastewater using rice husk as a biosorbent. *Asian Journal of Chemistry*, 22(10), 7453-7459.
- Municipal Council of Seberang Perai (MPSP). Draf rancangan tempatan daerah Seberang Perai Tengah 2020. Pulau Pinang: MPSP, 2015.
- Mustaffa, H., Kamarudin, M. K. A., Toriman, M. E., Rosli, M. H., Sunardi, S. (2023). Impact of Suspended Sediment on Pahang River Development using Geographic Information System. *Planning Malaysia*, 21(1), 116 – 133.
- Rahmanian, N., Ali, S. H. B., Homayoonfard, M., Ali, N. J., Rehan, M., Sadeh, Y., & Nizami, A. S. (2015). Analysis of physiochemical parameters to evaluate the drinking water quality in the State of Perak, Malaysia. *Journal of Chemistry*, 2015, 1-10.
- Rani, N. S. A, Toriman, M. E. H., Idris, M. H., Jamil, N. R., & Kamarudin, M. K. A. (2009). Muatan sedimen terampai dan perkaitannya dengan penghasilan muatan sedimen pada musim kering dan hujan di Tasik Chini, Pahang. *e-BANGI: Jurnal Sains Sosial dan Kemanusiaan*, 1, 70-83.
- Saad, M. H. M., Kamarudin, M. K. A., Toriman, M. E., Wahab, N.A, Ata, F. M., Samah, M. A. A., Manoktong, S. N. (2023). Analysis of the Flash Flood Event and Rainfall Distribution Pattern on Relau River Basin Development, Penang, Malaysia. *Planning Malaysia*, 21(1), 58-71.

- Salam, M. A., Kabir, M. M., Yee, L. F., & Khan, M. S. (2019). Water quality assessment of perak river, Malaysia. *Pollution*, 5(3), 637-648.
- Shafii, N. Z., Saudi, A. S. M., Pang, J. C., Abu, I. F., Sapawe, N., Kamarudin, M. K. A., & Saudi, H. F. M. (2019). Application of chemometrics techniques to solve environmental issues in Malaysia. *Heliyon*, 5(10), 1-12.
- Sulaiman, N. H., Khalit, S. I., Sharip, Z., Samsudin, M. S., & Azid, A. (2018). Seasonal variations of water quality and heavy metals in two ex-mining lake using chemometric assessment approach. *Malaysian Journal of Fundamental and Applied Sciences*, 14(1), 67-72.
- Suratman, S., Tahir, N. M., ERG, K. P. A. S., & Kimia, J. S. (2013). Kesan Antropogenik Terhadap Kualiti Air di Lembangan Sungai Marang. *Sains Malaysiana*, 42(6), 743-751.
- Tavakoly Sany, S. B., Monazami, G., Rezayi, M., Tajfard, M., & Borgheipour, H. (2019). Application of water quality indices for evaluating water quality and anthropogenic impact assessment. *International journal of environmental science and technology*, 16, 3001-3012.
- Toriman, M. E., Hashim, N., Hassan, A. J., Mokhtar, M., Juahir, H., Gasim, M. B., & Abdullah, M. P. (2011). Study on the impact of tidal effects on water quality modelling of Juru River, Malaysia. *Asian Journal of Scientific Research*, 4(2), 129-138.
- Tururaja, T., & Moge, R. (2010). Bakteri coliform di perairan Teluk Doreri, Manokwari aspek pencemaran laut dan identifikasi species. *Ilmu Kelautan: Indonesian Journal of Marine Sciences*, 15(1), 47-52.
- Wahab, N. A., Kamarudin, M. K. A., Toriman, M. E., Juahir, H., Saad, M. H. M., Ata, F. M., Ghazali, A., Hassan, A. R., Abdullah, H., Maulud, K. N., Hanafiah, M. M., Harith, H. (2019). Sedimentation and water quality deterioration problems at Terengganu River Basin, Terengganu, Malaysia. *Desalination and Water Treatment*, (149), 228-241.
- Wahab, N. A., Kamarudin, M. K. A., Toriman, M. E., Ata, F. M., Juahir, H., Ghazali, A., Anuar, A. (2018). The evaluation of Dissolved Oxygen (DO), Total Suspended Solid (TSS) and Suspended Sediment Concentration (SSC) in Terengganu River, Malaysia. *International Journal of Engineering and Technology*, 7(3.14), 44-48.
- Wong, Y. J., Shimizu, Y., He, K., & Nik Sulaiman, N. M. (2020). Comparison among different ASEAN water quality indices for the assessment of the spatial variation of surface water quality in the Selangor river basin, Malaysia. *Environmental monitoring and assessment*, 192, 1-16.
- Zali, M. A., Retnam, A., & Juahir, H. (2011). Spatial characterization of water quality using principal component analysis approach at Juru River Basin, Malaysia. *World Applied Sciences Journal*, 14, 55-59.
- Zin, M. S. M., Juahir, H., Toriman, M. E., Kamarudin, M. K. A., Wahab, N. A., & Azid, A. (2017). Assessment of water quality status using univariate analysis at Klang and Juru river, Malaysia. *Journal of Fundamental and Applied Sciences*, 9(2S), 93-108.

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STRATA MANAGEMENT AND MAINTENANCE: A COMPARATIVE ANALYSIS OF MALAYSIA AND SELECTED COUNTRIES

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Abstract

The escalating trend of high-rise strata living, coupled with the evolution of strata law in Malaysia, prompts an in-depth exploration of the strata management landscape in Australia, Singapore, and Hong Kong. This comparative analysis delves into various aspects, including development trends, laws, practices, and issues, offering valuable insights for Malaysia's strata living and building conditions. Many approaches from the selected countries align with Malaysia, while certain aspects warrant further exploration. Specifically, into areas such as the calculation of share value and maintenance fee as well recovery of unpaid fees. Additionally, considering the aging building factor, there's potential to introduce a blueprint or guideline for reviewing maintenance charges and sinking funds and its collection. The long-term strategy for Malaysia involves investing in awareness and facilitating access to information on costs of strata living and building maintenance.

Keywords: residential high-rise strata development, Strata Management Act 757, NSW Strata Law, Singapore Strata Management, Hong Kongs's Building Management Ordinance

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INTRODUCTION

The notion of Strata Management was traced back to have originated in Australia and has been extensively embraced globally, including in countries like Singapore, Canada, the Philippines among others, including Malaysia. Each country that has adopted strata management laws has further customised the frameworks to better suit their local circumstances. In Malaysia, since the introduction of the strata management concept, the corresponding law have progressively evolved, undergone amendments and improved over time, has now reached a more advanced state, known as the Strata Management Act 2013 (Act 757) & Regulations, with still room for improvements as the strata development trend further develops.

To achieve the goal of quality strata living and strata building management, this paper explores the differences and similarities between existing laws and practices established in other countries, particularly Singapore, Australia and Hong Kong. Australia's New South Wales (NSW) jurisdiction was selected for the study is primarily based on the assertion that the strata management concept originated in Australia and that it has since been widely adopted globally. Singapore was selected as the second benchmarks country due to its statutory similarities in strata management. Like Malaysia, Singapore also looked to Australian strata law before formulating the strata management law to suit their specific context. In the case of Hong Kong, the prevalence of high-rise living and the aging residential building draw parallels with Malaysia. Apart from new high-rise developments, Hong Kong consistently focuses on maintaining and assessing the aging process of their high-rise residential structures, which is the same direction as for most existing low-cost high-rise strata housing in Malaysia.

The housing sector indirectly fosters the economic development through the construction activities. Consequently, the Malaysian government consistently underscores the importance of constructing sufficient and affordable housing. In this case, Singapore and Hong Kong is comparable to Malaysia's strata development scenario and are notable examples where a significant proportion of their population has been provided with housing (Shahedin, 2020; Yeung & Drakakis-Smith, 1974).

The results of this study are anticipated to enhance understanding and to fill existing gaps towards improving the Malaysian strata management practices.

STRATA DEVELOPMENT: AN OVERVIEW

Malaysia

As of December 2020, there are more than 1.589 million strata units within Peninsular Malaysia alone (Radha & Razali, 2023). Forward to the 2021 data from the National Property Information Centre (NAPIC), it was revealed that the

total transactions in the residential sector account for 70% (42,620 units) of the total transactions, surpassing other sectors. Meanwhile, comparing between strata and landed properties, strata development records a higher number of transactions in both the third quarter of 2019 and the third quarter of 2020. The high-rise strata properties specifically shows a more significant difference compared to landed properties, with transactions consistently ranging between 18% to 28% higher in all three quarters (NAPIC, 2022).

From the legal perspective, the strata properties in Malaysia are governed by Strata Titles Act, Strata Management Act, with association with the Housing Developers (Control & Licensing) Act & its Regulations, among other development related legislative documents. In the context of the Strata Management Act, the Commissioner of Buildings (COB) serves as the empowered legal authority responsible for overseeing the comprehensive implementation of the Act. The Act also incorporates the Joint Management Body (JMB) and the Management Corporation (MC), the inclusion that was based on the expectation that these management bodies are professionally capable to effectively handle building, financial and resource management of their respective registered strata schemes.

The Strata Management Act 757 assigns a distinct role to share units, employing them to calculate maintenance charges and sinking funds, while also reflecting the allocation of voting power among strata owners. The Act outlines specific weightage factors for different parcel types. Despite approval from the COB on the share unit calculations, there are still disagreements over the maintenance fee that often result in refusals to pay or disputes between residents and the management body. Residents' disapproval of the fee amount is a significant factor contributing to non-payment. A report noted that residents were only willing to pay RM20, even after the fee was already the reduced amount. The Strata Management Tribunal predominantly handles six common claims, with approximately 80% concerning the collection of maintenance charges, contributions, debts, and unit shares. The remaining 10% pertain to meeting-related issues, while another 10% focus on management operations (Roznah, 2022).

Several method were used to recover unpaid maintenance fee from strata owners, that includes Warrant of Attachment, or by publishing names of defaulters, restrictions over access to buildings and/or common facilities, and instalment payments, to name a few (Chan & Teh, 2020). While certain methods aimed at recovering outstanding sums show promise, they have not yielded satisfactory long-term results or effectively resolved the issue at hand.

Insufficient maintenance fee collection negatively impacts building conditions, hindering necessary repair and maintenance work. Thus, numerous reports and studies highlight the subpar condition of low-cost strata housing in

Malaysia, particularly emphasizing poor maintenance especially of lift services, poor cleaning services and inadequate management services (Noor Suzilawati et al., 2021; Nurul Ain Sahira & Aryani, 2021; Wahi et al., 2018). As poor maintenance builds up and the building ages, regrettably, there are no specific guideline for regular building condition valuation towards ensuring that the buildings are continuously fit to be occupied especially for the low-cost strata housing. Nor were there any in-depth discussion on appraisal for the revision of sinking funds as practiced in Singapore (KRI, 2023). Instead focuses on 'remedial' repairs upon conforming major failure or deteriorating building condition through 'responsive' maintenance programmes for affordable housing that includes Program Penyelenggaraan Perumahan (PPP), and the Program Tabung Penyelenggaraan 1Malaysia (TP1M) (Au-Yong et al., 2018; PropertyGuru Editorial Team, 2020).

Australia

Sydney's first high-rise strata housing dated back to the early 20th century, initially designed for both living and professional use. After the World War II, there was a surge in demand for residential units, however, at the time high-rise residential ownership was not popular compared to present time. The property market in NSW is one of the most sought after in Australia, with over 84,000 existing strata schemes in NSW and the year 2040 projection shows that half of Greater Sydney's population will reside in strata buildings (HtAG® Analytics, 2023). The rising population of strata title ownership can be attributed to various factor such as conversion of formerly single-owned buildings, new development initiatives and government policies in promoting vertical growth in urban areas. The growing importance of strata development is evident as it is projected to involve property management worth AUD350 billion in NSW alone. With 15% of the entire NSW population now resides in apartments, villas, units or townhouses.

Introduced in 1948, the Australian strata law has further since evolved and been adopted by various countries, each infusing their own nuance to align with distinct cultural and lifestyle characteristics. Presently the regulatory framework overseeing the strata schemes in NSW are in accordance to the Strata Scheme Development Act 2015 (Development Act) under the governance of the Minister for Customer Service and the Strata Schemes Management Act 2015 (Management Act) as administered by the Minister for Better Regulation and Innovation (NSW Government, 2021).

The management contribution fee is a responsibility outlined in the act, signifying the owner's duty to uphold and repair the common property. Unfortunately, this obligation is frequently disregarded by owners' corporation. In NSW, the law focuses on the account sold units rather than the total share

aggregate. The owners' corporation is formed when the sold units reached at least one-third of the total developed units. Each owner is obligated to pay levy, which is occasionally referred to as 'contribution' or 'fee'. The fee amount for each owner is determined by the treasurer or the strata manager based on their 'unit entitlement' which represents the owners' share of ownership in the strata scheme (NSW State Government, 2018). There is the 'administrative fund' allocated for everyday expenses such as garden maintenance and strata management fees and additionally, a 'capital works fund' is designated for significant building projects like the replacement of roofing, lifts, or fencing.

Owner's failure to pay the strata levy can be recovered through these methods (Singh & Benson, 2021):

- i) Legislation allows owners corporation to recover unpaid levies after one month, along with interest and recovery expenses. Strata manager handles unpaid levies, costs charged to owner's lot statement. Owners Corporation may appoint debt collection lawyer at AGM.
- ii) Garnishee Order: Court order requires entity (e.g., bank or employer) to pay money from debtor's bank account or wages to Owners Corporation.
- iii) Writ for Levy of Property: Court order authorizes sheriff to seize and sell debtor's assets to repay debt.
- iv) Bankruptcy Notice: Alerts individual debtor that bankruptcy proceedings may follow if debt remains unpaid.
- v) Creditor's Statutory Demand: Alerts company debtor that winding up proceedings may follow if debt remains unpaid.

When it comes to the shared facilities that are commonly found in mixed-use developments where owners from different sections of the building use these amenities, the legislation does not explicitly assign responsibility for maintaining and repairing these shared features. Instead, it stipulates that the management themselves must guarantee fair distribution of expenses related to these shared facilities among different sections of the building. Furthermore, the agreed statement must specify the method employed to apportion the cost associated with these shared expenses (NSW Government, 2021). Should owners' corporation wish to terminate, vary terms of agreement and matters of disputes, among others, Owners Corporation may proceed or apply to the NSW Civil and Administrative Tribunal.

Singapore

There are primarily four main residential categories in Singapore; Housing & Development Board (HDB) flats, condominiums, apartments and landed properties along with other types of dwellings. Reported data indicates that HDB

dwellings collectively constitute more than 50% of the total housing units in Singapore (Christudason, 2004; *Singapore Household Statistics*, 2022).

Therefore, Singapore is committed to advancing the strata property management, particularly given that a significant portion of the strata properties are public HDB flats rather than private residential high-rises which are maintained and managed by respective town council. The ownership of public strata housing typically takes the form of a leasehold with a 99 years tenure. Despite the leasing arrangement, tenants are responsible for their individual units. While the Town Council is tasked with maintaining the common properties. Whereas in private developments with shared properties bear responsibilities to upkeep the common properties. The maintenance and management of strata properties in Singapore are overseen by the Land Title (Strata) Act (LTSA) and the Building Maintenance and Strata Management Act 2004 (BMSMA).

Each home purchaser is obligated to take responsibilities for aspects like the Share Unit Value, Establishment of Management Corporation, Maintenance and Sinking Fund, Managing Agents, utilization of common properties, and dispute resolution, among others. The collection of maintenance fee varies between HDB properties that pays according to respective Town Council, whereas private properties pay according to their respective property managements (A. Khoo, 2022; Ng, 2022). However, the extent of expectation and responsibility associated with managing and maintenance affairs has grown notably challenging, especially to the Town Council due to the rising costs and the inclusion of additional features in newer properties, making such service to may not necessarily be of economic value to continue to be under the responsibility of the Town Council (Ng, 2022).

Despite being under the management of the Town Council, Singapore too faces poor payment of maintenance fees. There are various strategies available to management to recover shortfalls in the maintenance fund resulting from defaulters of the S&CC, such as (Virginia Tanggono, 2021):

- i) Subject to interest charges and receipt of a lawyer's letter.
- ii) Defaulters may face fines of up to \$10,000 Singapore dollars.
- iii) Management may escalate the matter to the Tribunal or Courts.
- iv) The property may be auctioned off with specific prerequisites.

In addition to proactive maintenance planning conducted by property managers, the Singapore government has implemented long-term renewal policies for public housing, the likes of Lift Upgrading Programme (LUP), and the Home Improvement Programme (HIP) to name a few (Ahmad Ezanee et al., 2015)

Hong Kong

In Hong Kong, there are typically nine prevalent housing styles, including high-rise, low to mid-rise, duplexes, needle towers, walk-ups, townhouses, village houses, and luxury residences. Beyond these common housing types, the housing sector in Hong Kong can be classified into public rentals and subsidized flats administered by the Hong Kong Housing Authority. Public rental flats and subsidized sale flats make up approximately 43% of the total units. Factoring the private quarters that includes various types of flats and private blocks, high-rise residential properties, the total constitute over 50% of the overall housing supply in Hong Kong (Census & Statistics Department, 2022).

The statistic indication of continuous increase in the number of housing units in Hong Kong, especially in high-rise residential properties has significant implications for property management to uphold building quality. The relevant statutory provision include the Building Management Ordinance (BMO), which safeguards incorporated owners, Deed of Mutual Covenant (DMC) and the Property Management Services Ordinance (PMSO) which regulates the functioning of property management corporations (C.W. Ho & Liusman, 2016; Tiun, 2006; Wadu Mesthrige, 2021; Wong & Lai, 2021). There are primarily three types of owners' corporation in Hong Kong, Mutual Aid Committees and Owners' Committees (OC), Incorporation of Owners (IO), and / or the property management company (PMC). Of these, only Incorporation of Owners receive protection under the BMO (C.W. Ho & Liusman, 2016; Wadu Mesthrige, 2021).

The formation of owners corporation among owners of high-rise residential are voluntary in Hong Kong, unlike in Australia and Singapore which is a regulatory requirement to form the owners corporation and are automatically formed according to the ownership (Consumer Council, 2023). The management fees' calculation and charges are based on undivided shares, floor area and service contract with PMC. It is crucial to note that the developer creates the Deed of Mutual Covenant (DMC) following its Guidelines and potentially without the presence nor involvement of the purchasers and potential purchasers throughout the process. As a result, management fee disputes occasionally arise involving matters like undivided shares, unfair division of common facilities and unfair distribution of expenses amongst owners. If owners fail to pay management fees, maintenance fees, or funds, the owners' corporation (OC) may take the following actions (Home Affairs Department, 2024):

- i) Contact owner/tenant for payment before due date.
- ii) Send reminder via double registered mail with relevant legislation extract.
- iii) Pursue payment through lawyer, with possible Land Registry record of default.
- iv) File claim with Small Claims Tribunal for outstanding sums.

- v) Small Claims Tribunal handles claims up to \$75,000; District Court for claims \$75,000 to \$3,000,000; High Court for claims over \$3,000,000.

In terms of substantial maintenance or refurbishment initiatives, Hong Kong initially implemented various funding programs, including the Mandatory Building Funding Program, interest-free loans for household maintenance, and Funding Group Ownership Case Law Group funding. However, authorities observed overlaps with the government's Public Local Maintenance Funding. Consequently, the decision was made to discontinue the overlapping plans and channel support through the Public Local Maintenance Funding, People in Need to Repair Self-Occupied Property Allowance Plan, and the Building Safety Loan Plan of the Housing Department (Urban Renewal Authority, 2024). These programs aim to cater to the diverse needs of property owners and assist them in meeting their maintenance responsibilities.

Despite the positive impact of these funding initiatives, challenges persist for buildings without established corporations, mainly due to the majority of owners being elderly. To address this issue, the Urban Renewal Authority has introduced the Integrated Building Rehabilitation Assistance Scheme, incorporating the Building Maintenance Grant Scheme for Needy Owners (BMGSNO). The BMGSNO provides financial aid to eligible owner-occupiers aged 60 or above, meeting income and asset limits or receiving the Old Age Living Allowance (OALA) among other criteria, to help cover repair and maintenance costs for their self-occupied properties. This initiative aims to alleviate building deterioration and enhance safety. (Urban Renewal Authority, 2023).

METHODOLOGY

This study employs a comparative analysis to explore distinctions in the enforcements and practices of strata management between Malaysia and other selected countries. Where the data is presented using the cross-tabulation method and matrix table, providing insights into the strata law and management practices. This paper extends its comparative analyses to examine the fundamental background of strata management and maintenance and practices along with the respective legal framework in conducting the assessment.

DISCUSSION

The most significant similarities between these four countries are the increasing demand for high-rise strata properties, that includes the increasing trend for mixed-use developments. Though by comparison each country has different drive, such as Singapore and Hong Kong are mainly due to scarcity of land while

for Australia and Malaysia are more into the convenience that strata living has to offer.

This study presents its findings indicating the difference in practices and regulation enforcements within Malaysia and other counties gathered as tabulated in Table below:

Table 1: Summarized comparison of strata management

	Malaysia	Australia	Singapore	Hong Kong
Strata laws and regulations	Strata Title Act 318 Strata Management Act 757	Strata Schemes Development Act Strata Scheme Management Act	Land Title (Strata) Act Building Maintenance and Strata Management Act 2004	Building Management Ordinance Property Management Services Ordinance
Laws on deciding of Maintenance fee	Formula as provided in SMA757 and STA318	No specific law. Calculated based on unit entitlement, while frequency of payment is decided by owners' corporation.	Assigned share value approved by the COB.	According to the Deed of Mutual Covenant Guidelines
Authority and Stakeholders	Commissioner of Buildings (COB), Joint Management Body (JMB), Management Corporation (MC)	Minister for Customer Service, Minister for Better Regulation and Innovation, Owners Corporation	Commissioner of Buildings (COB), Town Council, Owners' Corporation	Owners' Committees (OC), Incorporation of Owners (IO), property management company (PMC)
Owners' Corporation	Compulsory / regulated	Compulsory / regulated	Compulsory / regulated	Voluntary
Strata Living Guidelines	Strata Management Handbook: A Clear and Comprehensive Guide to Strata Living in Malaysia by REHDA	Strata Living: Get Involved by NSW Government	Strata Living in Singapore: A General Guide by Building and Construction Authority	A Guide on Building Management Ordinance (Cap.344)
Maintenance fee Guideline	Calculated based on Share Unit Allocation	No Specific law, Estimation by Owners Corporation for	<u>For HDB and Private schemes:</u> Share value	Amount is based on size of each unit, undivided

	Malaysia	Australia	Singapore	Hong Kong
	through weightage factor	Administrative and Capital Work Funds	<u>Mixed-use developments:</u> Weight Factor calculation	shares, and service contract
Recovery of sums due	Warrant of Attachment, publishing names of defaulters, restrictions over access to buildings and/or common facilities, and instalment payments	Imposing interest on unpaid levies, Court order, seize and sell, Bankruptcy, Creditor's Statutory Demand	Lawyer's letter, fines up to \$10,000, Tribunal / Court, auctioned off properties.	Direct negotiation, Registered mail, Lawyer's letter, Tribunal.
Long term (major) Maintenance programme	Program Penyelenggaraan Perumahan (PPP), Program Tabung Penyelenggaraan 1Malaysia (TP1M)	Each strata development must make the 10-year plan from the first AGM and reviewed at least every 5 years.	Lift Upgrading Programme (LUP), Home Improvement Programme (HIP)	Public Local Maintenance Funding, Integrated Building Rehabilitation Assistance Scheme and many more

Source: Author (2023)

The findings indicate similarities on the basis of strata law framework between Malaysia, Australia and Singapore. The finding in Table 1 shows that the strata law in Malaysia and Singapore reflects thereof the Australian strata law as was claimed earlier in the study on the historical aspect of strata law.

Further onto Table 1, the comparative study found that both Malaysia and the three analysed countries encounter challenges associated to maintenance costs and / or maintenance charges. In general, the approach to calculating maintenance charges based on floor area is similar across selected countries. However, Malaysia lacks a specific standard or rates of reference or fee scales (Tiun, 2006) that stakeholders can use to assess the fairness of the charged fee amount. Unlike Australia, which depends on property market value, and HDB units in Singapore with justified rates due to subsidized fees by the local council, Malaysia lacks a general and accessible baseline for evaluating maintenance charges. This poses a concern, especially considering the number of disputes on maintenance rates filed by strata owners against their respective management bodies.

Disputes over the fairness of maintenance fees have exacerbated problems such as delayed contributions and outstanding payments. While each country and management body employ its own methods for recovering overdue

sums, Malaysia tends to take a more lenient approach, allowing for instalment payments or restricting access to common facilities. In contrast, countries like Singapore and Hong Kong frequently utilize legal notices, a practice permitted under their respective strata management regulations. Considering these practices, Malaysia could benefit from adopting a more proactive approach, including Lawyer's letters like Singapore and Hong Kong as well as implementing late payment penalties akin to those in Australia, to deter tardiness and improve the current situation of outstanding dues.

Concerning long-term major refurbishment and aging buildings, Malaysia, Singapore, and Hong Kong provide subsidies or funding plans with specific conditions. In contrast, Australia mandates each development to create a 10-year plan for major rectification works from the first general meeting, subject to review at least every 5 years.

In regards to mixed-use developments, there is an arise concerning the affairs in differentiating and defining the maintenance costs for shared common facilities among various types of property owners and tenants. Singapore in particular has imposed two different calculation formula where residential strata employ floor area based while the mixed-use development employs the weight factor method. This differs from the situation in Malaysia, while the strata management act recognizes the common properties, it has yet to further define the diversified shared properties with exclusive access for mixed-use development. In reference to a High Court ruling on a mixed development, where the share units in the said mixed development were considered to be unfair for the developer to distribute the maintenance charges based on selling prices (N. Khoo, 2021). In reality, there is no connection between parcel selling prices and the distribution of maintenance costs for common property. The unequal share units make it unjust and unreasonable to impose a fixed maintenance charge rate for all parcels. Hence proposals to meet the diverse approaches to distinguish the share unit formula between residential strata and mixed-use or commercial strata development. There has been an ongoing discussion about amending this aspect of share unit calculation for greater equity, the significance of these discussions has increased as Malaysia's strata development becomes progressively more complex over time.

There is a concern regarding the availability of clear documents and guidelines for property managers or owner's corporations to ensure effective strata management and maintenance. In countries like Australia and Singapore, related authorities issue such materials freely for accessibility. It would be more commendable if similar resources were provided by relevant authorities for broader access and staple reference during COB trainings for both management bodies and awareness campaigns amongst strata owners and residences. This is significant considering the workings of COB that currently owns their localized

approach and standard procedure to ensure quality strata management within their jurisdiction.

The professional practices of property managers in Australia, Singapore, Hong Kong, and Malaysia, each adhering to separate codes of conduct established by their respective professional bodies. To highlight a distinct approach in Malaysia, here, quality standards and operating procedures for Joint Management Bodies (JMB) or Management Corporations (MC) are evaluated as 'Good' through a Star Rating evaluation, assessed by the COB. While this practice serves as an encouragement for management bodies, it also presents a challenge due to the variations in the ability of JMB/MC to engage professional management and technical teams.

CONCLUSION

This paper has successfully identified, compared and contrasted practices in building and strata management, specifically focusing on maintenance works, and fee variations in several scenarios in high-rise strata residential buildings. Building property management plays a significant role in influencing the quality and satisfaction of building conditions and services. This paper was able to highlight the magnitude and importance of strata management and showcases the different issues, plans and impact of urban living and overall quality of life of strata living as observed in Australia, Singapore and Hong Kong. The comparison aids in identifying challenges and proposing the potential solutions applicable to the context of strata management in Malaysia.

DISCLOSURE STATEMENT

Following international publication policy and our ethical obligation as a researcher, we report that we have no conflict of interest.

REFERENCES

- Ahmad Ezanee, H., Siti Aida, S., Faridah, I., & Zulhabri, I. (2015). Managing Facilities on Malaysian Low-cost Public Residential for Sustainable Adaptation. *Procedia - Social and Behavioral Sciences*, 168, 52–60. <https://doi.org/10.1016/j.sbspro.2014.10.209>
- Au-Yong, C. P., Nur Farhana, A., & Nur Aaina, M. (2018). Maintenance of lift systems affecting resident satisfaction in low-cost high-rise residential buildings. *Journal of Facilities Management*, 16(1), 17–25. <https://doi.org/10.1108/JFM-04-2017-0015>
- C.W. Ho, D., & Liusman, E. (2016). Measuring the performance of property management companies in high-rise flats. *Facilities*, 34(3/4), 161–176. <https://doi.org/10.1108/F-06-2014-0056>
- Census & Statistics Department. (2022). *Housing in Figure 2022*. <https://www.hb.gov.hk/eng/publications/housing/HIF2022.pdf>
- Chan, J., & Teh, C. (2020). *How Management Bodies can Recover Outstanding*

- Maintenance Charges. Mah Weng Kwai & Associates.
<https://mahwengkwai.com/how-management-bodies-can-recover-outstanding-maintenance-charges/>
- Christudason, A. (2004). Common property in strata titled developments in Singapore: Common misconceptions. *Property Management*.
<https://doi.org/10.1108/02637470410525464>
- Consumer Council. (2023). *Optimising Value of Property Management Fee in Hong Kong*.
chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/[https://www.consumer.org.hk/f/initiative_detail/425023/448702/Transparency and Governance – Optimising Value of Property Management Fee in Hong Kong.pdf](https://www.consumer.org.hk/f/initiative_detail/425023/448702/Transparency%20and%20Governance%20-%20Optimising%20Value%20of%20Property%20Management%20Fee%20in%20Hong%20Kong.pdf)
- Home Affairs Department. (2024). *Measures for Recovery of Outstanding Payments*. The Government of the Hong Kong Special Administrative Region.
https://www.buildingmgt.gov.hk/en/Daily_Operation_of_Building_Management/5_1_3_2.html
- HtAG® Analytics. (2023). *NSW Real Estate Market & House Prices*.
<https://www.htag.com.au/nsw/>
- Khoo, A. (2022). *How Much Service & Conservancy Charges (S&CC) Do You Pay Each Month (And Rebates You Receive)? Dollars And Sense*.
<https://dollarsandsense.sg/much-service-conservancy-charges-scc-pay-month-rebates-receive/>
- Khoo, N. (2021, October 6). *Unfair to apply same maintenance rate on all parcel owners of mixed development – Burgess Rawson responds to High Court ruling*.
<https://www.edgeprop.my/content/1900235/unfair-apply-same-maintenance-rate-all-parcel-owners-mixed-development---burgess-rawson-responds-high-court-ruling>
- KRI. (2023). *Decent Shelter for the Urban Poor: A Study of Program Perumahan Rakyat (PPR)*. Khazanah Research Institute.
[https://www.krinstitute.org/assets/contentMS/img/template/editor/KRIBooklet_Decent Shelter for the Urban Poor; A Study of Program Perumahan Rakyat \(PPR\).pdf](https://www.krinstitute.org/assets/contentMS/img/template/editor/KRIBooklet_Decent_Shelter_for_the_Urban_Poor;_A_Study_of_Program_Perumahan_Rakyat_(PPR).pdf)
- National Property Information Centre (NAPIC). (2022). *Property Market 2022 Snapshots*.
- Ng, K. G. (2022, May 11). Put HDB in charge of maintenance for housing estates instead of town councils: Murali Pillai. *The Straits Times*.
<https://www.straitstimes.com/singapore/politics/mp-murali-pillai-proposes-putting-hdb-in-charge-of-maintenance-for-housing-estates-instead-of-town-councils>
- Noor Suzilawati, R., Mariana, M. O., Muhammad Faris, A., Zakiah, P., & Izlan Fitri, A. A. (2021). ISSUES FACED BY TENANTS IN HIGH-RISE STRATA RESIDENTIAL: CASE STUDY OF KLANG VALLEY. *PLANNING MALAYSIA*, 19(5), 180–191. <https://doi.org/10.21837/pm.v19i19.1070>
- NSW Government. (2021). *Statutory review of the Strata Schemes Development Act 2015 and Strata Schemes Management Act 2015*. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/[https://www.parliament.nsw.gov.au/tp/files/81193/DCS - Statutory Review on Strata Scheme Legislation.pdf](https://www.parliament.nsw.gov.au/tp/files/81193/DCS_-_Statutory_Review_on_Strata_Scheme_Legislation.pdf)

- NSW State Government. (2018). *Strata Living Get involved* (June 2018). © State of New South Wales. https://nsw.strata.community/wp-content/uploads/2014/06/Strata_Living_Guide-2018.pdf
- Nurul Ain Sahira, M. S., & Aryani, A. L. (2021). Kajian Kepuasan Penduduk Terhadap Kualiti Perumahan Program Perumahan Rakyat (PPR). *Research in Management of Technology and Business*, 2(2), 685–698.
- PropertyGuru Editorial Team. (2020). *Apa Itu Program Tabung Penyelenggaraan 1Malaysia (TP1M)?* <https://www.propertyguru.com.my/bm/panduan-hartanah/apa-tabung-penyelenggaraan-perumahan-1malaysia-tp1m-38295>
- Radha, K., & Razali, M. N. (2023). GOVERNANCE OF STRATA BUILDINGS FOR URBAN CONSOLIDATION IN MALAYSIA. *PLANNING MALAYSIA*, 21(3), 243–254. <https://doi.org/10.21837/pm.v21i27.1298>
- Roznah, A. J. (2022, November 24). 80% of Strata Management Tribunal claims are fee related. *EdgeProp.My*. <https://www.edgeprop.my/content/1904414/80-strata-management-tribunal-claims-are-fee-related>
- Shahedin, A. (2020). An Empirical Exploration of Demand and Supply in Malaysia Housing Market. *South Asian Journal of Social Sciences & Humanities*, 1(1), 123–135. https://www.researchgate.net/publication/343836661_An_Empirical_Exploration_of_Demand_and_Supply_in_Malaysia_Housing_Market
- Singapore Household Statistics*. (2022). SINGAPORE DEPARTMENT OF STATISTICS. <https://www.singstat.gov.sg/find-data/search-by-theme/households/households/latest-data>
- Singh, J. H., & Benson, A. (2021, May 11). Levy Recovery In Strata Schemes. *Kerin Benson Lawyers*. <https://kerinbensonlawyers.com.au/levy-recovery-in-strata-schemes/>
- Tiun, L. T. (2006). Managing High-Rise Residential Building in Malaysia: Where Are We? *Naprec Conference, Inспен*, 1–25.
- Urban Renewal Authority. (2023). *Integrated Building Rehabilitation Assistance Scheme*. <https://brplatform.org.hk/en/subsidy-and-assistance/integrated-building-rehabilitation-assistance-scheme/schemes-for-individual-owners/building-maintenance-grant-scheme>
- Urban Renewal Authority. (2024, January). *Integrated resources to promote owners “autonomous maintenance” municipal bureau push new “preventive maintenance” funding plan*. https://ura.org.hk/tc/news-centre/managing-directors-blog/mdblog_20240107
- Virginia Tanggono. (2021, July 1). 4 reasons why you shouldn't default on your condo maintenance fees. *Property News Insider*. <https://www.99.co/singapore/insider/4-reasons-why-you-shouldnt-default-on-your-condo-maintenance-fees/>
- Wadu Mesthrige, J. (2021). Quantifying the value of high-quality property management. *Property Management*, 39(5), 636–652. <https://doi.org/10.1108/PM-01-2021-0003>
- Wahi, N., Mohamad Zin, R., Munikanan, V., Mohamad, I., & Junaini, S. (2018). Problems and Issues of High Rise Low Cost Housing in Malaysia. *IOP Conference Series: Materials Science and Engineering*, 341(1), 012027. <https://doi.org/10.1088/1757-899X/341/1/012027>

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Khuzzan Alhabshi
Strata Management and Maintenance: A Comparative Analysis of Malaysia and Selected Countries*

- Wong, P., & Lai, J. (2021). On the Property Management Services Ordinance of Hong Kong: concerns and implications. *Property Management*, 39(5), 600–617. <https://doi.org/10.1108/PM-12-2019-0071>
- Yeung, Y., & Drakakis-Smith, D. W. (1974). Comparative Perspectives on Public Housing in Singapore and Hong Kong. *Asian Survey*, 14(8), 763–775. <https://doi.org/10.2307/2642726>

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VISITOR SATISFACTION WITH MUSEUM MANAGEMENT DURING THE COVID-19 PANDEMIC: A CASE STUDY OF THE NATIONAL MUSEUM OF MALAYSIA

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Abstract

During the 2019 global pandemic, widespread museum closures ensued, exacerbated by Malaysia's heightened distancing measures in response to emerging Covid Omicron variants. This research addresses the scarcity of studies on visitor perception during COVID-19, explicitly focusing on evaluating satisfaction by scrutinising visitation patterns, visitor satisfaction, and initiatives by the National Museum Malaysia. Employing mixed methods, a quantitative survey involving 260 museum visitors was conducted using convenient sampling and analysed using SPSS. The study also incorporated qualitative interviews with two museum personnel to complement the quantitative aspect, and these were thematically analysed. The findings reveal a decline in physical visits, and noteworthy efforts by management in online engagement and collaborations with broadcasters were observed. While overall satisfaction prevails, there is room for improvement in communicating online activities. The data indicates a readiness for a virtual museum in the future.

Keywords: COVID-19, Cultural heritage, Museum Management, National Museum Malaysia, Visitor Satisfaction

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INTRODUCTION

COVID-19 has profoundly impacted social, economic, and political aspects, inducing fear, lockdowns, income loss, and challenging decisions for leaders (Manderson & Levine, 2020). Teh et al. (2022) notes significant correlations between the pandemic and various factors in Malaysia. The tourism industry, particularly airlines and hotels, faced challenges, leading the government to implement economic stimulus measures (Foo et al., 2021). In addition, the global cultural heritage sector, including museums, encountered significant hurdles due to closures, impacting visitor engagement and satisfaction. Cobley et al. (2020) stresses the importance of cultural resilience, urging institutions to adapt and reinvent services amid uncertainty and prepare for future challenges. Despite the museum's innovative trend to sustain competitiveness during the pandemic, (Agostino et al., 2020; Antara & Sen, 2020), there is scarce effort to evaluate visitor satisfaction towards these paradigm shifts globally. Therefore, this study focuses on assessing visitor satisfaction with museum management during the COVID-19 pandemic, specifically at the National Museum of Malaysia. Objectives include investigating visitation patterns, determining visitor satisfaction levels, and exploring initiatives the museum management takes. The study aims to identify visitor satisfaction with museum management during COVID-19 at The National Museum of Malaysia.

LITERATURE REVIEW

Museology and museums have developed dramatically since the 15th century. In the 17th century, museums answered inquisitive minds, starting with Ole Worm's collections in Copenhagen, Denmark. The Worm Collection became the first collection of artefacts by the National Museum of Denmark, prompting its establishment. The Ashmolean Museum opened in 1683 in Oxford, England, and is considered the first public museum (Jalal et al., 2019). Meanwhile, Museology in Malaysia began with the Taiping Museum in 1883, founded by Hugh Low, a British Resident in Perak. The Sarawak Museum (1888) and Selangor Museum (1899) followed suit. In the early 20th century, museums were called 'pictorial schools' in British Malaya. Museology has since developed significantly in Malaysia, with various types of museums emerging, including statutory, federal, private, and state museums (Jalal et al., 2019; Tugang, 2020). More importantly, museums also have a significant role in informal education. For effective informal education in museums, language in exhibitions should be suitable for visitors of all ages, categories, and backgrounds, as appropriate language can influence understanding and satisfaction, especially among visitors of diverse races and religious beliefs (Kechot et al., 2012; Kechot, 2010).

To ensure heritage sustainability and fulfil educational roles, museums must embrace digital advancements. Bandelli (1999) emphasises the importance of digital museums, aligning with the technological paradigm, suggesting virtual museums can overcome geographical limitations. This argument aligns with the new museum concept proposed by Jalal et al. (2019) in Malaysia, highlighting positive developments through historical analysis and efforts to enhance historical education. In addition, King et al. (2021) analyse the impact of COVID-19 on UK museums' temporary exhibitions, questioning the conceptualisation and value of digital content. Ryder et al. (2021) explore the implementation of digital content by US cultural institutions during closures, revealing its role in fostering communities, enhancing transparency, increasing accessibility, and achieving higher social media engagement.

While advancing digital initiatives, museums prioritise engaging visitors to educate and connect them with their cultural heritage (Sukri et al., 2021). Agostino et al. (2020) and Giannini and Bowen (2021) stress the importance of creative efforts in museums during health crises, advocating for inclusive systems and exploring new conceptual models for structural change. Choi and Kim (2021) highlight sustainable competitiveness in adapting to the post-pandemic environment, emphasising the need for museums to change business models and prioritise user participation.

Zamri et al. (2022) examines museum management in Malaysia, focusing on the Penang House of Music and exploring visitor behaviour and interactive museum models. The study reveals the impact of digital tourism as museums adapt to social distancing rules, showcasing their creativity, diversity, and community online (Burke et al., 2020). Rahman and Velayuthan (2020) demonstrate that diversifying museum functions enhances creativity and addresses future needs, emphasising consumer-oriented approaches and leveraging digital initiatives for effective public engagement.

RESEARCH METHODOLOGY

This study adopts a mixed-method approach, integrating both quantitative and qualitative methodologies. For the quantitative component, an online survey was distributed employing a 5-point Likert scale to assess respondent visitation patterns and satisfaction levels. The data collection utilized convenient sampling, selecting a sample of 260 participants based on Krejcie and Morgan's (1970) population estimates. Subsequently, the data were analysed using the Statistical Package for Social Science (SPSS) software. Additionally, qualitative data were obtained through interviews with two personnel from the museum management to explore their initiatives in museum management during the Covid-19 pandemic. Purposive sampling was utilized for participant selection, and the data were analysed using thematic analysis following Braun and Clarke's (2006)

guidelines. The integration of both quantitative and qualitative data will be triangulated to address the research objectives of this study. The analysis aims to reveal visitation patterns, visitor satisfaction, and museum personnel initiatives during the COVID-19 pandemic, with data triangulation for comprehensive understanding.

Hypotheses include decreased visitation to the museum during the COVID-19 pandemic due to movement and social distancing restrictions (H1), higher visitor satisfaction level during the pandemic owing to the museum's initiatives to engage visitors (H2) and finally higher visitor interest and satisfaction due to management's initiative due to engagement initiatives (H3). Figure 1 depicts a conceptual framework with a mediating variable—availability of virtual resources—establishing a correlation between the COVID-19 Movement Control Order (MCO) and dependent variables.

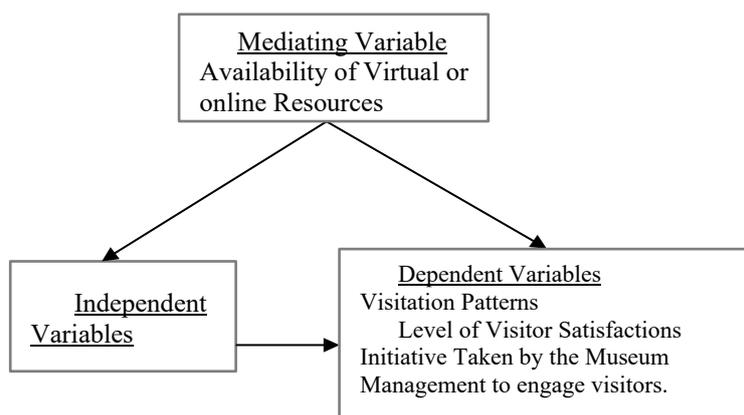


Figure 1: Conceptual Framework

DATA ANALYSIS

Visitation Patterns at The National Museum Malaysia During the COVID-19 Pandemic.

In this research, the visitation patterns are tagged 1-5, as presented below:

Visitation Pattern 1: "I have participated in activities organised by the museum during the pandemic".

Visitation Pattern 2: "Virtual exhibitions allow visitors outside Kuala Lumpur to visit the museum virtually".

Visitation Pattern 3: "I am delighted with the programs organised by the National Museum of Malaysia".

Visitation Pattern 4: "Virtual visits can attract the public's interest to visit the National Museum of Malaysia".

Visitation Pattern 5: "I have visited exhibitions organised by the museum before".

Table 1 shows visitation patterns to The National Museum of Malaysia during the COVID-19 outbreak, varying for each category.

Table 1: Mean Visitation Patterns

	Visitation Pattern_1	Visitation Pattern_2	Visitation Pattern_3	Visitation Pattern_4	Visitation Pattern_5
Mean	2.9423	4.2577	4.1192	4.3385	3.9615
N	260	260	260	260	260
Std. Dev.	1.29766	.87817	.85040	.80590	1.11780

The highest and lowest mean values were found for Visitation Pattern 4 (4.3385) and Visitation Pattern 1 (2.9423), respectively. The sample size (N) is 260; meanwhile, the standard deviation (Std. Deviation) for each visitation pattern varies, with the lowest and highest values corresponding to Visitation Pattern 4 (0.80590) and Visitation Pattern 1 (1.29766), respectively. Hence, the overall visitation patterns have a moderate to high value, with a mean of 3.9238 and a standard deviation of 0.75340. A comparison was made between male and female visitors based on Mean and Standard Deviation.

Table 2 presents statistics on gender-based groups for different variables (Visitation Patterns 1-5). Regarding Visitation Pattern 1, there are differences in mean scores and standard deviations between males and females. Males have a higher mean score (3.1364) than females (2.8000), indicating more significant visitation patterns for males. For Visitation Pattern 2, males have a higher average score (4.4273) with a lower standard deviation (0.78354) compared to females (4.1333, Std. Deviation = 0.92444). However, the difference may not be significant due to the relatively low standard deviation. In Visitation Pattern 3, males have a higher average score (4.4545, Std. Deviation = 0.68585) than females (3.8733, Std. Deviation = 0.87697). Both genders exhibit relatively high mean scores. In Visitation Pattern 4, males have a higher average score (4.4909, Std. Deviation = 0.73877) than females (4.2267, Std. Deviation = 0.83663). Both genders exhibit relatively high mean scores. In Visitation Pattern 5, males have a higher average score (4.3091, Std. Deviation = 0.91617) than

females (3.7067, Std. Deviation = 1.18461). Both genders exhibit relatively high mean scores.

Table 2: Comparison of Male and Female Visitation Patterns

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Visitation Pattern 1	Male	110	3.1364	1.21517	.11586
	Female	150	2.8000	1.34114	.10950
Visitation Pattern 2	Male	110	4.4273	.78354	.07471
	Female	150	4.1333	.92444	.07548
Visitation Pattern 3	Male	110	4.4545	.68585	.06539
	Female	150	3.8733	.87697	.07160
Visitation Pattern 4	Male	110	4.4909	.73877	.07044
	Female	150	4.2267	.83663	.06831
Visitation Pattern 5	Male	110	4.3091	.91617	.08735
	Female	150	3.7067	1.18461	.09672

Visitor Satisfaction with Museum Management During the COVID-19 Pandemic.

The level of satisfaction is characterised by satisfaction levels 1-6, as described below:

Satisfaction 1: "I have visited the National Museum of Malaysia during the pandemic."

Satisfaction 2: "The National Museum has the best management system throughout my visits to museums during the pandemic."

Satisfaction 3: "Information about the National Museum is easily accessible."

Satisfaction 4: "The museum staff are friendly towards visitors and possess good manners."

Satisfaction 5: "The ticket prices offered are affordable."

Satisfaction 6: "The Museum's management system is appealing through their handling of engaging activities."

The survey employs a 5-point Likert scale, encompassing the following options: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), and Strongly Agree (5). These options are assigned to questions

regarding satisfaction (1 – 6), as illustrated in Table 3. Gender significantly impacts satisfaction levels in each category. Males generally exhibit higher satisfaction levels than females, with variations observed between the two groups. Females tend to have higher variability in satisfaction levels, as indicated by higher standard deviation. In conclusion, the statistical analysis confirms gender differences in satisfaction levels and data precision variations across the examined categories.

Table 3: Comparison of Mean for Male and Female Visitor Satisfaction Levels

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Satisfaction 1	Male	110	4.2364	1.06596	.10164
	Female	150	2.9533	1.45324	.11866
Satisfaction 2	Male	110	4.4000	.78050	.07442
	Female	150	3.6867	.92058	.07517
Satisfaction 3	Male	110	4.4273	.74758	.07128
	Female	150	3.9333	.79989	.06531
Satisfaction 4	Male	110	4.4727	.70005	.06675
	Female	150	3.9933	.80682	.06588
Satisfaction 5	Male	110	4.4273	.70981	.06768
	Female	150	4.0200	.82307	.06720
Satisfaction 6	Male	110	4.4455	.69844	.06659
	Female	150	3.8400	.89052	.07271

Furthermore, Table 4 presents Levene's Test and T-Test for Equality of Means results. Levene's Test indicates no significant difference in variances between the two independent samples ($F = 7.333$, $p = 0.739$). Assuming equal variances, the T-Test shows a significant mean difference ($t = 7.384$, $df = 258$, $p = 0.000$). If the assumption of equal variances is not made, the results remain the same ($t = 7.384$, $df = 240.745$, $p = 0.000$). The p-value is below 0.05 in both cases, signifying a significant mean difference between the samples.

The mean difference between the samples is 0.66374, with a standard error of 0.09052. The 95% confidence interval ranges from 0.48549 to 0.84198 (assuming equal variances) or from 0.48667 to 0.84080 (not assuming equal variances). It indicates a significant mean difference between the samples, with the actual difference falling within the respective confidence intervals. In summary, the statistical analysis confirms a significant difference in means between the two independent samples, regardless of equal variances assumptions.

Table 4: Independent Samples T-Test of Satisfaction and Gender

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Difference	
									Lower	Upper
Satisfaction	Equal variances assumed	.111	.739	7.333	258	.000	.66374	.09052	.48549	.84198
	Equal variances are not assumed.			7.384	240.745	.000	.66374	.08989	.48667	.84080

Museum's Initiatives to Engage Visitors During the COVID-19 Pandemic

The analysis shows a significant positive correlation between two variable pairs in the same sample, as shown in Table 5. For Pair 1 (visitation pattern and management initiative), a correlation of 0.439 ($p = 0.000$) was observed. For Pair 2 (satisfaction and management initiative), a correlation of 0.536 ($p = 0.000$) was found. These results indicate a significant relationship between these variable pairs in the sample, with both pairs showing positive correlations.

The significant positive correlations between visitation pattern and management initiative and satisfaction and management initiative indicate a strong relationship between these variables. It means that as visitation patterns or satisfaction values increase, management initiative values also tend to increase, and vice versa. These correlations are statistically significant, as indicated by the very low p-values (0.000), suggesting that the relationships are not coincidental. In conclusion, the analysed data indicates a significant relationship between visitation patterns and management initiative, as well as between satisfaction and management initiative.

Table 5: Correlation between Visitation Pattern, Satisfaction and Management Initiative

Paired Differences						t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Visitation Pattern	-.28055	.77923	.04833	-.37571	-.18539	-5.805	259	.000
	Management Initiative								
Pair 2	Satisfaction Management Initiative	.18581	.72883	.04520	.27481	.09680	4.111	259	.000

Table 6 shows that H1, stating a decrease in visitation patterns during the pandemic, is rejected. Meanwhile, H2, which states high visitor satisfaction due to museum management initiatives, is accepted. Additionally, H3, stating the success of management initiatives in maintaining visitor interest, is also accepted.

Table 6: Overview of Hypotheses Testing

No	Hypothesis	Result
1	Hypothesis 1: The visitation patterns of visitors to the National Museum Malaysia during the COVID-19 pandemic have decreased due to restrictions on movement and social distancing measures.	Rejected
2	Hypothesis 2: The level of visitor satisfaction with the museum management system during the COVID-19 pandemic is high due to the initiatives the museum management took to engage visitors despite the challenges posed by the pandemic.	Accepted
3	Hypothesis 3: The initiatives taken by the museum management to engage visitors during the COVID-19 pandemic, such as online talks, competitions, and exhibitions, have successfully maintained visitor interest and satisfaction.	Accepted

DISCUSSION AND CONCLUSION

Visitation Patterns of the National Museum of Malaysia During the COVID-19 Pandemic

Virtual visits, specifically Visitation Pattern 4 with a mean score of 4.3385, effectively generate public interest in The National Museum of Malaysia,

demonstrating the 21st-century suitability of digital technology, as noted by King et al. (2021), Ryder et al. (2021), Agostino et al. (2020), and Giannini & Bowen (2021). The museum's online programs, especially those involving children, have surpassed the engagement of previous physical events despite pandemic-related restrictions, as indicated by informant 1:

We have organised many programs and received positive responses from online visitors, primarily when the activities are focused on children. (Informant 1, 2 December 2021, Online Interview)

In addition, according to the interview data, museum visits declined due to restrictions on movement, resulting in the presence of only local visitors. One informant commented:

Currently, only local visitors come to the museum. So that is why it indicates a downward trend throughout this pandemic. (Informant 1, 2 December 2021, Online Interview).

Visitor Satisfaction with Museum Management During the COVID-19 Pandemic

Table 6 shows gender-based differences in visitor satisfaction mean (Satisfaction 1 to 6) during the COVID-19 pandemic. Males, on average, express higher satisfaction with museum management than females in each category, but notable variations exist. Higher standard deviations for females indicate more significant variability in satisfaction levels, suggesting diverse experiences and expectations. These findings align with the theory of gender differences in preferences and experiences (Smith et al., 2018), indicating that variations may stem from differing expectations, interests, or experiences related to museum management during the pandemic.

Observing gender differences in visitor satisfaction suggests the need for tailored strategies by museum management to address diverse needs. This could involve customising exhibits, services, or communications based on gender-specific interests. Gathering qualitative feedback through research or surveys can provide insights into the factors driving these differences while considering other demographic factors such as age and cultural background can offer a more comprehensive understanding. Recognising gender's influence on satisfaction levels, especially during the COVID-19 pandemic, allows for targeted strategies that enhance visitor experiences. Further research is recommended to uncover the underlying reasons behind gender differences and develop effective strategies for meeting diverse visitor needs.

Museum's Initiatives to Engage Visitors During the COVID-19 Pandemic

The museum's response to COVID-19 reveals a positive correlation among visitation patterns, satisfaction, and management initiative. As one of these factors increases, the others also show an upward trend. This conclusion is reinforced by interview data illustrating proactive adaptations by museum personnel in implementing effective communication methods during the pandemic: "At the National Museum, we have organised numerous online programs. For example, if you visit our Facebook page, you will find the "Ceria Muzium Negara" program...." (Informant 1, 2 December 2021, Online Interview). The findings support previous research highlighting the necessity of digital initiatives in museum management during the COVID-19 pandemic (Bandelli, 1999; King et al., 2021).

Informant two further details the creative strategies employed in online programs, including DIY activities like crafts and batik-making. "We have conducted many online programs, such as Ceria di Muzium Negara' (Cheerful at the National Museum). These programs are like do-it-yourself (DIY) activities where participants can engage in crafts, batik-making, etc." (Informant 2, 3 December 2021, Online Interview). This discovery aligns with Ryder et al.'s (2021) recommendation for museum administrations to employ digital content to engage audiences on social media during global closures due to pandemics. The museum actively pursued initiatives to promote and mobilise its management, as outlined in the following interview excerpt:

"We were actively engaged in promotions...We often focused on promoting through RTM ... We also produced documentary programs ... We also collaborated with Nasional FM and RTM We utilised print media for announcements.... We had press conferences ... We invited The Star to cover our exhibitions. In terms of advertising, we had banners... We distributed pamphlets and printed materials...." (Informant 1, 2 December 2021, Online Interview)

The findings confirm the need for heritage institutions to be resilient and adaptable post-COVID, facing the challenge of sustaining competitiveness by diversifying functions and adapting business models in a competitive environment (Choi & Kim, 2021; Rahman & Velayuthan, 2020). In summary, H3 indicates successful maintenance of visitor interest and satisfaction through museum management's initiatives during the COVID-19 pandemic.

CONCLUSIONS

This research provides valuable insights into museum management in Malaysia during the COVID-19 pandemic, focusing on visitation patterns, visitor

satisfaction, and engagement initiatives. The findings enhance understanding of museums' adaptive strategies and shed light on maintaining interest and satisfaction. This research lays a foundation for improving museum management practices, informing decision-making, and guiding administrations in developing innovative strategies for potential pandemics. Understanding visitation patterns and satisfaction factors allows museums to tailor experiences for diverse audiences. The research emphasises the importance of adaptability and digital transformation in engaging visitors during crises, paving the way for continual improvement and innovation in Malaysian museum management practices.

REFERENCES

- Abd Jalal, A. F., Yusuf, A., Abd Hamid, A. F., & Abd Rahim, R. A. (2019). Kesedaran muzium baru di Malaysia. *Jurnal Melayu Sedunia*, 2(1), 93-111.
- Agostino, D., Arnaboldi, M., & Lampis, A. (2020). Italian state museums during the COVID-19 crisis: from onsite closure to online openness. *Museum Management and Curatorship*, 35(4), 362-372.
- Antara, N., & Shuvro, S. E. N. (2020). The impact of COVID-19 on museum and the way forward to be resilience. *Uluslararası Müze Eğitimi Dergisi*, 2(1), 54-61.
- Bandelli, A. (1999). Virtual spaces and museums. *Journal of Museum Education*, 24(1-2), 20-22. <https://doi.org/10.1080/10598650.1999.11510397>.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
- Burke, V., Jørgensen, D., & Jørgensen, F. A. (2020). Museums at home: Digital initiatives in response to COVID-19. *Norsk Museumstidsskrift*, 6(2), 117-123. <https://doi.org/10.18261/issn.2464-2525-2020-02-05>
- Choi, B., & Kim, J. (2021). Changes and challenges in museum management after the COVID-19 pandemic. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(2). <https://doi.org/10.3390/joitmc7020148>
- Cobley, J., Gaimster, D., So, S., Gorbey, K., Arnold, K., Poulot, D., ... & Jiang, M. (2020). Museums in the pandemic: A survey of responses on the current crisis. *Museum Worlds*, 8(1), 111-134.
- Foo, L. P., Chin, M. Y., Tan, K. L., & Phuah, K. T. (2021). The impact of COVID-19 on tourism industry in Malaysia. *Current Issues in Tourism*, 24(19), 2735-2739. <https://doi.org/10.1080/13683500.2020.1777951>
- Giannini, T., & Bowen, J. P. (2021). Museums at the crossroads: Between digitality, reality, and Covid-19. *SocArXiv*. <https://doi.org/10.31235/osf.io/2g567>
- Giannini, T., & Bowen, J. P. (2022). Museums and digital culture: From reality to digitality in the age of COVID-19. *Heritage*, 5(1), 192-214. <https://doi.org/10.3390/heritage5010011>
- Kechot, A. B. S., Hassan, Z., & Yunos, Y. (2010). Proses pendidikan muzium: satu kajian awal. *Jurnal Melayu*, 5(December 2009), 285-293. Retrieved from <http://ejournal.ukm.my/jmelayu/article/view/4960>.

- Kechot, A. B. S., S. A. H., Aman, R., Hassan, Z., & Jamal, D. H. D. (2012). Pendidikan warisan di muzium: Kajian berkaitan penggunaan laras bahasanya. *Malaysia Journal of Society and Space: GEOGRAFIA Online*, 8(8), 35-46.
- King, E., Smith, M. P., Wilson, P. F., & Williams, M. A. (2021). Digital responses of UK museum exhibitions to the COVID-19 crisis, March–June 2020. *Curator: The Museum Journal*, 64(3), 487-504.
- Kiyai, G., & Tugang, N. (2020). Jabatan Muzium Sarawak: Perkembangan sebelum dan selepas merdeka. *Jurnal Arkeologi Malaysia*, 33(1).
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, 30(3), 607-610.
- Manderson, L., & Levine, S. (2020). COVID-19, risk, fear, and fall-out. *Medical Anthropology: Cross Cultural Studies In Health And Illness*, 39(5), 367–370. <https://doi.org/10.1080/01459740.2020.1746301>
- Rahman, S., & Velayuthan, S. K. (2020). Evolution and diversification of museum functions: A reflection of market demand in Penang, Malaysia. *Planning Malaysia*, 18(3), 154–166. <https://doi.org/10.21837/PM.V18I13.782>
- Ryder, B., Zhang, T., & Hua, N. (2021). The social media “magic”: Virtually engaging visitors during covid-19 temporary closures. *Administrative Sciences*, 11(2). <https://doi.org/10.3390/ADMSCI11020053>
- Smith, J., Johnson, A., & Williams, R. (2018). Gender differences in preferences and experiences: A study in cultural institutions. *Journal of Cultural Studies*, 15(3), 123-145.
- Sukri, S., J., N. A., Apandi, S. N., George, A. N. E., Sim, M., Nagalingam, M., & Rahni, M. A. (2021). Visitors’ perception on the facilities management: A preliminary survey at Handicraft Museum Kota Bharu, Kelantan. *AIP Conference Proceedings*, 2347(July). <https://doi.org/10.1063/5.0052146>
- Teh, B. T., Ling, G. H. T., Lim, N. H. H., & Leng, P. C. (2022). Factors determining covid-19 severity in Malaysia: From social, economic and environmental perspectives. *Planning Malaysia*, 20(4), 328–339. <https://doi.org/10.21837/pm.v20i24.1209>
- Zamri, K., Radzi, R., Art, F., Mara, U. T., & Alam, C. S. (2022). Exploring the Interactive model of Malaysian Museums in the context of the COVID-19 Pandemic. *Art and Education*, 2(2), 8–16.

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THE MEDIATING EFFECT OF PLACE ATTACHMENT ON INTENTION TO VISIT AMONG VISITORS TO JAZAN PROVINCE, SAUDI ARABIA

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Abstract

This study examines the complex relationship among place attachment, visitor attributes, destination attributes, and intentions to revisit, providing valuable insights into the intricacies of sustainable tourism. Place attachment, which refers to the dynamic connections that are developed with particular destinations, significantly influences the likelihood that tourists will choose to revisit those locations. This research examines the above correlation in the tourism domain, specifically emphasising the function of place attachment as a mediating factor. Incorporating tourist attributes, destination attributes, and place attachment, the research forecasts travellers' likelihood of returning. The data was gathered utilising quantitative techniques, and Structural Equation Modelling (SEM-PLS) was employed for the analysis. The results of this study offer significant contributions to our understanding of the complex ways in which visitors make decisions and the impact that emotional connections have on their intentions to return to particular locations. By illuminating the interdependencies among these variables, the research makes a valuable contribution to the progression of sustainable tourism practices.

Keywords: Place Attachment, Revisit Intention, Tourist Behaviour, Tourist Attributes, Destination Attributes

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INTRODUCTION

Tourism dynamics are shaped by an intricate web of factors that influence tourists' decision-making processes, thereby determining their choices of destination, length of stay, expenditure, and propensity to return (Kozak, 2001). Among these are tourist-related factors, specifically social ones such as family and friends, psychological elements like feelings and mood, and personal factors encompassing preferences and interests (Kozak, 2001). Furthermore, general marketing studies have highlighted the role of demographic attributes in shaping consumer decisions. For instance, gender, level of education, age, and marital status have been considered pivotal determinants (Blackwell, Miniard, and Engel, 2006; Chong, Chan, and Ooi, 2012; Rani, 2014; Wang et al., 2004).

In addition to these, other factors that significantly influence tourist choices revolve around the attributes of the destination itself. Examples include its image, attractions, natural environment, location, and culture (Wang and Chen, 2015; Mittal, 2013). Predominantly, these factors play a crucial role in the selection of destinations. Another noteworthy factor is place attachment, which profoundly impacts revisit intention (Blackwell, et al., 2006). Place attachment, as a concept, encapsulates the emotional bonds that individuals form with specific locations. This, in turn, deeply influences their behaviours, attitudes, and preferences toward those places (Scannell & Gifford, 2010). This psychological construct seamlessly bridges the realms of a location's physical, social, and cultural aspects, fostering a profound sense of belonging and identity. Significantly, researchers have underscored a robust link between strong place attachment and tourists' intention to revisit a place, affirming place attachment's pivotal role in championing sustainable tourism practices (Ramkissoon, Weiler, & Smith, 2012).

Furthermore, revisit intention stands as a cornerstone in the discourse of sustainable tourism. The rise of tourism as a pivotal contributor to global economic performance has sparked an abundance of studies examining the sector's connection to the idea of sustainability (Azinuddin et al., 2022). This concept captures a tourist's inclination to return to a previously explored destination (Oppermann, 2000). Delving deeper into revisiting intention and its myriad determinants offers invaluable insights for destination marketers and tourism stakeholders. This is especially true given that repeat tourists often bring forth benefits like elevated spending and positive endorsements (Kozak, 2001, Shehab et al., 2023). With the evolving landscape of tourism, there's a palpable shift in tourist behaviours. The current trend leans heavily towards authentic experiences and genuine emotional connections to destinations (Hau, and Tuan, 2017). As a result, the nexus between tourists' and destinations' attributes, place attachment, and revisit intention has become paramount. While studies, such as those by Prayag & Ryan (2012), have initiated discussions on this

interconnectedness, a comprehensive understanding of their intricate interplay is still pending. Therefore, there is a pressing need for increased collaboration between the community and tourism stakeholders (Azwar et al., 2023). This necessity arises from the interdependency of actors within the tourism system, as they must work collectively to produce cohesive tourism products and services (Azinuddin et al., 2023).

However, a glaring gap persists in the literature, especially concerning the specific context of Jazan Province in the Kingdom of Saudi Arabia. Most extant research either offers a panoramic view of Saudi domestic tourism or delves into the country's attractions from a broader perspective. In light of this, this study explores the nuanced role of place attachment. Specifically, it examines its mediating effect on the relationship between tourist-related attributes, destination-related attributes, and revisit intention, focusing on visitors to Jazan province, Saudi Arabia. The province lies in the southwest corner of Saudi Arabia, situated on the coast of the Red Sea and serves a large agricultural heartland that has a population of over 1.4 million as of 2022 (Wikipedia, 2024). Refer Map 1 below of Jazan Province, highlighted in red.



Figure 1: Jazan Province in Saudi Arabia (Wikipedia, 2024)

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

An advantageous conceptual structure for comprehending the intricacies of your research model is the Theory of Planned Behaviour (TPB) (Ajzen 2011). As per TPB, three primary factors influence the behavioural intentions of individuals, including the intention to revisit a tourist destination: their attitudes toward the

behaviours, subjective norms (which represent social influences), and perceived behavioural control (which pertains to the perceived ease or difficulty of carrying out the behaviours). The attitudes of visitors are directly influenced by the "Destination Attribute" and "Tourist Attribute" in this model, as these attributes shape their perceptions of the destination (Kim, Penny Wan, and Pan 2015). These characteristics are crucial in ascertaining whether travellers hold favourable attitudes toward returning (Hau and Tuan, 2017). "Place Attachment" is an emotional attachment that tourists develop to a location, which can be impacted by the viewpoints and experiences of others (Dwyer, Chen, and Lee 2019). As such, it is intricately linked to the notion of subjective norms in TPB. Ultimately, the behavioural intention is denoted as "Revisit Intention" in TPB, which signifies the probability of a return visit to a particular location (Luo, Lam, and Wang 2021). Intentions that are robust, and are supported by favourable attitudes, societal conventions, and a sense of authority, are more inclined to follow through with. Within this particular framework, "Place Attachment" functions as a mediating variable, elucidating how the sentimental affinity towards a location significantly impacts the correlation between its attributes and the inclination to revisit. In its entirety, TPB furnishes a strong basis for comprehending the psychological underpinnings that shape the intentions and choices of travellers as they pertain to the research (Lewicka, 2011).

Tourists' Attributes and Revisit Intention

Tourists' attributes have been a focal point in tourism research, given their profound influence on travel behaviours and decisions. These attributes, which encompass a range of social, psychological, and personal factors, play a pivotal role in shaping revisit intentions (Prayag, Hosany, & Odeh, 2013). Social attributes, such as influences from family and friends, often act as catalysts, nudging tourists towards revisiting destinations based on shared experiences or recommendations (Smith, 2010). Psychological elements, including feelings and mood, further modulate this intention. A positive emotional experience during a trip can create a lasting impression, making revisiting more appealing (Brown, Assaker, & Reis, 2018). Moreover, personal factors, which include individual preferences and interests, are instrumental in this context. Tourists with specific interests, be it cultural, adventure, or leisure, may be inclined to revisit destinations that cater to these preferences (Liu & Wall, 2006). These attributes collectively weave a complex tapestry of factors determining whether a tourist will consider returning to a destination. Given the multifaceted nature of these attributes and their evident influence on revisit intention, it becomes imperative to delve deeper into their interplay.

Hypothesis 1: Tourists' attributes, encompassing social, psychological, and personal factors, have a significant positive relationship with their intention to revisit a destination.

Destination Attributes and Revisit Intention

Destination attributes, comprising a destination's tangible and intangible features, have been a focal point in tourism studies due to their profound influence on revisit intentions. Tangible attributes such as infrastructure, accessibility, and amenities play a pivotal role in shaping a tourist's experience and, consequently, their intention to return (Li, et al., 2018). Intangible attributes, on the other hand, encompass elements like cultural richness, local hospitality, and the overall ambiance of a destination. These have been identified as significant determinants in evoking emotional connections and influencing tourists' revisiting decisions (Chen & Phou, 2013). Moreover, the unique selling propositions of a destination, such as its natural beauty, heritage sites, or culinary experiences, can serve as compelling pull factors, enhancing the likelihood of repeat visits (Bieger & Laesser, 2014). Given the multifaceted nature of destination attributes and their evident influence on revisit intention, understanding their interplay is paramount in tourism research.

Hypothesis 2: Destination attributes, both tangible and intangible, have a significant positive relationship with tourists' intention to revisit a destination.

Tourist Attributes and Place Attachment

The nexus between tourists' attributes and place attachment has garnered significant attention in contemporary tourism research. Tourists' attributes, which encompass social influences such as family and friends, psychological elements like feelings and mood, and personal factors including preferences and interests, have been posited to play a pivotal role in fostering place attachment. Social influences, for instance, can amplify the sense of belongingness to a destination, especially when shared experiences or recommendations from close acquaintances are involved (Ramkissoon, Smith, & Weiler, 2013). Psychological elements, particularly emotions evoked during a trip, can deepen the bond tourists feel with a place, making them more attached (Hau and Tuan, 2017). Furthermore, personal factors, such as individual interests in cultural or adventure experiences, can enhance the affinity tourists feel toward destinations that cater to these preferences (Prayag, Hosany, & Odeh, 2013). Given the intricate relationship between these attributes and place attachment, it becomes imperative to further explore how these individual attributes collectively influence the depth of attachment tourists feel towards a destination.

Hypothesis 3: Tourists' attributes, including social, psychological, and personal dimensions, are positively correlated with the degree of place attachment experienced by tourists.

Destination Attributes and Place Attachment

Destination attributes, encompassing both the tangible and intangible features of a location, have been recognised as critical determinants in shaping place attachment in the domain of tourism research. Tangible attributes, such as the physical infrastructure, amenities, and natural landscapes, provide the foundational experiences that can either enhance or diminish a tourist's sense of attachment (Lewicka, 2011). On the other hand, intangible attributes, which include cultural experiences, local traditions, and the overall ambiance, play a pivotal role in evoking emotional connections and fostering a deeper sense of belonging to a destination (Ramkissoon, Weiler, & Smith, 2012). For instance, a destination's cultural richness or unique traditions can resonate with tourists, creating a heightened sense of attachment (Tonge, Ryan, Moore, & Beckley, 2015). Furthermore, a destination's overall perceived image and reputation can significantly influence the depth of attachment tourists develop (Zenker & Rütter, 2014). Given the multifaceted nature of destination attributes and their profound influence on place attachment, a comprehensive exploration of their interrelationship is essential in advancing tourism studies.

Hypothesis 4: Destination attributes, both tangible and intangible, exert a significant positive influence on the development of place attachment among tourists.

Place Attachment and Revisit Intention

Place attachment, characterised by the emotional and psychological bonds individuals form with specific locations, has been extensively studied for its potential influence on revisit intentions in the tourism sector (Chen & Phou, 2013). The depth of attachment tourists feel towards a destination often translates into a desire to relive experiences, thereby influencing their intention to return (Scannell & Gifford, 2010). A profound sense of belonging and identity stemming from place attachment can be a compelling motivator for tourists to revisit destinations, seeking familiarity and emotional resonance (Lewicka, 2011). Moreover, the memories and positive associations cultivated during initial visits can enhance the allure of a destination, making the prospect of revisiting more appealing (Yuksel, Yuksel, & Bilim, 2010). Research has consistently underscored the robust link between strong place attachment and revisit intentions, suggesting that destinations evoking stronger emotional connections are more likely to witness repeat visits (Ramkissoon, Weiler, & Smith, 2012).

Given the evident interplay between place attachment and revisit intention, understanding this relationship is crucial for destination marketers aiming to foster sustainable tourism practices.

Hypothesis 5: Place attachment mediates the relationship between tourists' attributes, destination attributes and tourists' intention to revisit a destination.

RESEARCH METHODOLOGY

This study employs quantitative research utilizing a survey that involves a systematic collection and analysis of numerical data to gain insights into a particular phenomenon. A survey, typically a structured questionnaire, is administered to a sample of participants chosen to represent a larger population. The study's target population consists of individuals (aged 18 and older) who possess previous experience in the tourism industry within the region. The participants comprising the sample are 384 to guarantee a group that is adequately representative for significant analysis, while also taking into account the practicality of data collection within the scope of the study. Following data cleansing, 384 responses were evaluated in total. Incomplete and biased responses were eliminated from the data analysis. The sampling technique utilized in this study is simple random sampling.

The operationalization of variables and the selection of measurement instruments in this study were meticulously planned to ensure accurate and dependable data collection (Jain 2021). The study employed Likert scale-based structured questionnaires to operationalise the independent variables (Destination Attribute and Tourist Attribute), mediating variable (Place Attachment), and dependent variable (Revisit Intention), with respondents rating on a scale from 1 to 5. The analysis was conducted using SEM-PLS software, which similar to SmartPLS, incorporated validation tests that enhanced the overall assurance of data quality. The combined endeavours in verifying the data and assessing its dependability served to fortify the integrity and credibility of the dataset utilised in the SEM-PLS analysis (Brown and Ochoa 1998).

ANALYSIS AND DISCUSSION

The statistics generated in the context of a measurement model in Smart PLS are used to evaluate the reliability and validity of the constructs. The reliability of a construct is assessed using Cronbach's alpha and composite reliability. The Cronbach's alpha values (ranging from 0.795 to 0.911) and composite reliability values (ranging from 0.803 to 0.913) demonstrate a high level of internal consistency within the latent constructs. This suggests that the items within each construct consistently measure the same underlying concept. Construct validity is evaluated by employing the Average Variance Extracted (AVE). The AVE

values, which range from 0.708 to 0.849, demonstrate a strong convergent validity. This means that a significant amount of the variability in the concept is accurately represented by its indicators. These statistics essentially verify that the measurement model is dependable and accurate in expressing the intended concepts, guaranteeing the strength and precision of the analysis in Smart PLS.

The Fornell-Larcker Criterion is employed to evaluate the discriminant validity of constructs within a structural equation model (Afthanorhan, Ghazali, and Rashid 2021). The diagonal values exhibit larger values compared to the off-diagonal correlations across constructs. These diagonal values indicate each construct's square root of the Average Variance Extracted (AVE). This demonstrates robust discriminant validity, suggesting that the categories, specifically "Destination Attribute," "Place Attachment," "Revisit Intention," and "Tourist Attribute," are clearly defined and do not have substantial overlap in their measurement. Put simply, the model effectively differentiates between both concepts, hence confirming the dependability of the measurement approach.

Table 1: R Square Overview

	R-square	R-square adjusted
Place Attachment	0.830	0.829
Revisit Intention	0.550	0.546

The R-squared values presented in Table 1 provide a measure of the degree to which the regression models for "Place Attachment" and "Revisit Intention" accurately represent the data. The high R-squared value of 0.83 for "Place Attachment" and its modified R-squared value of 0.829 indicates that the model successfully accounts for roughly 83% of the variability in this construct, indicating a solid match. In contrast, the "Revisit Intention" model has an R-squared value of 0.55, suggesting that it accounts for around 55% of the variability. The adjusted R-squared value of 0.546 suggests a decent level of fit. However, this also suggests that unidentified factors might affect "Revisit Intention," emphasising the necessity for future research into additional variables that could influence this concept.

Table 2: F- square list

	f-square
Destination Attribute -> Place Attachment	0.652
Destination Attribute -> Revisit Intention	0.080
Place Attachment -> Revisit Intention	0.000
Tourist Attribute -> Place Attachment	0.618
Tourist Attribute -> Revisit Intention	0.118

The F-square values, which indicate the extent to which one variable influences another in your structural equation model, are presented in Table 2. These values facilitate the assessment of the strength of the relationships between the variables. "Tourist Attribute -> Place Attachment" and "Destination Attribute -> Place Attachment" each have F-square values of 0.652 and 0.618, respectively. This suggests that the attributes "Destination Attribute" and "Tourist Attribute" exert a substantial impact on the quality "Place Attachment." This implies that "Place Attachment" fluctuations can be predominantly explained by modifications in the aforementioned attributes. On the contrary, "Tourist Attribute -> Revisit Intention" and "Destination Attribute -> Revisit Intention", each has F-square values of 0.08 and 0.118, respectively. The relatively small magnitudes of these values indicate that they have a comparatively lesser influence on the variable "Revisit Intention." Conversely, an F-square value of 0.000 indicates that the relationship between "Place Attachment" and "Revisit Intention" is not statistically significant. As a result, the variable "Place Attachment" does not significantly contribute to the explanation of the fluctuations observed in "Revisit Intention." The results of this study provide valuable insights into the interrelationships among the components in your model, underscoring the strength of these connections. Furthermore, they can guide subsequent research endeavors or efforts to enhance the model.

The study's hypothesis testing results are displayed in Table 3, illustrating the influence of individual factors on one another. The T statistics and p-values are employed for the assessment of hypotheses, while the sample mean and standard deviation offer contextual information. The hypotheses H4, H2, H3, and H1 are confirmed. These findings indicate that the "Destination Attribute" has a substantial influence on "Place Attachment," "Revisit Intention," and "Tourist Attribute," whereas the "Tourist Attribute" has a large impact on "Place Attachment" and "Revisit Intention." The high T statistics and p-values of 0.000 imply robust and statistically significant associations. Nevertheless, Hypothesis H5, which suggests that "Place Attachment" influences "Revisit Intention," is disproven. The T statistic has a relatively small value of 0.038, and the p-value of 0.970 indicates that it is not statistically significant. These findings suggest that "Place Attachment" does not substantially influence "Revisit Intention" in this study. In a nutshell, the study offers robust empirical evidence for most of the proposed connections, except for the minimal influence of "Place Attachment" on "Revisit Intention." These findings enhance comprehension of the links between the variables being studied in the research.

Table 3: Results of Hypothesis Testing

Hypothesis Testing	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values	
H4	0.495	0.497	0.032	15.476	0.000	Supported
H2	0.362	0.368	0.085	4.279	0.000	Supported
H5	-0.004	-0.008	0.094	0.038	0.970	Rejected
H3	0.482	0.48	0.036	13.546	0.000	Supported
H1	0.436	0.435	0.067	6.463	0.000	Supported

The statistics generated in the context of a measurement model in Smart PLS are used to evaluate the reliability and validity of the constructs. The reliability of a construct is assessed using Cronbach's alpha and composite reliability. The Cronbach's alpha values (ranging from 0.795 to 0.911) and composite reliability values (ranging from 0.803 to 0.913) demonstrate a high level of internal consistency within the latent constructs. This suggests that the items within each construct consistently measure the same underlying concept. However, construct validity is evaluated by employing the Average Variance Extracted (AVE). The AVE values, which range from 0.708 to 0.849, demonstrate strong convergent validity. This means that a significant amount of the variability in the concept is accurately represented by its indicators. These statistics essentially verify that the measurement model is dependable and accurate in expressing the intended concepts, guaranteeing the strength and precision of the analysis in Smart PLS.

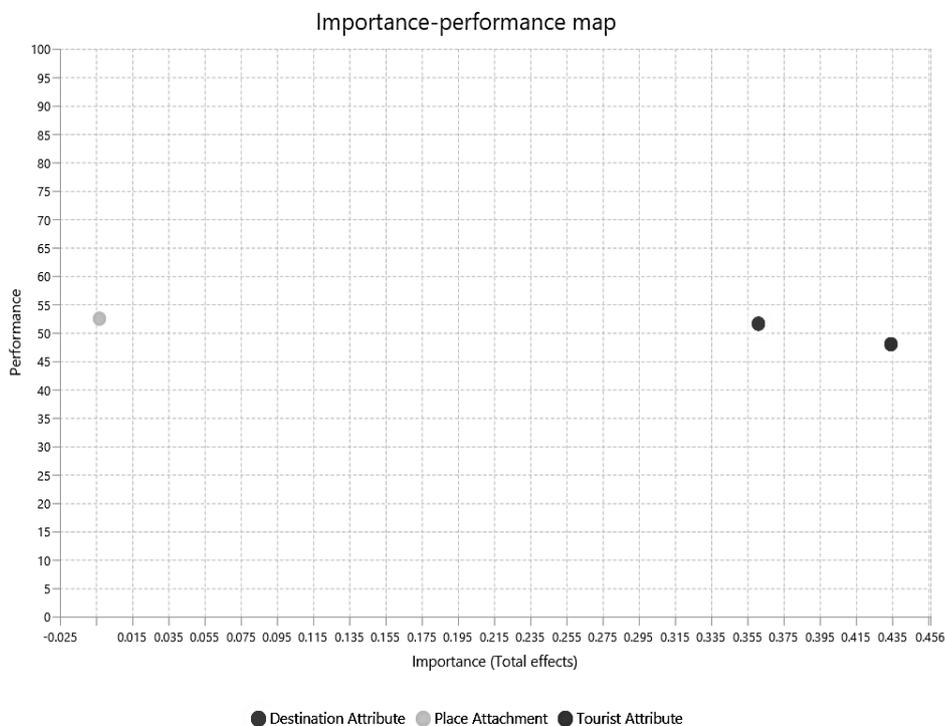


Figure 1: Importance – Performance Map

Within the framework of an Importance-Performance Map (Ringle and Sarstedt 2016) study illustrated in Figure 1, the precise values linked to "Revisit Intention" concerning the qualities are of utmost significance. The "Destination Attribute" with a score of 0.361 is of moderate importance and somewhat favourable influence on revisit intentions, indicating that it has a significant role. Conversely, the result of -0.004 for "Place Attachment" suggests that it has minimal or no effect on the likelihood of revisiting, and may even have a slightly negative impact. The "Tourist Attribute" has a score of 0.434, indicating its significant importance and a powerful positive impact on the intention to revisit, making it a critical factor. Hence, it is imperative for stakeholders and decision-makers to give precedence to enhancing the "Tourist Attribute" and "Destination Attribute" since these aspects have significant importance and exert a favorable influence on the likelihood of revisiting. The impact of "Place Attachment" seems to be limited and may not be a top priority for enhancement in this particular circumstance.

CONCLUSION

A multitude of factors exert a profound influence on the dynamics of tourism, shaping the decisions, actions, and likelihood of travellers to revisit particular destinations. These comprise attributes associated with the destination as well as those related to the tourists themselves, including personal, social, and psychological factors, as well as tangible and intangible characteristics of the locations. The notions of place attachment and revisit intention, which are widely acknowledged as crucial determinants in the field of sustainable tourism, are at the heart of this intricate interplay.

The literature review furnished an all-encompassing foundation for the research, emphasising the complex network of elements that impact the choices made by visitors. Remaining intention has been found to be significantly influenced by tourist-related characteristics, including personal preferences and interests and social influences such as recommendations from family and friends. In the same way, the return decisions of visitors are significantly influenced by destination-related tangible and intangible qualities, including infrastructure, natural beauty, cultural diversity, and atmosphere. Scholarly literature emphasizes the critical significance of place attachment in influencing intentions to revisit. Place attachment, distinguished by the development of emotional connections with particular destinations, cultivates a deep sense of identity and affiliation, thereby impacting the conduct and perspectives of visitors. A high degree of place attachment has been consistently associated with a larger inclination to revisit, underscoring the importance of this attribute in advancing sustainable tourism.

This study fills a significant void in the existing body of literature by concentrating on the particular circumstances of Jazan Province, Saudi Arabia. Previous studies have offered a more comprehensive perspective on domestic tourism in Saudi Arabia. However, this study focuses on the intricate function of place attachment as a mediator between attributes associated with the destination and visitors, which influences their inclination to revisit.

REFERENCES

- Afthanorhan, Asyraf, Puspa Liza Ghazali, and Norfadzilah Rashid (2021). "Discriminant Validity: A Comparison of CBSEM and Consistent PLS Using Fornell & Larcker and HTMT Approaches." In *Journal of Physics: Conference Series*, (Vol. 1874, No. 1, p. 012085). IOP Publishing.
- Ajzen, Icek (2011). "The Theory of Planned Behaviour: Reactions and Reflections." *Psychology & Health* 26(9): 1113–27. <https://doi.org/10.1080/08870446.2011.613995>.
- Azinuddin, M., Shariffuddin, N. S. M., Som, A. P. M., Salim, M. A. M., & Eppang, B. M. (2023). Interrelationship of networks, knowledge, and performance of businesses through the lens of coastal destination development. *Planning Malaysia*, 21(4), 376-

389.

- Azinuddin, M., Zain, W. M. A. W. M., & Shariffuddin, N. S. M. (2022). Tourism Sustainability: Perspectives on Past Works, Issues and Future Research Opportunities. In *Environmental Management and Sustainable Development: Case Studies and Solutions from Malaysia* (pp. 39-51). Cham: Springer International Publishing.
- Azwar, H., Hanafiah, M. H., Abd Ghani, A., Azinuddin, M., & Shariffuddin, N. S. M. (2023). Community-Based Tourism (CBT) moving forward: Penta helix development strategy through community local wisdom empowerment. *Planning Malaysia, 21*, 72-88.
- Beritelli, P., Bieger, T., & Laesser, C. (2014). The new frontiers of destination management: Applying variable geometry as a function-based approach. *Journal of travel research, 53*(4), 403-417.
- Blackwell, R., DSouza, C., Taghian, M., Miniard, P., & Engel, J. (2006). *Consumer behaviour: an Asia Pacific approach*. Deakin University.
- Brown, G., Assaker, G., & Reis, A. (2018). Visiting Fortaleza: motivation, satisfaction and revisit intentions of spectators at the Brazil 2014 FIFA World Cup. *Journal of Sport & Tourism, 22*(1), 1-19.
- Brown, R. E., and J. R. Ochoa (1998). "Distribution System Reliability: Default Data and Model Validation." *IEEE Transactions on Power Systems* 13(2), 704-709.
- Chen, C. F., & Phou, S. (2013). A closer look at destination: Image, personality, relationship and loyalty. *Tourism management, 36*, 269-278.
- Chong, A. Y. L., Chan, F. T., & Ooi, K. B. (2012). Predicting consumer decisions to adopt mobile commerce: Cross country empirical examination between China and Malaysia. *Decision support systems, 53*(1), 34-43.
- Dwyer, Larry, Ning Chen, and Jenny Lee (2019). "The Role of Place Attachment in Tourism Research." *Journal of Travel and Tourism Marketing* 36(5), 645-652.
- Hau, P. X., & Tuan, V. A. (2017). The development of rural tourism in Vietnam: Objectives, practical experiences and challenges. *Van Hien University Journal of Science, 5*(2), 189-200.
- Jain, Neha (2021). "Survey versus Interviews: Comparing Data Collection Tools for Exploratory Research." *Qualitative Report* 26(2).
- Kim, Samuel Seongseop, Yim King Penny Wan, and Steve Pan (2015). "Differences in Tourist Attitude and Behavior Between Mainland Chinese and Taiwanese Tourists." *Journal of Travel and Tourism Marketing* 32(1-2).
- Kozak, M. (2001). Repeaters' behaviour at two distinct destinations. *Annals of tourism research, 28*(3), 784-807.
- Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology, 31*(3), 207-230.
- Li, F., Wen, J., & Ying, T. (2018). The influence of crisis on tourists' perceived destination image and revisit intention: An exploratory study of Chinese tourists to North Korea. *Journal of destination marketing & management, 9*, 104-111.
- Liu, A., & Wall, G. (2006). Planning tourism employment: a developing country perspective. *Tourism Management, 27*(1), 159-170.
- Luo, Jian Ming, Chi Fung Lam, and Hongyu Wang (2021). "Exploring the Relationship Between Hedonism, Tourist Experience, and Revisit Intention in Entertainment Destination." *SAGE Open* 11(4).
- Mittal, M., Dawson-Amoah, R., & Benyi, K. (2013). Assessing the brand knowledge of

- Ghana as a tourism destination.
- Oppermann, M. (2000). Tourism destination loyalty. *Journal of travel research*, 39(1), 78-84.
- Prayag, G., Hosany, S., & Odeh, K. (2013). The role of tourists' emotional experiences and satisfaction in understanding behavioural intentions. *Journal of Destination Marketing & Management*, 2(2), 118-127.
- Prayag, G., & Ryan, C. (2012). Antecedents of tourists' loyalty to Mauritius: The role and influence of destination image, place attachment, personal involvement, and satisfaction. *Journal of travel research*, 51(3), 342-356.
- Ramkissoon, H., Weiler, B., & Smith, L. D. G. (2012). Place attachment and pro-environmental behaviour in national parks: The development of a conceptual framework. *Journal of Sustainable Tourism*, 20(2), 257-276.
- Rani, Z. M., Othman, N., & Ahmad, K. N. (2014). The role of perceived authenticity as the determinant to revisit heritage tourism destination in Penang. *Theory and Practice in Hospitality and Tourism Research, Penang, Malaysia*, 293.
- Ringle, Christian M., and Marko Sarstedt (2016). "Gain More Insight from Your PLS-SEM Results the Importance-Performance Map Analysis." *Industrial Management and Data Systems* 116(9), 1865-1886.
- Robert NAU (2015). "What's a Good Value for R-Squared?" *Linear regression models DUKE UNIVERSITY*.
- Scannell, L., & Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology*, 30(1), 1-10.
- Shehab, E., Som, A. P. M., & Al Qassem, A. (2023). Destination image and tourist retention in Jerusalem. *Planning Malaysia*, 21(1), 203-214.
- Smith, A. (2010). The development of "sports-city" zones and their potential value as tourism resources for urban areas. *European Planning Studies*, 18(3), 385-410.
- Tonge, J., Ryan, M. M., Moore, S. A., & Beckley, L. E. (2015). The effect of place attachment on pro-environment behavioural intentions of visitors to coastal natural area tourist destinations. *Journal of Travel Research*, 54(6), 730-743.
- Wang, D. (2004). Tourist behaviour and repeat visitation to Hong Kong. *Tourism geographies*, 6(1), 99-118.
- Wang, S., & Chen, J. S. (2015). The influence of place identity on perceived tourism impacts. *Annals of Tourism Research*, 52, 16-28.
- Wikipedia (2024). Jizan, 5 February 2024, <https://en.wikipedia.org/wiki/Jizan>.
- Yousof, Haitham M. et al. (2023). "An Alternative Model for Describing the Reliability Data: Applications, Assessment, and Goodness-of-Fit Validation Testing." *Mathematics* 11(6), 1308.
- Yuksel, A., Yuksel, F., & Bilim, Y. (2010). Destination attachment: Effects on customer satisfaction and cognitive, affective and conative loyalty. *Tourism Management*, 31(2), 274-284.
- Zenker, S., & Rütter, N. (2014). Is satisfaction the key? The role of citizen satisfaction, place attachment and place brand attitude on positive citizenship behaviour. *Cities*, 38, 11-17.

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SOCIAL NORM AND ENVIRONMENTAL CONCERN AS THE PREDICTORS OF CITIZENS' ACTUAL BEHAVIOUR TO ADOPT PUBLIC TRANSPORT IN TERENGGANU, MALAYSIA

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Abstract

The increasing penetration of private motor vehicles for commuting demonstrates an astonishing vehicle reliance in Malaysia. The use of public transport could provide a promising alternative by enabling accessibility, reducing congestion and fatalities, and mitigating environmental problems especially in densely populated areas. However, the utilisation of public transport does not depend only on the intention but the actual use as well. Understanding individuals' readiness to adopt public transport are critical for improving sustainable mobility. Based on the theory of Interpersonal Behaviour (TIB), this study aims to assess the individuals' behavioural readiness to use for public transportation to improve sustainable mobility instead of using single-occupancy vehicles in Terengganu, Malaysia. This quantitative survey is distributed on 200 citizens at four densely-populated locations in cities of Terengganu, namely Kuala Terengganu, Chukai, Dungun and Jerteh. Data analysis is analysed using structural equation modelling of partial least squares (PLS-SEM). The empirical results indicate that social norm and environmental concern are the main predictor that affecting the behavioural readiness on adopting public transport among the respondents. However, perceived value and affective construct do not have significant impact on citizens' readiness to use public transport. Policy implications like enhancing service quality, promoting environmental benefits and implementing visible safety measures are addressed. As cities continue to invest in and prioritize public transport, they contribute to a more sustainable and resilient transportation landscape.

Keywords: Environmental concern; Public transport; Social norm; Environment; Sustainability

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INTRODUCTION

The imperative task of reducing private car usage and promoting public transportation is fraught with challenges when it comes to addressing urban transport issues. In Malaysia, only 16% of commuters currently rely on public transport due to its unreliability and insufficiency, leading to dissatisfaction among users (Rahman and Abdullah, 2016). In contrast, private motor vehicles, especially cars, dominate transportation, constituting 47.3% of the 33.3 million registered vehicles in 2021 (Chan, 2022). This overdependence on private vehicles aggravates traffic congestion, notably in densely populated areas like Kuala Lumpur, where drivers lost around 170 hours per year in heavy traffic in 2019 (TomTom Traffic Index).

The escalating trend in private vehicle ownership raises alarming concerns about environmental sustainability. In 2018, the transport sector in Malaysia contributed a significant 28.8% of carbon dioxide (CO₂) emissions from total fossil fuel combustion, surpassing the global average of 24.5% (IEA, 2019). This is worsened by the rapid sectoral growth that relies heavily on transportation, namely tourism where the conversations have long been held to achieve optimal balance between the three pillars of sustainability of social, environment and economy (see Azinuddin et al., 2022). Therefore, recognizing the crucial importance of promoting public transport as a viable mode is essential to address the prevalent dependence on private cars in Malaysian urban areas and contribute to sustainable development efforts.

Terengganu, situated on the east coast of Peninsular Malaysia, is a state with a diverse economic foundation, deriving strength from the oil and gas industry, fisheries, and tourism. In 2019, the state's population stood at 1.25 million, experiencing an average annual growth rate of 2% (Department of Statistics Malaysia, 2020). The state is currently undergoing robust socio-economic development, diversifying into sectors like bioeconomy and agribusiness. With a targeted goal of attracting RM26 billion in private investments by 2025, this initiative aims to generate 36,600 employment opportunities and foster the emergence of 15,550 new local entrepreneurs (ECER, 2020). However, the rapid increase in Terengganu's population has paralleled a substantial surge in private cars in recent years.

From 2010 to 2018, the number of registered motor vehicles in Terengganu increased by 646,013 units (+50%) (Malaysian Automotive Association, 2018). The rising number of vehicles in the state, driven by competitive prices of national and foreign vehicles, signifies a remarkable dependence on private vehicles. This surge, compared to the population, underscores a significant challenge in encouraging public transport adoption among Terengganu residents. Therefore, understanding the factors influencing

residents' adoption on public transportation, such as bus services and taxis, is crucial amid the state's robust socio-economic development.

Previous research consistently affirms that intentions reliably predict subsequent behaviour (Ajzen, 1991; Gollwitzer, 1999). The established notion of a linear causal relationship between intention and behaviour posits that intention alone is sufficient for behaviour prediction. Notably, interventions utilizing incentives to bolster the intention to transition from using private vehicle to adopting public transportation have shown success in temporarily increasing its usage (Redman et al. 2013). For instance, providing fare structures that are competitive with private transport costs via subsidy mechanism may attract the individuals to adopt public transport. However, it is crucial to note that this behaviour tends to regress once the incentives are withdrawn. This phenomenon may elucidate why past intervention programs built on the intention-behaviour causal relationship have not resulted in a sustained shift from private vehicle to public transport adoption. (Chan et al. 2018).

Contrary to the prevailing assumption that intention invariably leads to overt actions, scholarly investigations, particularly those conducted by Gollwitzer (1993, 1996, 1999), posit that intention functions as a precursor to what is conceptually termed as behavioural readiness. A thorough examination of literature reinforces the pivotal role of intention in the cultivation of behavioural readiness, recognized as the proximal determinant of action according to Heckhausen's work (1991). This behavioural readiness, distinguished by its self-initiated and volitional properties (Heckhausen & Gollwitzer, 1987), denotes a proactive and deliberate shift in behavioural patterns. Within the domain of transport behaviour, actions stemming from volition demonstrate a more auspicious potential for inducing a discernible shift in commuting patterns within the Malaysian context, surpassing the impact of behaviour motivated solely by external incentives.

Hence, the primary aim of this study is to investigate the factors influencing public transport readiness among citizens in Terengganu, Malaysia. A thorough understanding of these determinants has the potential to guide policy formulation and assist public transportation providers in enhancing their current services. Furthermore, insights from this research can aid key stakeholders in developing more effective strategies to encourage the adoption of public transportation. This strategic shift has the potential to improve environmental sustainability (Mustaffa et al., 2023; Saad et al., 2023), and contribute to the overall health and well-being of the local population. Notably, a significant reduction in private vehicle ownership emerges as a viable mitigation measure in response to the increasing trend of private vehicle acquisition in Terengganu.

The subsequent sections of this paper are structured as follows: The following section provides an overview of the pertinent theoretical background.

Section 3 outlines the methodology of the study, encompassing details on the practical test, procedure, survey content, and the analytical approach employed. Section 4 elucidates the obtained results. Finally, Section 5 offers key conclusions and discussion points, incorporating considerations of limitations and practical.

LITERATURE REVIEW

The Theory of Interpersonal Behaviour (TIB, Triandis, 1980) is a widely employed framework for comprehending user acceptance, notably in the domain of transport behaviour. Within the TIB framework, intention, serving as the primary determinant of behaviour, signifies an individual's preparedness to engage in a specific behaviour. This intention is intricately influenced by three critical factors: 1) cognitive evaluations, reflecting individual thoughts and preferences regarding public transport services, 2) social norms, encompassing societal perceptions and endorsements of public transport, and 3) affective factors, encapsulating the emotional responses elicited by the contemplation of a specific behaviour.

TIB has been employed numerous times to assess and understand public transport behaviour. Mifsud et al. (2019) conducted an examination of the psychological determinants influencing the mobility of older individuals in Malta. The study found that the mobility of older people is primarily motivated by their intentions, which, in turn, are significantly influenced by prevailing social norms and pressures from specific reference groups. Moreover, the results underscore the considerable impact of intentional cognitive processes on mobility, surpassing the influence of habitual behaviours. In a separate investigation, Kang et al. (2019) identified predictors of drivers' intentions to transition from car driving to public transport. Their research revealed that factors such as convenience, commute impedance, and flexible service significantly influence the intention to adopt public transport. Subsequently, Kang et al. (2020) conducted a study aimed at measuring the propensity of individuals to switch from single-occupancy vehicles to reduce carbon emissions. The outcomes indicated that the desire for comfort and convenience played pivotal roles in predicting both intention and implementation intention to utilize public transport in Malaysia. Hence, in this study, we investigate the role of perceived value, social norm, affective and environmental concern to examine their influences on behavioural intention to use public transport in Malaysia. In addition, this study also hypothesizes that behavioural intention, is the main antecedent of behavioural readiness to use public transport among citizens in Malaysia.

Perceived value

The role of perceived value in shaping the public transportation utilisation is a significant aspect highlighted in the literature. Perceived value, a crucial factor,

arises when consumers make a comprehensive judgment about a product's worth, considering the balance between benefits gained and sacrifices made. An extensive literature review underscores the substantial impact of perceived quality and value on user satisfaction, subsequently influencing behavioural intention within the domain of public transportation. Furthermore, an additional inquiry establishes a positive correlation between perceived value and behavioural intention, wherein patrons of public transit assess the likelihood of sustained usage and express a proclivity to recommend the service to others (Lai and Chen, 2011). In the adoption of public transportation, individuals may associate perceived value with a preference for comfort, particularly if they are accustomed to the comfort provided by single-occupancy vehicles. Conversely, comfort in public transport is contingent upon the availability of sufficient seating (Wilson, 2011). Beckman (2013) advocates for an increase in bus ridership by minimizing standing duration and the number of standees during bus trips. Additionally, the cleanliness of public transport emerges as a crucial factor influencing comfort (Minhans et al., 2020). Another study posits that the presence of air-conditioning in public transport contributes to an increased intention to use such services (Curries and Wallis, 2008).

Limited literature explores the correlation between convenience and service quality in public transport. Notably, the implementation of an integrated ticketing system with smart cards is identified as a convenience factor that promotes the use of public transport (Kang et al., 2019). Furthermore, perceived value can be derived from perceived convenience, such as the availability of internet onboard, audio notifications for specific stops, and electronic text displaying destination signs at each station (Currie and Wallis, 2008). Subsequently, the provision of service information related to interchange times, expected departure and arrival times enhances the meaningfulness and reliability of trips (Velázquez Romera & Monzón, 2016). Taken together, we expect that perceived value positively influences behavioural intentions for public transportation usage and develop the following hypothesis:

H1: Perceived value is positively related on the intention to use public transport

Social norm

The social norm, reflecting perceived social pressure to engage or abstain from a behaviour, plays a pivotal role in the adoption of public transportation. Social influence provides valuable social insights, positively influencing intention and behavioural readiness to embrace diverse transportation modes (Bourke et al., 2019). For instance, an individual may initially consider driving but, influenced by social pressures, may opt for public transport. Research demonstrates that the subjective norm significantly predicts the intention to use public transportation

(Rezaimoghadam et al., 2022). Notably, the perceived opinions of significant others, a component of subjective norm measurement, exhibit a negative correlation with its impact strength on intention (Ekhardt, 2009). Furthermore, social norm is delineated by two distinct processes: anticipated feelings of guilt and perceived social norms. These processes elucidate how different social contexts can shape individual judgments and actual usage of public transportation (Neuber, 2021). Hence, a substantial body of evidence underscores the pivotal role of norms in elucidating behaviour regarding mode choice and usage frequency. Taken together, we expect that social norm positively influences behavioural intentions for public transportation usage and develop the following hypothesis:

H2: Social norm is positively related on the intention to use public transport

Affective

The third determinant of intention involves the affective factor, which pertains to the unconscious emotional responses' individuals evoke in specific situations (Gärling et al., 1998). An examination of car drivers' willingness to switch to public transport revealed that their post-experience satisfaction, as recalled in a study by Al-Ayyash and Abou Zeid (2019), was lower than their anticipated satisfaction before the experience. Affective outcomes related to specific trips on public transport, known as trip-based affect, can result in negative emotional responses among drivers due to social information received from their referents. Drivers may experience anxiety concerning their punctuality if they choose public transport (Schneider, 2013). Recently, Kang et al. (2020) investigated drivers' implementation intentions to use public buses and discovered that worry impedes drivers' intentions to adopt public transport in Malaysia. Generally, we expect that affective negatively influences behavioural intentions for public transport usage. Thus, we have the following hypothesis:

H3: Affective is negatively related on the intention to use public transport

Environmental concern

Environmental consciousness has been shown to impact the acceptance of public transportation. Research indicates that individuals with a higher level of environmental responsibility are more inclined to opt for public transportation as a sustainable mode of travel. Various factors, including demographic characteristics, transportation alternatives, trip-related considerations, and environmental concerns, have been recognized as influential elements shaping an individual's likelihood to utilize public transportation. Furthermore, the advantages associated with public transportation, such as reduced energy

consumption and pollution, are underscored as incentives to enhance its adoption (Li et al., 2021). These findings underscore the importance of promoting environmental awareness and highlighting the ecological advantages of public transportation as effective strategies for fostering its adoption and usage. Thus, we expect that environmental concern will positively influence behavioural intentions for public transport usage and develop the following hypothesis:

H4: Environmental concern is positively related on the intention to use public transport

Intention to use public transport

To transition to public transport, drivers must procure the requisite resources. Following the establishment of intention, they embark on a deliberate alteration of their daily travel patterns, meticulously strategizing the incorporation of public transport by planning the when, where, and how aspects. This entails crafting a specific journey with determination, systematically outlining every conceivable outcome—whether positive or negative—in a methodical and calculated manner. Thus, we expect that intention to use will positively influence behavioural intentions for public transport usage and develop the following hypothesis:

H5: Intention to use is positively related on the behavioural readiness to use for public transport

The proposed theoretical framework

Based on the above underpinning assumptions, we develop a theoretical framework that aims to understanding the factors contributing the behavioural intention and behavioural readiness to adopt public transport. The research model is shown in Figure 1. The model was drawn based on the Theory of Interpersonal Behaviour (TIB) to represent the perceived value, affective, social norm, environmental concern and to represent the individuals' readiness to adopt sustainable means of transportation (Triandies, 1980; Kang, 2019).

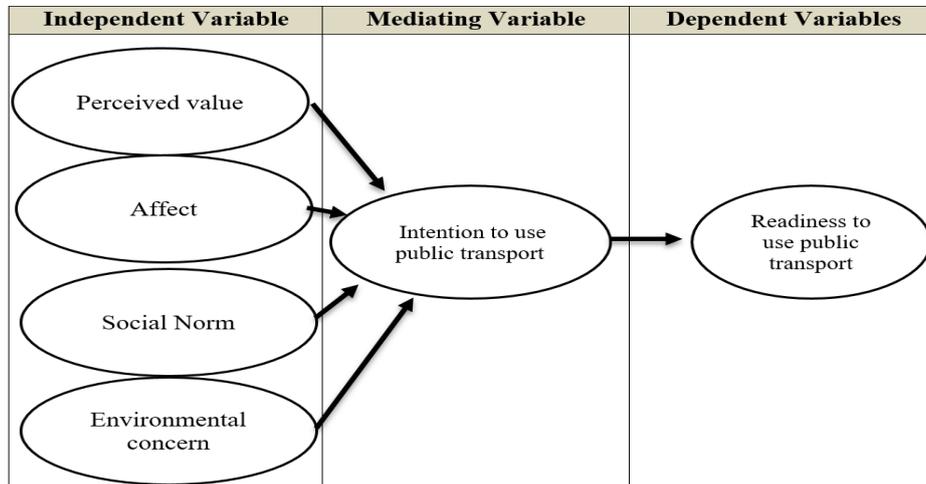


Figure 1: The proposed theoretical model

RESEARCH METHODOLOGY

Research Design

The study adopted a self-guided quantitative survey approach which was distributed in the Terengganu. Given that the Ministry of Transport Malaysia does not maintain records of consumers who use public transport, a convenience sampling method was employed to mitigate potential common method bias. The study's procedure includes two pre-tests, a pilot, and the actual study.

Data collection

A non-probability with convenience sampling method was used to select respondents to participate in the face-to-face quantitative survey. The survey questionnaire was conducted at four densely-populated locations in cities of Terengganu, namely Dungun, Jertih, Chukai and Kuala Terengganu. These cities are the main areas in the state where public transportation penetration is higher, and the public transportation sector is developed in Terengganu. Data collection began in September 2022 and ended in October 2022, with 200 thoroughly questionnaires being returned. After screening, we found 185 valid questionnaires (a 93% effective rate). Descriptive information regarding the respondents is shown in Table 1.

The demographic characteristics of the study respondents. The largest proportion (25.4%) resides in the Dungun district, closely followed by Jertih, Kemaman, and Kuala Terengganu, each accounting for 24.9%. The age distribution revealed that a significant portion (35%) falls within the 17-21 age bracket, while the subsequent age group of 22-26 comprises 28.1%. Ethnically,

the vast majority (99.5%) identify as Malay, with a nominal representation (0.5%) from the Indian ethnic group. Regarding transportation preferences, the data indicates that 63.8% of respondents primarily utilised private vehicles. Furthermore, a noteworthy 78.9% of respondents relied on bus services for commuting within their hometowns. Examining the frequency of bus usage, the majority respondents (60.5%) opted for bus transportation once a month. Additionally, 75.1% of respondents have availed themselves of taxi services in their hometowns, with 68.1% having never utilized taxi services. Conversely, a substantial 70.8% of respondents engaged with e-hailing services, such as Grab car and Maxim, within their hometowns.

Measures

The survey questionnaire was structured into six sections and 20 profiling questions. Perceived values were operationalized using 23 items to represent Comfort (10), Service Information (6), and Convenience (7) dimensions with scale range from 1= not at all important to 7 = very important. The social norm was measured using five items from 1 = strongly disagree to 7 = strongly agree. The affective construct was operationalized using 13 items to represent Unsure (3), Unsafe (6) and Uncomfortable (4) with scale range from 1 = never to 5 = always. Environmental concern construct was operationalized using 5 items from 1 = strongly disagree to 7 = strongly agree. This is also the case with the intention to use public transport and behavioural readiness to use public transport.

Data analysis

This study applies PLS-SEM approach to analyse the data. PLS-SEM is robust in handling multicollinearity, where predictors are highly correlated, which can be an issue in traditional regression methods. It is suitable for situations with smaller sample sizes where other methods might not perform well due to limitations in data. Also, PLS-SEM can model complex relationships between predictor and response variables, including situations where there might be nonlinear relationships. It is useful when dealing with datasets with many predictors or latent variables, making it suitable for structural equation modelling and path analysis. Furthermore, PLS-SEM is well-suited for predictive modelling, especially when the focus is on predicting outcomes rather than interpreting the individual relationships between variables (Salleh et al., 2023). It is particularly effective in situations where the goal is to maximize predictive accuracy. This study applied SmartPLS version 4.0 because of its robustness, especially in handling complex models with small sample sizes and multicollinearity, providing reliable results (Hair et al. 2014).

RESULT AND DISCUSSION

In the application of multivariate analysis, this study adopted Hair et al. (2017) recommendation of the PLS-SEM sequence to analyse path model. According to Hair et al. (2017), the path model involves the measurement models and followed by the structural model.

Measurement model

In the measurement model, the assessment involved were indicator reliability (outer loadings), internal consistency reliability (composite reliability [CR]) and convergent validity (average variance extracted [AVE]). The outer loadings of a construct should at least explain 50% of each indicator's variance. Meanwhile, the CR higher than 70% demonstrates an internal consistency reliability. Lastly, an AVE to be above the required minimum of 50% in order to have acceptable level of convergent validity. This study adopted two-stage method that involved using first-stage construct as an indicator for the second-stage construct, and extracting the AVE and CR for the higher-order construct (HOC). This approach is beneficial when multidimensional variables are mediating variables or endogenous. Besides, this approach can provide a consistent result since it does not necessitate an equal number of indicators for lower-order constructs (Ringle et al. 2015). The initial standardized factor loadings of the model items ranging from 0.727 to 0.953; hence, they were all greater than the suggested threshold value of 0.7 (Hair et al. 2019). In addition, the CR values were also more than the recommended threshold value of 0.6 (Hair et al. 2016), as they ranged from 0.673 to 0.918. Finally, the AVE values ranging from 0.630 to 0.780, so they were greater than the recommended threshold value of 0.5 (Hair et al. 2019). In order to measure the discriminant validity, the current study found out the HTMT for the overall model, including perceived value, social norm, affective, environmental concern, behavioural intention and behavioural readiness. All the HTMT values of the latent constructs in the overall model variables ranged from 0.032 to 0.864 and were thus below the threshold value of 0.90. This result proved that each latent construct measurement was totally discriminatory (Henseler et al. 2015).

Assessment of structural model

Because the measurement model exhibited reliability and validity, the next step in the analytical process involved scrutinizing the structural model. The evaluation of multicollinearity among the indicators in the structural model included analysing each set of constructs in relation to the endogenous construct. According to Hair et al. (2019), a variance inflation factor (VIF) value equal to or over 5.0 for a given construct suggests the presence of a possible issue with

multicollinearity. VIF threshold below the value of 5.0 was acceptable as multicollinearity does not reach its critical level.

Hypothesis testing

To test hypotheses, a bootstrapping function was employed. In this instance, a minimum of 5000 bootstrap samples were chosen, and critical values for one-tailed t-tests of 1.645 (significance level = 5%) and 2.33 (significance level = 1%) were utilized (Hair et al. 2014). Based on Table 5, the results show that social norm has a significant influence on intention to use public transport with a regression coefficient of 0.445, standard deviation = 0.094, t-statistic value = 4.719 and significant at the 1% level. This means, assuming social norm increases by 1% then intention to use public transport will increase by 44.5%.

Similarly, environmental concern has a significant influence on intention to use public transport with a regression coefficient of 0.293, standard deviation = 0.089, t-statistic value = 3.287 and significant at the 1%. This means, assuming environmental concern increases by 1% then intention to use public transport will increase by 29.3%. Next, the study found that intention to use public transport has a significant influence on behavioural readiness to use public transport with a regression coefficient of 0.310, standard deviation = 0.095, t-statistic value = 3.271 and significant at the 1% level. This means, assuming intention to use public transport increases by 1% then behavioural readiness to use public transport will increase by 31%. Lastly, the result also indicated a non-significant relationship between perceived value ($\beta = -0.071$, $p > 0.05$) and affective ($\beta = 0.096$, $p > 0.05$). Thus, hypotheses H1 and H3 in this study were not supported. In addition, Table 5 shows the results of the analysis of coefficient of determination (R-Square) and Effect Size (f-Square). The study found that perceived value can explain its influence on social influence as much as 0.144 or 14.4 percent. Next, perceived value, social influence and affective attitude can explain the influence on intention to try public transport as much as 0.374 or 37.4 percent. The rest, as much as 62.6 percent, is explained by other variables that were not studied in this study. The variable intention to try public transport and affective attitude can explain its influence on behavioural to try public transport as much as 0.139 or 13.9 percent.

In addition, Table 5 shows the results of the analysis of coefficient of determination (R-Square). The R-square value between perceived value, social norm, affective, environmental concern, and intention to use public transport were 0.374. It suggests that 37.4% of the variance in intention to use public transport could be explained by these constructs. The R-square value between intention to use public transport and behavioural readiness to use public transport were 0.139. It suggests that 13.9% of the variance in behavioural readiness to use public transport could be explained by intention to use public transport.

Table 5: Hypothesis testing

Ha	Relationship	Coefficient	Standard error	t-value	p-value	R-Square	Decision
H1	PV→IU	-0.071	0.069	0.976	0.329	0.374	Not supported
H2	SN→IU	0.440	0.094	4.719	0.000		Supported
H3	AF→IU	0.096	0.066	1.425	0.154		Not supported
H4	EC→IU	0.303	0.089	3.287	0.001		Supported
H5	IU→RU	0.318	0.095	3.271	0.001	0.139	Supported

Note: PV- Perceived value; SN- Social norm; AF- Affective; EC- Environmental concern; IU- Intention to use public transport; RU- Readiness to use public transport

Based on the findings of the current study, it is evident that the intention to use public transport plays a crucial role in shaping citizens' readiness to adopt this mode of transportation during the study period. This behavioural intention is significantly influenced by both social norms and environmental concerns. First, the study revealed a positive and significant influence of social norms on the intention and to adopt public transport, highlighting how individuals' perceptions of their external environment significantly shape their behaviour. Respondents tended to conform to the transportation behaviour of their social groups and peers. Consequently, the prevalent use of private transportation within certain social circles influenced individuals' inclination to follow suit, leading to increased intention and usage of public transport as a sustainable travel mode. This finding aligns with the findings of Bourke et al. (2019) and Kang et al. (2020), emphasizing the influence of information provided by household members, friends, and co-workers on encouraging positive behaviour regarding public transport adoption. Furthermore, the study identified a positive and significant influence of environmental concerns on intentions to use public transport. Individuals who prioritize environmental sustainability may actively seek ways to incorporate green practices into their daily lives. Opting for public transport can be perceived as a sustainable and responsible choice, contributing to a larger societal effort to reduce the environmental impact of transportation. The finding of present study is consistent with Ng and Phung (2021) who revealed that environmental health concern is important in rail transport usage among private motor vehicle users in Greater Kuala Lumpur.

The lack of a significant influence of perceived value on the intention to use public transport in the study may be attributed to several factors. Respondents noted cleanliness issues and the absence of air conditioning in some transportation terminals and public transport, which overshadowed any perceived value. Additionally, the lack of service information at terminals and during transit, absence of voice announcement systems at destinations, and the absence

of physical amenities like cashless payment options, Wi-Fi availability, and electronic display of the next stop limited respondents' use of public transport. The finding is in contradiction with Kang et al. (2020) who found a positive significantly relationship between perceived value and public transport intention among individuals in the state of Penang, Malaysia. It is most likely that the public transport infrastructure differences between Penang and Terengganu resulted in such a discrepancy. The absence of a significant relationship between affective factors and intention to use public transport among individuals may be attributed to various factors. One possibility is that respondents may not perceive a strong emotional connection or emotional influence in their decision-making process regarding public transport use. The finding is in contradiction with Silva et al. (2021), Das and Varshneya (2017) who found a positive and significant influence of emotions on passengers' behavioural intentions for public transport. It is most likely that limited obstruction on roads in Terengganu likely contributes to a reduced incentive for individuals to shift from private vehicles to public transport.

CONCLUSION

The study aimed to investigate the factors influencing behavioural readiness to use public transport among citizens in the state of Terengganu, Malaysia. Key findings highlighted the significant influence of social norms on individuals' decision to use public transport. This suggests that the opinions of close acquaintances play a crucial role in the decisions of Terengganu citizens regarding the adoption of public transportation. Additionally, the study revealed the significance of environmental concern, indicating that individuals in the study possessed substantial factual knowledge of the environment, leading to their readiness for public transportation adoption. However, affective constructs, such as feelings of uncertainty, discomfort, and insecurity, did not significantly impact actual behaviour in using public transport. Furthermore, perceived value was not found to significantly influence the decision to adopt public transport during the study period. These findings have important implications for policymakers and urban planners, emphasizing the need to address the importance of perceived value among individuals to encourage the adoption for public transportation as a medium for sustainable mobility. Firstly, the related government agencies may introduce subsidies that make public transport more affordable for a wider range of individuals. Special discounts for students, seniors, and low-income populations can increase accessibility and perceived value. In terms of quality-of-service standards, the policymakers should establish and enforce quality of service standards for public transport providers. This can include cleanliness, safety measures, and comfort standards to ensure a positive experience for passengers. The related ministries and public transport providers also must work

towards making public transport more accessible for people with disabilities. This includes ensuring that vehicles and stations are designed to accommodate individuals with diverse mobility needs.

Lastly, the policymakers can improve the diffusion and adoption rate of public transportation in Malaysia by enhancing public awareness campaigns. By highlighting the positive impact on reducing carbon emissions and congestion in the community, it can evoke a sense of pride and responsibility among passengers to safeguarding the earth. These recommendations are facilitated by the networks and collaborations between different public, private and hybrid stakeholders to enhance their domain capacities which similar to what has been achieved in different sectors and context (see Azinuddin et al., 2023). Several limitations associated with this study warrant consideration. Firstly, relying on cross-sectional self-reporting questionnaires, rather than observing actual behaviour, may introduce self-report bias and social desirability bias. This method may not fully capture real situations, potentially leading to under-reporting and over-reporting. Secondly, the utilization of convenience sampling resulted in a demographic bias, predominantly representing the Malay ethnic group, which deviates from the overall ethnic distribution in Malaysia. To gain deeper insights into consumers' psychological states, researchers may explore behavioural readiness through qualitative methods. Additionally, expanding the study to various states in Malaysia could provide a more representative ethnic group distribution, enhancing the generalizability of the results. A cross-cultural or cross-national study may also be beneficial to comprehend potential cultural variations in behavioural studies. Despite these limitations, this study contributes to our understanding of citizens' readiness for public transportation usage in the Malaysian context.

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REFERENCES

- Abd Rahman, N. A., & Abdullah, Y. A. (2016). Theorizing the concept of urban public transportation institutional framework in Malaysia. *MATEC Web of Conferences*, 66, 00043.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*.
- Azinuddin, M., Shariffuddin, N. S. M., Som, A. P. M., Salim, M. A. M., & Eppang, B. M. (2023). Interrelationship of networks, knowledge, and performance of businesses through the lens of coastal destination development. *Planning Malaysia*, 21(4), 376-389.

- Azinuddin, M., Zain, W. M. A. W. M., & Shariffuddin, N. S. M. (2022). Tourism Sustainability: Perspectives on Past Works, Issues and Future Research Opportunities. In *Environmental Management and Sustainable Development: Case Studies and Solutions from Malaysia* (pp. 39-51). Cham: Springer International Publishing.
- Beckmann, M. J. (2013). Traffic congestion and what to do about it. *Transportmetrica B*.
- Bourke, M., Craike, M., & Hilland, T. A. (2019). Moderating effect of gender on the associations of perceived attributes of the neighbourhood environment and social norms on transport cycling behaviours. *Journal of Transport and Health*.
- Chan, D. (2022). Vehicles outnumber people in Malaysia. *New Straits Times*.
- Currie, G., & Wallis, I. (2008). Effective ways to grow urban bus markets - a synthesis of evidence. *Journal of Transport Geography*.
- Department of Statistics Malaysia -DOSM (2020). <https://www.dosm.gov.my/portal-main/landingv2>
- Gärling, T., R. Gillholm, and A. Gärling (1998) Reintroducing attitude theory in travel behavior research: The validity of an interactive interview procedure to predict car use. *Transportation*, 25 (2), 129-146.
- Gollwitzer, P. M. (1993). Goal Achievement: The Role of Intentions. *European Review of Social Psychology*.
- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, 31(1), 2-24.
- Hair, J., Hult, G., Ringle, C., & Sarstedt, M. (2017). *A primer of partial least square structural equation model (PLS-SEM)* (2nd ed.). CA: SAGE.
- Heckhausen, H. (1991). Volition: Implementation of Intentions. In *Motivation and Action*.
- Heckhausen, H., & Gollwitzer, P. M. (1987). Thought contents and cognitive functioning in motivational versus volitional states of mind. *Motivation and Emotion*.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, 43, 115-135.
- Kang, A. S., Jayaraman, K., Soh, K. L., & Wong, W. P. (2019). Convenience, flexible service, and commute impedance as the predictors of drivers' intention to switch and behavioral readiness to use public transport. *Transportation Research Part F: Traffic Psychology and Behaviour*.
- Kang, A. S., Jayaraman, K., Soh, K. L., & Wong, W. P. (2020). Tackling single-occupancy vehicles to reduce carbon emissions: Actionable model of drivers' implementation intention to try public buses. *Journal of Cleaner Production*.
- Mifsud, D., Attard, M., & Ison, S. (2019). An exploratory study of the psychological determinants of mobility of older people in Malta. *Research in Transportation Business & Management*, 30, 100373.
- Minhans, A., Chatterjee, A., & Popli, S. (2020). Public perceptions: an important determinant of transport users' travel behaviour. *Human Geographies--Journal of Studies & Research in Human Geography*, 14(2).
- Mustaffa, H., Kamarudin, M. K. A., Toriman, M. E., Rosli, M. H., Sunardi, S. (2023).

- Impact of Suspended Sediment on Pahang River Development using Geographic Information System. *Planning Malaysia*, 21(1), 116 – 133.
- Neuber, T. E. (2021). Egocentric norm adoption (No. 116). ECONtribute Discussion Paper.
- Ng, P. Y., & Phung, P. T. (2021). Public transportation in Hanoi: Applying an integrative model of behavioral intention. *Case studies on transport policy*, 9(2), 395-404.
- Redman, L., Friman, M., Gärling, T., & Hartig, T. (2013). Quality attributes of public transport that attract car users: A research review. *Transport Policy*.
- Rezaimoghadam, M.R, Nooradin, Dabiri., Seyed, Rasoul, Davoodi. (2022). Public transportation users' behavior based on theory of planned behavior.
- Ringle, C.M., Wende, S., Becker, J.M. (2015), Boenningstedt: SmartPLS GmbH. <http://www.smartpls.com>.
- Saad, M. H. M., Kamarudin, M. K. A., Toriman, M. E., Wahab, N.A, Ata, F. M., Samah, M. A. A., Manoktong, S. N. (2023). Analysis of the Flash Flood Event and Rainfall Distribution Pattern on Relau River Basin Development, Penang, Malaysia. *Planning Malaysia*, 21(1), 58-71.
- Salleh, N. S. N. M., Zin, S. M., Abdullah, I. H. T., Sulaiman, W. A. T. W., & Ismail, W. N. A. T. (2023). Developing talent and performance of government employees, capacitate malaysia's development plan. *Planning Malaysia*, 21(6), 144-156.
- Silva, J., Sá, E. S., Escadas, M., & Carvalho, J. (2021). The influence of ambient scent on the passengers' experience, emotions and behavioral intentions: An experimental study in a Public Bus service. *Transport Policy*, 106, 88-98.
- Tomtom traffic index. Traffic Index ranking | TomTom Traffic Index. (2023, October 27). <https://www.tomtom.com/traffic-index/ranking/>
- Triandis, H. C. (1980). Values, attitudes, and interpersonal behavior. Nebraska Symposium on Motivation. Nebraska Symposium on Motivation.
- Wilson, H. F. (2011). Passing propinquities in the multicultural city: The everyday encounters of bus passengering. *Environment and Planning A*. <https://doi.org/10.1068/a43354>.

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ACCESSIBILITY TO WORKPLACE AND HOUSING LOCATION CHOICE AMONG THE LOW-INCOME GROUP: A CASE STUDY OF PULAU PINANG, MALAYSIA

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Abstract

When deciding where to reside, households must consider several factors of accessibility, including proximity to their workplace and other aspects of accessibility that are necessary for their family. This study aims to examine job accessibility, evaluate the extent of accessibility, and identify the specific type of accessibility that low-income groups prioritise when choosing where they want to reside. A total of 306 respondents from the Pulau Pinang eKasih list for 2016 were chosen to participate in the survey using the quantitative approach. The study established a correlation between the availability of career opportunities and the decision-making process involved in selecting a residential area. In addition, the accessibility to the city centre and supermarkets are identified as significant variables in determining the choice of home site. Nevertheless, the degree of accessibility on the island part of Pulau Pinang is not consistent. The southwest district has a lower level of accessibility to the city centre and supermarkets in comparison to the northeast district. The authorities should formulate a strategy to attain a balanced and harmonic state between housing growth and the average distance to job locations, city centres, and supermarkets. By strategically planning home building in appropriate locations, the quality of life, especially for low-income households, would be improved.

Keywords: Accessibility; Low-income households; Housing location choice

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INTRODUCTION

High-quality transport and road infrastructure are essential factors to consider when choosing a place to reside. The purpose of these elements is to facilitate access to a wide range of amenities and services, including jobs. The primary determinant of a location's competitive edge over others is the level of accessibility provided by its transport infrastructure (Vulevic, 2016). Hence, selecting a place that offers a high degree of accessibility, particularly in terms of job opportunities, is the optimal choice for residence.

Every household aspires to find the optimal area to reside in. Nevertheless, certain individuals, particularly those in low-income households, have limitations due to financial restraints. Low-cost housing is available for low-income groups; nevertheless, the development of such housing is severely restricted due to the continuously increasing costs. Furthermore, acquiring bank loans for developers to construct affordable housing and for purchasers to purchase such homes is notably arduous (Mohd Daud et al., 2023). Individuals experiencing poverty face multiple obstacles, including restricted access to education, healthcare, housing, and employment prospects (Sulaiman et al., 2023). Meanwhile, they require a residential area that provides optimal employment accessibility in order to have the chance to enhance their households' socio-economic status. In addition, they require a location that provides convenient access to essential amenities such as supermarkets, food establishments, healthcare facilities, educational institutions, and other vital requirements. Hence, accessibility is a highly significant attribute that the majority of households prioritise when selecting residential areas.

There is a scarcity of contemporary research on the determinants of housing site choice with regard to accessibility among low-income individuals in developing nations, particularly in urban areas that require enhancing their public transportation infrastructure. Hence, further research is required to broaden the scope of studies addressing this matter. Therefore, his study aims to investigate the locations of residential and workplaces among respondents in order to quantify their job accessibility. Next, this study will analyse the distance between their residence and various forms of accessibility. Ultimately, this study aims to determine the particular type of accessibility that low-income groups prefer when selecting the location of their residence.

LITERATURE REVIEW

Housing Location and Accessibility

The selection of a housing location is influenced not only by the household's financial capacity but also by the geographical and spatial conditions of a specific residential neighbourhood (Wee & Cao, 2020). Urban dwellers typically opt for residential neighbourhoods in suburban locales that boast favourable

neighbourhood attributes. They commonly use public transportation, like commuters, to facilitate mobility (Jones Lang Lasalle IP Ins., 2020). In their study, Larsson et al. (2022) discovered that the level of accessibility to everyday amenities is influenced by various transportation modes and types of settlement. They observed that cars offer high accessibility to both urban and suburban residents, while bicycles offer limited accessibility to residents living outside urban areas. Contrarily, Zhang et al. (2020) discovered that the proximity of housing to shopping malls had a noteworthy and favourable influence on housing values. However, the extent of this impact varied depending on the specific characteristics of the shopping mall and the metropolitan region. Evidently, accessibility is a crucial determinant when selecting the location of a house.

Furthermore, the geographical location of a housing unit is a crucial factor as it directly impacts both the financial implications and the overall well-being of its occupants. However, some households are ready to compromise on factors such as distance, commuting time, and access to facilities and services in order to get a more affordable dwelling (Khazanah Research Institute, 2019). Regardless of the housing features they are sacrificing for an affordable and high-quality home, the location of the housing is crucial in determining the level of accessibility. This refers to how easily a household can access the opportunities, goods, and services required. The performance of a city's economy and environment is optimised when the city is well-connected to all accessible locations through efficient transportation options that are easily accessible to its community (Saif et al., 2019). Hence, it is crucial to prioritise enhancing the efficiency of mobility to optimise accessibility levels in spatial planning and policy across all nations (Kompil et al., 2019).

RESEARCH METHODOLOGY

Primary Data Collection

This study was a quantitative study that focused on gathering primary data by adopting a questionnaire as its primary tool. A total of 306 respondents from the low-income demographic in Pulau Pinang, specifically the northeast and southwest regions of Malaysia, participated in the survey. The participants were specifically selected from Pulau Pinang's eKasih list for 2016. eKasih is a national poverty data bank that was created to compile comprehensive information on the impoverished population residing in both rural and urban regions across the nation. Therefore, it empowers the Malaysian government to devise and execute strategic poverty initiatives for the intended demographic efficiently. Based on the secondary data, the population size of the low-income group in the northeast and southwest districts of Penang is 1546 households. This figure is significantly large for this investigation. Thus, the sample size was adjusted to a suitable ratio to represent the real population

precisely, enabling the successful implementation of this study. The Morgan table (Table 1) was consulted for guidance in this process. According to the Morgan table, the appropriate sample size to represent the population accurately is 306 respondents.

Table 1: Krejcie and Morgan Table
Source: Krejcie & Morgan, 1970 in KENPRO, 2012

Population	Sample
1400	302
1500	306
1600	310
1700	313

Study Area

The study was carried out in the island region of Pulau Pinang state, Malaysia, specifically focusing on the districts located in the northeast and southwest areas of the state. This state encompasses an island and the adjacent land area on the mainland. The northeast district of this state includes the urban area and functions as the administrative hub for the state, hosting its capital city. The main commercial hub is also located within this district. On the other hand, the southwest district includes both urban and suburban areas, which have a notable number of vacant spaces that provide many possibilities for various spatial activities. Nevertheless, the district in issue is geographically separated from the northeast region because of a high ridge traversing the middle of the island.

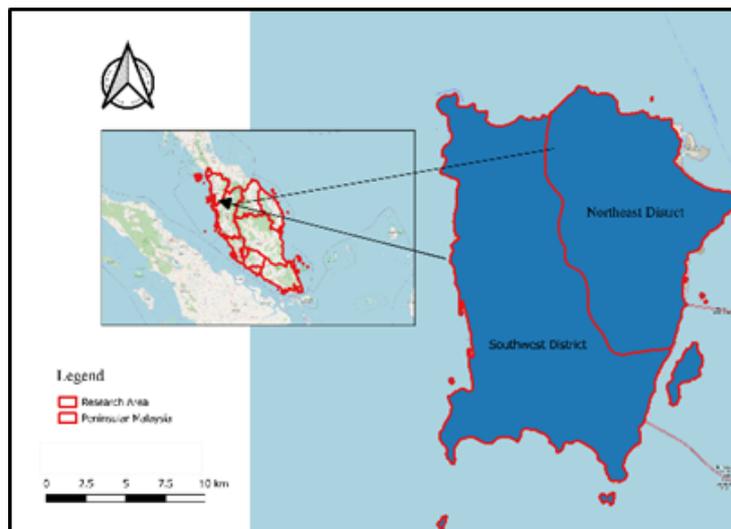


Figure 1: Study Area

FINDINGS AND DISCUSSION

Primarily, the statistical analysis in this study predominantly utilised descriptive statistics analysis, cross-tabulation, and chi-square tests. The chi-square test was employed to determine the statistically significant preferred types of accessibility.

Initially, from the data analysed, the demographic profile of the respondents is shown in Table 2. In this study, the majority of the respondents are Malay. Overall, most of the respondents are working in the manufacturing and services sectors. Based on the projected data, 37.58% of the respondents from the northeast district and 54.25% from the southwest district earn their households' monthly income of less than RM2,500.00. These figures indicate that the majority of the low-income group is facing financial burden. With such low income, they need to cater to the high cost of living on Penang Island, which keeps rising and becoming very expensive, including food, transportation, petrol, and other daily essentials. In addition, the figure also approaches the national poverty line of monthly household income of RM2,208.00 (World Bank, 2023).

Table 2: Demographic Characteristics of the Respondents

Demographic Characteristics	Northeast District		Southwest District	
	Total	Percentage (%)	Total	Percentage (%)
Ethnicity				
Malay	109	35.62	147	48.04
Chinese	8	2.61	7	2.29
Indian	13	4.25	22	7.19
Job				
Manufacturing sector	46	15.03	91	29.74
Services sector	77	25.16	76	24.84
Other sectors	7	2.28	9	2.95
Household Income				
Less than RM2,500	115	37.58	166	54.25
RM2,500-RM3,169	13	4.25	8	2.62
RM3,170-RM3969	2	0.65	2	0.65

The accessibility of jobs is intricately linked to the transportation system and the progress in the land use domain (Tao et al., 2020). There is a growing recognition of the significance of examining the connection between transport modes and the characteristics of urban neighbourhoods (Zheng et al., 2021). The Malaysian National Housing Strategy (2018-2025) prioritises accessibility and transportation in order to create a more comprehensive housing

strategy that promotes the development of high-quality homes and improves quality of life. Hence, the accessibility of job opportunities in close proximity to the residential area is considered a crucial factor when selecting a place of residence for a household. Hence, this study examined the significance of the distance between home and office as a factor influencing the residential site choices of respondents in both the northeast and the southwest districts.

Table 3 presents the cross-tabulation of the city where the respondent works and the distance between their house and workplace. Specifically, based on the statistics, the Bayan Lepas area has the highest number of workers among the 70 respondents (22.88%), while the Georgetown area has the second highest number with 51 respondents (16.67%). Typically, most respondents in these two-job settings commute from their homes to their workplaces, covering a distance of 1 to 15 kilometres.

Table 3: The City of the Respondents' Workplace Locations

City of the Respondents' Workplace	1-15km	16-30km	31-45km	46-60km	Number of Respondents
Air Itam	3	2	1	0	6
Balik Pulau	12	6	4	0	22
Batu Maung	1	10	2	0	13
Batu Uban	1	4	0	0	5
Bayan Baru	14	17	1	2	34
Bayan Lepas	30	29	6	5	70
Bukit Jambul	3	6	0	0	9
Gelugor	10	4	0	0	14
Georgetown	22	16	12	1	51
Jelutong	16	5	2	1	24
Gurney	3	3	0	2	8
Padang Kota	3	3	1	0	7
Paya Terubong	2	3	0	0	5
Sungai Ara	1	1	0	0	2
Sungai Dua	4	1	0	1	6
Sungai Nibong	5	3	1	1	10
Taman Tun Sardon	1	2	0	0	3

City of the Respondents' Workplace	1-15km	16-30km	31-45km	46-60km	Number of Respondents
Tanjung Bungah	2	1	0	0	3
Tanjung Tokong	2	4	0	0	6
Teluk Bahang	0	2	0	0	2
Teluk Kumbar	2	3	1	0	6
Total	137	125	31	13	306

The daily routine and spatial arrangement of activities are influenced by work schedules and workplace location (Cerda, 2009). Hence, policymakers and scholars view decreasing the distance between one's residence and workplace as a means of endorsing and promoting a particular policy (Celhay & Gil, 2020). This study acknowledges the significance of distance in influencing commuting patterns to the workplace on a daily basis. Additionally, it investigates the relationship between the distance separating the respondents' homes and workplaces, recognising it as a crucial factor in understanding the mobility patterns of the respondents.

The distance between the respondents' houses and workplaces can be categorised into four ranges: 1 to 15 km, 16 to 30 km, 31 to 45 km, and 46 to 60 km (refer to Figure 2). According to Figure 2, 44.80% of the respondents commute from home to work daily, covering a distance of 1 to 15 km. Furthermore, a significant proportion of the participants, specifically 40.80%, travel a distance of 16 to 30 kilometres to reach their workplace. Merely 10.10% and 4.20% of the respondents commute to their workplaces within a range of 31 to 45 kilometres and 46 to 60 km, respectively. Given these circumstances, it may be inferred that the majority of participants opted for a residential area within a 30km radius of their workplace.

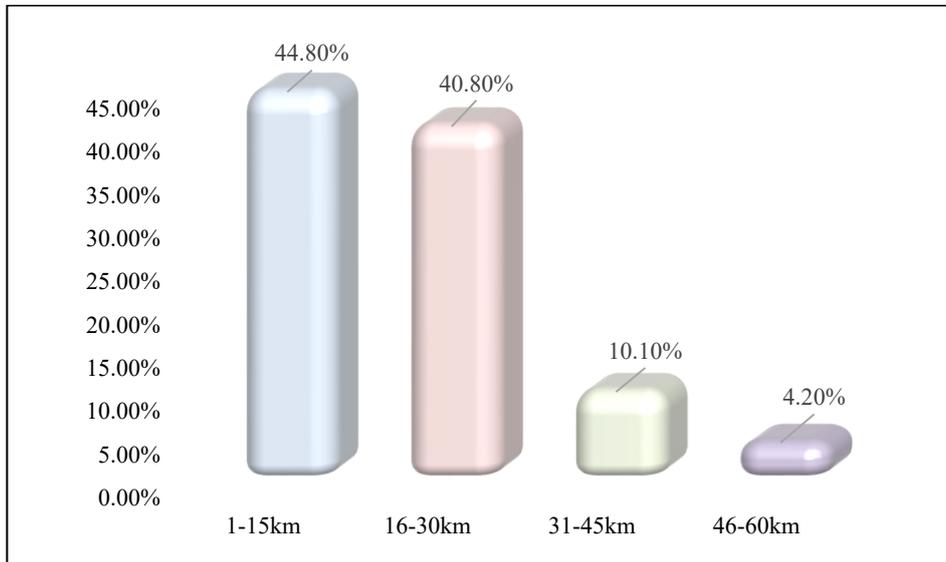


Figure 2: Distance Between the Respondent’s House and Workplace

In addition, the chi-square test was used to examine the association between the distance from the respondent’s home to their office and the location of their residence. The results of this analysis are illustrated in Table 4. The calculated value is statistically significant at 0.05, as it is smaller than the alpha level. This demonstrates the correlation between the variables. The minimal expected value, which is 5.52 and above 5, indicates a significant correlation between the two variables under examination.

Given that both criteria are satisfied, it may be inferred that a valid correlation exists between the distance separating one’s residence and workplace and the specific residential area where the respondent resides. Hence, the correlation between the two factors is also a significant element considered by respondents when choosing a home location. This conclusion is validated by a study conducted by Hu and Wang (2017), who investigated the impact of job accessibility on the housing preferences of low-income individuals in the Chicago metropolitan region. The study’s findings revealed that the availability of job opportunities significantly impacts the choice of residential areas. Tomasiello et al.’s (2020) study discovered a notable correlation between the geographical distribution of houses belonging to various socio-economic groups and their proximity to job prospects.

Table 4: Chi-Square Test of the Distance of Respondent's Home to Workplace

Chi-square Test	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	44.521 ^a	3	0.000
Likelihood Ratio	46.710	3	0.000
Linear-by-Linear Association	6.648	1	0.010
N of Valid Cases	306		

a. 0 cells (.0%) have an expected count of less than 5. The minimum expected count is 5.52.

This study evaluated various types of accessibility that are typically considered when selecting a location to reside. In order to identify the preferred types of accessibility, the Pearson chi-square analysis was conducted, as shown in Table 5. The results obtained indicate that only accessibility to the city centre and accessibility to supermarkets are significant, with a value $p < 0.005$, and the minimum expected count is greater than 5. This means that these two types of accessibility are the most preferred by the low-income group in choosing their housing location. In their study conducted in Slovenia, Ferlan et al. (2017) found that the price of housing is directly related to the proximity of the housing location to the city centre. This means that the closer a housing location is to the city centre, the higher the price one must spend to reside there. Their findings corroborated the results of this study by highlighting the significance of proximity to the city centre. However, Dai and Wang (2011) conducted a study in Southwest Mississippi to analyse the correlation between spatial access to food resource stores, such as supermarkets, and non-spatial factors. Their objective was to investigate potential strategies for addressing the issue of unequal access to food resources in the region. The study revealed that the majority of low-income neighbourhoods in the city exhibited a substantial degree of accessibility to food outlets, primarily attributable to favourable urban mobility. Nevertheless, in many suburban areas inhabited by economically disadvantaged individuals who lack personal transportation, the availability of grocery stores is limited (Dai & Wang, 2011). Their findings confirmed the results of this study, which emphasised the significance of convenient access to supermarkets. The reason accessibility to supermarkets is a determining factor in home location choice is due to its role as a food resource establishment.

Table 5: Pearson Chi-Square of Accessibility Preferred in Housing Location Choice

Types of Accessibility	Asymptotic Significance (2-sided)	Minimum Expected Count
1. Accessibility to city centre	0.000	19.12
2. Accessibility to supermarkets	0.000	8.5
3. Accessibility to public transport	0.006	1.27
4. Accessibility to health facilities	0.018	0.42
5. Accessibility to community facilities	0.000	1.7

Moreover, based on the analytical data, it is evident that convenient access to the city centre and proximity to supermarkets are crucial considerations in selecting a residential area. In addition, this study ascertained the distance between the residential locations of the respondents, the city centre, and the nearest supermarkets (refer to Table 6). Concerning the proximity of their residences to the city centre, 19.28% of the respondents residing in the northeast district live within a range of 6.0 to 10.0 km from the city centre. Meanwhile, 25.82% of the respondents in the southwest district live 20.0 to 30.0 km from the city centre, making them the majority. The respondents in the southwest district are a considerable distance from the city centre and require efficient transportation to reach the necessary facilities and services.

Furthermore, this study examined the proximity of respondents' residences to supermarkets, as it demonstrated that the ease of access to supermarkets is a significant determinant in the decision-making process for selecting a residential location. The study establishes that 22.55% of the participants residing in the northeast district are located within a distance of 0.5 to 5.0 km from the nearest supermarkets. However, a substantial portion (23.20%) of the respondents who live in the southwest district have to travel a distance of 11.0 to 20.0 km from their homes to reach the nearest supermarkets.

PLANMalaysia recommends that administrative centres, city centres, shopping centres, and supermarkets be located at a maximum distance of 1.6 km from residential areas. However, the findings indicate that the northeast district exhibits a high degree of accessibility to both the city centre and supermarkets. Evidently, a majority of the respondents residing in the northeast district have convenient access to supermarkets within a 5.0 km radius. On the contrary, the southwest area likely has a lower level of accessibility to the city centre and supermarkets, as the bulk of its residents live more than 10.0 kilometres away from these locations.

Table 6: Distance from Home to City Centre and Supermarkets

Distance from Home to City Centre	(0.5-5.0) km	(6.0-10.0) km	(11.0-20.0) km	(20.0-30.0) km
Northeast	13.07%	19.28%	8.17%	1.96%
Southwest	1.63%	8.50%	21.57%	25.82%
Distance from Home to Supermarkets	(0.5-5.0) km	(6.0-10.0) km	(11.0-20.0) km	(20.0-30.0) km
Northeast	22.55%	15.69%	3.27%	0.98%
Southwest	10.46%	18.03%	23.20%	5.56%

CONCLUSION

The study demonstrates a correlation between job accessibility and the decision-making process in choosing a home location. Additionally, the study's findings reveal that the respondents prioritise two forms of accessibility when selecting a residential location: proximity to the city centre and availability of supermarkets. However, a comparison of respondents' dwellings in the northeast district and southwest district reveals that the northeast district has a higher level of accessibility to the city centre and supermarkets compared to the southwest area. The authorities should devise a strategy to achieve a harmonious equilibrium between housing development and the average proximity to work sites, city centres, and supermarkets. This would ensure that housing development is strategically planned in optimal places, thereby enhancing the quality of life, particularly for low-income households. If there are constraints on building housing in optimal locations, a comprehensive and efficient public transport system that covers a broader network, including low-income residential areas, can be an excellent solution to enhance access to employment centres, city centres, and supermarkets.

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REFERENCES

- Ao, Y., Yang, D., Chen, C., & Wang, Y. (2019). Effects of rural built environment on travel-related CO2 emissions considering travel attitudes. *Transportation Research Part D* 73, 187-204. <https://doi.org/10.1016/j.trd.2019.07.004>.
- Celhay, P., & Gil, D. (2020). The function and credibility of urban slums: evidence on informal settlements and affordable housing in Chile. *Cities*, 99, 102605, <https://doi.org/10.1016/j.cities.2020.102605>.

- Cerdá, A., 2009. Accessibility: A Performance Measure for Land-use and Transportation Planning in the Montréal Metropolitan Region. Supervised Research Project Report. School of Urban Planning, McGill University, Montreal.
- Dai, D., & Wang, F. (2011). Geographic disparities in accessibility to food stores in Southwest Mississippi. *Environment and Planning B: Planning and Design*, 38(4), 659-677. <https://doi.org/10.1068/b36149>.
- Duncan, M. (2011). The cost-saving potential of carsharing in a US context. *Transportation*, 38(2), 363-382.
- Embong, A. R. (2011). Pembandaran dan kehidupan bandar di Semenanjung Malaysia. *Akademika*, 81(2), 23-39.
- Ferlan, N., Bastic, M., & Psunder, I. (2017). Influential factors on the market value of residential properties. *Inzinerine Ekonomika-Engineering Economics*, 28(2), 135–144. <http://dx.doi.org/10.5755/j01.ee.28.2.13777>.
- Grajeda, E., & Ward, P. (2011). Inheritance and succession in informal settlements of Latin American cities: a Mexican case study. *Latin America Research Review*, 139-162.
- Grandboulevard Initiative. (2013). *Jobs-Housing Balance and Fit*. Retrieved from Grandboulevard Initiative: People Friendly Places: <https://grandboulevard.net/housing/jobs-housing-balance-and-fit>. Accessed on 23rd February 2023
- Hu, L., & Wang, L. (2017). Housing location choices of the poor: Does access to jobs matter? *Housing Studies*, 34(10), 1721-1745.
- Jones Lang Lasalle IP Inc. (2020, Julai 31). *Housing needs and resident preferences across Europe during Covid-19*. <https://residential.jll.co.uk/insights/research/housing-needs-and-resident-preferences-across-europe-during-covid-19>
- Khazanah Research Institute. (2019). *Agenda perumahan: peranan kerajaan, pasaran dan masyarakat; sebuah laporan khas bagi penggubalan dasar perumahan negara (2018-2025), Malaysia*. Institut Penyelidikan Khazanah.
- Kompil, M., Jacobs-Crisioni, C., Dijkstra, L., & Lavallo, C. (2019). Mapping accessibility to generic services in Europe: A market-potential based approach. *Sustainable Cities and Society*, 47(2019), 101372, <https://doi.org/10.1016/j.scs.2018.11.047>.
- Larsson, A., Ellder, E., Vafeiadis, E., Curtis, C., & Steiner, A. (2022). Exploring the potential for sustainable accessibility across settlement types: a Swedish case. *Transportation Research Part D* 107, 103297. <https://doi.org/10.1016/j.trd.2022.103297>.
- Lee, C. (2020). Metropolitan sprawl measurement and its impacts on commuting trips and road emissions. *Transportation Research Part D* 82, 102329. <https://doi.org/10.1016/j.trd.2020.102329>.
- Ling, Oliver & Mansor, Nurul & Mohamed Musthafa, Siti. (2016). The housing preference of young people in Malaysian urban areas: A case study Subang Jaya, Selangor. *Malaysian Journal of Society and Space*, 12. 60-74.
- Lu, J., Li, H., & Xu, M. (2022). Does haze aggravate urban sprawl? *Habitat International* 130, 102709. <https://doi.org/10.1016/j.habitatint.2022.102709>.
- McGee, T. (2013). 9 The Emergence of Desakota Regions in Asia: Expanding a Hypothesis. In N. Brenner (Ed.), *Implisions /Explosions: Towards a Study of*

- Planetary Urbanization* (pp. 121-137). Berlin, Boston: JOVIS Verlag GmbH. <https://doi.org/10.1515/9783868598933-010>
- Mohd Daud, M., Rosly, S., & Muhammad Sori, Z. (2023). Determinants of investment to attract investment in affordable housing projects in Malaysia. *Planning Malaysia: Journal of the Malaysian Institute of Planners*, Volume 21, Issue 6, 297-312.
- Mok, O. (2016). Massive projects in place to alleviate urbanisation in Penang. <https://www.malaymail.com/news/malaysia/2016/10/29/massive-projects-in-place-to-alleviate-urbanisation-in-penang/1238453>. Accessed on 14th December 2021.
- Morris, E., Blumenberg, E., & Guerra, E. (2020). Does lacking a car put the brakes on activity participation? Private vehicle access and access to opportunities among low-income adults. *Transportation Research Part A* 136, 375-397. DOI: <https://doi.org/10.1016/j.tra.2020.03.021>.
- Padawangi, R. (2018). *Routledge handbook of urbanisation in Southeast Asia*. Abingdon: Routledge Handbooks Online. Accessed on 28th February 2023.
- Peng, X., Chen, X., & Cheng, Y. (2018). Urbanisation and Its Consequences. *Demography*, Vol. II, 1-16.
- Pierr, A., Ravetz, J., & Tosics, I. (2011). Peri-urbanisation in Europe.
- PLANMalaysia. (2013). Community facility planning guidelines. Kementerian Kesejahteraan Bandar, Perumahan dan Kerajaan Tempatan.
- Rostam, K., Rosul, M., Choy, E., Nor, A., Sakawi, Z., Hashim, N., & Muhammad, A. (2010). Pemandaran dan rebakan bandar di pinggir wilayah metropolitan Klang-Langat. *Malaysian Journal of Society and Space*, 6(2), 37-50.
- Saif, M. A., Zefreh, M. M., & Torok, A. (2018). Public transport accessibility: A literature review. *Periodica Polytechnica Transportation Engineering*, 1-8.
- Sulaiman, S., Abu Bakar, N., Tun Ismail, W., Mohd Pauzi, H., & Tuan Sembok, T. (2023). Poverty and well-being: The subjective well-being status of poor children in Kuala Lumpur, Malaysia. *Planning Malaysia: Journal of the Malaysian Institute of Planners*, Volume 21, Issue 6, 266-281.
- Tao, S., He, S., Ettema, D., & Luo, S. (2022). The role of transit accessibility in influencing the activity space and non-work activity participation of different income groups. *Journal of Transport and Land Use* 15(1), 375-398. <http://dx.doi.org/10.5198/jtlu.2022.2075>.
- Tomasiello, D., Giannotti, M., & Feitosa, F. (2020). ACCESS: An agent-based model to explore job accessibility inequalities. *Computers, Environment and Urban Systems* 81, 101462. <https://doi.org/10.1016/j.compenvurbsys.2020.101462>.
- Travisi, C., Camagni, R., & Nijkamp, P. (2010). Impacts of urban sprawl and commuting: A modelling study for Italy. *Journal of Transport Geography*, 18, 382-392, DOI: <http://dx.doi.org/10.1016/j.jtrangeo.2009.08.008>.
- Vulevic, A. (2016). Accessibility concepts and indicators in transportation strategic planning issues: theoretical framework and literature review. *Logistics & Sustainable Transport Vol. 7, No. 1*, 58-67. doi: 10.1515/jlst-2016-0006.
- Wee, B., & Cao, X. (2020). Residential self-selection in the relationship between the built environment and travel behavior: A literature review and research agenda. *Advances in transport Policy and Planning*, 9, 75-94. <https://doi.org/10.1016/bs.atpp.2020.08.004>.

- Weerakoon, P. (2015). How and where is urban growth? analysis of urban growth in Colombo district, Sri Lanka. *A Advances in Environmental Biology*, 9(4), 233-236.
- Wolday, F., Naess, P., & Tonnesen, A. (2019). Workplace location, polycentrism, and car commuting. *Journal of Transport and Land Use*, 12(1), 785-810.
- World Bank. (2023). *Poverty and Equity Brief East Asia and Pacific*. Malaysia: World Bank Group Poverty and Equity.
- Yi, C., Yuan, W., & Zhigang, L. (2017). From blueprint to action: the transformation of the planning paradigm for desakota in China. *Cities*, Volume 60, Part B, 454-465. <https://doi.org/10.1016/j.cities.2016.04.010>.
- Yusof, N., & Jamaluddin, Z. (2018). Kos perbelanjaan perumahan dalam kalangan penduduk kawasan perumahan kos rendah dan sederhana di Pulau Pinang. *Akademika*, 88(1), 167-179. <https://doi.org/10.17576/akad-2018-8801-12>.
- Zhang, L., Zhou, J., & Hui, E.-m. (2020). Which types of shopping malls affect housing prices? From the perspective of spatial accessibility. *Habitat International* 96, 102118. <https://doi.org/10.1016/j.habitatint.2020.102118>.
- Zheng, Z., Zhou, S., & Deng, X. (2021). Exploring both home-based and work-based jobs-housing balance by distance decay effect. *Journal of Transport Geography*, 93, 103043. https://reader.elsevier.com/reader/sd/pii/S096669232100096X?token=CCBF6AE2E8AAE7CC663F2C2B86770900B4598003425CD9154E15DBA476A96B7A7BB456A0A3D95C1C362245DD18F4C88F&originRegion=eu-west-1&originCreation=20220804142746#catch_JTRG103043.

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DESIGN GUIDELINE: EDUCATION BUILDING FOR HANDICAPPED PEOPLE TOWARDS HEALTHY ENVIRONMENT

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Abstract

Malaysia needs to revamp its education system to better support handicapped individuals, allowing them to lead fulfilling lives. Currently, there is a lack of educational institutions catering to their specific needs, inclusive and unconducive learning environments. Many educational buildings in Malaysia fall short in providing essential accessibility features and overlook critical factors like lighting, air quality, acoustics, and ergonomics. This research aims to address this issue by developing design guidelines that focus on creating educational facilities that are accessible and promote a healthy environment, thereby enhancing their educational opportunities and overall quality of life. This study uses a mixed-method approach, including questionnaire surveys, expert interviews, and data synthesis to assess the current state of educational building design. Findings emphasize few factors like accessibility, spatial planning, acoustics, ergonomics, and inclusive design in creating education buildings that are accessible, healthy, well-designed, and conducive to social integration for handicapped individuals.

Keywords: Design, Framework, Education Building, Handicapped People, Healthy Environment

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INTRODUCTION

The aim of the Malaysian education system is to enhance accessibility and inclusivity, particularly for children with special education needs. These children possess the same rights to formal education as their peers. As per the Special Education Regulations 2013, special education refers to an educational program that is delivered either in dedicated special schools or through integrated programs known as Program Pendidikan Khas Integrasi (PPKI) within mainstream schools. These inclusive programs cater to various educational levels, including preschools, primary, secondary, and higher secondary.

The special education program is specifically designed to address the unique needs and learning capacities of individuals with disabilities. This encompasses individuals with visual impairment, hearing impairment, speech difficulties, physical disabilities, and multiple disabilities, as well as those with learning disabilities such as autism, down syndrome, attention deficit hyperactivity disorder, and dyslexia. Pupils with special education needs necessitate additional support to overcome the challenges they face in their personal development.

Special Education

The Ministry of Education Malaysia (MOE) bears the responsibility of granting educational access to all children, including those with special education needs. In accordance with the Education Act 1996, the MOE is obligated to provide special education either through specialized schools or designated primary and secondary schools, utilizing integrated or inclusive programs. These regulations apply to government schools and government-aided schools that are offering special education programs.

Within the Malaysian education system, three distinct types of special education settings have been identified- special schools, integrated programs, and inclusive programs. Integrated programs, integrated within mainstream schools, strive to maximize social interaction between students with special education needs and their peers in regular classrooms. Identifying different categories of special needs helps schools to recognize and implement educational programs that suit the specific needs of these exceptional students. Thus, there is a Special Education Integrated Programme by MOE known as PPKI.

The MOE's Manual Operation for PPKI emphasizes careful considerations before implementing PPKI in schools. These considerations include assessing applications from parents or guardians, projecting student enrolment, determining the requirement for special education teachers, evaluating the physical infrastructure of classrooms, and ensuring the availability of necessary equipment and teaching materials (Yakob, 2022).

In addition to specialized academic materials, students with various disabilities may require physical assistance such as ramps, handrails, signage, and more. Educational facilities should prioritize creating a safe and secure environment for all students, especially those with special needs, where parents feel confident in allowing their children to be independent. It is essential for educational facilities to provide adequate resources. For instance, school spaces and environments should be safe and secure for both students and teachers, fostering a sense of calmness, motivation, activity, and confidence in movement. (Abdullah, 2018).

Children with Disabilities

The term "disabilities" originates from the concept of "disabled," which refers to issues with physical structure or function that hinder an individual's ability to carry out tasks or actions, as defined by the World Health Organization (WHO). A child with disabilities is defined as someone with various conditions such as mental retardation, hearing impairment, speech or language impairment, visual impairment, serious emotional disturbance, orthopaedic impairment, autism, traumatic brain injury, another health impairment, specific learning disability, deaf-blindness, or multiple disabilities. These children require special care, additional attention, special education, and related services. However, there are several general types of disabilities: blindness, deafness, physical disabilities, mental health disabilities, and intellectual or learning disabilities. Under the Persons with Disabilities Act 2008 (Act 685) (PWDA), individuals with long-term physical, mental, intellectual, or sensory disabilities that prevent them from fully participating in community or public life are considered persons with disabilities (WHO, 2023).

This paper aims to achieve two main goals: first, to emphasize the identification of design aspects in educational buildings catering to handicapped students, and second, to put forth a fundamental guideline for creating well-designed educational facilities that are specifically tailored to the needs of handicapped people. The findings of this paper will shed light on the significance of architectural design aspects for handicapped people emphasizing how these features can contribute to efficient spatial circulation and accessibility, thereby ensuring a conducive educational environment. Additionally, it will underscore the importance of preventing discrimination against this group in terms of education, while aligning with the broader objective of enhancing the overall quality of life through educational advancements. The results of this research will serve as a valuable guide for incorporating design elements that facilitate the creation of well-designed educational buildings.

LITERATURE REVIEW

Definition and Importance of Education Building for Handicapped People

Education building for handicapped people refers to specialized facilities that are designed to provide inclusive and accessible educational environments for individuals with disabilities. These buildings are specifically tailored to meet the unique needs of students with physical, sensory, cognitive, or developmental disabilities, ensuring equal opportunities for learning and participation. These buildings provide an environment that accommodates the specific requirements of students with disabilities, enabling them to fully engage in educational activities, interact with peers, and access necessary resources and support services. By addressing physical barriers and implementing assistive technologies, the education buildings for handicapped people aim to create an inclusive educational experience that fosters the intellectual, social, and emotional development of students with disabilities. They contribute to creating a more inclusive society by fostering understanding, acceptance, and empathy among all students (Ab Wahab, 2022). In summary, education buildings for handicapped people provide specialized facilities that accommodate the needs of students with disabilities, ensuring equal access to education and promoting inclusivity, diversity, and equal opportunities for all individuals.

Implementation of Education Building for Handicapped People in Malaysia

Individuals with disabilities face challenges in their interactions due to physical impairments, limitations in activities, and contextual factors. Consequently, their restricted mobility and reliance on others necessitate suitable housing and living arrangements, where well-designed housing facilities can contribute to their rehabilitation. Universal design principles are applied to housing, incorporating features, products, and procedures that benefit all users. By adhering to universal design principles, housing designs become accessible and advantageous to a wider range of individuals (Shamri, 2022).

Design Concepts

To design a space that caters to the needs of disabled people, the following characteristics of barrier-free adaptable housing can be considered to make it preferable:

Table 1: Design Space for Handicapped People.

Element	Description
Ensuring Accessibility	provide effortless access to buildings, housing units, and services for individuals with mobility, hearing, or vision limitations.
Providing Sufficient Space:	Adequate space should be included in housing units and public areas to accommodate wheelchair users.

Element	Description
Enhancing Safety	Safety should be the top priority in the design for individuals' daily activities
Addressing Emergency Preparedness	incorporate features that enhance safety during emergencies, enabling effective navigation and evacuation for individuals with disabilities.
Ensuring Ease of Use and Maintenance	enhance accessibility and ease of use for disabled individuals in using and maintaining the building, dwelling units, and equipment.

Source: Ab Rahman, 2018

Challenges in designing Education building for Handicapped People

Designing education buildings to accommodate handicapped individuals presents a distinct set of obstacles that must be overcome to ensure inclusivity and accessibility. Several key challenges arise in this context as per Table 2 below. Addressing these challenges in the design of education buildings for handicapped individuals promotes inclusivity, facilitates equal access to education, and fosters an environment where individuals with disabilities can thrive and fully participate in the educational experience (Shamri, 2022; Abdullah, 2018; Muhiddin, 2023).

Table 2: Challenges in Designing Education Building.

Key point	Description
Ensuring Physical Accessibility	Main challenge is to make the building easily accessible for people with disabilities. This means adding ramps, elevators, wider corridors, and doorways for wheelchair users. The layout should be designed to reduce obstacles and barriers that could make it difficult to move around.
Addressing Sensory Considerations	Education buildings need to accommodate people with sensory impairments like visual or hearing impairments. Ex: braille signage, auditory aids, visual aids, and proper lighting to improve visibility and communication.
Prioritizing Ergonomics and Comfort	The comfort of students with disabilities should be prioritized through ergonomic design principles. Ex: adjustable furniture, specialized seating options, and optimizing acoustics to create a conducive learning environment for individuals with hearing or cognitive impairments.
Integrating Assistive Technologies	Include assistive technologies to help students with disabilities learn effectively. Ex: accessible computer labs, assistive devices, and software applications that support communication, learning, and access to information
Creating Inclusive Learning Spaces	To make inclusive learning spaces that accommodate various learning styles and preferences Ex: flexible classroom arrangements, adaptable furniture, and interactive learning tools that cater to different abilities and disabilities.

Key point	Description
Ensuring Safety and Emergency Preparedness	Prioritize safety and emergency preparedness for individuals with disabilities. Ex: accessible evacuation routes, emergency alarms, and clear communication systems that consider the needs of all occupants.
Applying Universal Design Principles	Accessible and usable for people with different abilities. This means considering equitable use, flexibility, simplicity, clear information, error tolerance, low physical effort, and appropriate dimensions throughout the design process.

Source: Muhiddin, 2023

Disabled Community in Malaysia

Individuals with disabilities, commonly referred to as People with Disabilities (PWD), represent a vulnerable segment of the Malaysian population (Esfanfard, 2018). According to the Department of Social Welfare, Ministry of Women, Family and Community Development, Malaysia has seven (7) categories of disabled persons that can be considered for registration of disabled persons by the Department of Social Welfare, they are as follows: Hearing Disability, Visually Disability, Speech Disability, Physical Disability, Learning Disabilities, Mental Disability, and Multiple Disabilities. Figure 1 shows the number of registered PWDs in Malaysia according to states. As shown, Selangor had the highest registered number of PWDs with 100,835 while Johor had 72, 368 registered PWDs (Ab Rahman, 2018).

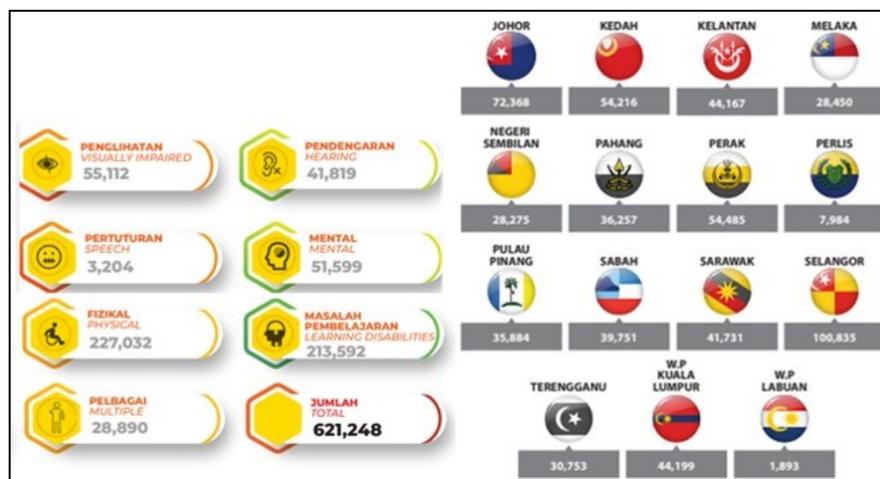


Figure 1: Registration of Persons with Disabilities, 2021

Source: Statistics Report 2021, Department of Social welfare, Ministry of Women, Family and Community Development, Malaysia.

Universal Design

Universal design refers to the concept of creating interior spaces that are accessible and usable by people of all abilities, including individuals with disabilities. It involves designing environments, products, and services in a way that eliminates barriers and promotes inclusivity. Universal design aims to accommodate a wide range of users, considering factors such as mobility, sensory, and cognitive impairments. The goal is to provide equal access and enhance the overall user experience for everyone, irrespective of their physical or cognitive abilities (Esfandfard, 2022; Steinfeld, 2012).

Table 3: Seven Principle for Universal Design.

Principle	Description
Equitable Use	Design possesses practicality and marketability for individuals with a wide range of abilities
Flexibility in use	Design caters to a broad spectrum of individual preferences and abilities.
Simple and intuitive use	Easily comprehensible, irrespective of the user's experience, knowledge, language skills, and level of concentration.
Perceptible information	Effectively communicates essential information to the user, regardless of ambient conditions or the user's sensory abilities.
Tolerance for error	Minimize hazards and mitigate the potential adverse consequences of accidents or unintended actions.
Low physical Effort	Enables efficient and comfortable use with minimal fatigue.
Size and space	Suitable for approach and reach, regardless of the user's body size, posture, and mobility.

Source: Centre of Excellence in Universal Design, National Disability Authority, 2020

The seven principles as per Table 3 above aim to provide guidance for designing environments, products, and communications. They can be utilized to assess existing designs, inform the design process, and educate designers and consumers on the qualities of more user-friendly products and environments (Nasir, 2021).

The idea of Universal Design originated with a focus on individuals with disabilities, but its application extends to providing assistance and support for various groups, such as the elderly, pregnant women, children, and those with temporary illnesses or injuries. As a result, the advantages of incorporating Universal Design are extensive. Table 4 below explains the category of design requirements in universal design.

Table 4: Category of Design Requirements in Universal Design.

Requirement	Component
Sensory	Tactile warning, guide ways and information
Outdoor environment	Obstruction, signage, street furniture, pathways, kern, ramps, pedestrian crossing, alarms
Horizontal areas	Door, entrance and lobbies, corridor, handrails and railings, bridges
Vertical areas	Ramps, lift and stairs

Source: Esfandfard, 2018

Universal design in any building should incorporate features such as ramps, accessible toilets, adequate space, accessible entrances, handrails, and practical overall design, as exemplified in Table 5.

Table 5. Design Feature of Universal Design

Design features	Description
Entrance	Stepless entrance, sloping walks at 1:20 max, light doorbell at reachable height, clear space inside and outside the door
Circulation	Easy access, accessible space for wheelchair user,
Bathroom /toilets	Provide clear space, curb less shower, handrails, handle, fauxet in single lever handles
Kitchen / Pantry	Space between Face of cabinets and walls, clear floor space, clear knee space under the table and sink, adjustable height wall cabinet,
Switches and control	Reachable height, accessible for wheelchair user and children, hands free switch, remote control,
Windows	Can view from the seat, reachable to open, close and lock,
Door	Clear opening, accessible, open loop handles,
Floor	Non-slip floor surface, easy to move,
Stair	Provide handrails
Ramp curb	Slope of 1:2 max, easy for mobility impairment and stroller.

Source: Esfandfard, 2018

RESEARCH METHODOLOGY

This research employs a mixed methods approach, recognized for its ability to provide a comprehensive understanding of research issues. The combination of quantitative and qualitative methods involves the administration of questionnaires and semi-structured interviews, ensuring direct data collection without interference. The study focuses on establishing a foundational framework for designing educational facilities tailored to the needs of individuals with disabilities. To achieve this, two strategies are implemented. The first involves distributing 30 sets of questionnaires to handicapped students, gathering demographic data and basic assessments to derive research criteria and objectives. The second stage consists of interviews with teachers, educators, and

three building construction experts (architects and interior designers), serving as a representative sample to gain insights into the research criteria and objectives. Semi-structured questions, tailored to the study's objectives, are presented to these experts, chosen based on their criteria of relevant experience, specialization, innovative thinking, and availability. The inclusion of quantitative data aids in obtaining early findings using Statistical Package for the Social Science (SPSS) regarding respondents' perceptions of education building, implementation levels, and participant involvement. Meanwhile, qualitative data are using computer assisted ATLAS.ti to capture content analysis on current situation of design and performance levels in developing educational buildings for handicapped individuals.

ANALYSIS AND DISCUSSION

This section presents the data analysis procedures that are followed in conducting the questionnaire, including respondents' selection, interview design, data collection, and analysis. It also discusses the educational building identification that is considered throughout the research process.

Questionnaire

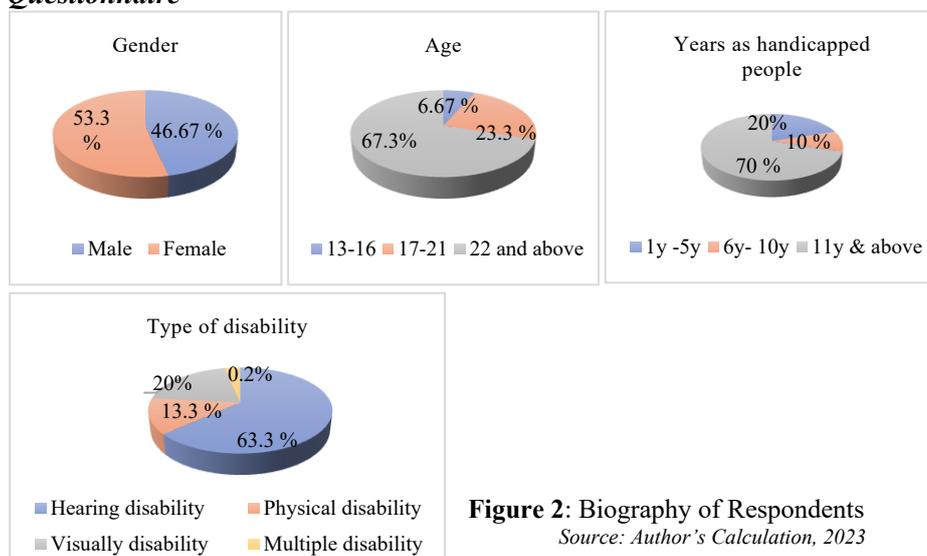


Figure 2: Biography of Respondents
 Source: Author's Calculation, 2023

This study comprised a total of 30 participants aged 13 and above who took part in the survey. The survey itself was administered and distributed online through social media platforms such as Facebook and WhatsApp. Based on the feedback received from the respondents, all 30 participants who completed the survey form were individuals with various types of disabilities.

Table 6: Handicapped Student Assessment

Type of educational institution previously	No of students	percentage
Public school	19	63.3%
School for hearing impaired	9 students	30%
Private School	2 students	6.67%
Home school	-	-

	Yes	No
1. Does your school/institution/college/university have students with handicapped person pursuing higher education?	28 (93.33%)	2 (6.67%)
2. Are you aware of the provision made for the students with disabilities in 'People with Disabilities Act, 1995'	13 (43.33%)	17 (56.67%)
3. Does your school/institution/college/university provide special infra-structural facilities for the handicapped student according to your needs?	19 (63.3%)	11 (36.67)

Source: Author's Calculation, 2023

The findings that are presented in Table 6 indicate that most of the respondents, specifically 93.33%, attend schools that cater to higher education for students with disabilities. In contrast, 6.67% of the respondents do not attend such schools. Additionally, only 43.33% of the students are familiar with the provisions that have been outlined in the 'People with Disabilities Act, 1995', while a significant portion, i.e., 56.67% remains unaware of it. Moreover, 63.3% of the students have reported that their school offers specialized infrastructural facilities for individuals in these categories, whereas 36.6% have mentioned the absence of such provisions at their school.

Table 7: Educational Building Identification

Identification of design aspects in educational buildings catering to handicapped students	Yes	No
1. Designated quiet areas or soundproof rooms	23 (76.67%)	7 (23.3%)
2. Captioning systems or sign language interpreters / clear signage and visual communication	13 (43.33%)	17 (56.67%)
3. Designated seating areas	11 (36.6%)	19 (63.3%)
4. Assistive technology: captioning devices or hearing aids	6 (20%)	24 (80%)
5. Visual alert systems to notify hearing-impaired students of emergency situations	15 (50%)	15 (50%)

Educational facilities specifically tailored to the needs of handicapped students	Yes	No
1. Classrooms equipped with appropriate acoustic treatments. Example: sound-absorbing materials, to minimize background noise	9 (30%)	21 (70%)
2. Accessible communication methods established, such as sign language interpreters	12 (40%)	18 (60%)
3. Training and awareness programs provided to teachers and staff members on how to effectively communicate	7 (23.3%)	23 (76.6%)
4. Color-coded pathways / tactile, visual alarms, to aid in navigation and communication	8 (26.67%)	22 (73.3%)
5. Accessible restrooms and common areas	27 (90%)	3 (10%)
6. Ongoing evaluations and assessments conducted to ensure the educational facilities remain in compliance with accessibility standards	10 (33.3%)	20 (66.67%)

Source: Author's Calculation, 2023

Based on Table 7, the data shows variations in the implementation of design aspects in educational buildings catering to handicapped students. Certain features such as designated quiet areas, captioning systems, and designated seating areas are more common; there is a need for more information on assistive technology and visual alert systems. Although there is progress in classrooms with acoustic treatments and accessible restrooms, improvements are required for accessible communication, training programs, and color-coded pathways. Ongoing evaluations are crucial for maintaining accessibility standards. These findings emphasize the importance of meeting the specific needs of handicapped students and further enhancing inclusive environments.

Interview

The interview sessions were conducted with educators and experts in the field of architecture, accessibility, and inclusive design. These interviews provide insights and expertise to inform the development of the design guidelines.

Table 8. Interview with Educators and Experts in Designing an Educational Building for Handicapped People

Participant, state	Most critical accessibility requirements	Specific regulations or guidelines that designers should follow	Specific considerations when designing classrooms	Key factors to consider of mobility, navigation, and wayfinding within the facility	Common areas: cafeterias, restrooms, and recreational spaces, made more inclusive and accessible
Madam Linda (Special Education Teacher), Terengganu	Accessible signage, adjustable-height workstations, and non-slip flooring.	Uncertainty	Accessible entrances, wide doorways, and sufficient space	Accessible entrances, ramps, and elevators	Provide flexible seating
Miss Ain Izzati (Hearing Impaired Teacher), Pahang	Ensuring that the building has ramps, elevators, and wide doorways	Uncertainty	Layout to minimize obstacles and provide clear pathways.	Use color contrast on walls, floors, and doors to aid individuals with visual impairments	Maintain clear and wide pathways
Architect, Johor Bahru	Wheelchair accessibility: ensuring that the building has ramps, elevators, and wide doorway, assistive listening systems, visual alarms, and clear acoustics	Universal design and accessibility in the built environment - code of practice, person with disabilities act (act 685) • Uniform Building By-Law (UBBL), 2014 universal design and accessibility in the built environment - code of practice (second revision)	Acoustic environment that minimizes background noise, technology resources, such as computers, tablets, and interactive whiteboards, are accessible to students with disabilities, supporting their learning needs	Avoid clutter, uneven surfaces, or unnecessary barriers that could impede mobility, install handrails, and grab bars in hallways, staircases	Create an environment with sensory sensitivities, integrate assistive technologies
Interior designer A, Kuala Lumpur	Implementing features like tactile signage, braille labels, and contrasting colors	Time-Saver Standards for Interior Design and Space Planning Book by Joseph De Chiara, et al.	Sound-absorbing materials, acoustic treatments, and consider the placement of speakers or microphones for effective communication. Adequate space between furniture for manoeuvrability	Implement clear and visible signage with legible fonts, contrasting colours, and appropriate pictograms	Design accessible restrooms with spacious layouts, grab bars, and accessible fixtures, inclusive equipment cater to a diverse range of abilities.

Participant, state	Most critical accessibility requirements	Specific regulations or guidelines that designers should follow	Specific considerations when designing classrooms	Key factors to consider of mobility, navigation, and wayfinding within the facility	Common areas: cafeterias, restrooms, and recreational spaces, made more inclusive and accessible
Interior designer B, Selangor	Designing ergonomic furniture, appropriate lighting, and clear pathways	Time-Saver Standards for Interior Design and Space Planning Book by Joseph De Chiara, et al, research papers, Application of Universal Design in the Built Environment by International Islamic University Malaysia (IIUM)	Accessible exits, evacuation chairs, apply universal design principles, such as flexibility, simplicity, and intuitive use	Ensure adequate lighting throughout the building, paying attention to areas with potential glare or shadows, minimize excessive noise and provide acoustic	Non-slip flooring, appropriate lighting, and clear emergency evacuation routes

Source: Author's Interview, 2023

From Table 8, the educators and experts shared their insights on critical accessibility requirements, regulations, and considerations when designing educational buildings for individuals with disabilities. Experts understand that the advantages of designing an educational building for handicapped people promote inclusivity, providing equal access to education for all students. Furthermore, it improves mobility and independence for individuals with disabilities, allowing them to navigate the facility with ease. The design fosters a sense of belonging and social integration among students.

The findings, meticulously organized and refined, underscore the critical importance of developing design guidelines for educational facilities catering to individuals with disabilities. This research not only emphasizes accessibility but also underscores the pivotal role of a healthy environment in fostering enhanced educational opportunities and an overall improved quality of life for handicapped individuals. This refined organization ensures that the findings seamlessly align with the primary goals of the research, facilitating more comprehensive understanding and application of study's outcome in the context of creating inclusive and supportive educational spaces.

CONCLUSION

The educational building for individuals with disabilities is to address the needs of disabled individuals who require design improvement and modifications to improve accessibility. These modifications enable them to maintain their

independence and continue to perform activities at the centre. However, depending on the manufacturer and contractor who is involved, building adjustments can vary in size, shape, and cost. Building or design space and modifications should align with the specific needs of the occupants or user. The significance of accessibility, circulation, spatial planning, acoustics, ergonomics, and inclusive design in creating education buildings is to promote a healthy and inclusive environment for handicapped individuals.

In summary, the design guidelines for educational facilities serving the disabled aim to provide a supportive atmosphere that considers their individual needs. It includes amenities like captioning systems, reserved seating places, quiet zones, and accessible bathrooms. Notably, there is potential for improvement in areas like visual alert systems, accessible communication techniques, assistive technology, and extensive training programs. Therefore, the key findings emphasize the importance of creating environments that enhance educational opportunities and overall quality of life for individuals with disabilities. The focus is on actionable insights to improve the accessibility and health aspects of educational buildings, contributing to a more inclusive and supportive learning environment for handicapped individuals.

ETHICAL STATEMENT

Ethical approval for this study was given by Faculty of Architecture & Ekistics, Universiti Malaysia Kelantan, and Faculty of Innovative, Design and Technology, Universiti Sultan Zainal Abidin.

REFERENCES

- Abdullah, M. F., & A. A. (2018). Factors Influencing parents in selecting school for children with special education need. *Journal of the Malaysian Institute of Planners*, 207-216.
- Ab Rahman, S. A., & N. S. (2018). Housing for Disabled People: What Do They Need? *Journal of the Malaysian Institute of Planners*, 266-274.
- Esfandfar, E., & M. H. Elnaz (2018). Universal Design in Urban Public Spaces for People with Disability: Case Study of Tehran, Iran. *Journal of The Malaysian Institute of Planners*, 173-182.
- Ministry of Women, Family and Community Development. (2021). *Statistics Report 2021, Department of Social Welfare*. Malaysia: OMR Press Sdn Bhd.
- Mohd Muhiddin, A. A., & H. M. (2023). Green Campus Implementation in The Malaysian Public Universities: Challenges And Solutions. *Journal of the Malaysian Institute of Planners*, 274-298.
- Nasir, C. M., & D. W. (2022). Housing as an Integral Development for Health categories that deliver a healthy housing in Malaysia. *International Journal of Accounting, Finance and Business*, 391
- Nasir, M. N. (2016). Special Education for Children with Disabilities in Malaysia: Progress and Obstacles. *Malaysian Journal of Society and Space*, 78-87.
- Shamri, S.L., E. M. (2022). Strategies in Improving the Building Efficiency and Daylighting: A Case Study of Green Building. *Journal of the Malaysian Institute of Planners*, 99-109.

Siti Nuratirah Che Mohd Nasir, Nurul Nashatah Zainol Ahmad, Salmiah Aziz, Juliza Mohamad and Noorul Huda Mohd Razali
Design Guideline: Education Building for Handicapped People Towards Healthy Environment

- Steinfeld, E., & Maisel, J. L. (2012). *Universal Design: Creating Inclusive Environments*. John Wiley & Sons.
- Wahab, L., & K. I. (2022). Accessibility And Inclusivity of Playgrounds for Children with Disabilities in Malaysia. *Journal of the Malaysian Institute of Planners*, 172-183.
- Yakob, H. S. A. (2022). Qualitative Assessment of Usability and Accessibility of Housing Design Elements for Disable People. *Journal of Malaysian Institute of Planners*, 374-388.

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DEVELOPMENT OF THE “HALAL DESTINATION CONCEPT”: ASSUMPTIONS OF TOURISTS IN KAKABAN ISLAND– INDONESIA

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Abstract

Since 1999, the government has been promoting Kakaban tourism. However, Kakaban Island only went viral in the 2010s through advertisements on several content such as Instagram and YouTube. At the same time, preferences have emerged regarding "halal destinations" from some world tourism. For tourism managers in Kakaban, this topic is adopted as an alternative for Muslim tourists during recreation, in the middle of a visit, or after traveling without worrying about matters of worship. The essence of this paper is to reveal the expressions of 576 tourists towards trust, religious values, commitments, and halal destination produced in Kakaban. The data collection technique used was accidental sampling. Then, the triangulation approach was operated by combining informants' opinions as outlined in the questionnaire. As a result, we found two facts: (1) religious values and commitment significantly influence halal destination; (2) religious values mediate trust to grow halal destination significantly. Halal destinations are also an appreciation for non-Muslim tourists who prioritize attractive and excellent service without any intervention that triggers rejection.

Keywords: Religious Values, Commitment, Halal Destination, Kakaban Tourism

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INTRODUCTION

In tourism science, the concept of "halal destinations" has been developed in various world tourism (Mawardi, 2021; Md Zain et al., 2023; Waryono, 2022). Although initially the idea sparked various debates and further comprehensive studies, it was adopted by nations that are predominantly Muslim, including Indonesia. The emergence of sharia-style destinations is inseparable from the requests of visitors who want an exclusive feel, without neglecting the elements of religious observance, concern for a sense of justice, and maintaining order. Recently, Muslim tourists have been on the rise in Indonesia and many are also interested in traveling trends that are oriented towards this terminology (Rahmawati et al., 2021). With the enthusiasm of friendly Muslim tourism, gave birth to a new term that needs to be interpreted.



Figure 1: Map of Kakaban Islands

Source: Own

Speaking of commercial affairs, tourism in East Kalimantan is no less superior than those ten destinations. In fact, Berau is one of the exclusive locations frequently visited by tourists (Suharto et al., 2019). Apart from being a global forest protection project in preventing climate change, such as in Kampung Merabu, Berau Regency also offers natural destinations with coastal beauty and caves on the water. Local authorities have encouraged iconic tourism, i.e: Maratua Island, Labuan Cermin, Derawan Island, Biduk-Biduk Beach and Kakaban Island. Especially for the island area which is separated from the city

center (Tanjung Redeb), including Kakaban Island, which plays a role in the conservation of rare marine biota such as rare green turtle nests, hawksbill turtles, coconut crabs and hawksbill turtles, so their habitat needs to be protected from the threat of extinction (see Fig. 1). The natural wealth which is the symbol and selling point of Kakaban also lies in the lake which was formed since prehistoric times. With a lake area of about 5 km² and steep rock walls as high as 50 meters, trapped seawater cannot return to the sea, thus forming Lake Kakaban. Not only showing the charm of the sea when diving, the panorama that is a favorite of tourists when visiting Kakaban Island is the resort, mangrove forest, and traditional culinary called "Tehe-tehe". This food contains glutinous rice and mixed with coconut milk which is packaged using dried sea urchin shells.

Recently, after the normal situation since the Covid-19 outbreak, policy makers have revived tourism performance. At the same time, most of the country's tourism ecosystems are centralized in halal destinations. This gives new enthusiasm to destination managers in Berau (including Kakaban) to modify halal tourism management matters. This moment became a valuable inspiration, where the Islamic Shari'a attaches great importance to tourist safety, a conducive environment, and considers religious access without conflicting with cultural heritage. Starting from a fundamental precision that shifts the old level into a new structure. The attractiveness of destinations with halal status is increasingly being highlighted and triggering a multiplier effect, especially restoring the tourism market. Therefore, the agenda in this paper is mapped as follows:

- Identify causality between trust, religious values, and commitment to halal destination;
- Investigate the relationship between trust and commitment to halal destination mediated by religious values.

THEORETICAL LANDSCAPE

Trust

In the literature that correlates with halal destinations, the role of trust is discussed. Al-Ansi & Han (2019), Sodawan & Hsu (2022) and Suhartanto et al. (2021) examines that tourist trust is compiled by experience, service quality, and satisfaction. With good management of halal destinations, the effect is reputation. The higher the reputation in the eyes of tourists, the impact on intention, awareness and return visits. New breakthroughs that promise and offer satisfaction as compensation that leads to trust in halal destinations. Constructively, it provides a deductive sensation that is hard to find in other destinations. In essence, local wisdom is converted into halal destinations to channel experiences. In the loyalty capacity, the uncertainty of automatic trust can be reduced through perceived value. Even though the initial appearance of a halal destination is contemporary, relative therapy must be proven with

professional literacy and facts. Exploration of the purpose of trust has implications for the internal components of tourism, including the regulation of halal destinations. Nowadays, in order to generate high-value halal destination images, tourism management must evaluate the system in detail. The first hypothesis is written as follows:

H₁. The more trust are improved, the more halal destinations will grow.

Religious Values

Putra & Tucunan (2021) clarifies that religious values have a systematic impact on halal destinations. Managerial skills to internalize religious values into the destination environment as diversification towards sustainability. In phenomenology, local resources, customs, uniqueness, and traditions can coexist with Islamic rules. The most basic priority of managing halal destinations is to harmoniously integrate tourism routines with Islamic provisions. Solid halal destination authenticity is controlled by credible and manifest institutional transfers to receive religious signals. Halal destinations describe universal goodness as long as they do not violate Islamic guidelines. Referring to the above arguments, the following hypotheses are arranged:

H₂. The more religious values are improved, the more halal destinations will grow.

Commitment

Several publications explain the commitment function to optimize halal destinations. The direct willingness of sharia actors is the basis for establishing halal destinations. This compliance represents recognition of halal tourism marketing. To balance spiritual and physical purity, halal destinations help tourists maintain health through food nutrition. Innovative and highly flexible mobility strengthens the potential of the halal destination market continuously. Another advantage of commitment is efficacy in trusting Halal destinations. To answer this challenge, position, quality, bargaining value, and competitiveness must expand pure sharia transactions (Izza et al., 2021; Junaidi, 2020; Wibawa et al., 2022). The next proposed hypothesis is the following scenario:

H₃. The more commitment are improved, the more halal destinations will grow.

Halal Destination

The logical motivation from a halal perspective in a destination is to introduce as well as bridge the basic needs of Muslim tourists when visiting (Han et al., 2019; Permana & Humairah, 2022). Below are detailed indicators or criteria about halal destinations:

- Accommodate recreational facilities that do not mix freely and maintain privacy between genders;
- Respect certain religious rituals or sacred celebrations, such as providing special services in "Ramadan" (takjil/drinks and food for breaking the fast);
- Integrate restaurants with halal food menus and at least give a sign to restaurants serving non-halal food in order to make it easier for Muslim tourists to observe and choose selectively;
- Create complementary facilities, such as prayer rooms that are appropriate for all religions.

The main urgency of a halal destination for all tourism that is oriented towards increasing spirituality in an entertaining way. In addition, halal destinations focus on fostering religious awareness and happiness motives. In service procedures and facilities that emphasize halal-certified culinary and provide separate prayer zones (Katuk et al., 2021; Yousaf & Xiucheng, 2018). In essence, halal destinations are side by side with Islamic tourism sketches that represent lifestyle, travel, and other patterns that are closely related to halal images (Pramana et al., 2022). Halal destinations are often actualized in sharia and religious tourism. Halal destinations take important lessons based on Islamic principles and involve Muslim adherents who are on a journey that does not conflict with spirituality. The proposition for the last hypothesis is formulated as follows:

H₄. Through religious values that are instilled in trust, it further enhances halal destination.

H₅. Through religious values that are instilled in commitment, it will further enhance halal destination.

Conceptual Framework

Figure 1 illustrates the model format developed based on empirical tabulations, theoretical considerations, and hypothetical schemes. According to the flow and direction of the paper addressing to trust, religious values, commitments, and halal destination indicate a concrete connection. Figure 2 also visualizes straight line arrows for direct influence paths, while dotted line arrows for mediating influence paths.

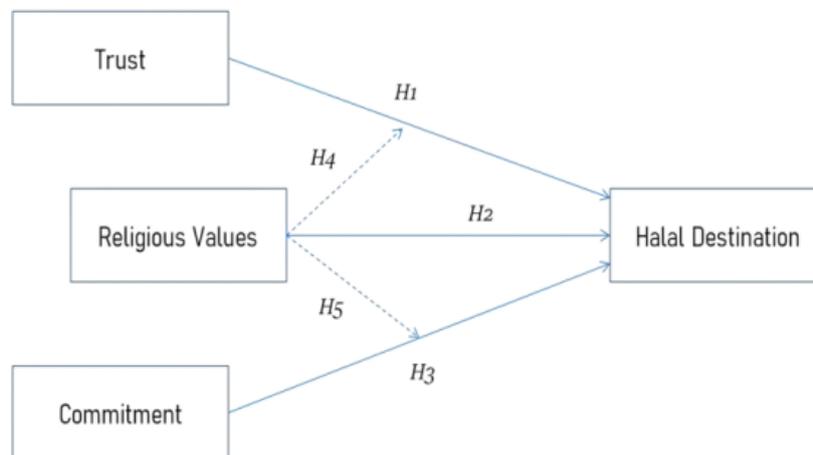


Figure 2: Model Format
 Source: Own

METHODOLOGY AND MATERIALS

Database and Sampling

Qualitative approaches were applied to draw data synthesis. The data source is dissected from the questionnaire. The triangulation method is designed to collect primary data via interviews. Sampling using accidental sampling. The sample targets are tourists who are traveling on Kakaban–Berau Islands.

Table 1: Sample Distribution

Population	n	Proportion (%)
Local tourists	204	35.4
National tourists	53	9.2
Foreign tourists	319	55.4
N	576	100

Source: Author's

Field observations were carried out from February 2023 to May 2023, where the volume of samples detected is summarized in Table 1. In practice, the number of samples willing to become informants was 576 tourists. For this case study, the sample was divided into three groups: 35.4% local tourists, 9.2% national tourists and 55.44% foreign tourists. Local tourists are visitors who domiciled in Berau Regency, while national tourists live outside Berau (but are still in Indonesian territory), and foreign tourists for those who come from outside Indonesia.

Measurements of Variable

Referring to the initial diagnosis, the variables that serve as antecedent variables are trust, religious values, and commitment. The consequent variable is played by halal destinations. On the one hand, religious values also contain mediating effects, so they are also dedicated as mediator variables. Each variable is formed by a different unit, where the trust variable consists of six items, the variable of religious values consists of five items, the commitment variable is described by four items, and the halal destination variable contains six items (see Table 2).

Table 2: List of Variables

Construct/Code	Category	Item/Author's
Trust (Tt)	Antecedent	Ability, Competence, Integrity, Benevolence, Subjectivity, and Willingness (Zimo et al., 2023)
Religious Values (RVs)	Antecedent/ Moderator	Knowledge, Ritualistic, Ideology, Experience, and Deepening (Cahyaningsih, 2020;)
Commitment (Cmt)	Antecedent	Calculative Commitment, Affective Commitment, Continuance Commitment, and Normative Commitment (Nusair, 2007; Nusair et al., 2010; Salah et al., 2019)
Halal Destination (HD)	Consequent	Memorable, Emotional, Novelty, Media and Communication, Atmosphere, and Friendly (Sthapit et al., 2023; Sumaryadi et al., 2020)

Analysis Tools

After the primary data is collected, then the data is tabulated. Data processing instruments were tested with five parameters. Table 3 below displays the test standards.

Table 3: Factor Analysis

Testing	Classification	Standard	Statistical Interpretation
Questionnaire	Likert scale/Mean (\bar{x})	1–5	- 0–1: very weak - 1–2: weak - 2–3: medium - 3–4: strong - 4–5: very strong
Validity	Pearson correlation (r_{xy})	.165	- $r_{xy} \geq r_{table}$: valid - $r_{xy} \leq r_{table}$: not valid
Bartlett's	Measure of Sampling Adequacy (MSA_j)	0–1	- $MSA_j \leq 0.5$: unpredictable variable - $MSA_j \geq 0.5$: variable predicted further - $MSA_j = 1$: predictable variable without error

Testing	Classification	Standard	- Statistical Interpretation
Reliability	Cronbach's alpha (α)	.70	- $\alpha_{value} \geq \alpha$: reliable - $\alpha_{value} < \alpha$: not reliable
Immediate significance	Probability (ρ)	.01–.05	- $\rho \geq t $: positive causality - $\rho \leq t $: negative causality
Indirect/Sobel significance	Probability (ρ)	.01–.05	- $\rho \geq z $: positive causality - $\rho \leq z $: negative causality

Source: Author(s)

ANALYSIS AND DISCUSSION

The demographics of informants based on gender are relatively more among women than men. Quantitatively, the percentage is 60.4% female and 39.6% male. The condition of Kakaban Island is known as a prestigious destination, so that 51.2% of tourists admit that they have visited twice, while the intensity of visits more than two times is 20.1% and the frequency of one visit is made by 28.6% of tourists. Interestingly, in terms of religious background, 53.3% of tourists are non-Muslims and 46.7% are those who adhere to Islam. Destinations in Kakaban are quite popular with visitors. Of the 576 informants who volunteered to be interviewed, 39.9% of tourists were aged 39–49 years, 28.6% were aged 28–38 years, 23.8% were over 50 years old, and the remaining 7.6% were aged 17–27 years. Table 4 displays that the educational background of the average informant is Bachelor/Diploma (61.1%). The table above also narrates that 20.3% of tourists have high school diplomas, 14.4% of tourists are Master graduates, and 4.2% are scientists or work as practitioners. This shows a broad level of insight in deciding which destinations to visit. Intellectual factors describe the prosperity of tourists. Apart from Maratua and Derawan which are so prominent, the destinations from Kakaban also shine. Thus, 50.9% prefer visiting the beach. Tourists have a high appetite for snorkeling at Kakaban beach. Among other favorite zones, 30.9% of tourists prefer visiting Lake Kakaban, which is the pride of the country. In contrast to these two zones, where another 8.7% said they tended to like cottages, 6.8% of tourists were enthusiastic about resorts, and only 2.8% came to explore mangrove forests.

Table 4: Status from Informant, n = 576

Profile	Frequency	%
<i>Sex</i>		
Man	228	39.6
Woman	348	60.4
<i>Visit intensity</i>		
More than 2 times	116	20.1
2 times	295	51.2
1 time	165	28.6
<i>Religion</i>		
Muslim	269	46.7

Profile	Frequency	%
Non-muslim	307	53.3
<i>Age</i>		
17–27	44	7.6
28–38	165	28.6
39–49	230	39.9
Over 50	137	23.8
<i>Last education</i>		
Doctor	24	4.2
Master	83	14.4
Bachelor/Diploma	352	61.1
Senior High School	117	20.3
<i>Favorite zone</i>		
Cottage	50	8.7
Resort	39	6.8
Mangrove forest	16	2.8
Lake	178	30.9
Beach	293	50.9
<i>Information source</i>		
Internet	334	58
Colleague/family	187	32.5
Newspaper	55	9.5

Source: Interview result

The majority of informants know Kakaban destinations via the internet. Rapidly developing technology, such as the most up-to-date social media, makes it easier for 58% of tourists to get reports about destinations. As many as 32.5% of tourists try to get access to news about tourism by word of mouth (family and colleagues) and 9.5% of tourists actually know Kakaban Island from promotions written in newspapers.

Table 5 examines the fit between the constructs and indicators of each variable calculated by the three tools: validity, Bartlett's, and reliability. All three use different tolerance limits, the validity test is Pearson's correlation ($\alpha = .165$), Bartlett's ($MSA_j = 0-1$), and reliability ($r_{xy} = .70$). Based on Table 5, the reliability statistics for all constructs are categorized as "reliable". When compared, the most dominant reliability score is halal destinations ($\leq .904$) and the lowest is religious values ($\geq .753$). Surprisingly, even though the indicators on religious values are relatively not prominent referring to their Cronbach's Alpha compared to indicators from other variables, the coefficient and anti-image correlation values meet the criteria applied. As a review of each construct, there is an item with the most striking coefficient score, namely Tt_1 ($\leq .724$). The item is an element of the trust variable. But, the smallest coefficient is on the Cmt_1 item ($\geq .139$) which is part of the commitment variable. In other words, this item is classified as "invalid" and the nineteen indicators are "valid".

Table 5: Data Eligibility Determination

Variable	Questions	Pearson Corr.	MSA	Cronbach's Alpha
Trust				.856
	Tt_1. Destination managers have the ability to be responsible	.724	.889	
	Tt_2. Managerial recruiting talented HR employees	.688	.658	
	Tt_3. Management administration has integrity	.648	.693	
	Tt_4. Benevolence in maintaining the destination	.689	.915	
	Tt_5. Subjective awareness in building relationships	.711	.889	
	Tt_6. Reliable willingness	.685	.923	
Religious Values				.753
	RVs_1. This destination adds knowledge to share with each other	.591	.861	
	RVs_2. The practice of religious rituals in this destination is very diverse and does not bother tourists	.552	.833	
	RVs_3. There are no consequences arising from the ideology that is entrenched in this destination	.626	.824	
	RVs_4. I got valuable experience about this destination	.676	.878	
	RVs_5. The management has provided constructive deepening of information	.708	.876	
Commitment				.789
	Cmt_1. Capability in guaranteeing financial and non-material losses	.139	.849	
	Cmt_2. Competence in establishing positive bonds	.400	.659	
	Cmt_3. Perseverance provides dialogue to visitors in writing or orally	.583	.475	
	Cmt_4. Responsibility to control managerial ethics	.514	.837	
Halal Destination				.904
	HD_1. This destination gives a positive impression	.669	.747	
	HD_2. Destinations in Kakaban build emotional closeness	.596	.914	

Variable	Questions	Pearson Corr.	MSA	Cronbach's Alpha
	HD_3. I enjoy the attractions that are presented	.549	.885	
	HD_4. The media promotes halal destination from Kakaban in a communicative way	.561	.721	
	HD_5. I believe that the atmosphere of a comfortable destination leaves an impression on my memory	.534	.850	
	HD_6. Friendly is the motto of Kakaban tourism	.595	.657	

Source: Data extracted from SPSS v. 29

In the corridor of data homogeneity as measured by anti-image correlation which involves the likelihood ratio statistical function, various scores were obtained. From each construct studied, one variable experienced problems in the sample data. There is a data variance discrepancy in Cmt_3 ($\geq .475$) which indicates that this item cannot be predicted further. Then, the determination of the other twenty one indicators exceeded expectations and none reached "1" or no residue. The MSA coefficient that is above the criteria illustrates that the items in the variable can be simulated. Fantastically, the correlation on the three items of the two variables (halal trust and destinations) is almost close to "perfect". These items include Tt_4 ($\geq .915$), Tt_6 ($\geq .923$), and HD_2 ($\geq .914$).

Table 6 relates the perceptions conveyed by the informants to the questions in the questionnaire. Overall, tourists respond positively. As for the relevance of each Likert scale: 4–5 = very strong; 3–4 = strong; 2–3 = medium; 1–2 = weak; and 0–1 = very weak. The average mean of the four constructs is varied. Trust ($\bar{x} = 4.02$), religious values ($\bar{x} = 3.66$), and halal destinations ($\bar{x} = 3.68$) are categorized as "strong". Meanwhile, commitment ($\bar{x} = 2.69$) is interpreted as "medium". Of the available options, three variables (trust, religious values, and halal destinations) have a "very strong" mean, including Tt_1 ($\bar{x} = 4.59$), RVs_4 ($\bar{x} = 4.58$), and HD_6 ($\bar{x} = 4.69$). One "weak" indicator is in the commitment variable, where the mean score is average for Cmt_3 ($\bar{x} = 1.63$).

Table 6: Informants' Responses to the Questionnaire

Variable	Abbreviations	Mean	Mark
Trust		4.02	Strong
	Tt 1	4.59	Very strong
	Tt 2	3.85	Strong
	Tt 3	4.42	Strong
	Tt 4	4.37	Strong
	Tt 5	4.03	Strong
	Tt 6	2.87	Medium

Variable	Abbreviations	Mean	Mark
Religious Values		3.66	Strong
	RVs 1	3.28	Medium
	RVs 2	3.35	Medium
	RVs 3	3.63	Strong
	RVs 4	4.58	Very strong
	RVs 5	3.45	Strong
Commitment		2.69	Medium
	Cmt 1	2.94	Medium
	Cmt 2	3.16	Strong
	Cmt 3	1.63	Weak
	Cmt 4	3.04	Moderate
Halal Destination		3.68	Strong
	HD 1	3.52	Strong
	HD 2	3.47	Strong
	HD 3	3.98	Strong
	HD 4	3.21	Medium
	HD 5	3.20	Medium
	HD 6	4.69	Very strong

Source: Data extracted from SPSS v. 29

With a degree of probability of 5% and 1%, trust is not related to halal destinations ($\rho = .063$), religious values encourage halal destinations significantly ($\rho \leq .05$), and the commitment built is proven to stimulate halal destinations ($\rho \leq .01$). On the moderation path, trust is actually significantly related to halal destinations ($\rho \leq .01$) while commitment does not have a significant impact on halal destinations ($\rho = .145$). Based on this evidence, the first hypothesis and the fifth hypothesis are rejected. However, the second hypothesis, third hypothesis, and fourth hypothesis are accepted.

Table 7: Partial Causality and Mediation Causality

From	With	To	Coef.	Std. Error	Prob.
Trus		Halal Destination	.194	.102	.063
Religious Values		Halal Destination	.330	.057	.008*
Commitment		Halal Destination	.239	.045	.000**
Trus	Religious Values	Halal Destination	.064	.019	.000**
Commitment	Religious Values	Halal Destination	.021	.361	.145

Source: Data extracted from SPSS v. 29 and Sobel software (Soper, 2023)

Notation: *Significance at .05, **Significance at .01

Additionally, testing on indirect causality prove that there are different findings. According to the statistical output in Table 7, it can be concluded that there are two things. First, there is a "partial mediation" which implies that by involving a mediator variable, the antecedent variable indirectly influences the consequent variable. The positive effect between trust in halal destinations and incorporating religious values causes partial mediation (see Figure 3). Second, it is certain that the antecedent variable does not affect the consequent variable through the mediator variable, resulting in "full mediation" or "perfect mediation". This is triggered by the absence of an effect between commitments to halal destinations when religious values are included in the equation (see Figure 4).

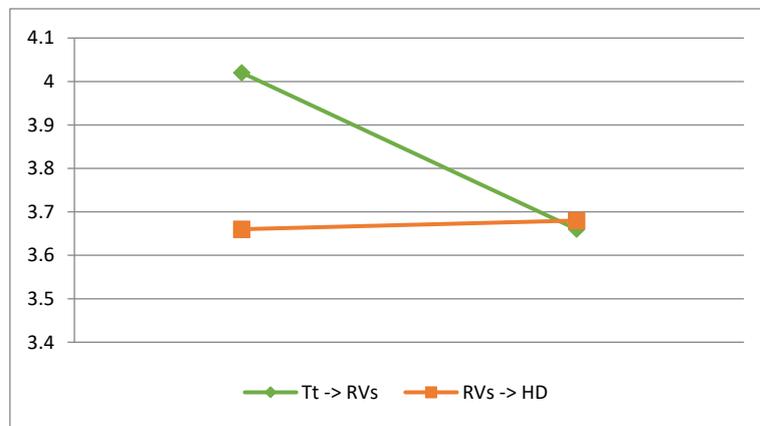


Figure 3: Effect of Moderation on the First Structure
Source: Data extracted from Ms. Excel

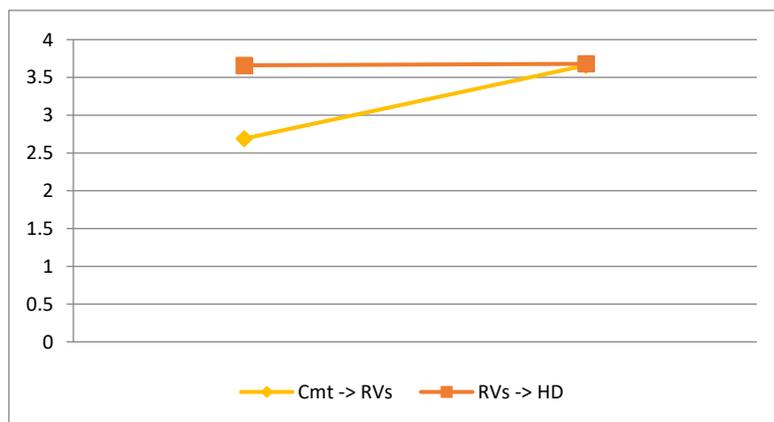


Figure 4: Effect of Moderation on the Second Structure
Source: Data extracted from Ms. Excel

Too, tourists claim that trust in halal destinations is manipulative. The majority of informants tend to give a bad impression after the tour, so they tell unproductive messages to other visitors. Negative perceptions of the management of halal destinations arise as a result of an unprofessional managerial hierarchy. This problem is also triggered by external aspects, including the conflict of interest between the tourism manager and the government. In the end, the commitment to branding destinations (including the interior) which is not creatively managed, has reduced the urgency of religious values. So that this polemic does not last long, a solution and seriousness from tourism actors are needed.

The transformation to changes in halal destinations which are increasingly impressive has an optimistic impact on handling Indonesian tourism. Short-term planning for halal destinations supported by solidarity among tourism stakeholders is still below expectations. With a population dominated by Muslims, this is a valuable opportunity to mobilize a skilled Halal destination. In developing markets and developed countries there are clear instructions for the halal destination industry in food sorting, Muslim tourist clusters, supply chain management, and market areas to be halal certified (Lubis et al., 2022).

CONCLUSION

The synopsis of this work is to explore the influence of trust and commitment in fostering the concept of halal destinations in Kakaban tourism which is mediated by religious values. The findings emphasize four important points: (1) religious values and commitment to success significantly influence halal destination; (2) trust does not have a significant effect on halal destination; (3) trust has a significant impact on halal destination through instilled religious values; (4) commitment is actually unable to influence halal destination even though it is mediated by religious values. The low level of tourist trust in the concept of halal destinations is influenced by contradictory issues, thus triggering a misperception. Ironically, in indirect causality mediated by religious values, commitment actually has negative implications for halal destinations. Commitments in tourism management that seem incomplete, give rise to an ambiguous point of view in interpreting.

REFERENCES

- Al-Ansi, A., & Han, H. (2019). Role of halal-friendly destination performances, value, satisfaction, and trust in generating destination image and loyalty. *Journal of Destination Marketing & Management*, 13, 51-60.
- Cahyaningsih, E. (2020). Minat berwisata halal: Pengaruh religiusitas dan efikasi diri berwisata ke Yogyakarta. *Master Thesis*. Universitas Islam Indonesia, Yogyakarta. <https://dspace.uii.ac.id/handle/123456789/28993> [In Indonesian]
- Han, H., Al-Ansi, A., Olya, H. G. T., & Kim, W. (2019). Exploring halal-friendly destination attributes in South Korea: Perceptions and behaviors of Muslim

- travelers toward a non-Muslim destination. *Tourism Management*, 71, 151-164.
- Izza, N. N., Rusydiana, A. S., & Avedta, S. (2021). A qualitative review on halal tourism: NVivo approach. *Halal Tourism and Pilgrimage*, 1(1), 1-15.
- Junaidi, J. (2020). Halal-friendly tourism and factors influencing halal tourism. *Management Science Letters*, 10(8), 1755–1762.
- Katuk, N., Ku-Mahamud, K. R., Kayat, K., Abdul Hamid, M. N., Zakaria, N. H., & Purbasari, A. (2021). Halal certification for tourism marketing: The attributes and attitudes of food operators in Indonesia. *Journal of Islamic Marketing*, 12(5), 1043-1062.
- Lubis, F. R. A., Muhammad Arsy, R. G. P., & Yuandita, R. (2022). Comparative study of the potential of the halal industry in Developed Countries Vs Developing Countries. *ARBITRASE: Journal of Economics and Accounting*, 3(1), 95-102.
- Mawardi, I. (2022). Comparing the concept of halal tourism in Indonesia, Thailand, and Malaysia. *Mozaik Humaniora*, 21(2), 178–192.
- Md Zain, N. A., Hanafiah, M. H., Asyraff, M. A., Ismail, H., & Wan Mohd Zain, W. M. A. (2023). Exploring medical tourism competitiveness in Malaysia, Thailand, and Singapore: The Indonesian tourists' perspectives. *Planning Malaysia*, 21(6), 313–328.
- Nusair, K. (2007). A model of commitment in B-to-C travel context: A structural equation modeling. *Doctoral Dissertation*. Ohio State University, Ohio.
- Nusair, K., Hua, N., & Li, X. (2010). A conceptual framework of relationship commitment: E-travel agencies. *Journal of Hospitality and Tourism Technology*, 1(2), 106-120.
- Permana, D., & Humairah, D. (2022). Recognizing the halal tourism destination in Indonesia from the lens of destination image, e-wom and Muslim-friendly amenities. *International Journal of Scientific Research in Science and Technology*, 9(3), 615-624.
- Pramana, A., Sukma R. D., Zamaya, Y., & Jayalaksamana, M. (2022). Zoning potential halal tourism evidence in Indonesia. *Journal of Digital Marketing and Halal Industry*, 4(2), 105-122.
- Putra, M. F. S., & Tucunan, K. P. (2021). The concept of halal tourism and the fulfillment of Muslim tourist needs in halal tourism. *Halal Research Journal*, 1(2), 56–62.
- Rahmawati, R., Oktora, K., Ratnasari, S. L., Ramadania, R., & Darma, D. C. (2021). Is it true that Lombok deserves to be a halal tourist destination in the world? A perception of domestic tourists. *GeoJournal of Tourism and Geosites*, 34(1), 94–101.
- Salah, M., Abou-Shouk, M., & Fawzy, N. M. (2019). Exploring the impact of internal marketing on organizational commitment of travel agents employees. *International Journal of Hospitality & Tourism Systems*, 12(1), 1-12.
- Sodawan, A., & Hsu, R. L.-W. (2022). Halal-friendly attributes and Muslims' visit intention: Exploring the roles of perceived value and destination trust. *Sustainability*, 14(19), 12002.
- Soper, D. S. (2023). *Sobel test calculator for the significance of mediation [software]*. <https://www.danielsoper.com/statcalc/calculator.aspx?id=31>
- Sthapit, E., Björk, P., & Piramanayagam, S. (2023). Motivational, emotional and memorable dimensions of non-Muslim tourists' halal food experiences. *Journal*

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Development of the "Halal Destination Concept": Assumptions of Tourists in Kakaban Island-Indonesia

of Islamic Marketing, 14(1), 23-42.

State of the Global Islamic Economy Report. (2018). An inclusive ethical economy. https://ded.ae/DED_Files/StudiesAndResearch/SGIE-Report-2018-19_Eng_1540649428.pdf

Suhartanto, D., Dean, D., Wibisono, N., Astor, Y., Muflih, M., Kartikasari, A., Sutrisno, R., & Hardiyanto, N. (2020). Tourist experience in halal tourism: What leads to loyalty?. *Current Issues in Tourism*, 24(14), 1976-1990.

Suharto, R. B., Roy, J., & Darma, D. C. (2019). Degree of potential and development strategy of tourism objects. *International Journal of Scientific & Technology Research*, 8(9), 2343-2347.

Sumaryadi, S., Sutono, A., Rahtomo, W., Rumayar, C. H., & Puksi, F. F. (2020). Smart halal destination ecosystem: The exploration of halal tourism ecosystem model. *Masyarakat Pariwisata: Journal of Community Services in Tourism*, 1(1), 29-48.

Waryono, W. (2022). The importance of halal tourism policy in West Sumatera. *RELEVANCE: Journal of Management and Bussines*, 5(1), 60-77.

Wibawa, B. M., Bramanti, G. W., & Pranindyasari, C. (2022). Do individual characteristics impact willingness to pay for halal food?. *Journal of Halal Research, Policy and Industry*, 1(2), 1-7.

Yousaf, S., & Xiucheng, F. (2018). Halal culinary and tourism marketing strategies on government websites: A preliminary analysis. *Tourism Management*, 68, 423-443.

Zimo, H., Omar, S. I., Bachri, S., & Sumarmi. (2023). Visitor willingness to pay conservation fees at CMC Tiga Warna in Malang, Indonesia. *Planning Malaysia*, 21(4), 452-466.

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INDICATORS AND DIMENSIONS IN THE FORMULATION AND EVALUATION OF A SUSTAINABLE CAMPUS INDEX

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Abstract

The establishment of a green campus assumes significance in ensuring comfort and elevating the overall quality of life. This study was conducted to ascertain the variability in the questionnaires and delineate the attributes of questions exhibiting high variation in the results. Therefore, constructing the UniSZA Green Campus index based on the acquired weighted values. A total of 420 questionnaires were returned out of 500. Principal Component Analysis was employed to extract distinctive information from the amalgamated dataset. The results of the analysis draw out four factors that were discerned and subsequently interpreted as environmental management (46.65%), environmental infrastructure (12.53%), environmental atmosphere (6.35%), and environmental program (5.39%). In assessing the variation of the UniSZA Green Campus Index, distinct categories were identified, encompassing excellent, good, fair, poor, and bad classifications. This study suggests that the average UniSZA Green Campus index is situated within the second category. Despite the indication of good standing, the university should proactively take steps to ensure that UniSZA aligns with the principles of environmental sustainability in daily practices. The index system can serve as a guide for universities to attain sustainability on their campuses.

Keywords: Environment; Green campus; Sustainable; UniSZA Green Campus Index

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INTRODUCTION

The discourse on sustainability has been a focal point of deliberations in numerous international conferences of global significance (Hisham et al., 2023; Rwelamila & Purushottam, 2015). The promulgation of the sustainable development paradigm transpires through the conveyance of information, fostering an understanding of the imperative for equilibrium among the environment, economy, and society (Abakumov & Beresten, 2023). The concept of sustainable development has imposed fresh requisites for engagement from higher education institutions, positioning universities as pivotal entities in spearheading transformative change and progress. Consequently, they function as a nexus between scientific knowledge and practical wisdom (Pereira Ribeiro et al., 2021). The concept of sustainability in higher education was initially introduced in the Stockholm Declaration of 1972, forging a connection between humanity and the environment while acknowledging their interdependence in attaining environmental sustainability (Dawodu et al., 2022). The endeavour toward establishing a green campus has garnered significant attention from the university community, especially in the aftermath of the Sustainability in Higher Education declaration (Tan et al., 2014). In response to the imperative of environmental sustainability, universities have commenced the integration of measures spanning education, research, university operations, and administration. This comprehensive approach includes the oversight of green buildings, energy, water, food, transportation, purchasing, waste, and the implementation of sustainable landscaping practices (Rwelamila & Purushottam, 2015).

The Green Campus Initiatives encompass educational efforts in sustainable development and the integration of eco-friendly infrastructures within university campuses (Gomez & Yin Yin, 2019). The awareness of green practices in society has been extensively studied in the context of environmental practices. Certain studies have introduced a sustainability framework tailored for university campus societies, aiming to transition towards a Green campus and thereby promote a healthier environment for the campus community, with a specific emphasis on enhancing the economic, social, and environmental quality of life for university community (Anthony Jnr, 2021). The concept of a green campus is conceived to advance sustainable development within tertiary education institutions. Aligned with the Malaysian government's support for the establishment of green university campuses in the nation, several Malaysian universities have commenced the adoption of diverse green practices. These initiatives involve the implementation of various strategies aimed at fostering sustainable practices (Anthony Jnr, 2021).

The UI GreenMetric, introduced by Universitas Indonesia in 2010, primarily assesses universities using specific criteria and indicators designed to

ensure the environmental sustainability of higher educational institutions, aiming to create a global ranking based on universities' sustainable practices (Suwartha & Sari, 2013). The UI GreenMetric World University Ranking establishes its six primary criteria based on information provided by respective universities, showcasing their dedication to environmentally sustainable practices. These criteria encompass environmental settings and infrastructure, energy and climate change efforts, waste management practices, water usage policies, transportation initiatives, and environmental education programs (Atici et al., 2021). The six principal criteria of the UI GreenMetric Ranking are founded on sustainability practices, the successful implementation of which is anticipated to yield a favourable impact on the quality of life (QOL). Previous study stated that enhancing the quality of life for the university community is essential to underpinning the mindset of the entire university community in effectively implementing the sustainable development policy for a green campus (Tiyarattanachai & Hollmann, 2016). The concept of quality of life is multifaceted and may lack a precise definition, encompassing notions such as well-being, satisfaction, and happiness (Bakaruddin & Idris, 2022). Nevertheless, the aspiration for a green university initiative may not be universally suitable if the universities are not adequately prepared for its implementation.

In contemporary research, diverse statistical techniques are employed to assess and comprehend intricate datasets for enhanced understanding. Statistical methodologies, including principal component analysis, are frequently utilized to delve into the data, facilitating the identification of potential factors influencing datasets (Fazillah et al., 2022). As of now, there is a scarcity of reported studies employing multivariate statistical techniques in green campus research. Consequently, this study puts forth a standardized multivariate analysis method, specifically principal component analysis, to accurately decipher the data and derive optimal insights about the green campus aspect. Drawing upon a study conducted by Abdullah et al., 2021, which utilized PCA to formulate an index, the current study adopted similar procedures to generate a green campus index for UniSZA.

This paper aims to delineate the significance of different criteria in evaluating the levels of achievement in green university campuses in Malaysia. The findings also contribute to the formulation of the UniSZA Green Campus Index for assessing the green campus status at UniSZA. Hence, the primary objective of this study was to scrutinize the perceptions held by the university community concerning their quality of life. The objective was to investigate if a Green Campus university, demonstrating exemplary performance across the six primary criteria of the UI GreenMetric World University Ranking, indeed had positive effects on the QOL of its resident university stakeholders.

RESEARCH METHODOLOGY

Study Setting

This study employs a quantitative approach utilizing primary data collection through the administration of a questionnaire. This research was conducted at Universiti Sultan Zainal Abidin (UniSZA) and the study sample was the university community. The utilized questionnaire focused on sociodemographic information, and addressed elements related to a green campus and the respondents' perceptions of quality of life. The responses were measured using the five Likert Scale and sorted in ascending order ranging from 1 (strongly disagree) to 5 (strongly agree). A Google form tool was used as a channel to distribute the questionnaire at the university. A link to the web-based survey was sent through the email and WhatsApp application. No incentive was provided to the respondents for completing the questionnaires. The study successfully obtained responses from 420 participants within the 5-month data collection period who were randomly selected. The number of samples collected conformed to the anticipated sample group size.

Data Analysis

Dimensionality of Data

In this study, principal Component Analysis was utilized to discern the variability within the dataset and uncover concealed features within its complexity to ascertain the factors that exert a noteworthy impact on the environmentally sustainable practices within the university campus (Gupta et al., 2018). Hence, developing a UniSZA Green Campus University. PCA is a technique employed to manage extensive and intricate datasets, transforming them into meaningful representations. This method involves scrutinizing the data to produce a lower-dimensional linear structure. The PCs can be expressed as:

$$z_{ij} = a_{i1}x_{1j} + a_{i2}x_{2j} + \dots + a_{im}x_{mj} \quad (1)$$

Where z is the component score, a is the component loading, x is the measured value of the variable, i is the component number, j is the sample number and m is the total number of variables.

The Establishment of UniSZA Green Campus Index

Each factor can be considered as a dimension within the broader context of the green campus framework. Hence, the scores of each factor can serve as a singular index, signifying the specific aspect to which the factor is linked. A green campus index is formulated using the methodology outlined by (Li & Weng, 2007). The comprehensive score for each participant is derived through the application of weights to individual factor scores, taking into account their respective variances.

In the course of this investigation, the green campus index for UNISZA is constructed by assigning weights to the dimensions based on the variance of their corresponding factors. The formulation of a UniSZA Green Campus Index (UniSZA GCI) necessitated the amalgamation of four distinct factors, each emblematic of various facets of a sustainable campus environment. Each factor positively contributes to the overall quality of life for university community. The cumulative score for each category was subsequently derived by summing the weighted factor scores of the four elements through the equation provided below:

$$\text{UniSZA GCI} = \sum_i^n F_i W_i \quad (2)$$

In the context of this study, where n represents the number of selected factors, F_i denotes the i score of the factor, and variance w_i signifies the percentage of variance explained by the factor i . The cumulative score, computed through the application of equation 1, exhibits a range spanning from -212.763 to 66.154. The index values encompass both negative and positive values, which were recalibrated into z-values (transformed to a new, smaller scale to ensure unity variance for each variable) through the application of the following equation:

$$\text{Rescaling (1 to 100)} = a + ((xi - A) X (b - a)/(B - A)) \quad (3)$$

where a is equal to 1, xi is the actual observation, A and B are the lowest and highest factor scores, respectively, and b is a constant with a value of 100.

RESULT AND DISCUSSION

The Socio-demographic Profile of University Residences

The entirety of the participants consisted of individuals who were Malays (100%) and adherents of the Muslim faith. Study participants were predominantly female (70.71%) with an average age of 18-24 years. The majority of respondents (99.29%) possessed a commendable level of education, signifying their enrolment or attainment of higher education qualifications. While a considerable portion of the respondents (68.57%) has not undergone formal environmental coursework, more than half of them (69.29%) have participated in environmental programs organized either on-campus or off-campus. Figure 1 illustrates the socio-demographic composition of the study sample.

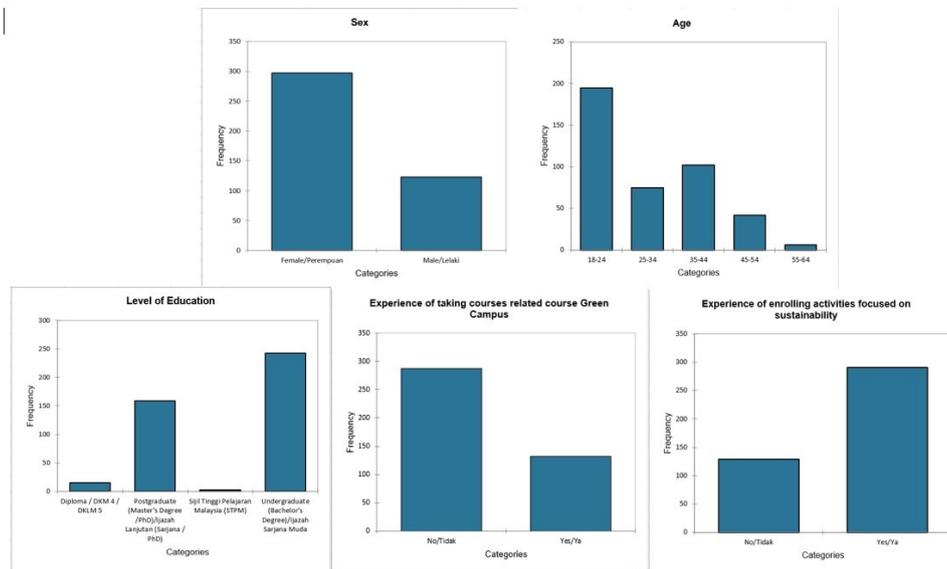


Figure 1: The socio-demographic composition of the study sample

Variations of the answer given by university community

Summary statistics for the answers given by university community in the study area are presented in Figure 2. The majority of questions displayed limited variation in the provided responses, as evidenced by small standard deviations. However, question 4 exhibited the highest variation among all questions, suggesting a more dispersed range of responses from the university community. The high variation of answer given for SB4 (1.013), SB2 (0.975), SB13 (0.866), SB20 (0.814), SB18 (0.799), SB19 (0.796), SB17 (0.786), and SB11 (0.753) suggests that the realization of the green campus aspect was not achieved by the university community. Additionally, a majority of them were not aware of the implementation of a green campus in the university. Consequently, this study recommends the necessity to promote and enhance education on green campuses. With the exception of SB1, all questions exhibit considerable variability. Question SB1 exhibits the smallest box plot length, corresponding to the lowest standard deviation value of 0.48. This implies that, on the whole, respondents hold the belief that environmental management is crucial for the university's campus.

Question SB3 and SB14 asking about the importance of green campus shows not significantly different since the mean score for SB3 is 4.54 and SB14 is 4.24. most of them agreed that green campus might enhance the QOL. A campus designed as a green campus has the potential to offer comfort to its users, contributing to an enhanced perception of their QOL. In line with this study,

Tiyarattanachai & Hollmann, (2016) and McFarland et al. (2008) indicated findings demonstrated that the community within the university's green campus exhibited higher satisfaction levels and experienced a significantly improved quality of life.

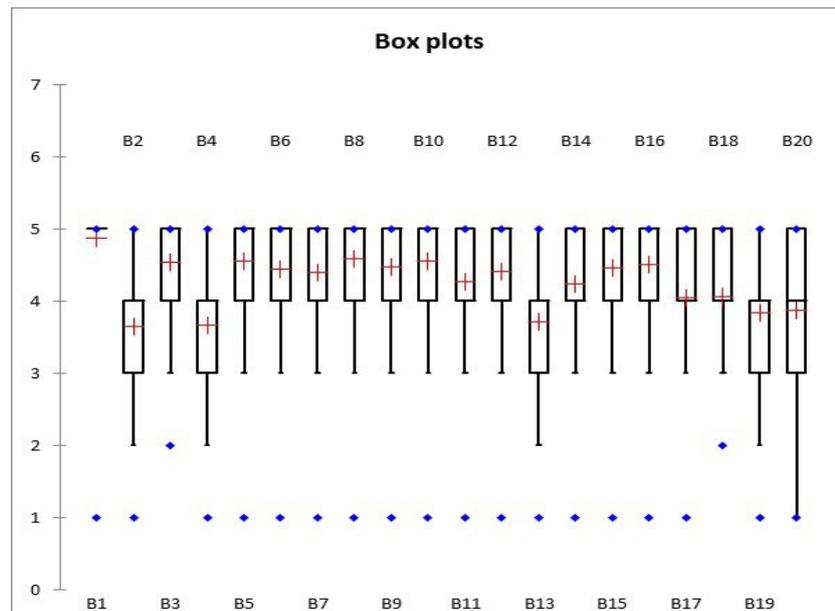


Figure 2: Box Plot explains the variability of question among UniSZA Resident

Determination Characteristics of Green University Campus Criteria on Quality of Life

Before performing PCA, an evaluation of the KMO measure and Bartlett's sphericity test was conducted on the parameter correlation matrix to assess the appropriateness and validity of employing PCA in the given context. The KMO result was 0.90 and Bartlett's test was significant ($p < 0.0001$), which indicated the validated use of PCA. The noteworthy Principal Components (PCs) were the factors that clarified the greatest extent of variability observed in the impact of the green university campus aspects on the university residence. A total of four significant Principal Components (PCs), each exhibiting an eigenvalue greater than 1, were extracted from the variables. This contributed to a cumulative explained variance of 70.91%. The variances explained by the individual PCs were 46.65% for PC1, 12.53% for PC2, 6.35% for PC3, and 5.40% for PC4. The first two PCs were the most significant, explaining a total of 59.17% of the variance in the data. The remainder of PCs did not reveal any significant similarities among answers given by the university community.

The present study employed PCA to assess the main influences of a green university campus aspects on the well-being of the university community in the study area. Table 1 presents the outcomes of the varimax rotated factor analysis concerning the quality of life of the university community regarding to the green campus aspects. Four major components with eigenvalues greater than 1 were identified with a total variance of 70.91%. Interpreting factor loadings plays a pivotal role in PCA. These loadings serve as indicators of the associations between variables and factors. Typically, the PC loadings are organized based on the criteria of strength, moderation, and weakness, aligning with absolute loading values exceeding 0.75, within the range of 0.75–0.50, and falling between 0.50–0.30, respectively. The interpretation of the four factors serves to delineate the dimensions of green campus criteria in the following manner:

Table 1: Factor loadings after Varimax rotation from PCA

	EM	EI	EA	EP
B1				
B2		0.824		
B3			0.767	
B4		0.788		
B5				
B6				
B7				0.831
B8				0.755
B9	0.848			
B10	0.769			
B11				
B12	0.776			
B13		0.859		
B14			0.780	
B15				
B16				
B17				
B18				
B19				
B20				
Eigenvalue	9.329	2.505	1.269	1.079
Variability (%)	46.647	12.525	6.345	5.396
Cumulative %	46.647	59.173	65.517	70.913

Extraction method: principal component analysis

Rotation method: varimax with Kaiser normalization

EM: environmental management

EI: environmental infrastructure

EA: environmental atmosphere

EP: environmental program

Factor 1 exhibits strong positive loadings (exceeding 0.8) on three variables: SB9 (0.85), SB10 (0.77), and SB12 (0.78). Factor 1 is linked to environmental management since SB9 and SB10 focusing on university's management on waste and water, while SB12 academic courses and activities related to environmental issues. Environmental management including water management and solid waste management are the criteria of green indicator (Darus et al., 2009). The goal of implementing water and solid waste management is to decrease the production of waste. In the context of practical implementation for managing food waste on the university campus, the waste disposal system on campus can convert food leftovers into compost, consequently diminishing the volume of waste sent to landfills (Kamarudin et al., 2020; Anthony Jnr, 2021). It is essential to address the management of wastes produced during university campus operations by integrating waste recycling. This process entails recovering unwanted materials through reuse, either for alternative purposes or their original intended use (Sugiarto et al., 2022; Md Zain et al., 2012).

Alternative research contends that achieving sustainability and directing environmental management involves various aspects, such as initiatives related to environmental protection, education, and active participation of students (Tan et al., 2014). Via environmental education, residents of university develop a heightened interest in sustainability, actively engaging in resolving environmental challenges. Consequently, there arises a necessity for comprehensive sustainability plans that encompass educational elements for the sustainable advancement of universities (Denan et al., 2018; Choi et al., 2017). A higher score on factor 1 implies an enhanced quality of life for university community in the realm of environmental management.

Factor 2 is distinguished by substantial positive loadings on SB2 (0.82), SB4 (0.79), and SB13 (0.86). The questions lie into this factor related to the infrastructure of university. Consequently, its interpretation aligns with environmental infrastructure, indicating the contentment of university community with the green infrastructure within the university. Establishing an enabling infrastructure for university community is crucial for attaining the development of a green campus (Yusoff et al., 2020; Tan et al., 2014).

An effective infrastructure offered by the university serves as a key component in the institution's pursuit of sustainability (Abakumov & Beresten, 2023). Cultivating a supportive infrastructure serves as a strategic approach to realizing Sustainable Campuses, aiming to streamline the development of an energy and resource-efficient campus through the reduction of energy consumption (Sugiarto et al., 2022; Tan et al., 2014). The implementable components of the university's green campus infrastructure encompass amenities such as bicycle parking, distinct receptacles for various waste categories, initiatives addressing food and waste management, utilization of energy-efficient

technologies, and programs aimed at reducing the consumption of paper and plastic packaging (Abakumov & Beresten, 2023). According to this study, the attainment of a green and sustainable campus requires that the provided infrastructure meets specified quality standards.

Factor 3 can be understood as reflecting the environmental atmosphere. This factor exhibits a substantial loading on SB3 (0.77) and SB14 (0.78), indicating the environmental atmosphere at the university. This query pertains to the criterion of a green campus as the primary factor that distinguishes a campus as a preferred choice. Another study asserted that initiatives for a Green campus encompass the management of green buildings, energy, water, food, transportation, purchasing, waste, and sustainable landscaping (Rwelamila & Purushottam, 2015). The construction of a campus environment should aspire to the goal of being resource-saving and environmentally friendly (Wang et al., 2014). As an integral aspect of the environmental setting and infrastructure criterion, universities are expected to furnish ample green spaces within their campuses. The roles of green campus have the capacity to contribute to an enhanced quality of life for university community. This is supported by study in 2008, Concluded that residents of the university perceive green spaces to exert a positive influence on their Quality of Life (McFarland et al., 2008).

Factor 4 demonstrates a noteworthy positive loading on SB7 (0.83) and SB8 (0.76). The query within this domain pertains to the university's management program for climate change mitigation and solid waste management. Numerous scholarly investigations have delineated climate change as a crucial consideration in the endeavour to cultivate a sustainable and eco-friendly campus environment (Helferty & Clarke, 2009). By implementing waste management programs, including practices like waste separation and reduction, universities have actively endeavored to enhance their dedication to advancing education and research in the sphere of sustainable development (Tan et al., 2014). Execute sustainable education initiatives encompassing waste management and climate change programs, with the objective of equipping university students with essential skills to confront environmental challenges while fostering an enduring appreciation for the environment (Mebane et al., 2023; Suwartha & Sari, 2013). This factor can be interpreted as environmental program.

Within this investigation, Principal Component Analysis (PCA) yielded substantial data reduction, where 10 questions, constituting approximately 50% of the total 30 questions, elucidated 70% of the variance in the data. PCA functioned as a tool to pinpoint these specific questions, showcasing their significant contribution to the green campus dimension among university community.

UniSZA Green Campus Index

The construction of the UniSZA Green Campus Index (UniSZA GCI) entailed the application of univariate clustering, which was then classified into five discrete groups, excellent, good, fair, poor and bad. The highest value of the UniSZA Green Campus Index signifies the optimal quality of life concerning the green campus aspect, whereas the lowest value of the UniSZA Green Campus Index reflects the least favourable level of quality of life in relation to the green campus aspect. The index categories of UniSZA GCI as elaborated below.

Excellent UniSZA GCI: The weightage value for this category ranges from 24.921 to 66.154. The highest value of UniSZA GCI demonstrates that the UniSZA has excellent green campus aspects. About 41.43% of UniSZA residents have excellent UniSZA GCI. The second index category is Good UniSZA GCI. The numerical range for this category spans from -5.663 to 22.692, with approximately 20.71% of the study sample demonstrating a favourable UniSZA GCI. The fair UniSZA GCI with the weighting value for this category ranges from -44.113 to -9.431, encompassing 27.86% of the study sample. This category has moderate level of green campus index. The poor UniSZA GCI implies the scores varied within the range of -117.361 to -46.727, constituting 6% of the study sample. The lowest index is bad UniSZA GCI whereas, the scores exhibited variation in the span of -212.763 to -152.768, comprising 3.57% of the study sample. The picture of UniSZA GCI is presented in Figure 3.

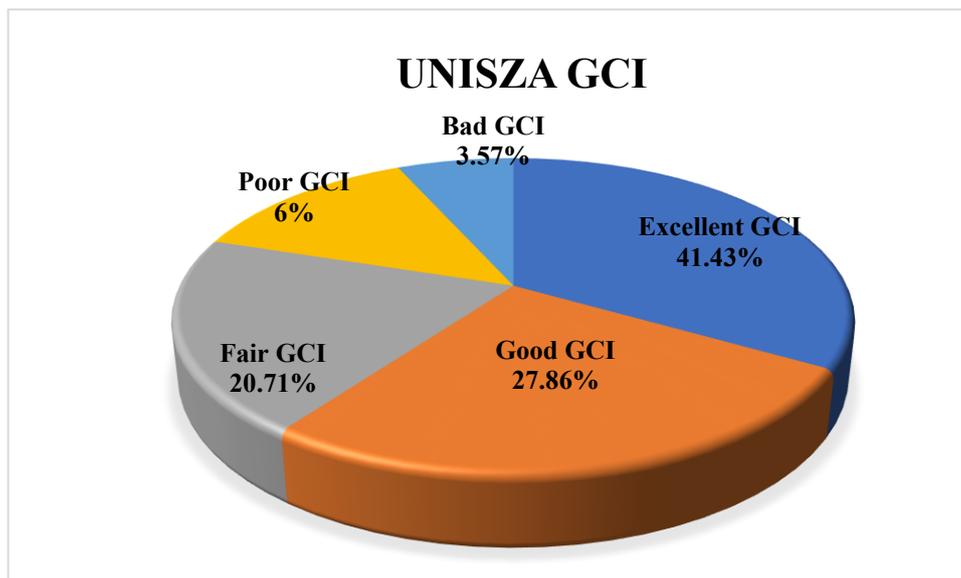


Figure 3: Percentage of UniSZA GCI based on categories.

The creation of such an index typically involves identifying and assessing diverse factors, which may encompass environmental management, environmental infrastructure, the environmental atmosphere, and environmental programs. From the study, we can conclude that the average of UniSZA GCI is Good. The UniSZA Green Campus Index encompasses a thorough framework designed to evaluate and quantify the university's sustainability initiatives and practices comprehensively. This index functions as a metric to measure the university's dedication to environmental stewardship and the formulation adoption of sustainable practices.

CONCLUSION

The concept of a green campus is built upon various variables. This study specifically concentrates on four crucial variables deemed significant and influential in the QOL of the university community. These variables include environmental management, environmental infrastructure, environmental atmosphere, and environmental programs, all identified as factors impacting the QOL of the university community. Implementing the principles of green campus design is recommended for enhancing the overall quality of life on the campus. The creation of the UniSZA Green Campus Index has resulted in the categorization of indexes as excellent, good, fair, poor, and bad.

These categories serve as indicators to ascertain the level of the green campus index at UniSZA. This study suggests that commencing the UniSZA Green Campus Index necessitates a methodical approach. In association with this index, continuous monitoring and periodic assessments are crucial for tracking advancements and pinpointing areas that warrant ongoing enhancement. This iterative process underscores the university's steadfast commitment to advancing sustainability objectives and making substantial contributions to the wider dialogue on environmentally responsible campus management.

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REFERENCES

- Abakumov, E., & Beresten, S. (2023). Green Campus as a Part of Environmental Management of St. Petersburg State University. *Sustainability (Switzerland)*, 15(16). <https://doi.org/10.3390/su151612515>
- Abdullah, S., Ismail, A., Juahir, H., Lananan, F., Mat Hashim, N. M., Ariffin, N., & Tengku Mohd, T. A. (2021). Estimation of rainwater harvesting by the reflectance of the purity index of rainfall. *Environmental Science and Pollution Research*, 28, 1–15.

- <https://doi.org/10.1007/s11356-021-12772-6>
- Anthony Jnr, B. (2021). Green campus paradigms for sustainability attainment in higher education institutions – a comparative study. *Journal of Science and Technology Policy Management*, 12(1), 117–148. <https://doi.org/10.1108/JSTPM-02-2019-0008>
- Atici, K. B., Yasayacak, G., Yildiz, Y., & Ulucan, A. (2021). Green University and academic performance: An empirical study on UI GreenMetric and World University Rankings. *Journal of Cleaner Production*, 291(xxxx), 125289. <https://doi.org/10.1016/j.jclepro.2020.125289>
- Bakaruddin, A. I., & Idris, H. A. (2022). Improving The Quality Of Life Of The Academic Community In The Application Of Green Campus At The Muhammadiyah Riau University. *Journal of Positive School Psychology*, 6(6), 7590–7600. <https://www.journalppw.com/index.php/jpsp/article/view/8913>
- Choi, Y. J., Oh, M., Kang, J., & Lutzenhiser, L. (2017). Plans and living practices for the green campus of portland state university. *Sustainability (Switzerland)*, 9(2). <https://doi.org/10.3390/su9020252>
- Darus, Z. M., Khalim, A., Rashid, A., Hashim, N. A., Omar, Z., Saruwono, M., & Mohammad, N. (2009). Development of sustainable campus: Universiti Kebangsaan Malaysia planning and strategy. *WSEAS Transactions on Environment and Development*, 5(3), 273–282.
- Dawodu, A., Dai, H., Zou, T., Zhou, H., Lian, W., Oladejo, J., & Osebor, F. (2022). Campus sustainability research: indicators and dimensions to consider for the design and assessment of a sustainable campus. *Heliyon*, 8(12), e11864. <https://doi.org/10.1016/j.heliyon.2022.e11864>
- Denan, Z., Mazlan, M. A. H., Majid, N. H. A., & Sanusi, N. A. Z. (2018). Design Analysis To Achieve Green/Eco School Building Design Typology for Malaysia. *Planning Malaysia*, 16(2), 39–49. <https://doi.org/10.21837/PM.V16I6.459>
- Fazillah, S. N. A., Azimah, I., Juahir, H., Badlishah, R.A. , Faturrahman, L., Umar, R., Kamarudin, M. K. ., & Muzlinda, N. H. (2022). Rainwater harvesting opportunities: water resource sustainability. *Journal of Sustainability Science and Management*, 17(1).
- Gomez, C. P., & Yin Yin, N. (2019). Development of a progressive green university campus maturity assessment tool and framework for Malaysian universities. *MATEC Web of Conferences*, 266, 01018. <https://doi.org/10.1051/mateconf/201926601018>
- Gupta, S., Gadi, R., Sharma, S. K., & Mandal, T. K. (2018). Characterization and source apportionment of organic compounds in PM10 using PCA and PMF at a traffic hotspot of Delhi. *Sustainable Cities and Society*, 39, 52–67. <https://doi.org/10.1016/j.scs.2018.01.051>
- Helferty, A., & Clarke, A. (2009). Student-led campus climate change initiatives in Canada. *International Journal of Sustainability in Higher Education*, 10(3), 287–300. <https://doi.org/10.1108/14676370910972594>
- Hisham, N. H. N., Dali, M. M., & Alias, A. (2023). Developing Sustainable Urban Regeneration (SUR) Evaluation Method Fir The Malaysia Context. *Planning Malaysia Journal*, 21(6), 100–115.
- Kamarudin, M. K. A., Wahab, N. A., Samah, M. A. A., Baharim, N. B., Mostapa, R., Umar, R., Abdul, K. N. (2020). Potential of field Turbidity measurements for computation

- of Total Suspended Solid in Tasik Kenyir, Terengganu, Malaysia. *Desalination and Water Treatment*, (187), 11-16.
- Li, G., & Weng, Q. (2007). Measuring the quality of life in city of Indianapolis by integration of remote sensing and census data. *International Journal of Remote Sensing*, 28(2), 249–267. <https://doi.org/10.1080/01431160600735624>
- McFarland, A. L., Waliczek, T. M., & Zajicek, J. M. (2008). The relationship between student use of campus green spaces and perceptions of quality of life. *HortTechnology*, 18(2), 232–238. <https://doi.org/10.21273/horttech.18.2.232>
- Md Zain, S., Basri, N. E. A., Mahmood, N. A., Basri, H., Zakaria, N., Elfithri, R., Ahmad, M., Ghee, T. K., & Shahudin, Z. (2012). Recycling practice to promote sustainable behavior at University Campus. *Asian Social Science*, 8(16), 163–173. <https://doi.org/10.5539/ass.v8n16p163>
- Mebane, M. E., Benedetti, M., Barni, D., & Francescato, D. (2023). Promoting Climate Change Awareness with High School Students for a Sustainable Community. *Sustainability (Switzerland)*, 15(14), 1–15. <https://doi.org/10.3390/su151411260>
- Pereira Ribeiro, J. M., Hoeckesfeld, L., Dal Magro, C. B., Favretto, J., Barichello, R., Lenzi, F. C., Secchi, L., Montenegro de Lima, C. R., & Salgueirinho Osório de Andrade Guerra, J. B. (2021). Green Campus Initiatives as sustainable development dissemination at higher education institutions: Students' perceptions. *Journal of Cleaner Production*, 312(May). <https://doi.org/10.1016/j.jclepro.2021.127671>
- Rwelamila, P. M. D., & Purushottam, N. (2015). Green campus initiatives as projects: Can creating conducive internal university project environment a key to success? *Proceedings of the 31st Annual Association of Researchers in Construction Management Conference, ARCOM 2015, September*, 367–376.
- Sugiarto, A., Lee, C. W., & Huruta, A. D. (2022). A Systematic Review of the Sustainable Campus Concept. *Behavioral Sciences*, 12(5). <https://doi.org/10.3390/bs12050130>
- Suwartha, N., & Sari, R. F. (2013). Evaluating UI GreenMetric as a tool to support green universities development: Assessment of the year 2011 ranking. *Journal of Cleaner Production*, 61, 46–53. <https://doi.org/10.1016/j.jclepro.2013.02.034>
- Tan, H., Chen, S., Shi, Q., & Wang, L. (2014). Development of green campus in China. *Journal of Cleaner Production*, 64, 646–653. <https://doi.org/10.1016/j.jclepro.2013.10.019>
- Tiyarattanachai, R., & Hollmann, N. M. (2016). Green Campus initiative and its impacts on quality of life of stakeholders in Green and Non-Green Campus universities. *SpringerPlus*, 5(1), 1–17. <https://doi.org/10.1186/s40064-016-1697-4>
- Wang, Q., Feng, X. P., Bei, T., & Chen, Y. L. (2014). Green campus culture construction of Green university. *Advanced Materials Research*, 869–870, 980–985. <https://doi.org/10.4028/www.scientific.net/AMR.869-870.980>
- Yusoff, M. A., Ngadi, E., Ahmad, R., Mohammed, S., Arif, M., & Abdul, I. (2020). Investigation on Potential of Green Area for Establishment of Forest in University Campus. *Insan Junior Researcher Conference 2020 (IJURECON 2020)*, 48–61.

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GREENING THE CITY: CRITERIA AND INDICATORS FOR EVALUATING THE EFFECTIVENESS OF SMALL URBAN PARKS IN PROMOTING URBAN RESILIENCE TO CLIMATE CHANGE

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Abstract

As cities face the challenges of climate change, small urban parks offer a promising solution for promoting urban resilience. These parks can mitigate the impacts of climate change by providing carbon sequestration, reducing the urban heat island effect, and improving stormwater management. They can also serve as a key adaptation strategy by providing shade and cooling, reducing air pollution, and enhancing social cohesion and community engagement. However, there is a need for criteria and indicators that can guide the design, implementation, and management of small urban parks for climate change mitigation and adaptation. This paper proposes a set of criteria and indicators that can be used to evaluate the effectiveness of small urban parks in promoting urban resilience. The criteria include ecological, social, economic, governance dimensions, and the indicators are measurable, relevant, and practical. The proposed framework can support decision-making processes for planners, policymakers, and practitioners to prioritise and allocate resources for small urban parks that can contribute to climate change mitigation and adaptation in cities.

Keywords: Small Urban Park; Criteria and Indicator; Resilient Cities; Climate Change; Policies and Management

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INTRODUCTION

The United Nations (2018) reports that half of the world's population currently resides in urban areas, and this figure is projected to increase to two-thirds by 2050. While urbanisation has brought economic opportunities and improved living standards in some developing countries (Hannah & Max, 2018), it has also caused extensive environmental degradation and ecological destruction, with significant implications for climate change (Liang et al., 2019; Qasim et al., 2014). Urban areas are particularly vulnerable to the impacts of climate change, including extreme weather events, rising temperatures, and sea-level rise (Ezcurra & Rivera-Collazo, 2018; Gasper et al., 2011; Magadza, 2000). Climate change is widely recognised as the biggest global health and environmental threat of the twenty-first century that demands immediate action (Costello et al., 2009; Seddon et al., 2021). These impacts disproportionately affect vulnerable communities and exacerbate existing social and economic inequalities (Leichenko & Silva, 2014; Levy et al., 2015). As more than half of the global population now lives in cities, effective climate change mitigation and adaptation measures are urgently needed to ensure the resilience and sustainability of urban areas.

Small urban parks (SUPs) are increasingly crucial in cities with limited green spaces, as they offer numerous physical, mental, social, and ecological benefits (Fatiah & Pornahono, 2022; Hashim et al., 2019; Jasmani et al., 2017; Labuz, 2019a). However, with the challenges imposed by climate change, it is crucial to identify criteria and indicators for SUPs that contribute to climate change mitigation and adaptation efforts. To design and manage SUPs that maximise their potential for climate change resilience, a comprehensive understanding of the criteria and indicators that promote resilience is necessary. Despite its importance, there has been a lack of synthesis in the available information to identify the key criteria and indicators for designing and managing SUPs that promote climate change resilience.

Thus, this research article aims to identify the criteria and indicators for promoting urban resilience through SUPs with a specific focus on mitigating and adapting to the impacts of climate change. To achieve this goal, the review process will analyse various research works that have proposed a set of indicators based on sustainable park principles to evaluate the performance of green open spaces. By collecting and synthesising pertinent information, this article will establish essential criteria and indicators for designing and managing SUPs that effectively foster climate change resilience.

LITERATURE REVIEW

Background of small urban park

Small urban parks (SUPs), also known as pocket parks, play a vital role in promoting the concept of a “Green City” as envisioned by Sir Ebenezer Howard. These parks are crucial in bringing nature closer to people’s homes; providing access to green spaces and recreational opportunities; and mitigating the impacts of climate change in urban areas (Labuz, 2019; Lin et al., 2017; Rosso et al., 2022). While there is no universally agreed-upon definition of SUPs, in the Malaysian context, they are defined as land-based areas smaller than 2 hectares with vegetation, a distinct boundary, and an entrance. SUPs can be found in small available spaces, unused areas, vacant lots, and abandoned areas; they provide a convenient location for rest and recreation for urban residents (Fatiah et al., 2021; Fatiah & Pornahono, 2022; Jasmani et al., 2017).

Researchers have extensively explored the potential of SUPs in promoting sustainable urban development; their design and functions; and factors predicting their restoration. Despite the differing definitions and viewpoints, SUPs remain critical in advancing low-carbon cities and mitigating the impacts of climate change. Previous studies (Fatiah & Pornahono, 2022; Nordh et al., 2009) have focused on how SUPs can contribute to achieving the aforementioned goals.

Harnessing the Potential of Small Urban Parks for Sustainable Urban Development in the Face of Climate Change

SUPs have emerged as a powerful tool for promoting sustainable urban development and mitigating the negative effects of urbanisation on the environment and human health. Research has shown that these green spaces, particularly when strategically designed and located, can help reduce urban heat island effects, improve air quality, sequester carbon, and support biodiversity (Ariluoma et al., 2021; Fatiah & Pornahono, 2022; Jasmani et al., 2017). One study conducted in Melbourne, Australia, found that SUPs with high vegetation cover can significantly reduce surface temperatures, leading to energy savings and increased comfort for park users (Motazedian et al., 2020). Another research conducted in Helsinki, Finland, using the i-Tree planting tool found that planting trees and mixing biochar into a growing medium of SUPs can significantly increase carbon storage and sequestration, with the potential to store up to 330,000 tonnes of CO₂ over 50 years at the city level. These findings highlight the important role of SUPs in mitigating and adapting to climate change while promoting sustainable urban development (Ariluoma et al., 2021). By prioritising the development of SUPs and green spaces in urban planning and policymaking, policymakers and urban planners can create more liveable, sustainable, and resilient urban environments that benefit both people and the planet.

SUPs offer a promising solution to enhancing the adaptive capacity of urban areas to climate change impacts, such as flooding, by functioning as green infrastructure for stormwater management and providing recreational and social spaces. In cities like Copenhagen and Beijing, green infrastructure in the form of SUPs designed for stormwater management has been found to significantly reduce the risk of flooding while providing aesthetic and recreational benefits. These findings highlight the potential of SUPs to contribute to the various aspects of sustainable urban development, including climate change mitigation and adaptation (Liu et al., 2019). However, it is crucial to carefully plan and design these green spaces and ensure their ongoing maintenance and management to fully realise their potential. The Malaysian government has set a target through the National Urbanization Policy to provide 2 hectares of open space for every 1000 people by 2020, but such a measure has proven challenging due to limited urban spaces and land scarcity, particularly in cities such as Kuala Lumpur and Penang. However, the establishment of SUPs presents a potential solution to address the issue of limited open space in densely populated areas. Such parks can help fulfil the goal of the National Urbanization Policy while providing a range of benefits to urban residents, including improved physical and mental health, social interaction, and enhanced biodiversity.

METHODOLOGY

To foster resilient cities in the face of climate change, it is essential to conduct a comprehensive literature analysis to develop effective evaluation criteria and indicators for SUPs. Content-matrix analysis can be utilised to identify themes and patterns in the literature and categorise them according to specific criteria, thus enabling the development of criteria and indicators for assessing the effectiveness of SUPs. This analysis can identify critical factors, such as the provision of green space, conservation of biodiversity, adaptation to climate change, and community engagement, which contribute to the effectiveness of SUPs in promoting urban resilience to climate change. By categorising and quantifying the prevalence of each factor, researchers can discern patterns and themes that can guide policy and practice related to the design, management, and evaluation of SUPs, ultimately leading to the development of effective strategies for addressing the impacts of climate change in urban areas.

ANALYSIS AND DISCUSSION

Development of Criteria and Indicators for Evaluating the Effectiveness of Small Urban Parks in Promoting Urban Resilience to Climate Change

A recent systematic literature review by Dizdaroglu (2021) found that no urban park worldwide has implemented all the sustainable design criteria proposed. The study aimed to contribute to the development of a comprehensive sustainable

park design practice for future cities by identifying potential performance indicators that could assist stakeholders in evaluating their progress towards sustainability. Similarly, Firmansyah et al. (2018) proposed a set of indicators based on sustainable landscape design principles to evaluate green open spaces' performance in Bandung City, covering ecological, sociocultural, health, and economic aspects. These indicators could also be applied to SUPs to promote sustainable and liveable cities. Likewise, Chan et al. (2018) proposed a sustainable park management framework for Hong Kong, incorporating sustainable urban landscape indicators and parameters derived from sustainable landscape design principles. Mohamed Ikhwan Nasir Mohamed Anuar & Saiful Arif Abdullah (2022) underscore the advantages of green infrastructure by transforming lost highway spaces into vibrant public spaces, a concept especially impactful in densely populated urban areas. Sarhan et al. (2016) developed a matrix defining six-measure priority for each park type and the quantity value of attributes driven within each measure, which could serve as criteria and indicators for evaluating the effectiveness of SUPs in promoting urban resilience to climate change.

Through a content analysis of the literature, the study found significant similarities between the identified indicators and those proposed in previous research. The study then presented a matrix analysis (Table 1(a)-(c)) that integrates both analyses in terms of their indicators for each term. The indicators suggest that greenery coverage, accessibility, and community involvement in planning and maintenance play a crucial role in the effectiveness of SUPs in promoting urban resilience. Additionally, these parks offer socio-economic benefits that can mitigate the adverse effects of climate change, including enhanced physical and mental health, social cohesion, and economic development. To evaluate the effectiveness of SUPs in promoting urban resilience, a comprehensive set of criteria and indicators is necessary, encompassing ecological, social, economic, and governance dimensions. By utilising the criteria and indicators outlined in the article, policymakers and park managers can assess the performance of SUPs and work towards creating sustainable and liveable cities.

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Greening the City: Criteria and Indicators for Evaluating the Effectiveness of Small Urban Parks in Promoting Urban Resilience to Climate Change

Table 1 (a): Matrix Analysis of Ecological Aspects Evaluating

Measures for park system sustainability	Purpose	Planning	Maintenance and Management	Access	Satisfaction	Safety	Ecological Services	Health and well-being	Economic benefits
Indicator									
Climate and microclimatic modifications (e.g., UHI effect mitigation; temperature moderation through evapotranspiration and shading; wind speed modification)							●		
Air quality improvement (e.g., pollutant removal; lower emissions)							●		
Reduced building energy use for heating and cooling (e.g., shade via trees; building covered by green roof and green walls)							●		
Hydrological regulation (e.g., flow control and flood reduction; regulation of water quality; water purification)							●		
Improved soil quality and erosion prevention (e.g., soil fertility; soil stabilization)							●		
Noise level attenuation							●		
Biodiversity protection and enhancement (e.g., communities; species; genetic resources; habitats)							●		

Table 1 (b): Matrix Analysis of Social Aspects Evaluating

Measures for park system sustainability	Purpose	Planning	Maintenance and Management	Access	Satisfaction	Safety	Ecological Services	Health and well-being	Economic benefits
Indicator									
Food production (e.g., urban agriculture; kitchen gardens; edible landscape and community gardens)							●		
Opportunities for recreation, tourism, and social interaction (i.e., community livability)									●
Improved pedestrian paths and connectivity (e.g. quality of path; connectivity and linkage with other modes)				●					
Accessible for all ages				●					
Provision of outdoor sites for education and research								●	
Reduction of crimes and fear of crime (e.g., comfort; amenity and safety)						●			
Attachment to place and sense of belonging (i.e., cultural and symbolic value)								●	
Enhanced city attractiveness (e.g., more desirable views; restriction of undesirable views)								●	
Improved physical well-being (e.g., physical outdoor activity; healthy food; healthy environments)								●	
Better social well-being (e.g., social interaction; social integration; community cohesion)								●	
Improved mental well-being (e.g., reduced depression and anxiety; recovery from stress; attention restoration; positive emotions)								●	

Table 1 (c): Matrix Analysis of Managerial and Institutional Aspects Evaluating

Measures for park system sustainability		Purpose	Planning	Maintenance and Management	Access	Satisfaction	Safety	Ecological Services	Health and well-being	Economic benefits
Managerial and Institutional Aspects	Indicator									
	Public mandate/mission for park purposes.	●								
	Stakeholders involvement		●							
	Contractor service quality assessment			●						
	Regular Park users surveys and analysis.			●						
	Park maintenance and management expenses.			●						
	Police patrol frequency in park.						●			
	Public definition of park core services/themes.	●								
	Management and maintenance guidelines	●								
	Facilities and play equipment checks frequency.			●						
	Percentage of qualified staff in park management-related disciplines.			●						
	Integrated park and recreation plan in citywide urban planning.		●							
	Government financial allocation.		●							
	Park security guard.						●			
	Policies supporting park's educational function.		●							
	Geo-referenced database for park mapping		●							
	Distance to nearest public transport access points.					●				
	Adequate lighting							●		

Source: Adopted from Chan et al. 2018; Firmansyah et al 2018; Mohamed Ikhwan Nasir Mohamed Anuar & Saiful Arif Abdullah 2022; Dizdaroğlu 2022

The criteria and indicators proposed in the framework (Figure 1) can offer valuable insights into the factors that contribute to the effectiveness of SUPs in promoting urban resilience to climate change. These insights can inform policy and practice related to the design, management, and evaluation of SUPs, and contribute to the development of effective strategies to address the impacts of climate change in urban areas. By continuously monitoring and evaluating the performance of SUPs, policymakers and park managers can identify best practices for designing and managing SUPs, leading to sustainable urban development and enhanced resilience of cities to the impacts of climate change.

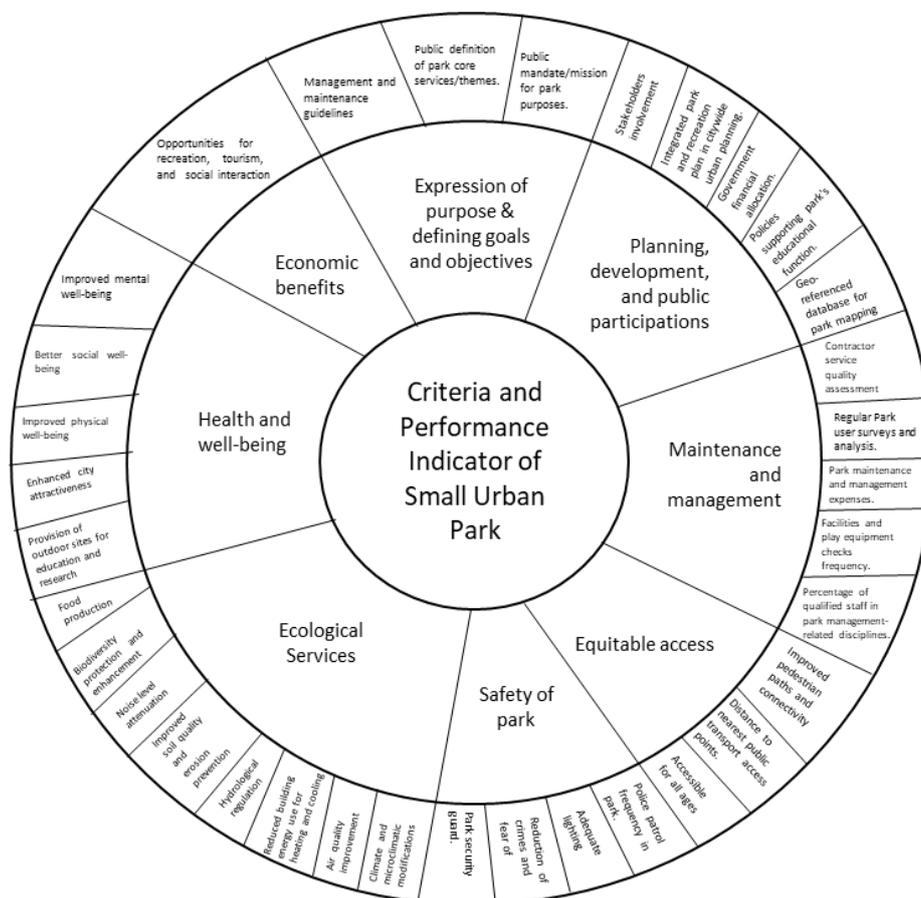


Figure 2: Proposed Framework for Evaluating the Effectiveness of SUPs in Enhancing Urban Resilience to Climate Change.
 (Source: Author)

CONCLUSION

The incorporation of carbon sinks into urban planning, such as the development of SUPs in high-density cities, is essential to improve urban resilience to climate change. Local authorities play a significant role in managing, planning, and regulating the expansion of territories under their jurisdiction, and they are granted a considerable level of discretion through the statutes designed to regulate local governments. Proper administration and planning are crucial for maintaining green urban areas and ensuring their benefits for society and the environment. Therefore, future research may focus on identifying best practices

for designing and managing SUPs to maximise their benefits for sustainable urban development. These practices could inform policymakers and park managers in creating effective strategies to address the impacts of climate change in urban areas.

Limitations or Potential Biases of the Research Approach

Although this study utilised a comprehensive search of multiple databases and sources, limitations are noted in terms of publication bias due to heavy reliance on the published literature. Further research may employ the Delphi method to gather information from relevant stakeholders in Petaling District as a case study on the proposed criteria and indicators framework. Also, the study focused solely on SUPs and disregard other forms of green infrastructure, such as green roofs or bioswales, which may also contribute to promoting urban resilience and climate change mitigation and adaptation. It is imperative to note that the developed criteria and indicators framework may not apply to all contexts. Further research may replicate the current study in different urban environments and communities.

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REFERENCES

- Ariiluoma, M., Ottelin, J., Hautamäki, R., Tuhkanen, E. M., & Mänttari, M. (2021). Carbon sequestration and storage potential of urban green in residential yards: A case study from Helsinki. *Urban Forestry and Urban Greening*, 57. <https://doi.org/10.1016/j.ufug.2020.126939>
- Chan, C. S., Si, F. H., & Marafa, L. M. (2018). Indicator development for sustainable urban park management in Hong Kong. *Urban Forestry and Urban Greening*, 31, 1–14. <https://doi.org/10.1016/j.ufug.2018.01.025>
- Costello, A., Abbas, M., Allen, A., Ball, S., Bell, S., Bellamy, R., Friel, S., Groce, N., Johnson, A., Kett, M., Lee, M., Levy, C., Maslin, M., McCoy, D., McGuire, B., Montgomery, H., Napier, D., Pagel, C., Patel, J., ... Patterson, C. (2009). Managing the health effects of climate change. Lancet and University College London Institute for Global Health Commission. In *The Lancet* (Vol. 373, Issue 9676, pp. 1693–1733). Elsevier B.V. [https://doi.org/10.1016/S0140-6736\(09\)60935-1](https://doi.org/10.1016/S0140-6736(09)60935-1)
- Dizdaroglu, D. (2021). Developing design criteria for sustainable urban parks. *Journal of contemporary urban affairs*, 6(1), 69–81. <https://doi.org/10.25034/ijcua.2022.v6n1-7>
- Ezcurra, P., & Rivera-Collazo, I. C. (2018). An assessment of the impacts of climate change on Puerto Rico's Cultural Heritage with a case study on sea-level rise.

- Journal of Cultural Heritage*, 32, 198–209.
<https://doi.org/10.1016/j.culher.2018.01.016>
- Fatihah, A. A., Ponrahono, Z., & Zakariya, K. (2021). Quality of designs and features of small urban green spaces in Petaling Jaya Town, Malaysia. In *Planning Malaysia Journal Volume* (Vol. 19). <https://doi.org/10.21837/pm.v19i15.931>
- Fatihah, A. A., & Pornahono, Z. (2022). Small urban parks: the building blocks of low carbon cities. *Baltic journal of law & politics A Journal of Vytautas Magnus University*, 15(1), 983–996. <https://doi.org/10.2478/bjlp-2022-00063>
- Firmansyah, Soeriaatmadja, A. R., & Wulanningsih, R. (2018). A set of sustainable urban landscape indicators and parameters to evaluate urban green open space in Bandung City. *IOP Conference Series: Earth and Environmental Science*, 179(1). <https://doi.org/10.1088/1755-1315/179/1/012016>
- Gaspar, R., Blohm, A., & Ruth, M. (2011). Social and economic impacts of climate change on the urban environment. In *Current Opinion in Environmental Sustainability* (Vol. 3, Issue 3, pp. 150–157). <https://doi.org/10.1016/j.cosust.2010.12.009>
- Hannah, R., & Max, R. (2018). *Urbanization - Our World in Data*.
- Hashim, N. I., NHS, Y., Aris Anuar, A. N., & Sulaiman, F. C. (2019). The restorative environment offered by pocket park at laman standard chartered Kuala Lumpur. *Journal of Hotel and Business Management*, 08(01). <https://doi.org/10.35248/2169-0286.19.8.194>
- Jasmani, Z., Ravn, H. P., & van den Bosch, C. C. K. (2017). The influence of small urban parks characteristics on bird diversity: A case study of Petaling Jaya, Malaysia. *Urban Ecosystems*, 20(1), 227–243. <https://doi.org/10.1007/s11252-016-0584-7>
- Labuz, R. (2019a). Pocket park-a new type of green public space in Kraków (Poland). *IOP Conference Series: Materials Science and Engineering*, 471(11). <https://doi.org/10.1088/1757-899X/471/11/112018>
- Leichenko, R., & Silva, J. A. (2014). Climate change and poverty: Vulnerability, impacts, and alleviation strategies. In *Wiley Interdisciplinary Reviews: Climate Change* (Vol. 5, Issue 4, pp. 539–556). Wiley-Blackwell. <https://doi.org/10.1002/wcc.287>
- Levy, B. S., Patz, J. A., & Sherborn, M. (2015). *Climate Change, Human Rights, and Social Justice*.
- Liang, L., Wang, Z., & Li, J. (2019). The effect of urbanization on environmental pollution in rapidly developing urban agglomerations. *Journal of Cleaner Production*, 237. <https://doi.org/10.1016/j.jclepro.2019.117649>
- Lin, P., Lau, S. S. Y., Qin, H., & Gou, Z. (2017). Effects of urban planning indicators on urban heat island: a case study of pocket parks in high-rise high-density environment. *Landscape and Urban Planning*, 168, 48–60. <https://doi.org/10.1016/j.landurbplan.2017.09.024>
- Liu, L., Fryd, O., & Zhang, S. (2019). Blue-green infrastructure for sustainable urban stormwater management-lessons from six municipality-led pilot projects in Beijing and Copenhagen. *Water (Switzerland)*, 11(10). <https://doi.org/10.3390/w11102024>
- Magadza, C. H. D. (2000). *Climate Change Impact and Human Settlements in Africa*.
- Ministry of Housing and Local Government. (2019). National Urbanization Policy. Kuala Lumpur, Malaysia: Government Printing Office.

- Mohamed Ikhwan Nasir Mohamed Anuar & Saiful Arif Abdullah (2022). The benefits of green infrastructure planning in addressing lost spaces underneath elevated urban highways. In *Planning Malaysia Journal Volume* (Vol. 20) <https://doi.org/10.21837/pm.v20i23.1165>.
- Motazedian, A., Coutts, A. M., & Tapper, N. J. (2020). The microclimatic interaction of a small urban park in central Melbourne with its surrounding urban environment during heat events. *Urban Forestry and Urban Greening*, 52. <https://doi.org/10.1016/j.ufug.2020.126688>
- Nordh, H., Hartig, T., Hagerhall, C. M., & Fry, G. (2009). Components of small urban parks that predict the possibility for restoration. *Urban Forestry and Urban Greening*, 8(4), 225–235. <https://doi.org/10.1016/j.ufug.2009.06.003>
- Qasim, M., Usman Ghani, M., Khalid, M., Muhammad Anees, M., Malik, J., & Bashir, A. (2014). *Environment degradation cause by urbanization in Pakistan: a review health risk assessment of indoor air quality in developing countries view project environment degradation cause by urbanization in Pakistan: A review view project environment degradation cause by urbanization in pakistan: A Review*. <https://www.researchgate.net/publication/331486089>
- Rosso, F., Pioppi, B., & Pisello, A. L. (2022). Pocket parks for human-centered urban climate change resilience: Microclimate field tests and multi-domain comfort analysis through portable sensing techniques and citizens' science. *Energy and Buildings*, 260. <https://doi.org/10.1016/j.enbuild.2022.111918>
- Sarhan, A.-A., Farghaly, Y., & Elsayed, R. (2016). Measures and attributes for sustainability of parks. *Procedia Environmental Sciences*, 34, 453–460. <https://doi.org/10.1016/j.proenv.2016.04.040>
- Seddon, N., Smith, A., Smith, P., Key, I., Chausson, A., Girardin, C., House, J., Srivastava, S., & Turner, B. (2021). Getting the message right on nature-based solutions to climate change. *Global Change Biology*, 27(8), 1518–1546. <https://doi.org/10.1111/gcb.15513>
- United Nations. (2018, May 16). 68% of the world population projected to live in urban areas by 2050, says UN | UN DESA | United Nations Department of Economic and Social Affairs. <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>

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“NOT VIRAL, NOT POPULAR”: WHAT IS THE FORMAT FOR THE DEVELOPMENT OF IKN? IN A PARTICIPATORY PLANNING LENS

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Abstract

The Indonesian government administration, which was originally centered in Jakarta, will be moved in 2024. Interestingly, the construction of the Ibu Kota Nusantara (IKN) reaps pros–cons from the community. Discussions about the IKN planning pattern continue to be debated. To conduct this event, the orientation of the article is to invite public participation (outside the government) to determine the choice of what planning format is valid for the sustainability of the new IKN development. The profiles of respondents are local netizens who often use social media to test their insights who live around the IKN. The cluster sampling survey was carried out partially using online interviews throughout the 2022 period. Besides, the data collection process only focused on 251 respondents who have skills and are certified as urban planners who are members of associations with special expertise. The collected primary data is extracted into the Chi–Square model. As a result, it detects that the planning formulation suggested by netizens has an effect on the sustainability of the IKN development. From various walks of life including: scientists, observers/environmental activists, community leaders, social media observers, and entrepreneurs, the majority consider the most realistic planning approach for the sustainability of IKNs to be green cities. For the long–term, netizens reason and assume that this concept fulfills the necessary of green open space (RTH).

Keywords: IKN, Netizens, Public Engagement, Social Media, Chi–Square

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INTRODUCTION

Background

In the second quarter of 2021, the Indonesian economy managed to grow and even achieved the highest growth since the "sub-prime mortgage" crisis of 7.07 percent. Improvement in domestic demand resulted in all business sectors experiencing positive aggregates in the second quarter of 2021, including information and communication which grew to 6.87 percent (Amanda, 2021). According to Anas et al. (2022) and Prestianawati & Setyanti (2021), the increase in this component was triggered by a shift in people's behavior towards a "low-touch and contactless economy", especially during the pandemic. This situation is a digital transformation in various business potentials, so that it has positive implications for accelerating economic recovery.

Indonesia has a demographic bonus that supports superior digital escalation (Aniqo, 2020). The majority of Indonesia's population are generation Z and millennials aged 8 to 39 years who are talented with high levels of digital adoption (Hinduan et al., 2020; Rahadi et al., 2021; Sudirman et al., 2022). As many as 37 percent of new digital economy consumers have emerged during Covid-19 and 93 percent of them will continue to utilize post-Covid-19 digital economy products, such as: Google, Bain, and Temasek. So far, digital economy routines in Indonesia have continued to increase, with 41.9 percent of ASEAN's total digital economy transactions in 2020 coming from Indonesia and reaching US\$44 billion. For 2025, it is projected to reach US\$ 124 billion. Torda (2020) explains that the Covid-19 situation has also driven advances in education and health technology which have reformed online learning and health consultations.

Furthermore, ElMassah & Mohieldin (2020) concluded that the flow of digitalization in developing markets, an example is Indonesia, which also provides opportunities to accelerate the Sustainable Development Goals (SDGs) which have become global commitments through 3 enablers including: (1) access to information and services available to every individual in urban-rural areas; (2) increased connectivity between individuals and organizations; and (3) resource efficiency from massive productivity. One of the examples in the implementation of the SDGs included in the Medium-Long Term Development Plan (RPJMN) of 2020–2024 is the concept of "smart city", "green city", and "sustainable city". Broadly speaking, Viola & Fitrianto (2022) defines a smart city as an urban arrangement or governance that applies technology to increase capacity and reduce the negative impacts of urbanization that may arise. The function of a smart city is needed to overcome various problems, for example: congestion, garbage accumulation, decreased water and air quality, and the dynamics of crime (Batty et al., 2012). Then, the target of a green city is to produce an integrated urban development in order to reduce the negative impact on the consequences of development on the environment that combines spatial, infrastructure, and social intensity strategies (Ahmed, 2013). On the other hand, a sustainable city

scheme for managing and strengthening regional-national scale planning that integrates environmental, economic and social corridors in rural, urban and suburban areas (Höjer & Wangel, 2015; Permana & Harsanto, 2020; Saad et al., 2017; Wang & Liu, 2016).

Explicitly, the "100 smart city" movement which is accommodated by the authorities has compiled master plans and quick win smart cities for 100 Regencies/Cities throughout Indonesia (Herdiyanti et al., 2019; Pratama, 2022). The focus of smart city design emphasizes six main pillars: smart governance, smart mobility, smart economy, smart living, smart people, and smart environment. Currently, the Indonesian government is also taking the initiative to prepare a "digital transformation strategic framework" as a basic guideline in completing the digitalization process which is directed at 3 aspects: digital government, digital economy, and digital society, where the output becomes an element in promoting as well as guaranteeing information disclosure.

At the same time, regulations related to the capital city of the archipelago or what is called "IKN" contained in Law no. 3 of 2022 has been issued. In principle, these rules are an effort to improve the governance of the Indonesian IKN area (Jiuhardi et al., 2023). In 2045, the scenario for moving IKN is located in Sepaku (Penajam Paser Utara/PPU, East Kalimantan). The relocation of the new government center allows for dispersion, equity, and is oriented towards a more stable Indonesian macroeconomic connection. However, the problem is that IKN spatial standards have not been determined. Talking of planning documents, priority development and urban clusters are also awaiting a decision in a forum that invites development stakeholders. Uniquely, the topic circulating around the categorization of IKN development is claimed by one party to lead to a green city. On the one hand, referring to regional characteristics, the initial technocratic framework tends to detect sustainable cities. Besides that, some community groups actually view that a suitable and competent criterion for the future IKN is a smart city. Even though the three of them are predicted to cause weakness, they also have advantages. Everything really depends on the extent to which the government can empower the community, maximize natural resources, socialize and invite all indicators to be involved in the planning cycle, understand procedures and commitment to the system chosen.

Towards productive and responsible governance, protection from civil society is needed. In this era of sophisticated technological adaptation, the conversations, highlights, and comments from netizens are increasingly unstoppable. Freedom in channeling arguments is seen as an expression, including responding to the condition of the nation. In the context of democracy, the detective role channeled by netizens responds to open government policies. Yet, the current reality also sometimes conflicts with ethics in articulating opinions. Excessive reactions that are not followed by a comprehensive level of insight and education can trigger endless debates. The side effect of expanding

public perception to assess and evaluate government performance often creates political mindset maneuvers. Improperness in displaying logic with minimal literacy often results in one-sided tension. Among these anomalies, it is also relatively constructive which provides solutions and is interpreted in terms of the objectivity of the polemic being discussed. In particular, the majority of the public agrees that the moment of moving to the new IKN is relevant to optimizing areas that were before isolated into inclusive development.

In fact, by utilizing social media, for example YouTube, Facebook, Instagram, and TikTok, it will make it easier for the government to inform progress about urban planning in IKN. The urgency is to be able to fend off hoax news and teach the public about the motives, mission, and benefits of relocating the IKN. Substantively, it also collaborates with all elements to make IKN successful. In the perspective of developing smart cities, green cities and sustainable cities for IKN, aggressive access to information is still needed that takes into account public assumptions. Stakeholder experience in supervising and proposing ideas regarding urban planning mechanisms in IKN must be heard, read, and shown to the Indonesian government in making decisions.

Contribution and Motivation

The contribution of this paper is concentrated in two ways. *First*, to explore academic knowledge of the use and control of social media. *Second*, it aims to group the concepts of smart city, green city, and sustainable city theoretically. For this reason, the motivation for this paper is to investigate the attention of IKN development actors (outside the government) in relation to urban planning to the essence of sustainability.

LITERATURE REVIEW

Smart City

Albino et al. (2015) views that the term "smart city" needs to be clarified. Extensive literature review needs to explore and clarify the definition of a smart city which is often compared to a "traditional city". From the performance, features and physical versions, smart cities focus on the interaction between the environment and human activities. Ramaprasad et al. (2017), Stratigea (2012), and Toli & Murtagh (2020) argue that smart cities tend to be addressed to the prosperity agenda, where digital intelligence mobilizes government, thus enabling humans to adapt to city innovations. As an illustration, smart cities are driven by rapid urbanization. Apart from the accessibility of citizens, the smart city introduces a distinctiveness in a striking urban structure. In a multidisciplinary foundation, smart cities simulate more complex landscapes. In practice, elaboration in social sciences, public policy, information technology, and urban design, smart cities are actualized as gaps to bridge development gaps holistically. Smart cities represent expectations that highlight 6 primary

attributes: (1) effective integration between intelligence gathering and government institutional services; (2) network partnerships; (3) displaying the formulation of decisions; (4) prioritizing information and knowledge; (5) strengthening local creativity; and (6) preparing a modern digital network.

Green City

Naturally, a green city is based on respect for environmental habitats. Nature that is protected, expanded, and maintained without expansively changing the typological face of the city, reflects the key in providing ideal services for the interests of city residents. That way, harmonious city development does not ignore green open space/RTH (Breuste, 2020). Green city does not eliminate socio-ecology as a cross-sectoral pollution prevention measure (Zain et al., 2022). Forming a green city must adjust the service ecosystem that is connected to nature. Drastic global climate change has invited many cities to compete in issuing quantitative parameters that classify and track environmental friendliness–social welfare–economic consistency over time (Abu Bakar et al., 2021). The outcomes of these three trends, make it a valuable tool in the “quality of green cities” index.

In general, Brillhante & Klaasgreen (2018) dedicates a green city as a manifestation, step, and ambition to save energy without destroying resources and on an environmentally friendly basis. In addition to carbon emissions and Gross Domestic Product (GDP), to track these achievements, green cities seek to consolidate and introspect air quality, sanitation factors, and population in a measurable manner. The green city pattern, not only compiles urban capabilities, greening thresholds, and land use, but also describes and makes solid and liquid waste management, reduces greenhouse gases, and electricity without putting pressure on the system (El Ghorab & Shalaby, 2016). To combat external risks from decreasing air quality, green cities provide rational alternatives to minimize the electrical power in each building material (Hameed, 2020).

Sustainable City

Cohen (2017) tells that qualifications in a sustainable city project must ensure social, economic and environmental resilience to maintain the existing population without compromising future generations. Sustainable cities imply safe residential populations that are able to absorb well-being without disturbing nature or at least reducing the environmental impact to a minimum. In the long-term scenario, the leading paradigm of sustainable cities stimulates cities to fight crime, be sensitive to environmental degradation, become pilot programs, maintain the "environmentally friendly" label, and revitalize technology (Bibri & Krogstie, 2019). Given the large number of exploitation of natural resources that are still carried out conventionally, it is increasingly hampering the environment, economy and social. This clearly creates a new contradiction in the transition to

a sustainable city (Hassan & Lee, 2015). Pira (2019) emphasized that the characteristics of a sustainable city are following SDGs elements which instill quality of life in human capital referring to environmental sustainability. Urban health determines livability. The best way to meet the challenges of a sustainable city is to synergize with the existence of technology and social behavior (Crane et al., 2021).

Sustainable city pioneered the formation of smart cities and green cities. In other words, the development of green cities and smart cities begins with the unification of the concept of sustainability (Ahvenniemi et al., 2017; Trindade et al., 2017). The point is that smart cities and green cities have studied and observed the root causes related to the importance of embracing the environment and the economy into all classes of society.

Hypothesis

Observing the premises and analogies in the literature discussed above, the development of the hypothesis is structured as follows:

- 1) *Alternative hypothesis (H_a)*. There is a relationship between the planning formulation suggested by netizens and the sustainability of the IKN development; and
- 2) *Null hypothesis (H_0)*. There is no relationship between the planning formulation suggested by netizens and the sustainability of the IKN development.

METHODS

Data Sources and Samples

The data type is primary. The sampling technique is cluster sampling, where data information is obtained from informants. The selection of sample measurements focuses on public (non-government) parties who are competent to fill in the data. The resource persons were identified as respondents who have competence and expertise on regional development planning. Too, their expertise is tested by skill level, certified as planners, active on social media, and provides choices and recommendations for IKN planning documents that correlate with the concepts of smart cities, green cities, and sustainable cities. The sample volume is 251 units verified as scientists, environmental observers or activists, community leaders, social media activists, and entrepreneurs. Determination of the sample belongs to the "penta-helix".

Data Collection Instruments

Data collection was taken online during 2022. The survey data collection technique was supported by a questionnaire made with two narratives (see Table

1). The sample demographics are located in four IKN areas: Balikpapan, PPU, Kutai Kartanegara, and Samarinda which are part of East Kalimantan.

Table 1: List of questions.

Variables	Question	Item
Planning type	What are the appropriate planning criteria for IKN?	(1) smart city; (2) green city; (3) sustainable city
Sustainability of development	Does the chosen planning format coexist with the sustainability of the IKN development?	(1) yes; (2) no

Below is a breakdown of the score based on the respondents' answers developed as follows:

- 1) *Planning*. If the informant answered "smart city", then a score of "1" was given. Meanwhile, informants who chose "green city", were given a score of "2" and if the answer was "sustainable city", then given a score of "3".
- 2) *Sustainable development*. If the informant took the "yes" option, then he was given a score of "1" and vice versa, the informant who concluded "no", was given a score of "2".

Analysis Tools

After the survey questionnaire was tabulated, the data was entered and processed using SPSS. The analytical method used is Chi-Square (χ^2). This model corrects non-parametric comparative tests on planning variables and development sustainability variables, where the data scale for both variables is nominal. In description, Chi-Square refers to the lowest degree. In outline, the plot shown in the Chi-Square table consists of: continuity correction, likelihood ratio, Fisher's exact, and linear-by-linear association. The basic Chi-Square equation function is written as follows:

$$\chi^2 = \sum_{i=1}^k \frac{(f_o - f_h)^2}{f_n}$$

where: χ^2 = the Chi-Square symbol; f_o = observed frequency; f_h = expected frequency; n = sampling; k = upper limit; i = the sum index entered as a variable in the econometric function; and 1 = lower limit.

Furthermore, each component in Chi-Square is derived into continuity correction, likelihood ratio, Fisher's exact, and linear-by-linear association which are formulated as follows:

$$\chi^2_{Yates} = \sum \frac{[(n_{ij} - \hat{\mu}_{ij}) - 0.5]^2}{\hat{\mu}_{ij}}$$

where: χ^2_{Yates} = Pearson; n_{ij} = difference in observed values with contingencies; $\hat{\mu}_{ij}$ = residue; and 0.5 = probability level.

$$G^2 = 2 \sum_{i=1}^c O_i \ln \left(\frac{O_i}{E_i} \right)$$

where: G^2 = Likelihood ratio; c = coefficient; O_i = expected frequency; \ln = logarithm; E_i = observation frequency; i = the sum index entered as a variable in the econometric function; and 1 = lower limit.

$$\chi^2_{\rho} = \sum_{ij} \frac{(f_{ij} - E_{ij})^2}{E_{ij}}$$

where: χ^2_{ρ} = Fisher's exact; ij = sampling; f = frequency; and E = cell.

$$\alpha = \frac{y_2 - y_1}{x_2 - x_1}, \text{ with the provision of } x_2 \neq x_1$$

where: α = constant; y, x = linear Gradient on the independent and dependent variables; and \neq = not equal.

The 2 basis for decision making in the Chi-Square hypothesis is represented by the Chi-Square score and probability (asymptotic significance) is illustrated below:

$$DF = (r - 1)(c - 1)$$

where: DF = degree of freedom; r = correlation; and c = coefficient.

It was confirmed that the table Chi-Square scores were: $DF = (2 - 1)(3 - 1) = 2$ and the significance level applied is 95 percent, then the critical limit is 0.05 on DF 2, so the table value is 4.709. In other words, collective causality among variables is detailed below:

- 1) Asymp. sig. > 0.05 and Chi-Square count < Chi-Square table indicates that H_0 is accepted and H_a is rejected.
- 2) Asymp. sig. < 0.05 and calculated Chi-Square > Chi-Square table indicates that H_0 is rejected and H_a is accepted.

RESULTS

Profile of Informant

In Table 2, describes the characteristics of informants based on age, gender, regional identity, profession, education, and social media used to monitor the development of IKN. Of the 251 netizens, 31.5 percent were aged 44–50 years, 23.1 percent were aged 31–37 years, 16.7 percent were aged 38–44 years, 16.3 percent were over 51 years old, and 12.4 percent were 25–31 years. Besides that, the survey produced a gender background, where most of the informants were male (57.8 percent), while female informants (42.2 percent). The majority of the interviewees live in the capital city of East Kalimantan (Samarinda) reaching 46.6 percent, 27.9 percent are from Balikpapan, 15.1 percent live in PPU, and the remaining 10.4 percent are domiciled in Kutai Kartanegara. Informants are dominated by professional backgrounds as observers/environmental activists (32.7 percent), social media observers (25.5 percent), work positions as academics/scientists (25.1 percent), community leaders who are also partners with regulators such as: religious and customary leaders, village officials, education initiators, and other public figures are 13.9 percent, and the involvement of entrepreneurs is 2.8 percent.

Table 2: Netizen profile.

Background	Item	Frequency (n)	Percentage
Age	25–31	31	12.4%
	31–37	58	23.1%
	38–44	42	16.7%
	44–50	79	31.5%
	>51	41	16.3%
Gender	Female	106	42.2%
	Male	145	57.8%
Population identity	Balikpapan	70	27.9%
	PPU	38	15.1%
	Kutai Kartanegara	26	10.4%
	Samarinda	117	46.6%
Profession	Scientist	63	25.1%
	Environmental observer/activist	82	32.7%
	Public figure	35	13.9%
	Social media observer	64	25.5%
	Entrepreneur	7	2.8%
Last education	Diploma	49	19.5%
	Bachelor	51	20.3%
	Masters	110	43.8%
	Doctor/Assoc. Prof.	28	11.2%
	Professor (full)	13	5.2%
Social media	Instagram	7	2.8%
	WhatsApp	105	41.8%
	Twitter	32	12.7%
	YouTube	55	21.9%

Background	Item	Frequency (n)	Percentage
	Facebook	52	20.7%

Source: online interviews

Referring to the level of education, all resource persons had diplomas and completed campus education. A total of 43.8 percent held Master’s degrees, 20.3 percent held Bachelor degrees, 19.5 percent held Diploma degrees, and 11.2 percent held Doctoral degrees or were classified as Associate Professors. In particular, among the respondents, 5.2 percent were those who served as full professors. Collectively, in conversations about IKN, informants are more interested and subscribed to social media platforms such as WhatsApp (41.8 percent), YouTube (21.9 percent), Facebook (20.7 percent), Twitter (12.7 percent), and few use Instagram (2.8 percent). Also, that type is media that has been installed on the mobile device self-taught.

Validity

The level of accuracy of the interview, measured via the validity of the questionnaire. Table 3 to see if there is missing data during processing. Besides that, it also reads data packets, lost data and the amount of data. Based on the statistical output summarized in Table 3, the data is spread across 251 sources, all of which are input into SPSS. Invited participants have returned or filled out the questionnaire completely. Therefore, the level of data validity is 100 percent.

Table 3: Summary of case processing.

Variable	Cases					
	Valid		Missing		Total	
	<i>n</i>	<i>Percent</i>	<i>n</i>	<i>Percent</i>	<i>n</i>	<i>Percent</i>
Planning	251	100%	0	0%	251	100%
Sustainable development	251	100%	0	0%	251	100%

Source: IBM-SPSS v. 28

Cross-Tab

Cross-tab is an analysis in the form of a table containing a sketch of the observed data. This cross-tab or contingency table is to determine the level of correlation or the strength of the relationship between variables. Table 4 displays the Cross-tab values. Overall, based on 251 participants who reviewed planning variables, they were grouped into 3 codes: smart city, green city, and sustainable city, while two codes for two responses: yes and no. With the existing conditions, 124 votes (49.4 percent) are for green city-based planning, 73 votes (29.1 percent) are for smart cities, and 54 (21.5 percent) are for sustainable cities. It was noted that based on smart city planning, 47 respondents (64.4 percent) agreed with this concept and 26 respondents (35.6 percent) did not, then for green city-based planning, 101 respondents (81.4 percent) agreed and The other 23 did not (18.6

percent), and specifically for sustainable cities, which reached 39 respondents (72.2 percent) and those who did not were 15 respondents (27.8 percent). Simultaneously, based on the three types of planning proposed, 187 respondents (74.5 percent) reacted that it could succeed in the development of a sustainable IKN, while 64 respondents (25.5 percent) indicated that it had no impact.

Table 4: Cross tab results.

Planning	Sustainable development		Total
	Yes	No	
Smart city	47	26	73
Green city	101	23	124
Sustainable city	39	15	54
n	187	64	251

Source: IBM-SPSS v. 28

Referring to the question of sustainable development, 47 participants thought that if smart cities were implemented, it would affect the IKN. Implicitly, 101 participants who chose a green city, showed an increasing influence on the development of IKN and 39 participants who were recorded as taking the sustainable city option, estimated that IKN was getting closer to sustainable development.

Chi-Square

Table 5 below reports the Chi-Square values. asymp. sig. and Exact sig. symbolized by probability (ρ). The first empirical results via Fisher's method, found that in one-way exact ($\rho = .040$) or two-way exact ($\rho = .003$) the relationship between planning and planning is significant. In other cases, with 4 models outside Fisher's including: Pearson, continuity correction, likelihood, and linearity, that all exceed the target or have a systemic effect.

Table 5: Test of χ^2 .

	Value	Asymp. sig. (2-sided)	Exact Sig. (1-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	6.918	.007		
Continuity correction	5.741	.036		
Likelihood ratio	9.260	.019		
Fisher's exact			.040	.003
Linear-by-linear association	8.305	.024		
n	251			

Source: IBM-SPSS v. 28

Using table limit = 4.709, it can be concluded that Pearson Chi-Square ($\chi = 6.918$; $\rho = .007$), continuity correction ($\chi = 5.741$; $\rho = .036$), likelihood ratio ($\chi = 9.260$; $\rho = .019$), and linear-by-linear association ($\chi = 8.305$; $\rho = .024$). In

short, preference for planning has a significant impact on sustainable IKN development. Throughout 2022, the more netizens' sensitivity in public communication is increased, the more it will give a positive signal to the IKN development plan.

DISCUSSION

The entry of news in various media automatically facilitates the circulation of information. Humanity is dealing with revolution 4.0, where news coverage is currently dominated by social media (Yilmaz et al., 2017). Ifigenia & Dimitrios (2018) presented that public enthusiasm for highlighting an issue that originates from social media is getting higher. This also includes the scope of the relocation of IKN which creates a dilemma (Indrawati et al., 2022). In planning, the simulation is still in its contemporary phase. Public trust is determined by actual news developments, but if it is unreliable and does not represent true reality, it will trigger wild opinions (Darmawan et al., 2023). Surprisingly, information about IKN is abstract and still requires fundamental initiation. Even though the IKN area is photographed into four zones, i.e: government administration: PPU, economic center: Balikpapan, national strategy: Samarinda, and buffer zone: Kutai Kartanegara, the spatial master plan shown is speculation, so it needs to be set separately (see Figure 1). In the stages of preparing the IKN planning documents, the government's role is to publish to the media and facilitate public statements as a form of legal documentation. But, limitations on IKN financing raise uncertainty. The controversy is what development entity to use? Then, what approach is applied? And what is the position of IKN in 2045?

To answer the above questions, reasonable alibis and comparative studies are needed that focus on a nation or territorial division that successfully adopts the three planning experiments. Take for example Surabaya–Indonesia, where smart cities tend to highlight “e–government” to expose local government performance. In the digital era, regional autonomy is determined by bureaucratic structures, attitudes, communication, and natural resources (Pangestu et al., 2021). Another case in the big cities of Greece. Formulating a coherent framework into digital projects, generating returns and mitigating risks that have the potential to derail the quality of services provided (Siokas et al., 2021). Smart cities are best practice for parts of the European Union, for example Vienna–Austria, Copenhagen–Denmark, Barcelona–Spain, Helsinki–Finland, and Amsterdam–Netherlands. With the speculated pressure of urbanization increasing, economic and social problems are also accumulating in urban agglomerations (Alaverdyan et al., 2018). Governments in big cities that use smart city management relatively speed up the process of public administration, so that the collected community inspiration can be processed appropriately. There is a conceptual shift in smart cities that rely on and operate “big data”

commodities (Safitri, 2021). This transformation starting from a challenge that needs to be solved in big data quality.

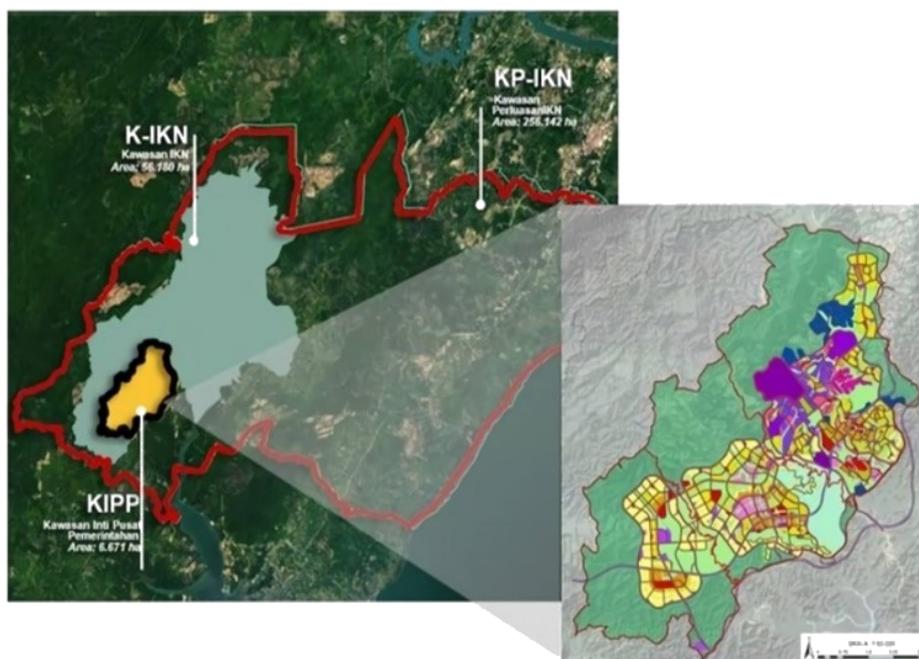


Figure 1: Construction engineering of IKN.
Source: CNBC Indonesia (2022)

Moreover, Kurniawati et al. (2017) and Subadyo et al. (2019) discusses the competitive advantage of Malang–Indonesia which connects green cities with the harmony of nature. In its actualization, the Malang City accommodates green communities, green design, and green open spaces into thematic planning in collaboration with companies through a corporate social responsibility (CSR) scheme. In pioneering a green city in Surakarta–Indonesia, it must focus on the balance of bioecosystems into a sustainable environmental architecture to create comfort at a low cost (Wicaksono, 2013). Aji et al. (2019) demonstrated a pilot project in urban housing in the Serpong area (South Tangerang–Indonesia). Recently, environmental degradation caused by resource scarcity, especially the water crisis, has prompted a regional review of modern housing that takes into account the balance of rainwater recycling.

With regard to the concept of a sustainable city, Bartniczak & Raszkowski (2022), Guimarães (2012), and Muhamad Khair et al. (2020) stated that the nature of the SDGs in EU nations in complex planning makes a city that is not only measured by the level of resilience, inclusiveness and security, but

also emphasizes sustainable generation. For other cases, such as Malaysia for example, it has promoted the active participation of its civil society to be empowered and involved in monitoring environmental sustainability. To fight for achievements, the process also changed the face of southern cities in Brazil in protecting the environment and improving the quality of life of citizens.

Following up on the IKN case, the news operation that was converted into social media, has not yet indicated a development that has a specific identity. In detail, if the IKN replica is modified into: smart city–green city–sustainable city, these three options must also intensely study literacy, digital, or innovation. Thus, the first challenge that needs to be overcome is to pursue literacy and innovation to create a strong digital economy. In 2020, out of 131 countries, Indonesia's global innovation index is ranked 85th and Indonesia's digital literacy index is on a "medium" scale. In its terminology, internet infrastructure is still dominated by Java, so the disparity is very stark with regions outside Java.

Technically, to reach internet access throughout Indonesia, including IKN, provides a large proportion of financial incentives to develop internet supporting facilities, such as: (1) building towers and 4G networks through the deployment of base transceiver stations (BTS) in frontier areas, remote, and lagging (3T); (2) develop and train workers in the field of telecommunications; (3) cooperate with providers in the "public service obligation" scheme; (4) instructed to increase the capacity of the satellite network or launch the Republic of Indonesia Satellite I (SATRIA I); (5) migration of analog to digital television broadcasting which saves frequency, so that the remaining frequency at 700 MHz can be used by telecommunication operators to deploy 5G or 4G; and (6) gradual rollout of the 5G network to operate commercially to support internet connections. Through the digitization program, it can reflect GDP growth of up to 1 percent per year, thereby employing an extra 2.5 million workers, 600 thousand digital talents each year, 50 percent of SMEs that are digitalized (around 30 million ready on board), 82.3 percent internet users, and 5 thousand new start-ups.

In 2024, Indonesia will achieve various better rankings at the global level, such as in the "E-Government Survey of United Nations" which released a competitiveness index based on the digital institute for management development, information and communication technology development index, and World Bank ease of doing business index. Not only for IKN, but also for Indonesia if it is collected through good collaboration between the private sector and the government, the SDGs target will be achieved more quickly. Impressive IKN development, adjusted to the carrying capacity and planning aspirations.

CONCLUSION

This paper aims to mediate and assist the government in determining appropriate planning proposals as a step towards sustainable IKN development. Through a

survey process using the Chi-Square test, the results of the investigation confirm 2 main points: (1) planning creation contained in the concept of smart city, green city and sustainable city as a solution for the sustainability of IKN development in the future; and (2) the findings predict that the green city is the most desirable model, according to the criteria, and in line with the IKN planning strategy.

As a practical reference for stakeholders, we recommend that if the smart city concept is decided on for the IKN development document, then the government also needs to reconsider other alternatives, such as smart cities and sustainable cities. Then, when the transfer of IKN in 2024 is held, local wisdom must be stimulated so as not to trigger conflicts of interest and political passions that can interfere with the productivity of IKN development. In the future, development participation will consistently encourage the public through the critical thoughts of netizens in monitoring the development and dynamics of IKN on social media. Finally, the crucial weakness of this article is the model approach and questionnaire data collection techniques which are still limited. To look at the direction of future research, the link between participation in the IKN development plan also invites stakeholders from the government side.

REFERENCES

- Abu Bakar, A., Mustapa, S. I. & Mohammad, N. (2021). Green city initiatives: Human-nature interaction. *PLANNING MALAYSIA*, 19(1), 13–24.
- Ahmed, E.H.M. (2013). Green cities: Benefits of urban sustainability. In: *Simpson, R., Zimmermann, M. (eds) The Economy of Green Cities*. Local Sustainability, vol 3. Springer, Dordrecht.
- Ahvenniemi, H., Huovila, A., Pinto-Seppä, I. & Airaksinen, M. (2017). What are the differences between sustainable and smart cities?. *Cities*, 60(Part A), 234–245.
- Ali, F., Lestari, D., Putri, M. & Azmi, K. (2019). Green city development concept pilot project in Serpong urban residential. *CSID Journal of Infrastructure Development*, 2(1), 20–30.
- Alaverdyan, D., Kučera, F. & Horák, M. (2018). Implementation of the smart city concept in the EU: Importance of cluster initiatives and best practice cases. *International Journal of Entrepreneurial Knowledge*, 6(1), 30–51.
- Albino, V., Berardi, U. & Dangelico, R.M. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of Urban Technology*, 22(1), 3–21.
- Amanda, C. (2021). The risk of sub-prime mortgage crisis and Covid-19 pandemic: Lesson learned from Indonesia. *Indonesian Journal of Business and Entrepreneurship*, 7(1), 73–81.
- Anas, T., Hill, H., Narjoko, D. & Putra, C.T. (2022). The Indonesian economy in turbulent times. *Bulletin of Indonesian Economic Studies*, 58(3), 241–271.
- Aniqoh, N.A.F. (2020). The role of digital economy to enhancing sustainable economic development. *International Journal of Social Science and Business*, 4(4), 519–527.
- Bartniczak, B. & Raszkowski, A. (2022). Implementation of the sustainable cities and communities sustainable development goal (SDG) in the European Union.

- Sustainability*, 14(24), 16808.
- Batty, M., Axhausen, K.W., Giannotti, F. *et al.* (2012). Smart cities of the future. *The European Physical Journal Special Topics*, 214(1), 481–518.
- Bibri, S.E. & Krogstie, J. (2019). Generating a vision for smart sustainable cities of the future: A scholarly backcasting approach. *European Journal of Futures Research*, 7, 5.
- Breuste, J. (2020). The green city: General concept. In: *Breuste, J., Artmann, M., Ioja, C., Qureshi, S. (eds) Making Green Cities*. Cities and Nature. Springer, Cham.
- Brilhante, O. & Klaas, J. (2018). Green city concept and a method to measure green city performance over time applied to fifty cities globally: Influence of GDP, population size and energy efficiency. *Sustainability*, 10(6), 2031.
- Cohen, S. (2017). Defining the sustainable city. In: *The Sustainable City (pp. 3-14)*. New York Chichester, West Sussex: Columbia University Press.
- Crane, M., Lloyd, S., Haines, A., Ding, D., Hutchinson, E., Belesova, K., Davies, M., Osrin, D., Zimmermann, N., Capon, A., Wilkinson, P. & Turcu, C. (2021). Transforming cities for sustainability: A health perspective. *Environment International*, 147, 106366.
- CNBC Indonesia. (2022). Wow! 250-an ribu orang bakal ngumpul bangun IKN. Available online at: <https://www.cnbcindonesia.com/news/20220829135251-4-367428/wow-250-an-ribu-orang-bakal-ngumpul-bangun-ikn>
- Darmawan, A., Al Wajieh, M., Setyawan, M., Yandi, T. & Hoiriyah, H. (2023). Hoax news analysis for the Indonesian national capital relocation public policy with the support vector machine and random forest algorithms. *Journal of Information Systems and Informatics*, 5(1), 150–173.
- El Ghorab, H.K. & Shalaby, H.A. (2016). Eco and green cities as new approaches for planning and developing cities in Egypt. *Alexandria Engineering Journal*, 55(1), 495–503.
- ElMassah, S. & Mohieldin, M. (2020). Digital transformation and localizing the sustainable development goals (SDGs). *Ecological Economics*, 169, 106490.
- Guimarães, L.B. (2012). Sustainability and cities: A proposal for implementation of a sustainable town. *Work*, 41(Suppl 1), 2160–2168.
- Hameed, A.A.S. (2020). Green cities and sustainable urban development: (Subject review). *International Journal of Advances in Scientific Research and Engineering*, 6(11), 31–36.
- Hassan, A.M. & Lee, H. (2015). The paradox of the sustainable city: Definitions and examples. *Environment Development and Sustainability*, 17(6), 1267–1285.
- Herdiyanti, A., Hapsari, P.S. & Susanto, T.D. (2019). Modelling the smart governance performance to support smart city program in Indonesia. *Procedia Computer Science*, 161, 367–377.
- Hinduan, Z.R., Anggraeni, A. & Agia, M.I. (2020). Generation Z in Indonesia: The self-driven digital. In: *Gentina, E. and Parry, E. (Ed.) The New Generation Z in Asia: Dynamics, Differences, Digitalisation (The Changing Context of Managing People)*. Emerald Publishing Limited, Bingley, pp. 121-134.
- Höjer, M. & Wangel, J. (2015). Smart sustainable cities: Definition and challenges. In: *Hilty, L., Aebischer, B. (eds) ICT Innovations for Sustainability*. Advances in Intelligent Systems and Computing, vol 310. Springer, Cham.

- Ifigeneia, M. & Dimitrios, A. (2018). Globalization, social media and public relations: A necessary relationship for the future?. *KnE Social Sciences*, 3(10), 309–325.
- Indrawati N.S., Nisa, M.C., Hadiyat, Y., Agustina, N. & Zaki, N.A.M. (2022). Relocation of the new capital: What are civil servants' concerns?. *TIJARI International Journal of Islamic Economics, Business and Entrepreneurship*, 2(3), 24–35.
- Jiuhardi, J., Rosyadi, R., Wijayanti, T. C. & Fitriadi, F. (2023). What is the perspective of millennial tourists on the revitalization of tourism development in new IKN?. *PLANNING MALAYSIA*, 21(1), 232–246.
- Kurniawati, D.E., Justicia, J.S., Kusumaningrum, D.N. & Haffsari, P.P. (2021). Revitalization of green open space (GOS) in Kota Malang as the government response to urban social sustainability. *IJRDO-Journal of Social Science and Humanities Research*, 2(5), 01–11.
- Muhamad Khair, N.K., Lee, K.E. & Mokhtar, M. (2020). Sustainable city and community empowerment through the implementation of community-based monitoring: A conceptual approach. *Sustainability*, 12(22), 9583.
- Pangestu, R.P.A., Sudibyo, D.P. & Nugroho, R.A. (2021). Evaluation of Surabaya smart city implementation in realizing smart government, smart economy, smart environment, smart living, smart people, and smart mobility. *Proceedings of the 1st International Conference of Education, Social and Humanities (INCESH 2021)*. Advances in Social Science, Education and Humanities Research, vol. 581, p. 320–327.
- Permana, C.T. & Harsanto, B. (2020). Sustainable city planning concepts and practices in emerging economies: A systematic review. *The Journal of Indonesia Sustainable Development Planning*, 1(1), 67–82.
- Pira, M. (2019). A novel taxonomy of smart sustainable city indicators. *Humanities and Social Sciences Communications*, 8(1), 197.
- Pratama, A.B. (2022). “Smart is not equal to technology”: An interview with Suhono Harso Supangkat on the Emergence and Development of Smart Cities in Indonesia. *Austrian Journal of South-East Asian Studies*, 15(1), 125–132.
- Prestianawati, S.A. & Setyanti, A. M. (2021). Covid-19 cases growth and business continuity in Indonesia: A causality test. *Communicare: Journal of Communication Studies*, 8(2), 134–145.
- Rahadi, R.A., Putri, N.R.R., Soekarno, S., Damayanti, S.M., Murtaqi, I. & Saputra, J. (2021). Analyzing cashless behavior among generation Z in Indonesia. *International Journal of Data and Network Science*, 5(4), 601–612.
- Ramaprasad, A., Sánchez-Ortiz, A. & Syn, T. (2017). A unified definition of a smart city. *International Conference on Electronic Government (EGOV) 2017*. Lecture Notes in Computer Science, vol 10428. Springer, Cham.
- Saad, M.M., Ibrahim, M.A. & El Sayad, Z.M. (2017). Eco-city as approach for sustainable development. *American Academic Scientific Research Journal for Engineering, Technology, and Sciences*, 28(1), 54–74.
- Safitri, Y. (2018). Key factors in big data implementation for smart city: A systematic literature review. *Journal of Public Administration Studies*, 6(1), 16–22.
- Siokas, G., Tsakanikas, A. & Siokas, E. (2021). Implementing smart city strategies in Greece: Appetite for success. *Cities*, 108, 102938.
- Stratigea, A. (2012). The concept of ‘smart’ cities–Towards community development?.

- Netcom*, 26(3-4), 375–388.
- Subadyo, A.T., Tutuko, P. & Jati, R.M.B. (2019). Implementation analysis of green city concept in Malang - Indonesia. *International Review for Spatial Planning and Sustainable Development*, 7(2), 36–52.
- Sudirman, A., Lie, D., Nainggolan, N.T., Sherly, S. & Sianipar, M.Y. (2022). Stimulant adoption of mobile game services in Indonesia. *International Journal of Entrepreneurship and Sustainability Studies*, 2(2), 20–28.
- Torda, A. (2020). How COVID-19 has pushed us into a medical education revolution. *Internal Medicine Journal*, 50(9), 1150–1153.
- Trindade, E.P., Hinnig, M.P.F., da Costa, E.M., Marques, J.S., Bastos, R.C. & Yigitcanlar, T. (2017). Sustainable development of smart cities: A systematic review of the literature. *Journal of Open Innovation Technology Market and Complexity*, 3(1), 11.
- Viola, H.A. & Fitrianto, A.R. (2022). The strategy smart city development concepts in Indonesia. *Jurnal Public Policy*, 8(1), 1–10.
- Wang, M. & Liu, J. (2016). Theoretical analysis of the concept of a sustainable city. *Chinese Journal of Urban and Environmental Studies*, 4(4), 1650029.
- Wicaksono, G. (2013). Implementation of sustainable architecture to support the efforts to achieve green city. *Training and Development*, 1(1), 5–10.
- Yilmaz, İ., Aygün, D. & Tanrikulu, Z. (2017) Social media's perspective on industry 4.0: A Twitter analysis. *Social Networking*, 6(4), 251–261.
- Zain, A.F.M., Pribadi, D.O. & Indraprahasta, G.S. (2022). Revisiting the green city concept in the tropical and global south cities context: The case of Indonesia. *Frontiers in Environmental Science*, 10, 787204.

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PLANNING FOR QUALITY OF LIFE: AN ASSESSMENT OF INDIGENOUS COMMUNITIES IN MALAYSIA

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Abstract

Malaysian society develop awareness on the environmental issues such as air pollution, floods, heat waves and increase in temperature. The indigenous people community is no exception; indeed, they are the primary community to directly experience the consequences of the natural changes taking place. This study aims to assess the quality of life for indigenous people in adapting to environmental issues. This study was conducted in Gua Musang, Kelantan with 87 residents of indigenous people. Data collected through questionnaire and analysed using Relative Importance Index (RII). The findings of the study show that majority of the indigenous people were satisfied with the air quality and generally feel safe in their residential area. Moreover, various indicators and measure were highlighted aimed at enhancing the existing living standards in improving the quality of life for indigenous people.

Keywords: Environmental Issues; Indigenous People; Quality of Life; Relative Importance Index

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INTRODUCTION

Malaysia is experiencing a range of environmental issues such as climate change effects, including altered rainfall patterns, elevated temperatures, and meteorological extremes that pose a hazard to human life (Ismail et al., 2023). As anthropogenic activities increase, the country is expected to experience increasingly unpredictable weather systems. According to the IPCC, more than 50% risk that global temperature rise would increase by 1.5 degrees celcius or more between 2021 and 2040 in all scenarios observed (Boehm & Schumer, 2023) and for the scenarios of a high-emissions trajectory, the world may exceed the threshold in between 2018 and 2037 or even sooner than expected.

The Temiar people are one of the indigenous people tribes from the Senoi tribe. Indigenous peoples are diverse social and cultural groups that have inherited connections to their ancestral country and natural resources (United Nation, 2021) which they have a strong connection with personalities, values, and livelihoods, and they depend entirely on the land and natural resources to live their daily existence. As mentioned by Muhammad & Yaacob (2020), Malaysia known as a country with possesses abundant resources, however it confronts several challenges that are leading to the concerning trend of environmental change, most notably the disappearance of forested areas.

Several research have explained that the indigenous people community in the rural areas feels threatened since they are unable to adjust to safe settings due to pressure from environmental and social changes (Ford, 2020). Traditionally, the lifestyle of indigenous people has been closely related to nature, for instance the forest serving as the basis for their primary income sources and economic activities. Hence, in terms of environmental issues, adaptation can lessen danger and social pressure while allowing indigenous people to continue living with the changes that come with naturally sustainable.

Research by Rosli et al. (2018) mentioned that the idea of Quality of Life (QOL) is associated with psychological well-being, which includes the perception of health, access to sufficient nutritious food, shelter, and environmental adaptation, including everyone's and group's perception of the environment as a resource as well as a resource of aesthetic satisfaction. The objective of this study is to investigate the quality of life for indigenous people in adapting the environmental issues. The outcome from this paper will identify the well-being of indigenous people in adjusting to the environmental issues occurred in their residential.

LITERATURE REVIEW

Indigenous People of Malaysia

The term "Orang Asli" refers to the indigenous people of Malaysia, who are primarily widespread in the states of Peninsular Malaysia. Over 852 communities

in Peninsular Malaysia are belong to the diverse group known as the indigenous people of Malaysia (Saifullah, 2020). Stated by Salim et al. (2023), indigenous people have its own unique belief and knowledge systems, and they also have vital expertise about natural resource management strategies that are sustainable. In Malaysia, the government organisation tasked with ensuring the welfare of the indigenous peoples is called the Department for Orang Asli Development (JAKOA). The Negritos, Proto-Malays and Senois were the three main ethnics for indigenous people with 18 ethnicities (Government of Malaysia, 2023). The Orang Asli Negrito group is made up of the ethnic groups Bateq, Mendriq, Jahai, Lanoh, Kintak, and Kensiu; which primarily found on the northern side of the peninsula and live in the area surrounding the Titiwangsa range. Meanwhile, the Titiwangsa slopes of Perak, Kelantan, and Pahang are home to the Senoi tribe, (Che Wong, Semai, Semoq Beri, Jahut, Mahmeri, and Temiar).

Besides, the Proto-Malay Orang Asli ethnic group consists of the Temuan, Semelai, Jakun, Orang Kanaq, Orang Kuala, and Orang Seletar tribes; lived in valley, kuala, and coastal areas (Abdullah, 2022). Research for the indigenous people is advancing among social scientists, development planners and academics in Malaysia with a variety of perspectives from the disciplines of history, economics, anthropology, and the environment are emerging (Saifullah et al., 2021). According to the 2020 Census, Malaysia's Indigenous Peoples were predicted to make up 11% of the country's 32.4 million inhabitants (Jaouen, 2023).

Quality of Life (QOL) Indicators

Quality of life known as self-improvement, healthy lifestyle, access to and independence from knowledge acquisition, and a standard of living that surpasses the physiological and psychological demands of individuals to reach a level of social well-being consistent with national aspirations (MENTERI, 2012). Stated by Yadav & Gupta (2021), the term quality of life (QOL) describes the "goodness of life" and the capacity to have a prosperous and contented existence in one's surroundings. The concept of quality of life has been extensively explored as a key measure of well-being in scientific, professional, service, and diverse fields (Pitting & Radza, 2022). Hence, attaining a higher standard of living is an essential component for Malaysia in line with the goal of being a developed nation. Table 1 shows the Malaysia Quality of Life (MQLI) components.

Table 1: Malaysia quality of life (QOL) components (MENTERI,2012)

Components	Sub-Index
Income and Distribution	113.3
Workplace Environment	104.6
Transportation and Communication	120.3
Health	110.5
Education	120.4
Housing	115.7
Environment	106.6
Family Life	104.6
Social Participation	110.1
Public Safety	110.8
Culture and Leisure	113.5
Malaysia Quality of Life Index	111.9

*Note: Base Year 2000 = 100

The Malaysia Quality of Life Index (MQLI) has 45 indicators categorized under 11 components of QOL. Reported by MENTERI (2012), the level quality of life in Malaysia has indicating an improvement during the 2000-2010 period with increasing of 11.9 points for the Malaysia Quality of Life (MQLI) index. All the 11 components of MQLI demonstrated an increment compared to the base year 2000, as shown in table 1. Thus, recognizing the well-being of the community could help local decision-makers to evaluate how well the government meets the requirements of the community and how effectively local resources are allocated (Rasdi et al., 2023).

RESEARCH METHODOLOGY

The quantitative study applied in this research was conducted in Kuala Lah (5.125077743473917, 101.9796729227671), Gua Musang, Kelantan. This study was carried out in December 2023. Figure 1 displayed the location of study area. The head of household or called as "*ketua isi rumah*"(KIR) for indigenous people in Kuala Lah were 87 (JAKOA, 2022). The study samples involve 87 indigenous people who live in Kampung Kuala Lah. Furthermore, a questionnaire instrument was utilized in collecting the information related to climate change and the impact of land use and its relation to the quality of life of indigenous people in Kuala Lah. Besides, a likert scale ranging from 1 to 5 is employed for answering the survey questionnaire. The research data collected was analysed by the Relative Importance Index (RII). Those measurements and statistical, mathematical, or numerical analysis that can be converted into a useful statistic are highlighted by the quantitative methods.

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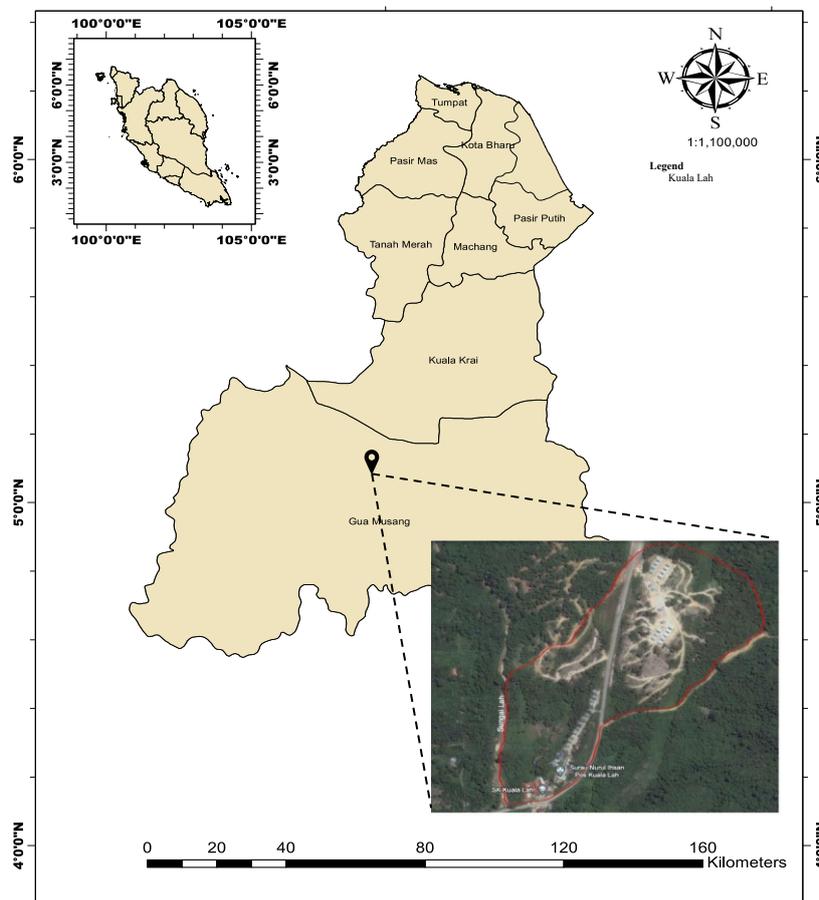


Figure 1: Location of the study area, Kuala Lah (E5.125, N101.979)

ANALYSIS AND DISCUSSION

Socio-Demographic Analysis

87 respondents living in Kuala Lah were selected. Respondents selected are between the age of 15 - 70 years old. The respondents had a range of demographic backgrounds and traits; thus, it makes the sampling randomly represent the population in Kuala Lah, Gua Musang.

Table 2: Socio-demographic profile from respondents

Socio-demographic		Percentage (%)
Age	Below 18	13.79
	19 - 25	16.09
	26 - 40	42.35
	41 - 59	22.99
	60 and above	4.60
Gender	Woman	55.2
	Man	44.8
Religion	Islam	98
	Others	2
Education Level	No formal education	32.2
	Primary school	21.8
	Secondary school	43.7
	STPM/HSC	1.1
Marital Status	Married	71.3
	Single	24.1
	Widow	4.6
Occupations	Self-Employed	47.1
	Government	1.1
	Private Sector	4.6
	Housewife	19.5
	Unemployed	24.1
	Others	3.4
Income	RM 1,000 and below	82.76
	RM 1,001-2,000	17.24

Table 2 shows the socio-demographic background of 87 respondents from Kuala Lah. Majority of the survey participants came from responders who were at age 26-40 years old (42.35%), and minority participants were at age 60 and above (4.60%) while the second-highest group age were 41-59 at 22.99%. Furthermore, majority of the respondents were 55.2% woman and minority of the were 44.8% man. 98% of the respondents were Islam and 2% of them are others religion.

Meanwhile, the education level was 21.8% of the respondents were primary school, 43.7% attended secondary school, 1.1% STPM with 32.2% got no formal education. Whereas 71.3% of the respondents were married, 24.1% were single with 4.6% were widower. For occupations, 47.1% of respondents were self-employed with government (1.1%) and private sector (4.6%). Moreover, 19.5% of the respondents were housewife and 24.1% were unemployed. Out of 87 respondents, 82.76% of respondents' income were RM1000 and below meanwhile 17.24% had RM1001 - RM2000 as their monthly income.

Relative Importance Index (RII) Analysis

The primary data from the field survey, which were used to measure QOL in this study, were based on the Relative Importance Index (RII). This RII was calculated based on the survey respondent's preference scale. The highest values of RII indicate the highest scale that respondents choose to measure their quality of life. The formula for calculation of RII were as below:

$$RII = \frac{\sum W}{A * N}$$

W = Weight given to each statement by respondents (range from 1-5)

A = Higher integers of respondents

N = Total number of respondents

Table 3: Relative Importance Index (RII) generated from QOL components.

Components	RII	Rank
<i>INCOME AND DISTRIBUTION</i>		
Satisfied with currently income	0.662	3
Well distribute the income and sufficient	0.683	1
Able to support myself and family with the income	0.680	2
<i>WORKPLACE ENVIRONMENT</i>		
Satisfied with current job	0.722	1
Low unemployment rate in my community	0.662	3
Current job activities involve high risks	0.701	2
<i>TRANSPORTATION AND COMMUNICATION</i>		
Own a vehicle	0.683	3
Use mobile phone for communication	0.779	2
Satisfied with road facilities in residential areas	0.805	1
<i>HEALTH</i>		
Satisfied with current health status	0.839	1
Community has long life expectancy	0.733	3
Satisfied with the healthcare facilities provided	0.830	2
<i>EDUCATION</i>		
Community can read and write	0.763	2
Majority communities pursuing education beyond the secondary level	0.639	3
Satisfied with the education facilities provided	0.777	1
<i>HOUSING</i>		
Satisfied with the current house	0.782	2
Sufficient electricity supply	0.798	1
Sufficient water supply	0.775	3
<i>ENVIRONMENT</i>		
Satisfied with the air quality	0.816	1
Satisfied with the water quality	0.766	2
Logging activity occurred around my residential areas	0.733	3
<i>FAMILY LIFE</i>		
Satisfies with food expenses and kitchen supplies	0.743	2
Large number of family members living together	0.834	1

Components	RII	Rank
Juvenile issues in my community	0.595	3
<i>SOCIAL PARTICIPATION</i>		
Community involved in NGO activities	0.752	3
Community participates in activities organized by JAKOA/JKKK/TOK BATIN	0.869	1
Register as electorate	0.761	2
<i>PUBLIC SAFETY</i>		
Feel safe in my residential area	0.841	1
Accidents frequently occur in residential area	0.664	2
Higher crime rate in residential area	0.607	3
<i>CULTURE AND LEISURE</i>		
Watch entertainment programs on television	0.724	1
Accommodations such as hotel/homestay/chalet at my residential	0.437	3
Many tourists visiting my residential area	0.577	2

Table 3 represents the relative importance index (RII) generated from the QOL components. For income and distribution aspects of QOL, the highest RII was well distribute the income and sufficient (RII=0.683) while (RII=0.662) were satisfied with currently income. Besides, for workplace environment aspects it shown that (RII=0.722) were satisfied with current job and (RII=0.701) mentioned that current job activities involve high risks.

The highest RII index was (RII=0.805) satisfied with road facilities in residential areas and the lowest RII index was (RII=0.683) with respondents own a vehicle for QOL aspects of transportation and communication. Moreover, for health aspects of QOL, the highest and lowest RII were (RII=0.839) and (RII=0.733) with the items of satisfied with current health status and community has long life expectancy respectively.

Majority of the respondents stated that large number of family members living together (RII=0.834) for QOL housing elements and feel safe in the residential area with (RII=0.841) for QOL public safety elements. For QOL elements of education, the highest RII index were satisfied with the education facilities provided (RII=0.777) and the lowest RII index were majority communities pursuing education beyond the secondary level (RII=0.639). Furthermore, for housing aspects, the highest and lowest RII were sufficient electricity supply and sufficient water supply with (RII=0.798) and (RII=0.775) respectively.

In terms of environment's QOL elements, it shown that (RII=0.816) were satisfied with the air quality in the residential and (RII=0.733) were mentioned logging activity occurred around the residential area. Overall, social participation aspects had the highest RII with community participates in activities organized by JAKOA/JKKK/TOK BATIN (RII=0.869). In contrast, the culture and leisure aspect had the lowest RII (RII=0.437) which accommodations such as hotel/homestay/chalet were provided at the residential.

CONCLUSION

In summary, regarding the environmental factors, the participants express satisfaction regarding the quality of the air. It indicates that sentiments on the perceived quality of the air in the surveyed area are generally favourable. Besides, the RII results indicates that the respondents generally feel safe in their residential areas in terms of public safety. To improve the quality of life for indigenous people in Malaysia, conservation and preservation of environment must through wisely resource management, cultural preservation, land rights protection, cooperative climate change adaptation, and wildlife protection.

ACKNOWLEDGEMENT

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REFERENCES

- Abdullah, A. H. (2022). A Systematic Review of What Malaysia Can Learn to Improve Orang Asli Students' Mathematics Learning from Other Countries. *Sustainability*, 14(20), 13201. <https://doi.org/10.3390/su142013201>.
- Boehm, S., & Schumer, C. (2023, March 20). 10 Big Findings from the 2023 IPCC Report on Climate Change. World Resources Institute. <https://www.wri.org/insights/2023-ipcc-ar6-synthesis-report-climate-change-findings>.
- Ford, J. D., King, N., Galappaththi, E. K., Pearce, T., McDowell, G., & Harper, S. L. (2020). The resilience of indigenous peoples to environmental change. *One Earth*, 2(6), 532-543.
- Government of Malaysia. (2023). *The Indigenous Peoples Data.gov.my*. <https://data.gov.my/dashboard/orang-asli>.
- Ismail, W. N. A. T., Amin, A., Kamarudin, M. K. A., Ibrahim, A., & Salleh, N. S. N. M. (2023). Community concerns of river pollution spatial model using Geographic Information System (GIS) in Ibai River, Terengganu. *Planning Malaysia*, 21 (1), 89-100.
- Jaouen, M. (2023, March 29). *The Indigenous World 2023: Malaysia - IWGIA - International Work Group for Indigenous Affairs*. IWGIA - International Work Group for Indigenous Affairs. <https://www.iwgia.org/en/malaysia/5125-iw-2023-malaysia.html>.
- MENTERI, J. P. (2012). *Kualiti Hidup Malaysia 2011*.
- Muhammad, Z., & Yaacob, S. (2020). Sejarah Perubahan Kawasan Berhutan Di Negeri Perak 1965-2010: Analisis Data Jabatan Perhutanan Semenanjung Malaysia Dan Jabatan Pertanian: A Historical Review from 1965 Until 2010: Forest Cover Change in Perak Based On Data Analysis from Forestry Department of Peninsula Malaysia and Department of Agriculture. *Sejarah: Journal of the Department of History*, 29(2) (December).

- Pitting, Z., & Radzi, M. M. (2022). Kesahan dan Kebolehpercayaan Instrumen Kualiti Hidup Perumahan Awam Bagi Miskin Bandar (Validity and Reliability of Quality Of Life Instrument for Urban Poor Public Housing).
- Rasdi, A. L. M., Som, A. P. M., & Shariffuddin, N. S. M. (2023). Responsible Tourism and Quality of Life Among the Local Community in Cameron Highlands. *Planning Malaysia*, 21.
- Rosli, N. F., Rabe, N. S., Osman, M. M., & Abdullah, M. (2018). Perception of Quality of Life Among Community in Selangor. *Planning Malaysia Journal*, 16. <https://doi.org/10.21837/pm.v16i6.456>.
- Saifullah, M. K. (2022). Well-being index of Indigenous people of Peninsular Malaysia: an application of the multidimensional poverty index (MPI). *AlterNative: An International Journal of Indigenous Peoples*, 18(3), 424–435. <https://doi.org/10.1177/11771801221117183>.
- Saifullah, M. K., Masud, M. M., & Kari, F. B. (2021). Vulnerability context and well-being factors of Indigenous community development: a study of Peninsular Malaysia. *AlterNative: An International Journal of Indigenous Peoples*, 17(1), 94–105.
- Salim, J. M., Anuar, S. N., Omar, K., Mohamad, T. R. T., & Sanusi, N. A. (2023). The Impacts of Traditional Ecological Knowledge towards Indigenous Peoples: A Systematic Literature Review. *Sustainability*, 15(1), 824. <https://doi.org/10.3390/su15010824>.
- United Nation. (2021). Indigenous People, Indigenous Voice. *United Nations Permanent Forums on Indigenous People*.
- Yadav, J., & Gupta, N. (2021, June). Urban quality of life: Domains, dimensions and indicators for Indian cities. In *IOP Conference Series: Earth and Environmental Science*, 796(1), 012032. IOP Publishing.

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SPATIAL-TEMPORAL ANALYSIS BETWEEN LANDCOVER CHANGE AND URBAN SURFACE TEMPERATURE OF BEKASI CITY, INDONESIA

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Abstract

Unregulated urban growth can result in a rise in urban population density, leading to the expansion of developed land into suburban regions. The urbanization of Bekasi City inevitably results in the conversion of vegetated land and green open spaces into built-up areas. In addition, there has been a notable rise in the exceptionally high average surface temperature of 12.66 °C during the past 25 years. It is vital to investigate the correlation between landcover change factors and surface temperature, considering these two significant occurrences. This study conducted a spatial-temporal analysis of the relationship between landcover and urban surface temperature in the years 1993, 1998, 2004, 2009, 2018, and 2023. The Random Forest classification approach was employed to acquire comprehensive landcover information, while the remote sensing/image satellite approach was utilized to obtain surface temperature data. The temperature is determined using the thermal channel of satellite photography. The research findings indicate a robust correlation between alterations in land cover, specifically high-density buildings, medium/low-density buildings, and high-density vegetation, and variations in the surface temperature of an urban area. Hence, it is imperative to closely monitor the expansion of land cover to uphold the stability of surface temperature in urban areas.

Keywords: Landcover Change, Local Climate Zone, Urban, Surface Temperature.

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INTRODUCTION

Currently, the inevitable phenomena of urbanization is responsible for the ongoing developments in cities and urban areas in Indonesia. Uncontrolled urbanization can result in a rapid growth of population and a rise in urban density, leading to the expansion of developed land into suburban regions (Engelke & Biehl, 2010; Essex, 2016). This is due to the correlation between the rise in population growth and the corresponding surge in demand for land required to construct essential infrastructure, including residential buildings, educational institutions, medical facilities, and other supporting facilities (Darsono, 2022; Singh, 2019). The need for land for the procurement of these supporting facilities will result in land conversion from non-built-up land to built-up land.

The rapid population growth in Bekasi City has resulted in the procurement of built-up land in Bekasi City also growing rapidly as well. The transformation of land use in Bekasi City is evident through the comparison of data from 1989 and 2015. In 1989, the city had developed land covering 26.43% of the whole area, equivalent to around 5,661.31 hectares. By 2015, this figure had increased significantly to 72.64% of the total area, or approximately 15,576.48 hectares. The expansion of urban areas always comes at the cost of natural vegetation and green open spaces. During this period, the City of Bekasi has experienced a loss of 74% of its accessible green open space (Danniswari et al., 2020).

The City of Bekasi has experienced a massive change in the area of land use from open space to built-up land, and this development does not take into consideration environmental factors such as air temperature. The significant rise in average surface temperature in Bekasi City is evident, with a notable increase of 12.66 °C during the past 25 years (Danniswari et al., 2020). The aforementioned variables demonstrate the occurrence of urbanization and significant fluctuations in air temperature. Hence, it is imperative to investigate the correlation between alterations in land cover extent and fluctuations in surface temperature within Bekasi City.

LITERATUR REVIEW

Landcover Change

Changes in land cover that occur in Bekasi City are mostly the conversion of vegetated land into built-up land (Marko et al., 2016; Rachma et al., 2022). One of the factor of change in cities is sprawl of the development and the increase in built-up areas (Agustina et al., 2022; Noor et al., 2013). Land cover change refers to the process of land being converted from one form of use to another, resulting in a decline in other types of land use over time. This might also involve a change in the function of the land at a later period. Alterations in land cover typically

lead to corresponding advancements in the quantity of amenities and infrastructure that facilitate community activities (Singh, 2019).

Surface Temperature

Land Surface Temperature is the average temperature of the type of surface in each pixel which is calculated by covering the weight (Tomlinson et al., 2011). The surface temperature has an important effect on global climate, one of which is rising surface temperature can cause polar ice to melt and cause sea level rise to increase (Rajeshwari & Mani, 2014). The primary climatological parameter is surface temperature. The surface temperature regulates the long wave flux that is emitted back into the atmosphere. Nevertheless, the surface temperature is influenced by other surface factors, including albedo, surface humidity, and vegetation cover. At first, the determination of surface temperature was conducted manually by placing a thermometer on the ground. The data obtained is localized and has a restricted geographical coverage. Thus, in order to get temperature data that has a greater geographical scope, it is necessary to gather temperature data from multiple weather satellites (Yulianto et al., 2016).

RESEARCH METHODOLOGY

Bekasi city is located in the northern part of West Java, Indonesia. With a geographical location of 106.99° East Longitude and 6.27° South Latitude (see Figure 1). This study utilized Landsat satellite imaging data from three sources: Landsat 5, Landsat 7, and Landsat 8. This research utilizes time series satellite imaging data spanning the years 1993, 1998, 2003, 2013, 2018, and 2023. Each year, satellite imagery data is transformed into surface temperature and landcover information. The variables are subjected to regression analysis to determine the association between them, as depicted in Figure 2.

LOCATION OF BEKASI CITY

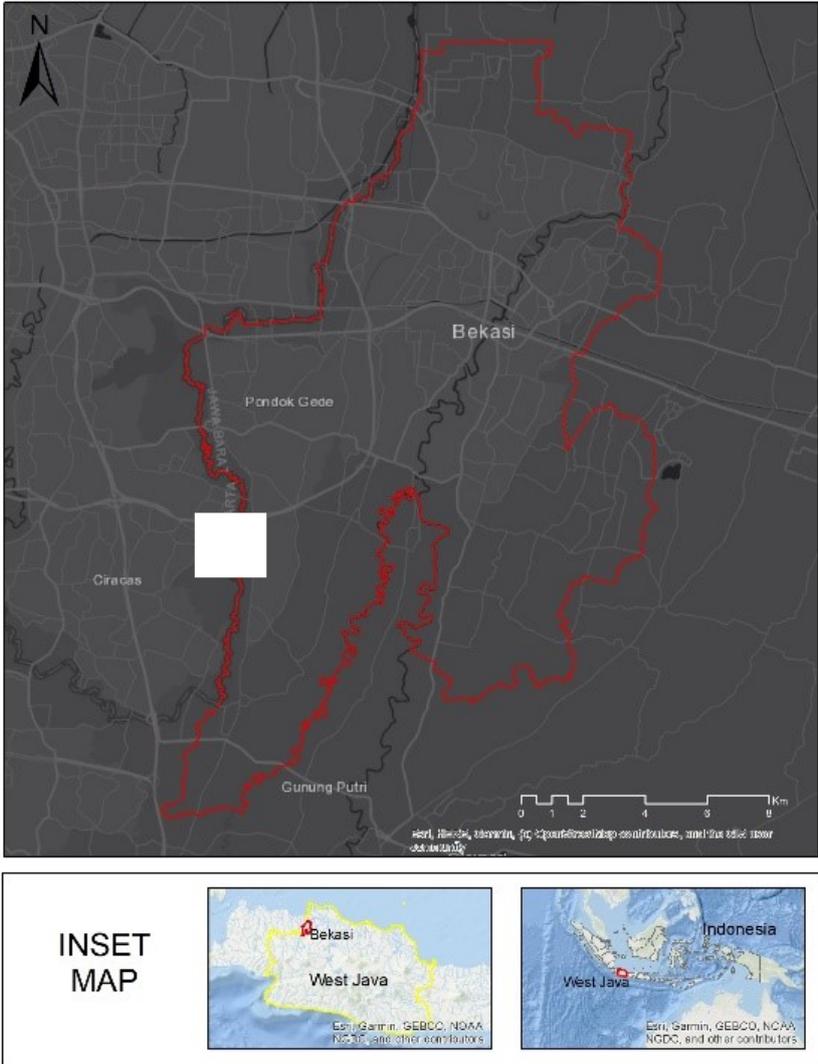


Figure 1: The position and Location of Research Area

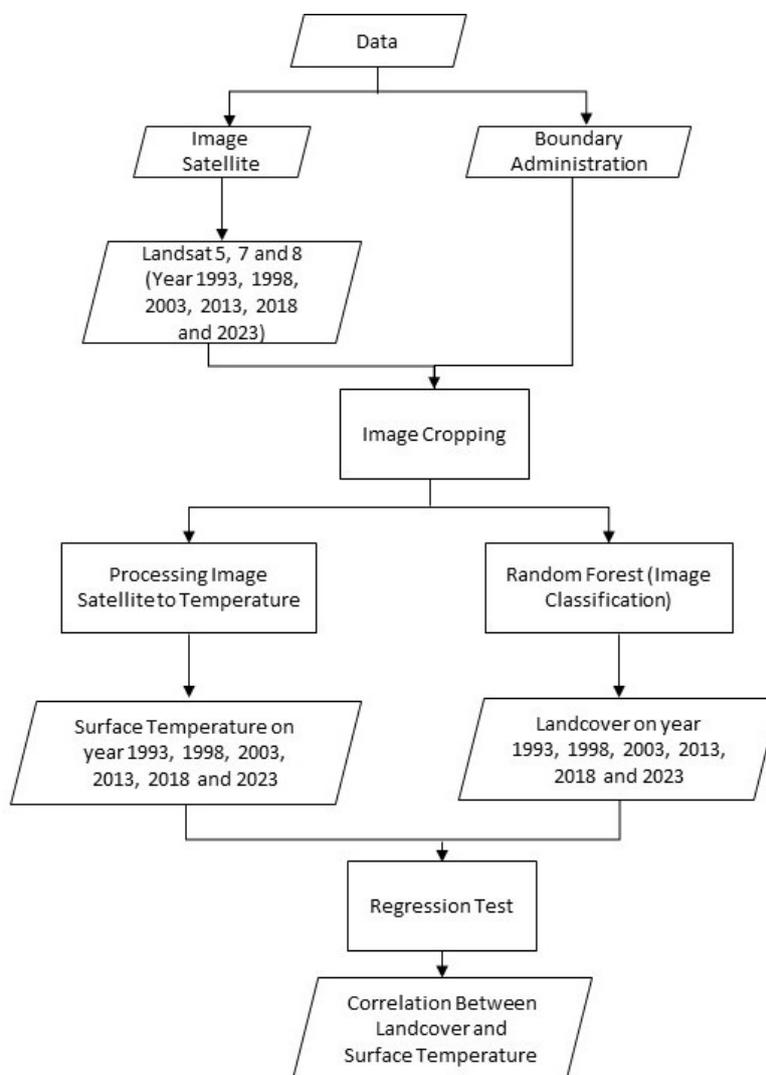


Figure 2: Flowchart Diagram of Research

Random Forest Classification

Random forest classification is an algorithm that is often used for land cover classification using remote sensing (Rodriguez-Galiano et al., 2012). Prior to doing the random forest classification, training points were generated for each category of land cover. Training points are representative sample locations that demonstrate the specific land cover type. The digitization of this training location is conducted utilizing the Google Earth Engine platform. Training points are used to ascertain the statistical attributes of pixel values representing land cover in the

accessible multi-spectral photos. This information is subsequently employed to construct a model that classifies all images into distinct land cover categories. Training point digitization is required only for each category, as the random forest classifier method classifies the entire area based on the given training area. Increasing the number of training regions leads to improved accuracy in the classification results (Pradhesta et al., 2019). The land cover classification applied in this study refers to the Local Climate Zone, which includes (Stewart & Oke, 2012):

1. High-density built-up land (covering LCZ 1, 2 and 3)
2. Low and medium-density built-up land (covering LCZ 4, 5 and 6)
3. Lush trees (LCZ A)
4. Scattered trees (LCZ B)
5. Shrubs (LCZ C)
6. Vacant Land (LCZ F)
7. Waters (LCZ G)

Surface Temperature

Band 6 in Landsat 5 photography can be utilized to acquire surface temperature data, whereas band 10 is the thermal band employed for Landsat 8 and Landsat 9 photos. It is recommended to use band 10 with an accuracy of $\sim\pm 1$ K for simple estimation. The spectral radian is obtained from the conversion of pixel values in the image by performing the following equation:

$$L\lambda = MLQ_{cal} + AL \dots\dots\dots(1)$$

which:

$L\lambda$ = spectral radian on the sensor (W/(m² .sr.μm)

Q_{cal} = pixel value / digital number (DN),

ML = rescaling constant, obtained from image metadata

AL = incremental constants, obtained from image metadata

The spectral radian value above is then converted to the top of atmosphere (TOA) brightness temperature, which is denoted TB. Brightness temperature itself is the effective temperature on the satellite, assuming a uniform emissivity level. The conversion of the spectral radian value to the top of atmosphere (TOA) is by using the following equation :

$$TBK = \frac{K_2}{\ln\left(\frac{K_1}{L\lambda}\right)+1} \dots\dots\dots(2)$$

which:

TBk = Brightness temperature (Kelvin)

K1 = Spectral radian calibration constant (W/(m2.sr.µm), obtained in band 10 metadata

K2 = Spectral radian calibration constant (W/(m2.sr.µm), obtained at band 10 or 11 metadata

Lλ= emissivity corrected spectral radian values

Converting from Kelvin to Celsius, it is necessary to reduce it by an absolute value of zero (273.15 °C), as presented in the equation below.

$$TBC = TBK - 273,15.....(3)$$

ANALYSIS AND DISCUSSION

Surface Temperature

Based on the results of the analysis, the surface temperature of Bekasi City was obtained from 1993, 1998, 2004, 2009, 2013, 2018 and 2023. The surface temperature of Bekasi City based on the results of more detailed analysis can be seen in Table 1, Surface Temperature of Bekasi City in 1993 – 2023 as well as in Figure 3.

Table 1: Bekasi City Surface Temperature 1993 – 2022 (°C)

Year	Surface Temperature	
1993	Maximum	29,15
	Mean	23,76
	Minimum	20,2
1998	Maximum	27,91
	Mean	23,48
	Minimum	20,2
2004	Maximum	31,19
	Mean	26,48
	Minimum	21,08
2009	Maximum	38,29
	Mean	30,86
	Minimum	23,26
2013	Maximum	40,67
	Mean	32,33
	Minimum	21,38
2018	Maximum	43,2

Year	Surface Temperature	
	Mean	32,98
	Minimum	23,5
	Maximum	39,71
2023	Mean	32,37
	Minimum	24,73

(Source: Analysis Results, 2023)

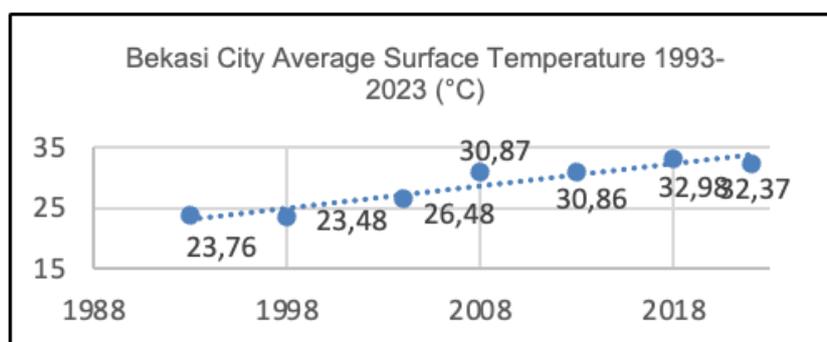


Figure 3: Bekasi City Average Surface Temperature 1993-2022 (°C)
Analysis Results, 2023

Table 1 and Figure 3 show that Bekasi's surface temperature has risen significantly during the past 30 years. The average surface temperature of Bekasi city was 23.76 °C in 1993 and 32.37 °C in 2023. This means Bekasi's average surface temperature rose 8.61 °C during the period. Bekasi's highest temperature rose 10.56 °C between 1993 and 2023. The highest maximum temperature was 43.2 °C in 2018. Figure 4 shows that western Bekasi City, notably Medan Satria District, West Bekasi District, Pondok Gede District, and Pondok Melati District, has the highest temperatures. All of these sub-districts are in West Bekasi, which borders DKI Jakarta Province.

Surface temperature in Bekasi increased significantly from 1998 to 2003 and 2008 to 2013. Between 1998 and 2003, temperatures rose from below 25 degrees to 25–27 degrees Celsius, showing a change from low to moderate temperatures. Between 2008 and 2013, temperatures rose from 30–34 degrees Celsius to over 34 degrees Celsius. Red maps, which indicate high surface temperatures, are becoming more common.

Land Cover Analysis

Currently, land cover is categorized into seven distinct classifications: high density built-up land, medium and low-density built-up land, high density

vegetation, low density vegetation shrubs, unoccupied land, and waters. The initial phase in this research involves identifying the training points for each of the 56 classifications (El-Hattab, 2016). Subsequently, the random forest algorithm is executed using the Google Earth Engine software by inputting the outcomes of the created training points into the script, resulting in the generation of a land cover categorization. By doing a random forest classification study, it is feasible to ascertain the extent of the seven distinct categories of land cover that have been identified. The table 3 displays the respective areas of each land cover category.

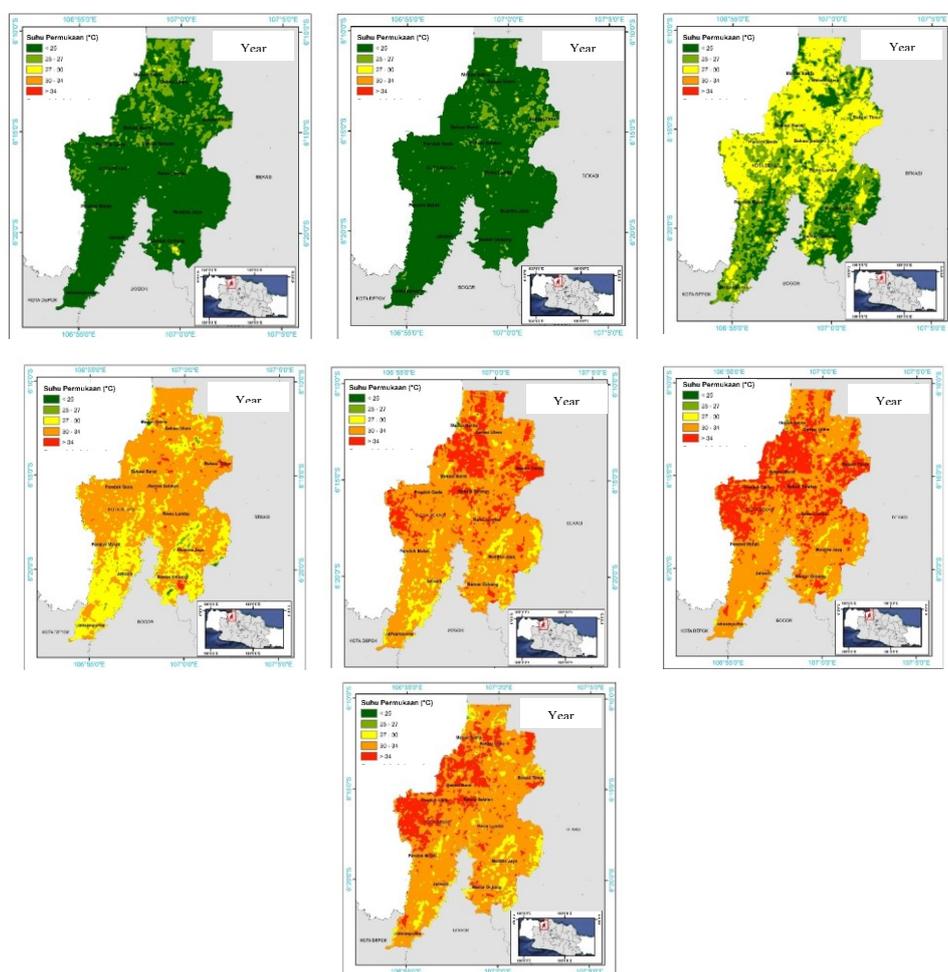


Figure 4: Bekasi City Surface Temperature Conditions in Years 1993, 1998, 2003, 2008, 2013, 2018 and 2023.

Table 3: Area of Each Type of Land Cover in Bekasi City 1993-2023 (Km²)

Tahun	High-Density Built-up Area	Medium and Low-Density Built-up Areas	Total Built-up Area	High-Density Vegetation	Medium and Low-Density Vegetation	Total Vegetation	Shrubs	Empty land	Waters	Total
1993	1,22	40,32	41,54	80,55	10,43	90,98	78,21	1,32	2,04	214,09
1998	4,59	58,77	63,36	76,39	0,85	77,24	63,20	8,09	2,19	214,09
2004	14,64	89,25	103,90	47,53	0,30	47,84	57,52	3,17	1,67	214,09
2009	17,23	107,26	124,49	34,40	1,13	35,53	50,75	1,31	2,01	214,09
2013	21,37	126,81	148,18	28,61	2,41	31,02	28,34	3,77	2,78	214,09
2018	33,19	118,57	151,76	29,32	1,96	31,28	23,74	4,90	2,42	214,09
2023	40,63	115,22	155,85	20,41	6,10	26,51	27,98	1,41	2,33	214,09

(Source: Analysis Results, 2023)

Table 3 shows a notable rise in the land area occupied by built-up areas between 1993 and 2023. Table 3 reveals a rise of approximately 114.31 km² in the built-up area land cover, resulting in built-up areas accounting for nearly 53% of Bekasi city. Conversely, the vegetation land cover has experienced a substantial decline from 1993 to 2023, namely by 64.47 units, resulting in around 51% of the vegetation remaining compared to the initial year.

Figure 5 illustrates the notable alterations in land cover within the city of Bekasi between 1993 and 2023. The most prominent transformations occurred in the northern and western regions, where there was a transition from vegetative land cover to built-up areas. In 1993, the city of Bekasi was primarily covered by vegetation, however in 2023, nearly all parts of the city had been developed into built-up regions.

average surface temperatures. For the statistics, refer to Table 4.9 which provides specific information on the surface temperature of Bekasi City's land cover from 1993 to 2022.

Table 4: Average Surface Temperature and Land Cover in Bekasi City (°C)

Year	High-Density Built-up Area	Medium and Low-Density Built-up Areas	High-Density Vegetation	Medium and Low-Density Vegetation	Shrubs	Empty land	Water
1993	24,95	25,18	22,87	24,83	23,87	25,26	23,46
1998	24,83	24,48	22,68	23,84	23,26	24,25	23,24
2004	28,16	27,45	25,03	25,31	25,68	26,46	25,69
2009	32,24	31,62	28,73	29,87	30,21	32,06	28,91
2013	33,75	33,01	30,33	30,88	30,37	32,66	30,12
2018	34,31	33,51	31,38	32,69	31,10	32,31	30,89
2022	33,70	32,76	30,88	31,79	30,04	32,03	29,77

(Source: Analysis Results, 2023)

Analysis of the Relationship between Area Change of Each Land Cover and Surface Temperature

This analysis was carried out using a simple linear regression method by comparing the average surface temperature each year (variable y) with the proportion of each type of land cover each year (variable x) as has been done. This analysis was conducted to find out how significant changes in each type of land cover are to changes in surface temperature in Bekasi City.

Table 5: Relationship of the Proportion of Land Cover Area with Surface Temperature in Bekasi City, 1993 - 2022

No	Land Cover	R ² Value	Change in Surface Temperature for Every 1% Increase in Land Cover Area (°C)	Correlation
1	High-Density Buildings	0,83	0,55	Very strong
2	Medium and Low-Density Buildings	0,87	0,25	Very strong
3	High-Density Vegetation	0,92	-0,34	Very strong
4	Medium and Low-Density Vegetation	0,04	-0,47	Very weak
5	Shrubs	0,84	-0,33	Very strong
6	Empty land	0,09	-1,06	Very weak
7	Waters	0,25	12,28	Weak

(Source: Analysis Results, 2023)

According to the analysis, high-density vegetation has the highest R² value. The high-density vegetation variable has the greatest impact on the fluctuations in average surface temperature in Bekasi City. The analysis indicates that high-density vegetation has a strong correlation with a R² value of 0.92. Furthermore, a 1% increase in the proportion of high-density vegetation will result in a decrease of the average surface temperature by 0.34°C. Furthermore, shrubs have an inverse relationship with average surface temperature, similar to vegetation. Shrubs have a high R² value of 0.84, indicating a strong correlation. Increasing the proportion of shrub-covered area by 1% results in a notable decrease of 0.33 °C in average surface temperature.

In addition to high-density vegetation and shrubs, buildings also have a significant effect on surface temperature, and this can be seen in Table 5. 10 The study examines the correlation between land cover area proportion and surface temperature in Bekasi City from 1993 to 2022, using regression analysis. High-density buildings exhibit a R² value of 0.82 in relation to surface temperature, whereas medium and low-density buildings demonstrate a R² value of 0.87 in relation to surface temperature. These data suggest a highly significant correlation between building factors and surface temperature. Furthermore, the findings of this analysis indicate that a 1% increment in the ratio of high-density built-up land in Bekasi City will result in a surface temperature increase of 0.55°C. Similarly, a 1% increase in the ratio of medium and low-density built-up land in Bekasi City will lead to a surface temperature rise of 0.25°C. There is not a significant correlation between other factors

such as low and medium density vegetation, bare land, and waters. The research indicates that the association between these three factors and the average surface temperature falls under the weak and very weak categories. Consequently, the changes in these variables have no impact on the surface temperature.

CONCLUSION

According to the results of the land cover categorization research, Bekasi City has had substantial alterations in the past three decades in terms of the categories of land cover, including construction land cover, vegetation, and shrubs. According to the data, the urbanized area in Bekasi City has expanded from 41.54 km² to 155.85 km², representing a growth of 375.22% during the past three decades. Simultaneously, there was a reduction in the amount of vegetation and shrubs. The vegetation declined by 70.86%, going from 90.98 km² to 26.51 km². Similarly, the shrubs decreased from 78.21 km² to 27.98 km², representing a decrease of 64.22% over the past 30 years. According to the surface temperature analysis, the average surface temperature of Bekasi City has risen by 8.61 °C during the past 30 years. In 1993, the average surface temperature of Bekasi City was 23.76 °C, however in 2022, it increased to 32.37 °C.

Certain land covers exhibit a substantial association with fluctuations in temperature. The relationship between the average surface temperature and each type of land cover can be observed through the R² value. Vegetation with a high density has a strong correlation coefficient (R²) of 0.92. Additionally, a small increase of 1% in the proportion of vegetated area will result in a noticeable decrease of 0.34°C in the average surface temperature. Furthermore, shrubs exhibit a contrasting influence on the average surface temperature. For instance, when compared to vegetation, shrubs demonstrate a R² value of 0.84. Additionally, a just 1% increase in the proportion of shrub-covered area results in a notable decrease of 0.33 °C in the average surface temperature. Conversely, high-density built-up land and medium & low-density built-up land have R² values of 0.82 and 0.87, correspondingly, in response to a 0.55°C and 0.25°C rise in average surface temperature for every 1% increase in area.

REFERENCES

- Agustina, I. H., Aji, R. R., Fardani, I., Rochman, G. P., Ekasari, A. M., & Mohmed, F. A. J. (2022). Cellular Automata for Cirebon City Land Cover and Development Prediction. *Planning Malaysia*, 20(1), 77–88. <https://doi.org/10.21837/PM.V20I20.1080>
- Danniswari, D., Honjo, T., & Furuya, K. (2020). Land Cover Change Impacts on Land Surface Temperature in Jakarta and Its Satellite Cities. *IOP Conference Series: Earth and Environmental Science*, 501(1), 12031. <https://doi.org/10.1088/1755-1315/501/1/012031>
- Darsono, H. (2022). Analysis of The Correlation of Population Growth to Fulfillment of The Support Capacity of Educational Facilities in Sukabumi District (Case Study of Cisaat District and Surade District). *Journal of Architectural Research and Education*, 4(2),

167–174.

- El-Hattab, M. M. (2016). Applying post classification change detection technique to monitor an Egyptian coastal zone (Abu Qir Bay). *The Egyptian Journal of Remote Sensing and Space Science*, 19(1), 23–36. <https://doi.org/https://doi.org/10.1016/j.ejrs.2016.02.002>
- Engelke, D., & Biehl, E. D. (2010). Land Use Management as Key Part of Metropolitan Governance for Sustainable Urbanisation. *46th ISOCARP Congress*.
- Essex, J. (2016). International development institutions and the challenges of urbanisation: the case of Jakarta. *Development in Practice*, 26(3), 346–359.
- Marko, K., Zulkarnain, F., & Kusratmoko, E. (2016). Coupling of Markov chains and cellular automata spatial models to predict land cover changes (case study: upper Ci Leungsi catchment area). *IOP Conference Series: Earth and Environmental Science*, 47(1), 12032. <https://doi.org/10.1088/1755-1315/47/1/012032>
- Noor, N. M., Abdullah, A., & Manzahani, M. N. H. (2013). Land cover change detection analysis on urban green area loss using GIS and remote sensing techniques. *Planning Malaysia*, 11.
- Pradhesta, Y. F., Nurjani, E., & Arijuddin, B. I. (2019). Local Climate Zone classification for climate-based urban planning using Landsat 8 Imagery (A case study in Yogyakarta Urban Area). *IOP Conference Series: Earth and Environmental Science*, 303(1), 12022. <https://doi.org/10.1088/1755-1315/303/1/012022>
- Rachma, T. R. N., Silalahi, F. E. S., & Oktaviani, N. (2022). Monitoring 20 Years of Land Cover Change Dynamics in The Satellite Cities of Jakarta, Indonesia. *IOP Conference Series: Earth and Environmental Science*, 1111(1), 12034. <https://doi.org/10.1088/1755-1315/1111/1/012034>
- Rajeshwari, A., & Mani, N. D. (2014). Estimation of land surface temperature of Dindigul district using Landsat 8 data. *International Journal of Research in Engineering and Technology*, 3(5), 122–126.
- Rodriguez-Galiano, V. F., Ghimire, B., Rogan, J., Chica-Olmo, M., & Rigol-Sanchez, J. P. (2012). An assessment of the effectiveness of a random forest classifier for land-cover classification. *ISPRS Journal of Photogrammetry and Remote Sensing*, 67, 93–104. <https://doi.org/https://doi.org/10.1016/j.isprsjprs.2011.11.002>
- Singh, R. (2019). Urban Sprawl and Its Impact on Generation of Urban Heat Island : A Case Study of Ludhiana City. *Journal of the Indian Society of Remote Sensing*, 8. <https://doi.org/10.1007/s12524-019-00994-8>
- Stewart, I. D., & Oke, T. R. (2012). Local climate zones for urban temperature studies. *Bulletin of the American Meteorological Society*, 93(12), 1879–1900.
- Tomlinson, C. J., Chapman, L., Thornes, J. E., & Baker, C. (2011). Remote sensing land surface temperature for meteorology and climatology: A review. *Meteorological Applications*, 18(3), 296–306.
- Yulianto, F., Prasasti, I., Pasaribu, J. M., Fitriana, H. L., Zylshal, Haryani, N. S., & Sofan, P. (2016). The dynamics of land use/land cover change modeling and their implication for the flood damage assessment in the Tondano watershed, North Sulawesi, Indonesia. *Modeling Earth Systems and Environment*, 2(1), 47. <https://doi.org/10.1007/s40808-016-0100-3>

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THE POTENTIAL OF HERITAGE TRAIL MAPPING IN BANDAR PENGGARAM, BATU PAHAT, JOHOR MALAYSIA: AN EMPIRICAL INVESTIGATION

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Abstract

This research assesses the potential of heritage trail mapping in Bandar Penggaram, Batu Pahat, Johor by observing the community's perceptions. This research intends to profile and map the cultural heritage descriptions of Bandar Penggaram as a unique town from historical, economic, socio-cultural, and environmental backgrounds. This research has adopted a mixed-method approach by disseminating questionnaire surveys to the respondents, and having focus group discussions with various public and private agencies. The result shows that the majority (76.2%) of the respondents perceived that the heritage zone of Bandar Penggaram has the potential to attract tourists and researchers to the town, while the cooperation between the authorities and stakeholders has been found to be necessary to create awareness among the communities of their historical glory within the heritage zone.

Keywords: Heritage Trail, Bandar Penggaram, Batu Pahat, Heritage Potential, Perceptions Study

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INTRODUCTION

Bandar Penggaram or Bandar Batu Pahat has a unique cultural history and heritage; it has grown as a port city and is now the second-largest main town in the state of Johor. To date, Bandar Penggaram has about 430 pre-war buildings with façade and architectural styles influenced by the (i) Eclectic, (ii) Early Colonial/Anglo Indian, and (iii) Art Deco styles (Majlis Perbandaran Batu Pahat, 2016). To ensure that Bandar Penggaram is regarded as one of the tourist destinations that can generate economic returns, a new approach needs to be embodied through the heritage trail programme.

This approach is to document and profile the history of the town, which is a continuous effort to educate the younger generation on the cultural path of the heritage zone. The initiative to conserve the old buildings in Batu Pahat town was also found to be less encouraging than that in other districts in the state of Johor (Indera, 2022). Furthermore, there are many dilapidated colonial-era buildings found here, which are not given much attention, and these valuable heritage assets should be conserved by the authorities before they might disappear. The need to conserve the cultural heritage has been outlined in Johor's State Structure Plan 2030, which aims to 'Mainstream the sustainability of the state through the preservation of the natural assets and cultural heritage of the people of Johor which is invaluable, resilient to the challenges of global change' (PLANMalaysia, 2017).

This project produces the first cultural mapping of Bandar Penggaram's cultural heritage assets. The town previously did not have any cultural heritage mapping, which can be found in other heritage towns in Malaysia. This indirectly makes it difficult to identify the historical and heritage assets of the town that can be shared with the outsiders. The project intends to profile the historical descriptions of Bandar Penggaram as a unique port town from the historical, economic, socio-cultural, and environmental perspectives. This article emphasizes on the future growth of historical areas based on their potential as cultural tourism destinations.

LITERATURE REVIEW

Heritage Trail

A heritage trail is a designated route that links significant items of an area's heritage. It can be a walking trail or a driving route in urban and rural settings. Heritage trails are typically identified by signage and guidebooks that provide information about the cultural heritage associated with the trail (National Heritage Board, 2017). The heritage can include built architecture, cultural heritage narratives, and historical monuments (Hayes & Macleod, 2008; Lai, 2009; Vos, 2018).

According to Fienieg et al., (2008) and Rana (2015), heritage trails serve several purposes, such as community development, community participation, discovering community heritage, and promoting urban conservation activities. They can also encourage support for projects related to the conservation and protection of historical monuments (MacLeod, 2017). A heritage trail can consist of a single property or building, a trail or corridor, or a district comprising of multiple heritage sites (Silbergh et al., 1994). Additionally, a heritage trail can be part of a regional network of natural and cultural heritage sites (Antonson & Jacobsen, 2014; Lourens, 2007; MacLeod et al., 2009; Silbergh et al., 1994). According to Mastura et al., (2019), visitors are exposed to the rural lifestyle and culture, agricultural activities and farming, cottage industries, and other informal enterprises by constructing a history trail, which serve as important parts that can create income for the local community and the nation as a whole. Heritage trails keep history alive, protect cultural places, and let people experience the past and present (Nadianti et al., 2022).

Historic Background of Batu Pahat

Batu Pahat or Bandar Penggaram has a rich history that dates back to the fifteenth century. The name 'Batu Pahat' literally means 'chiselled stone', which possibly can be traced back through the history where the stone-well was carved by the Siamese army in search of drinking water - on its way to attack the Malacca Malay Sultanate in 1456 (Aziffah, 2019; Neil et al., 2017). The act of sculpting the stone has given its name to Batu Pahat, and the well is called the Batu Pahat well, which still exists today (MPBP, 2016). It was originally a fishing village and was later developed into a port town as a trading centre along the Batu Pahat river and the Straits of Melaka (Figure 1).



Figure 1: An Old Photo Taken in 1920s Featuring the View of Bandar Penggaram
Source: Majlis Perbandaran Batu Pahat (2016)

Bandar Penggaram Heritage Zone

Bandar Penggaram Heritage Zone is in the center of the old port town (Figure 2 and Figure 3). It consists of old shophouses, civic buildings, mansions, building relics, and private property that has significant value for the heritage assets. There are more than 400 buildings that have been identified as historically valuable and in the process of being restored through the Bandar Penggaram Heritage Zone Transformation Programme by the Batu Pahat Municipal Council (MPBP).



Figure 2: The Old Japanese Club Building Was Built in 1925 and is One of the Most Iconic Buildings Alongside Jalan Shahbandar Facing Batu Pahat River
Source: Indera Syahrul (2022)



Figure 3: Bird's Eye View of Bandar Penggaram Heritage Zone
Source: Southern Corridor Malaysia (2023)

METHODOLOGY

This research has adopted a mixed-method approach (see Creamer, 2017; Creswell, 2015) by disseminating questionnaire surveys to the respondents. For quantitative data, the sample of the study comprised of 172 individuals who participated through a web-based survey. On the other hand, focus group discussions (FGD) involved various individuals from public and private agencies, NGOs, and community representatives from federal, state, district, and local levels. The following are the approaches undertaken by this research.

Focus Group Discussion

Held online on 30 September 2021 and 28 October 2021 with representatives from Batu Pahat District Office, Batu Pahat Municipal Council (MPBP), Tourism Johor, PLANMalaysia, Johor Economic Planning Division, ICOMOS Malaysia, Think City, Malaysian Tourist Guide Council, Dept. of Orang Asli Development (JAKOA), Batu Pahat History Society, communities and school headmasters.

Survey

The survey was conducted online from January to March 2022 through Google Forms. A total of 172 respondents were involved in this survey.

Interview

Interviews were conducted with the respondents within the Batu Pahat heritage zone, and included professionals, community representatives, shopkeepers, and the public.

Site Observation

Site observation was conducted in Bandar Penggaram, Batu Pahat to observe the current scenario and the site's potential from the perspective of the researcher(s) (Figure 5). This task also included photo shoots which included buildings, sites, monuments, historical remains, and others.

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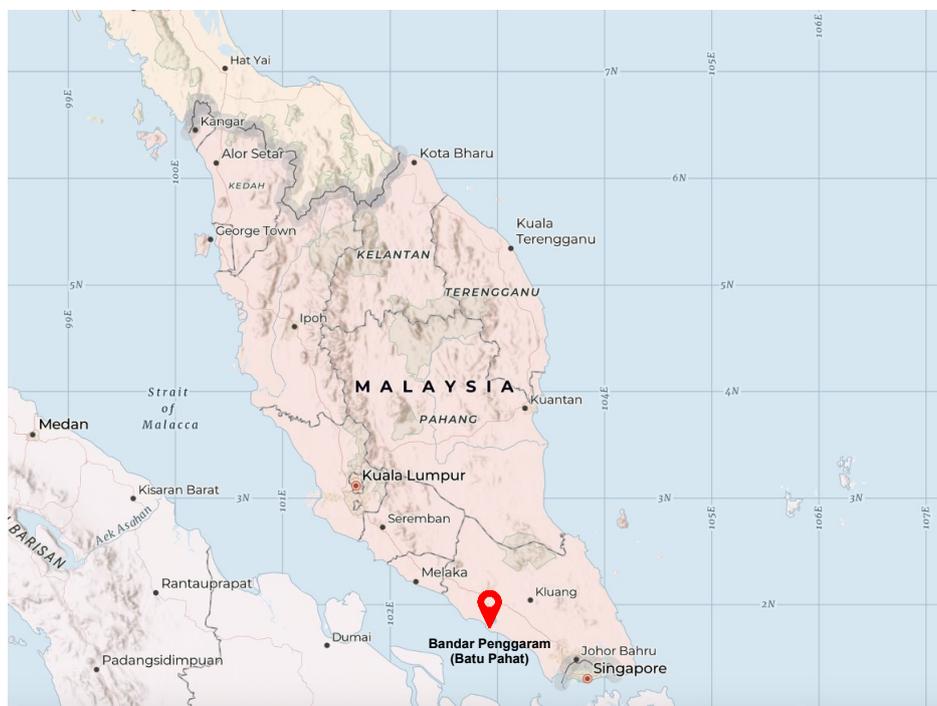


Figure 4: Diagrammatic Map of Bandar Penggaram, Batu Pahat, Johor
Source: Adapted from Google Map (2023)

EMPIRICAL FINDINGS

Bandar Penggaram or Batu Pahat has a unique cultural history and heritage, and it has grown as a port city and is now the second largest main town in the state of Johor (Figure 5). Online survey instruments were prepared based on the insights to investigate respondents' perceptions towards local heritage, their willingness to participate in heritage programmes, and the potential of Bandar Penggaram to be established as a tourist destination, and to identify a wide range of tangible and intangible elements such as the built and natural heritage for heritage trail development. The findings revealed the socio-economic profile of 172 respondents who participated in this survey.



Figure 5: Bandar Penggaram is the Second Largest Town in Johor and Well Known for Its Textile and Garment Industry
Source: Southern Corridor Malaysia (2023)

Respondents Profile

Table 1 provides the summary statistics for the respondents' social profiles. The gender breakdown for respondents was 59.3% male and 40.7% female. The most represented race group was Malay (83.1%), followed by Chinese (8.7%), Indian (5.2%), and others (3.0%). Most of the respondents were aged 36-45 years (28.5%), followed by 46-55 years (24.3%), 18-25 years (22.1%), and 26-36 years (19.8%), while the remainder were above 55 years. Almost all respondents had undergone a formal education (Table 2). Roughly 74% of the respondents had attended university; 11% had completed college education, 14% had attended up to secondary school, and less than 1% had attended up to primary school.

Table 1: Respondents' Social Profile

Profile	Numbers	Percentage (%)
Number of respondents	172	100.0
Gender		
Male	102	59.3
Female	70	40.7
Race		
Malay	143	83.1
Chinese	15	8.7
Indian	9	5.2
Others	5	3.0
Age		
Below 17 years	0	0
18-25 years	38	22.1
26-36 years	34	19.8
36-45 years	49	28.5
46-55 years	42	24.3
56-65 years	7	4.1
66-75 years	2	1.2
Above 76 years	0	0

Source: Author (2022)

Table 2: Respondents' Education Background

Profile	Numbers	Percentage (%)
University	128	74.4
College	19	11.0
Secondary school	24	14.0
Primary school	1	0.6

Source: Author (2022)

Awareness of Local Heritage and Interest Level by Race

Table 3 presents cross-tabulation data that sheds light on patterns or disparities in awareness of local historical heritage across various racial groups. The data shows that Malay respondents exhibit the highest level of awareness compared to other racial groups. Among Malays, the majority (129 out of 145) are aware of the existence of local heritage, while 16 Malay respondents reported being unaware. Conversely, Chinese and Indian respondents show lower levels of awareness compared to the Malays, with 11 and 6 respondents respectively indicating awareness. Among other racial groups, only 1 out of 3 reported awareness, representing the lowest level of awareness across all racial groups. This underscores the necessity for targeted initiatives aimed at enhancing awareness and appreciation of local heritage across all segments of society.

Table 3: Awareness of the Existence of Local Heritage*Race Crosstabulation

		Race				Total
		Malay	Chinese	Indian	Others	
Awareness on the existence of local heritage	Yes	129	11	6	1	147
	No	16	4	3	2	25
Total		145	14	9	3	172

Source: Author (2022)

As illustrated in Table 4, respondents were queried about their reactions toward the local historic sites and heritage buildings in the town. Upon comparing responses across racial groups, it becomes apparent that Malays demonstrate the highest level of interest, followed by Chinese, Indians, and others category. Disparities in interest levels across races may be attributed to several factors, including cultural heritage, historical significance, or personal experiences associated with these sites within each community.

Table 4: Reaction to the local historic sites and heritage buildings*Race Crosstabulation

		Race				Total
		Malay	Chinese	Indian	Others	
Reaction to the local historic sites and heritage buildings	Not interested	8	3	0	0	11
	Less interested	29	2	0	0	31
	Neutral	39	6	3	0	48
	Interested	45	3	5	1	54
	Very interested	24	1	1	2	28
Total		145	15	9	3	172

Source: Author (2022)

Educational Attainment, Willingness and Engagement Perceptions

Furthermore, all the respondents were asked about their willingness to participate in a heritage-related programme in the town. The provided cross-tabulation in Table 5 illustrates the relationship between individuals' willingness to engage in a heritage-related volunteer programme and their respective levels of education. Analysis of the willingness reveals variations across different educational levels. Notably, the highest count of individuals willing to participate is among those with a university education (66), followed by those uncertain (52), and individuals with a secondary school education (11). Conversely, there are no respondents with a primary school education who express willingness to participate. In summary, the most apparent result is the disparity in willingness to participate based on educational attainment, with higher levels of education correlating positively with a greater willingness to engage in the heritage-related volunteer programme.

Table 5: Willingness to be Involved in Heritage-Related Volunteer Programme *Education Level Crosstabulation

		Education Level				Total
		University	College	Secondary	Primary	
Willingness to be involved in heritage-related volunteer programme	Yes	66	10	11	0	87
	No	10	0	5	0	15
	Uncertain	52	9	8	1	70
Total		128	19	24	1	172

Source: Author (2022)

The cross-tabulation data in Table 6 presents an examination of the relationship between respondents' levels of education and their corresponding responses categorized as 'Yes', 'No', or 'Uncertain'. Within each educational category, the breakdown of responses is as follows: among respondents with University education, 118 individuals responded affirmatively, 3 answered negatively, and 7 expressed uncertainty. In the College education group, 15 respondents provided positive responses, 2 responded negatively, and 2 were uncertain. For individuals with a Secondary education background, 21 respondents answered 'Yes', 2 replied 'No', and 1 expressed uncertainty. Only one respondent with a Primary education level provided a positive response. The total count of responses across all categories indicates 155 'Yes' responses, 7 'No' responses, and 10 uncertain responses. This tabulated data offers valuable insights into the distribution of responses across different educational levels. Notably, there is a discernible trend wherein the likelihood of affirmative responses decreases as educational attainment decreases. Additionally, variations in uncertainty levels across educational categories are apparent.

Table 6: Engagement between Authorities and Stakeholders, (Private Sector, Communities, and NGOs) is Essential*Education Level Crosstabulation

		Education Level				Total
		University	College	Secondary	Primary	
Engagement between authorities and stakeholders (Private, Community, NGOs etc.) is essential?	Yes	118	15	21	1	155
	No	3	2	2	0	7
	Uncertain	7	2	1	0	10
Total		128	19	24	1	172

Source: Author (2022)

Perception of Heritage Trail Potential

Figure 6 shows respondents' evaluation on the view of whether Bandar Penggaram has a potential to attract researchers and tourists. It was found that 76% of the respondents were positive of this and agreed that Bandar Penggaram has potential, while 3% disagreed, and another 21% felt uncertain. The survey also encouraged the respondents to rate the importance of community engagement in the aspect of planning and implementing a heritage trail on-site. Figure 7 shows that most of the respondents rated it as very important (50%), many others rated it as important (38%), and very few of them rated it as slightly important (7%) and not at all important (5%).

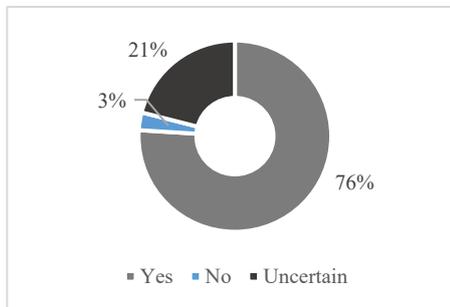


Figure 6: Potential to Attract Researchers and Tourists
Source: Author (2022)

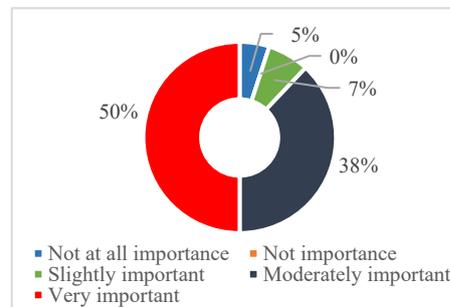


Figure 7: Importance of Community Engagement in the Aspect of Planning and Implementation
Source: Author (2022)

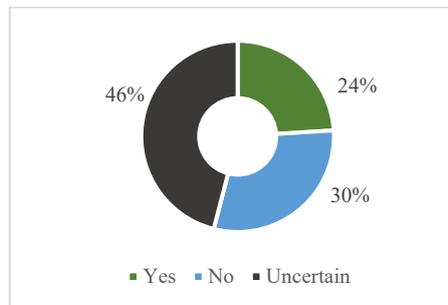


Figure 8: Satisfaction of Quality of Service by the Local Authority in Safeguarding Heritage Buildings
Source: Author (2022)

Figure 8 shows the data of the residents' view on the question, 'Are you satisfied with the quality of service performed by the local authority in safeguarding heritage buildings in Batu Pahat?'. The result shows that majority of the respondents (46%) felt uncertainty here, 30% were found to be unsatisfied

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with the quality of service, and 24% were satisfied. The following evidences have been recorded in the survey, which states that: *“Many historic buildings are dilapidated, less promotion about Batu Pahat cultural heritage, no expertise to treat the old buildings, conservation works have been done but not following the international best practices, local authorities are not proactive enough, and information about heritage buildings in Batu Pahat needs to be recorded”*.

OUTCOME

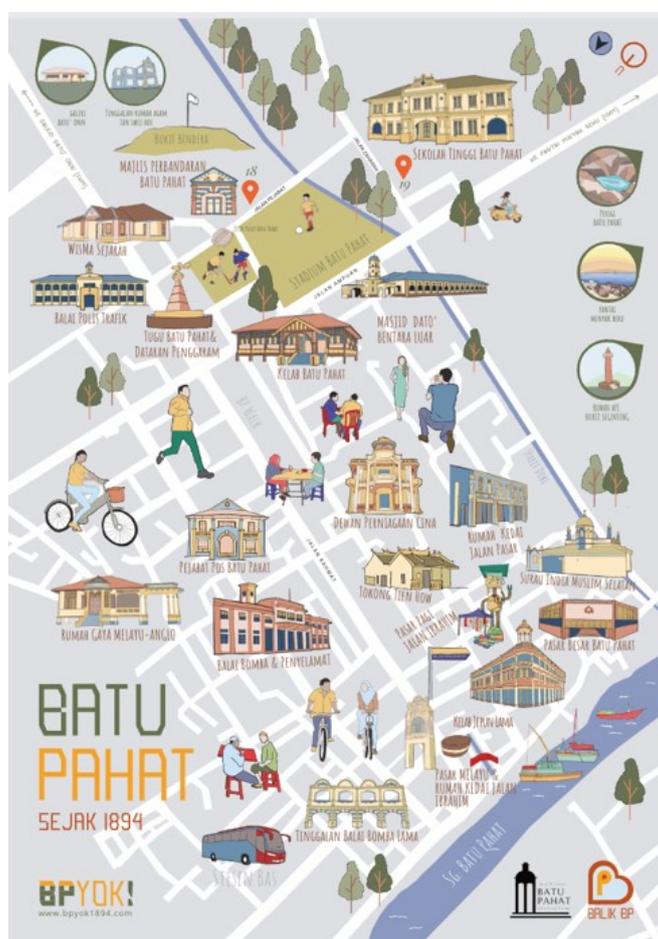


Figure 9: Proposed Heritage Trail Map for Batu Pahat Town
 Source: Indera Syahrul (2022)

Figure 9 shows the proposed heritage trail map for Batu Pahat with 25 historical assets and cultural heritage. It was based on the town's unique and authentic historic built environment as an economic driver, which in turn, will provide an important reason for conservation activities and community development. The heritage trail map covers an area of 15 km radius from the Batu Pahat heritage zone, up to the Minyak Beku beach in the southwest, and Jalan Kluang towards the northeast. In this sense, this trail is expected to help visitors explore, understand, and appreciate the town's heritage in ways that give it a new image, identity, and a sense of place. Thus, heritage interpretation would enable visitors to have a rewarding and meaningful experience exploring the historic town (Yunus et al., 2021).

CONCLUSION

This research is a collective effort to document the history and heritage of Bandar Penggaram and to educate the younger generations on the cultural path of their historical areas. The findings showed that Bandar Penggaram displays strong evidence of tangible and intangible elements in historical facets, based on the unique architecture of the shophouses, landmarks, sites' natural beauty, monuments, and historical significance. This potential could help educate, illustrate or provide further scientific investigation concerning its distinctive cultural heritage value.

It is found to be a catalyst to mobilise a stronger collaboration, especially between the university and stakeholders, including local authorities, industry, community, and NGOs to formulate new programmes and innovations in the field of tourism, history, cultural heritage, and local culture. Given today's post-pandemic challenges, tourism is often seen as a self-serving 'industry', thus leading to incorrect implementations. Tourism acts as an engine of economic growth and most importantly as a social force. Tourism is much more than an industry or the 'government's business' - it is people. Perhaps it is time to rethink the 'industry' classification and find ways to connect with all stakeholders involved in this potential sector.

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REFERENCES

- Antonson, H., & Jacobsen, J. K. S. (2014). Tourism development strategy or just brown signage? Comparing road administration policies and designation procedures for official tourism routes in two Scandinavian countries. *Land Use Policy*, 36, 342–350. <https://doi.org/https://doi.org/10.1016/j.landusepol.2013.09.003>

- Aziffah, A. S. (2019). *Reviving the historic of Minyak Beku, Batu Pahat through heritage trail approach*. Doctoral Dissertation. Universiti Teknologi MARA (Puncak Alam Campus), Malaysia.
- Creamer, E. G. (2017). *An introduction to fully integrated mixed methods research*. Thousand Oaks, California, USA: SAGE Publications.
- Creswell, J. W. (2015). *A concise introduction to mixed methods*. Thousand Oaks, California, USA: SAGE Publications.
- Fienieg, A., Parthadius, R., Groot, B., Jaffe, R., Linde, S., & Van, R. (2008). Heritage trails: International cultural heritage policies in a European perspective. *Dutch Colonialism, Migration and Cultural Heritage* (pp. 23–62). KITLV Press: Leiden.
- Google Map. (2023). Google Map of Batu Pahat, Johor, Malaysia. Retrieved July 20, 2023 from <https://www.google.com/maps/place/Batu+Pahat,+Johor/>
- Hayes, D., & Macleod, N. (2008). Putting down routes: An examination of local government cultural policy shaping the development of heritage trails. *Managing Leisure, 13*, 57–73.
- Indera, S. M. R. (2022). *Kajian potensi pembangunan kawasan jejak warisan (heritage trail) di Bandar Penggaram, Batu Pahat, Johor*. Technical Report. Universiti Tun Hussein Onn Malaysia. Retrieved July 24, 2023 from <https://www.bpyok1894.com/copy-of-demografi-bp>
- Lai, S. Y. (2009). *Heritage trail planning in Melaka Historic City: Its potential objective, themes and target users*. Master Dissertation. Universiti Teknologi Malaysia, Skudai, Johor.
- Lourens, M. (2007). Route tourism: A roadmap for successful destinations and local economic development. *Development Southern Africa, 24*(3), 475–490.
- MacLeod, N. (2017). The role of trails in the creation of tourist space. *Journal of Heritage Tourism, 12*(5), 423–430.
- MacLeod, N., Hayes, D., & Slater, A. (2009). Reading the landscape: The development of a typology of literary trails that incorporate an experiential design perspective. *Journal of Hospitality Marketing & Management, 18*(2–3), 154–172.
- Mastura, J., Norziani, D., Fatimah, H., & Suhaida, H. S. (2019). Heritage tourism trail development in Kampung Luat, Perak: A case study. *KATHA-The Official Journal of the Centre for Civilisational Dialogue, 15*(1), 66–88.
- Majlis Perbandaran Batu Pahat. (2016). *Draf rancangan kawasan khas Bandar Penggaram 2016-2025*. Majlis Perbandaran Batu Pahat (MPBP) & Perunding UEP Sdn. Bhd.
- Nadiyanti, M. N., Nur, H. M. H., Suriati, A., David, S. J., & Ismail, H. S. (2022). Highlighting the potential of Kampung Kuchai, Ipoh, Perak through a heritage trail. *Planning Malaysia, 20*(22). 25-36.
- National Heritage Board. (2017). *Heritage trails: A practical guide to action*. NHB: Singapore. National Heritage Board (NHB).
- Neil K., Mariana, I., & Maganjeet, K. (2017). *The town of Malaya: An illustrated urban history of the Peninsula up to 1957*. Editions Didier Miller (EDM): Malaysia. Kuala Lumpur.
- PLANMalaysia. (2017). *Draf rancangan struktur negeri Johor 2030*. KPKT: Malaysia. Kementerian Perumahan & Kerajaan Tempatan (KPKT). Kuala Lumpur.

- Rana, T. A. M. (2015). Sustainable urban development in historical cities using the heritage trail approach: A case study of the old city of Karak, Jordan. *Journal of Culture, Society and Development*, 12, 48–60.
- Silbergh, D., Fladmark, J. M., Henry, G., & Young, M. (1994). A strategy for theme trails. *A Strategy for Theme Trails*, 123–146.
- Southern Corridor Malaysia. (2023). *Batu Pahat - A friendly Town 2023*. Southern Corridor Malaysia (SCM). Retrieved July 24, 2023. YouTube. <https://www.youtube.com/watch?v=cjlsIUI23IY>
- Vos, C. (2018). Heritage and policy. In *The Encyclopedia of Archaeological Sciences* (pp. 1–5). John Wiley & Sons, Ltd. Retrieved July 23, 2023 from <https://onlinelibrary.wiley.com/doi/10.1002/9781119188230.saseas0284>
- Yunus, N., Endut, E., & Said, S. (2021). Cultural mapping and heritage trail in Kuala Kangsar. *Planning Malaysia*, 19(1), 127–137.

Author's Ethical Statement

We, the author(s) of this research paper, affirm our commitment to ethical conduct in all aspects of our work. We have upheld integrity, transparency, and accountability throughout the research process. We have obtained appropriate consent, minimized conflicts of interest, and followed ethical guidelines for data collection and analysis. We aim to contribute to knowledge while maintaining the highest standards of integrity.

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THE EFFECTIVENESS OF THE REGIONAL LONG-TERM DEVELOPMENT PLAN OF PURWOREJO REGENCY: THE EVALUATION OF STRATEGIC PLANNING

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Abstract

The implementation of strategic planning in the public sector is the art of managing government affairs involving the utilization of state power. A set of regional planning in Indonesia is characterized by continuity and interconnectedness within a planning system consisting of the Regional Long-Term Development Plan (RPJPD), the Regional Medium-Term Development Plan (RPJMD), and the Regional Government Work Plan (RKPD). RPJPD, as part of the national development planning system in Indonesia, is a planning document that guides regional governance for 20 years and delineated into four periods of the RPJMD, each with a validity period of five years. In the planning cycle, the evaluation process is essential to do. The study aimed to examine the effectiveness of the long-term development performance in the public sector in the framework of strategic planning evaluation in Purworejo Regency. The methods employed in the evaluation were cross-sectional and longitudinal qualitative comparative, which involved comparing and correlating the performance achievement of the four periods of the RPJMD conducted at the end of each planning year in the final period. The dominant aspect that supports the achievement of development performance targets is the aspect of government. The inhibiting aspects that hinder the achievement of performance targets in the RPJPD of Purworejo Regency for 2005-2025 are the aspects of economics, infrastructure, socio-culture, and time.

Keywords: government, evaluation, RPJPD, strategic planning

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INTRODUCTION

In undertaking regional development planning, the government must prepare the strategic planning context for vital activities as it guides the functioning of governance. These results are influenced by external forces, such as economic influences (Roberts, 2000). According to (Bryson & Crosby, 2009), strategic planning is a deliberate effort to generate fundamental decisions and actions that shape and guide entities to achieve objectives. The demand for strategic thinking amidst the turbulent decades is more significant than the previous one (Hamel, G, & Prahalad, 1994). The beginning of strategic planning implementation in the public sector, primarily within the military and government system fields, corresponds to the art of managing government affairs involving the use of state power (Freedman, 2013). The alignment of objectives, efforts, and effectiveness related to performance is a significant basis for strategic planning (Bryson & Crosby, 2009). (Syahroni., 2002) also explains that regional development planning is a systematic effort from various parties (i.e., public, government, private, community, and others) to synergize in addressing the interdependence and interconnectedness of development aspects (i.e., physicality, socio-economy, environment, and others).

The systematic implementation of development guided by development planning documents will significantly impact the achievement of development objectives and targets for improving community prosperity and regional advancement (Nasution & Achmad, 2021). Regarding regional development planning, the Indonesian government, specifically the central government, has established Laws and Regulations to govern these cases, including Law Number 25 (Pemerintah Indonesia, 2004) concerning the National Development Planning System and Law Number (2014) concerning Regional Government. This law mandates regional governments to formulate regional development planning as an integration of the national development planning system. The regional development planning encompasses the Regional Long-Term Development Plan (*Rencana Pembangunan Jangka Panjang Daerah*), hereinafter abbreviated as RPJPD, the Regional Medium-Term Development Plan (*Rencana Pembangunan Jangka Menengah Daerah*) hereinafter abbreviated as RPJMD, and the Regional Government Work Plan (*Rencana Kerja Pemerintah Daerah*) hereinafter abbreviated as RKPD. Urban development must consider the objectives, plans, strategies, and general policy directions of the regional government as the foundation for the development process. Therefore, regional development proceeds based on the formulated and established plans.

Purworejo Regency has RPJPD documents according to the Regional Regulation of Purworejo Regency Number 9 of 2010 concerning the Long-Term Development Plan of Purworejo Regency for 2005-2025. Purworejo Regency has a vision of "*Purworejo Daerah Agribisnis Yang Maju, Berdaya Saing, Mandiri,*

Lestari dan Sejahtera” (Purworejo as an Advanced, Competitive, Independent, Sustainable, and Prosperous Agribusiness Region). The Development Mission of Purworejo Regency for 2005-2025 has been established to achieve these visions, namely:

1. Enhancing agricultural productivity and the quality of agricultural outputs broadly by empowering, developing, optimizing agricultural potential, and increasing the added value of agricultural outputs through developing industries, trades, and services.
2. Realizing conducive climate and the availability of infrastructure to attract investment in developing industries, services, and trades to enhance regional advancement.
3. Increasing regional revenue to support development.
4. Realizing the professionalism of the apparatus and government that is trustworthy, clean, free from KKN (Corruption, Collusion, and Nepotism), and democratic by prioritizing law enforcement, security guarantees, and public order, supported by high public participation.
5. Realizing a productive, educated, and competent society with controlled growth.
6. Realizing a quality life for society, state, and nation by preserving cultural heritage, natural resources, and the environment to support tourism growth and sustainable development.
7. Realizing a healthy community physically and spiritually, positive personality traits with a profound understanding of Pancasila as an ideology, and a high regard for religion, human rights, gender equality and justice, and child protection.

The achievement of the vision and mission is assessed based on the indicators established concurrently with the establishment of the vision and mission. The steps to achieve the target indicators of the vision and mission in the long-term development plan for 2005-2025 are divided into four stages of medium-term development. Each stage has a duration of five years, namely the RPJMD of Purworejo Regency for 2006-2010, the RPJMD of Purworejo Regency for 2011-2015, the RPJMD of Purworejo Regency for 2016-2021, and the RPJMD of Purworejo Regency for 2021-2026. The effectiveness of regional development planning is inseparable from the control and evaluation process used because it can provide essential information to stakeholders and development policymakers to assist them in understanding, improving, and deciding the best action based on past experiences (IK Winaya, 2017).

Therefore, to assess the effectiveness and consistency of development planning, an evaluation of the achievement of the vision and mission based on

the medium-term planning documents must be conducted. The evaluation was conducted based on the regulation of Ministry of Home Affairs Number 86 of (Pemerintah Indonesia, 2017) on Procedures for Planning, Controlling, and Evaluating Regional Development, the Procedures for Evaluating the Regional Regulation Drafts on the Regional Long-Term Development Plan, and the Procedures for Amending the Regional Long-Term Development Plan, the Regional Medium-Term Development Plan, and the Regional Government Work Plan. The novelty from this article is RPJPD evaluation has never been carried out before

Furthermore, the implementation of evaluation is also conducted to provide crucial information that can be utilized to assist stakeholders and development policymakers in managing and enhancing previous works.

LITERATURE REVIEW

THE EVALUATION OF DEVELOPMENT PLANNING

Planning is a comprehensive process of formulating objectives by specifying the steps and actions to accomplish the predetermined objectives, supported by all available resources. Planning must also be a concern to discover a solution or an alternative for any issues that are currently or will be encountered by considering the available resources (Riyadi and Baratakusumah, 2008). Planning is also important for aligning resources and capacity and coordinating regional actions in addressing the decrease of government funding to programs/activities (Bellamy et al., 2017). In the planning process should include: thoughtfulness when create the terms of reference, extensive public consultation, and updating and reviewing the plan (Ahmad et al., 2013).

Meanwhile, according to Tjokroamidjojo (2002), development is a continuous transformation mechanism that makes a place better than its previous condition. The development process must be supported by thorough planning. Therefore, planning has a fundamental role in the process of development. In the planning, it is strongly recommended that the authorities prioritise on the cultivation aware (Lim et al., 2019). All levels of government and all elements of government (stakeholders) participate in development planning to establish development priorities and steps to take for social prosperity (Sriharyati & Sholihannisa, 2020)

The development planning mechanism requires evaluation to ensure that the development planning outcomes can effectively achieve its objectives (Kaiser et al., 1995). The planning evaluation is a structured assessment that compares various plans from multiple aspects quantitatively, based on current outcomes with selected objectives and targets. There are two types of planning evaluation described by Kaiser et al. (1995), namely:

1. Pre-adoption evaluation. Before adopting a plan, the planning evaluation becomes a tool for determining decisions. The planner can utilize the evaluation to provide recommendations for improvement.
2. Post-adoption monitoring and evaluation. After the selection and implementation of the plan, monitoring and evaluation emerge as essential processes for collecting data and information on the results of the implemented development plan. It is utilized as a benchmark for the progress of success in achieving objectives and targets. The first step is selecting the objectives and plans to take. The second step is identifying information and data, selecting the data, and conducting an evaluation. Furthermore, the third step is improving the plan for further planning. This third step becomes the foundation of the subsequent stage of planning.

The evaluation of development planning is crucial to determine whether development has successfully achieved its intended objectives and targets and its positive impact on the surrounding community. Through evaluation, the success of the planning process and actions, programs, and activities in planning can be traced to the results in the field (Lukasiewicz et al., 2020).

THE PROCEDURE FOR FORMULATING THE NORMATIVE EVALUATION DOCUMENT FOR THE RPJPD OF REGENCY/CITY

This evaluation is conducted based on the Regulation of Ministry of Home Affairs Number 86 of 2017 concerning the Procedure for Planning, Controlling, and Evaluating Regional Development, the Procedure for Evaluating the Regional Regulations on the Regional Long-Term Development Plans, and the Regional Medium-Term Development Plans, and the Procedure for Amending the Regional Long-Term Development Plan, the Regional Medium-Term Development Plan, and the Regional Government Work Plan; Specifically regulated further in the attachment of the Regulation of the Ministry of Home Affairs Number 86 of 2017.

Based on the Regulation of Ministry of Home Affairs Number 86 of 2017 Article 183, control and evaluation of Regional Development Planning include:

- 1) Control and evaluation of regional development planning policy formulation,
- 2) Control and evaluation of the implementation of regional development plans,
- 3) Evaluation of the results of regional development plans.

The results evaluation is conducted by examining the alignment and achievement of vision, mission, and objectives between the RPJPD documents and the RPJMD documents. The alignment and achievement are analyzed using form E.56 contained in the Regulation of Ministry of Home Affairs of the Republic of Indonesia Number 86 of 2017 concerning the Procedures for Planning, Controlling, and Evaluating the Regional Development, the Procedures for Evaluating the Regional Regulation Drafts on the Regional Long-Term Development Plan, the Regional Medium-Term Development Plan, and the Regional Government Work Plan.

Based on the Regulation of Ministry of Home Affairs Number 87 of 2017, the assessment of development performance achievement refers to the following levels.

Table 1: The Assessment of Performance Results

No.	Performance Realization Score Interval	Performance Realization Assessment Criteria
1.	$91\% \leq 100\%$	Very High
2.	$76\% \leq 90\%$	High
3.	$66\% \leq 75\%$	Medium
4.	$51\% \leq 65\%$	Low
5.	$\leq 50\%$	Very Low

Source: The Regulation of Ministry of Home Affairs Number 86 of 2017

THE METHOD FOR THE IMPLEMENTATION OF PLANNING DOCUMENT EVALUATION

The methods used in this evaluation process are quantitative cross-sectional-longitudinal, single case study, and comparative qualitative (Bryson & Crosby, 2009). The quantitative cross-sectional-longitudinal method is an evaluation utilizing time-series data of regional indicators for four periods of the RPJMD document of Purworejo Regency, followed by an analysis of achievement calculation by the provisions stated in the Regulation of Ministry of Home Affairs of the Republic of Indonesia Number 86 of 2017. The evaluation uses a taxonomy matrix to perform certain calculations from existing data (Ali & Ahmad, 2022). The comparative qualitative method is employed to examine the alignment of the RPJPD document of Purworejo Regency for 2005-2025 with the documents of RPJPN, RUTR of Regency, and RPJP of Province. In the evaluation process, the achievement of RPJPD is reached due to key performance indicators, macro-regional level targets, and the achievement of Sustainable Development Goals (SDGs). The achievement is completed due to the targets and indicators

realization in the RPJMD document for four periods and is related to the main targets of the RPJPD of Purworejo Regency for 2005-2025. Thus, the level of achievement of these indicators and the level of achievement of the main targets of the RPJPD of Purworejo Regency for 2005-2025 can be obtained.

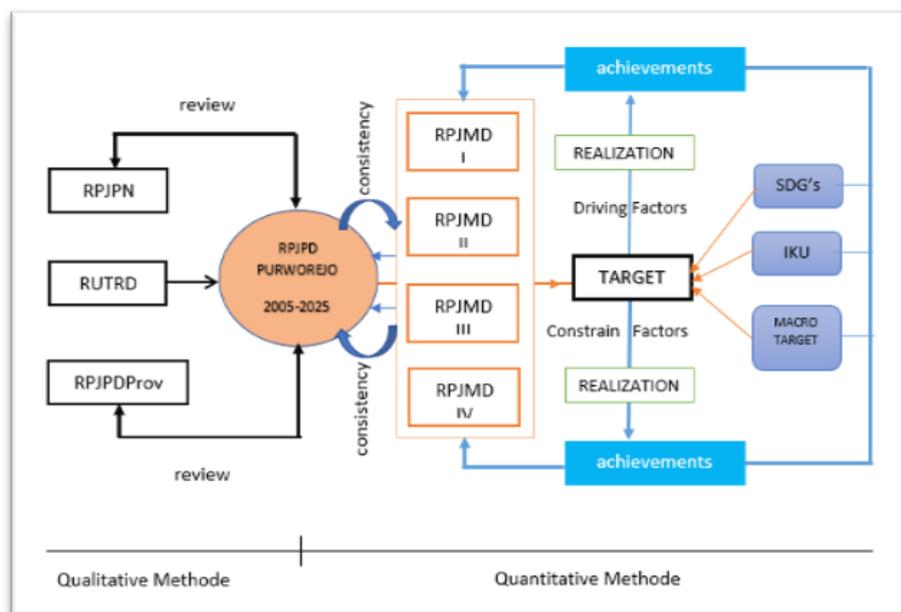


Figure 1: The Chart of RPJPD Evaluation Method of Purworejo Regency for 2005-2025

Source: Research Team

DISCUSSION

Strategic planning is flexible; therefore, its planning form varies. The strategic planning of various cases have different formats, styles, and substances. None of the forms of strategic planning is considered the most correct. Empirically, plans can vary depending on the situations related to the preparation and objectives of the planning process (Rider, 1983). Strategic planning holds significant potential in delivering benefits to the city and the community (i.e., one of which is evaluated based on the improvement of regional planning capacity or implemented innovations), even if it fails to implement its mission or achieve its vision (Abis E and Garau C, 2015).

The evaluation of the RPJPD of Purworejo Regency is conducted by assessing the alignment of the planning due to the objectives and the final results as a manifestation of its effectiveness. There is a listed format in the Regulation of Ministry of Home Affairs Number 86 of 2017, which all regions can use the

formats in evaluating development plans. The evaluation of the RPJPD of Purworejo Regency is regarded as the evaluation of the RPJPD conducted for the first time in Indonesia, specifically at the end of 2022. Based on two types of evaluation, according to (Kaiser et al., 1995), the RPJPD document evaluation of Purworejo Regency is included in the type of postadoption monitoring and evaluation because the RPJPD document of Purworejo Regency has been previously formulated with planning, objectives, and development targets for a period of 20 years. Furthermore, in the document, development planning is implemented, and the implementation process can be observed. Subsequently, it is ideally recommended to conduct monitoring and evaluation of quantitative data collection from various aspects every five years as a benchmark to ascertain the alignment of the development planning with the established objectives and targets. Afterward, the evaluation results can generate input and improvements for a better future development plan. The following are the quantitative evaluation results of the RPJPD of Purworejo Regency for 2005-2025.

THE EVALUATION OF THE PLANNING DOCUMENT FOR THE RPJPD OF PURWOREJO REGENCY

The implementation results are evaluated by considering the alignment and achievement of the visions, missions, and targets between the RPJPD and RPJMD documents. The alignment and achievement are analyzed using form E.56 in the Regulation of Ministry of Home Affairs of the Republic of Indonesia Number 86 of 2017.

THE VISION EVALUATION

The RPJPD of Purworejo Regency for 2005-2025 has a vision of “*Purworejo Daerah Agribisnis Yang Maju, Berdaya Saing, Mandiri, Lestari dan Sejahtera*” (Purworejo as an Advanced, Competitive, Independent, Sustainable, and Prosperous Agribusiness Region). The RPJMD of Purworejo Regency for 2005-2009 has a vision of “*Menuju masyarakat Purworejo yang lebih sejahtera dengan meningkatkan kemandirian serta daya saing, melalui penyelenggaraan pembangunan daerah yang aspiratif, dengan dukungan birokrasi profesional, dan bersih dari korupsi serta peran serta aktif sektor swasta dan masyarakat*” (Towards a more prosperous Purworejo community by increasing independence and competitiveness, through the implementation of aspirational regional development, supported by a professional bureaucracy, corruption free, and actively involving the private sector and the community). The visions of RPJPD and RPJMD in the first period have an alignment. It is noticeable through the utilization of the keywords of the RPJPD vision in the RPJMD vision, namely competitiveness, independence, and prosperity.

The second period, The RPJMD of Purworejo Regency for 2010-2014 has a vision of “*Menuju masyarakat Purworejo yang lebih sejahtera dengan meningkatkan kemandirian serta daya saing, melalui penyelenggaraan pemerintahan, pembangunan daerah, dan kemasyarakatan yang aspiratif bertumpu pada agribisnis, yang didukung birokrasi profesional dan bersih dari korupsi, kolusi dan nepotisme serta peran serta aktif sektor swasta dan masyarakat pada umumnya*” (Towards a more prosperous Purworejo community by increasing independence and competitiveness, through governance, regional development, and an aspirational community based on agribusiness, which is supported by professional bureaucracy and free from corruption, collusion, and nepotism as well as the active participation of the private sector and society in general). The utilization of keywords in the RPJPD vision of Purworejo Regency in the RPJMD for 2010-2014, including agribusiness, competitiveness, independence, and prosperity, demonstrates the alignment of visions between two development documents in Purworejo Regency.

During the third period of the RPJMD for 2015-2019, the alignment can also be indicated in the decline of the keywords used in the vision of the RPJPD of Purworejo Regency, namely agriculture/agribusiness and agriculture. The RPJMD of Purworejo Regency for 2015-2019 has a vision of “*Terwujudnya Kabupaten Purworejo Yang Semakin Sejahtera Berbasis Pertanian, Pariwisata, Industri, dan Perdagangan yang Berwawasan Budaya, Lingkungan dan Ekonomi Kerakyatan*” (The realization of a prosperous Purworejo Regency based on Agriculture, Tourism, Industry, and Trade with cultural, environmental, and people-oriented economic knowledge).

During the fourth period, the Development Plan of Purworejo Regency for 2020-2024 has a vision of “*Purworejo Berdaya Saing 2025*” (Purworejo is competitive in 2025). The utilization of the keyword "competitive" in this medium-term development document also demonstrates the alignment between the RPJPD document and the RPJMD document of Purworejo Regency.

Regarding the vision alignment, the overall RPJPD of Purworejo Regency for 2005-2025 has a high level of vision alignment and has been effectively interpreted into the Medium-Term Development Planning Documents. This alignment can be noticed from the utilization of keywords in the medium-term development planning document as the direction and the objective of development in Purworejo Regency.

THE ALIGNMENT OF MISSION

The RPJPD of Purworejo Regency for 2005-2025 has seven missions. Furthermore, the mission of the Medium-Term Development Planning Document of Purworejo Regency is varies. In determining this alignment, a comparison is made between the mission contained in the RPJPD of Purworejo Regency

document for 2005-2025 and Medium-Term Development Planning Document for each period.

In general, it can be inferred that the mission of the RPJPD of Purworejo Regency for 2005-2025 indicates a significant level of alignment with the medium-term planning document in the Regency. It is due to the formulation of medium-term planning documents, namely the RPJMD of Purworejo Regency for 2005-2009, 2010-2014, 2015-2019, and 2020-2024 refers to the missions that have been formulated in the RPJPD document of Purworejo Regency for 2005-2025.

In general, it indicates a high level of alignment between the mission of the long-term development planning documents and the Regional Medium-Term Development Plan of Purworejo Regency. It is revealed in the formulation of the medium-term development planning documents of Purworejo Regency, namely the RPJMD of Purworejo Regency for 2005-2009, 2010-2014, 2015-2019, and 2020-2024, which have been based on the missions outlined in the RPJPD document of Purworejo Regency for 2005-2025.

THE ALIGNMENT OF DEVELOPMENT TARGETS

The alignment of the main development targets of Purworejo Regency is conducted through a comparison between the development targets of the RPJPD of Purworejo Regency for 2005-2025 and the targets of the medium-term development planning documents. It is indicated that the main development targets of the RPJPD and the RPJMD of Purworejo Regency are in alignment. There is an alignment between the RPJPD of Purworejo Regency for 2005-2025 and the RPJMD of Purworejo Regency for 2005-2009. This alignment is related to the targeted sentence contained in the RPJMD document of Purworejo Regency for 2005-2009, which was formulated based on the RPJMD missions and aligned with the main development targets contained in the RPJPD of Purworejo Regency for 2005-2025. Furthermore, it indicates an alignment between the targets of the RPJPD and the RPJMD for 2010-2014. The RPJMD for 2010-2014 has 61 targets. The target of this RPJMD is formulated based on the mission of the RPJMD and aligned with the main development targets outlined in the RPJPD. Accordingly, it shows an alignment.

There are 58 targets in the RPJMD of Purworejo in period III. This target aligns with the existing target in the RPJPD of Purworejo for 2005-2025. The main development targets in the RPJPD of Purworejo Regency are implemented and detailed in the targets of the RPJMD in period III. Furthermore, the RPJMD in period IV, the RPJMD for 2020-2024, has 17 targets. These targets indicate an alignment with the targets contained in the RPJPD document.

The level of development targets achievement in each RPJMD period in Purworejo Regency varies, as explained below:

1. The Level of Performance Achievement of Development Targets in the RPJMD for 2005-2009
 The level of performance achievement of development targets in the RPJMD in period I is indeterminable and unquantifiable. It occurs due to the absence of target data for all performance indicators, despite the achievement data, resulting in the unknown (0%) or very low due to performance achievement of the RPJMD in period I.
2. The Level of Performance Achievement of Development Targets in the RPJMD for 2010-2014
 The level of performance achievement in the RPJMD development targets in period II is 94.08% or very high.
3. The Level of Performance Achievement of Development Targets in the RPJMN for 2015-2019
 The level of performance achievement of development targets in the RPJMD in period III is 89.79% or high. The percentage calculation of RPJMD in period III with performance achievement level uses the calculation of RPJMD period III + IKU (Key Performance Indicators) + macro target. Calculating the percentage of performance achievement in the RPJMD in period III is determined by calculating the RPJMD period III + IKU + macro targets.
4. The Level of Performance Achievement of Development Targets in The RPJMD for 2020-2024
 The level of performance achievement of development targets in the RPJMD in period IV + IKU is 83.94% or high.
5. The Level of Performance Achievement Assessed from the Overall Targets of The RPJPD in Each Period
 The table and graph depicting the achievement level of the main targets in each period of the RPJMD of Purworejo Regency are presented. The level of achievement varies. Additionally, period I cannot be calculated due to the unavailability of data.

Table 5: The Achievement Level of Basic Targets in Each Period of RPJMD

Target	Period I	Period II	Period III + 20 IKU + Macro Targets	Period IV + 30 IKU	Average
Target 1	0%	91.68%	89.19%	75.00%	63.97%
Target 2	0%	90.99%	94.40%	99.72%	71.28%
Target 3	0%	91.69%	75.42%	55.56%	55.67%
Target 4	0%	94.80%	99.95%	98.76%	73.38%
Target 5	0%	89.42%	96.82%	94.69%	70.23%

Target	Period I	Period II	Period III + 20 IKU + Macro Targets	Period IV + 30 IKU	Average
Target 6	0%	100%	85.71%	93.95%	69.92%
Target 7	0%	100%	87.06%	69.92%	64.24%

Source: The Calculations Research by Research Team

Table 5 shows the average level of achievement of the main target of the RPJPD of Purworejo Regency for 2005-2025, namely the average score of Target 1 is 63.97%, while Target 2 has achieved a 71.28%. Target 3 obtained an achievement level of 55.67%, and Target 4 reached 73.38%, which is the highest level. Meanwhile, targets 5, 6, and 7 respectively reach an achievement level of 70.23%, 69.92%, and 64.24%. Regarding the achievement level for each target, the score of the performance achievement level of the RPJPD of Purworejo Regency for 2005-2025 is 66.95%. Based on the Regulation of Ministry of Home Affairs Number 86 of 2017, this performance scoring level is in the category of Medium.

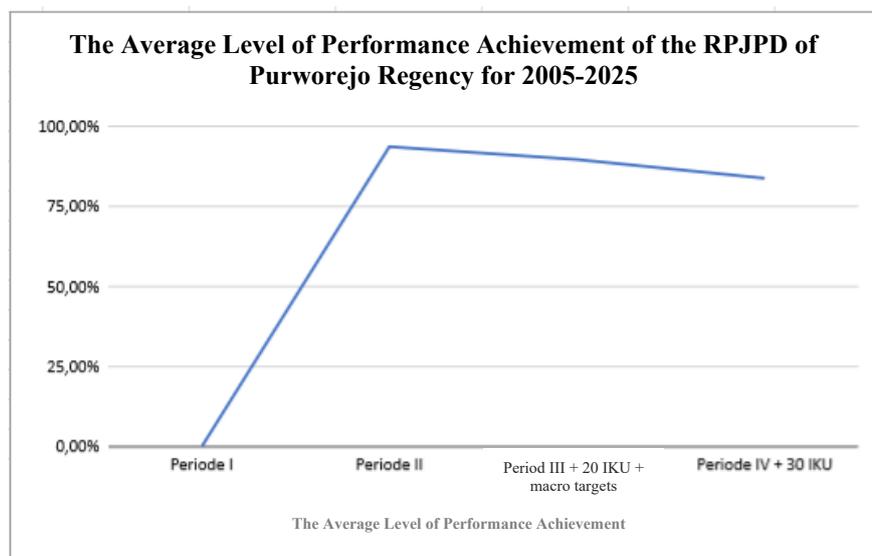


Figure 2: Graph The Average Level of Performance Achievement of The RPJPD of Purworejo Regency for 2005-2025

Source: The Calculating Results by Research Team

DRIVING AND INHIBITING FACTORS

Purworejo Regency, in the RPJPD implementation for 2005-2025, has several inhibiting factors and driving factors that affect the performance targets

achievement of RPJPD for 2005-2025, which are classified into five aspects: government aspects (i.e., apparatus, programs, regulations, and budget), infrastructure aspects (i.e., physic and environment), economic aspects, socio-cultural aspects, and time aspects.

- *Government Aspects*

An example of these driving factors is the presence of “One Agency One Innovation” policy contained in the RPJMD for 2021-2026, which mandates that all regional apparatuses must have a minimum of one innovation every year. In addition to the driving factors, government aspects also encompass several inhibiting factors, such as not optimal exploration and data collection of innovations implemented in a regional government. Many innovations have been implemented but lack legal standards, socialization to the public, and innovation from stagnant proper results due to the completion of Civil Servants (*Aparatur Sipil Negara*) hereinafter abbreviated as ASN training.

- *Infrastructure, Environmental, and Physical Aspects*

The examples of driving factors in infrastructure, environmental, and physical aspects include the improvement of healthcare service quality at both level I and higher level, supported by increased public healthcare financing, both through health insurance coverage and regional health insurance programs, as well as enhanced cross-program and cross-sector collaboration. The following driving factor is the ability to provide adequate infrastructure, which attracts investors in developing industries, services, and trades to enhance regional advancement as a priority in Purworejo Regency. It is also evidenced by the construction of the New Bogowonto Bridge as an infrastructure facility to enhance road accessibility. It accordance with (Hamzah et al., 2022) that infrastructure factors influence the assessment of the development of region.

There are also inhibiting factors from the aspects of infrastructure, environment, and physicality in many villages in Purworejo Regency topologically, whose raw water quality does not meet the standards of Minister of Health Regulation 492/2010, such as the water contains a high amount of *e-coli*, *Fe*, and others. Consequently, the necessity to use water sources from other regions causes the inability to acquire the clean water coverage percentage indicator.

- *Economic Aspects*

The driving factor in the economic aspect is the collaboration of private funding from Corporate Social Responsibility (CSR), which supports the development programs of tenements and special houses funded through CSR initiatives. Another example of driving factors in the economic aspect is the

rise in income due to the high purchasing power of the society, leading to efficient and well-distributed trade, increased demand for small and medium enterprise (SME) products, and the presence of government policies that support SMEs. The driving factors contribute to the achievement of the cooperative's growth percentage indicator.

Several inhibiting factors include funding relying on funds from Specific Allocation Fund (*Dana Alokasi Khusus*) hereinafter abbreviated as DAK and funding collaboration to accelerate the achievement of adequate sanitation. The inhibiting factors from an economic aspect can be assessed through the condition of the economy, as reflected by Gross Regional Domestic Product (*Produk Domestik Regional Bruto*) hereinafter abbreviated as PDRB, which fails to achieve key performance targets in the RPJPD.

- *Sociocultural Aspects*

An example of a socio-cultural aspect is the presence of driving factors leading to an increase in the proportion of women employed in the government sector, occupying strategic positions in the Regional Government, and the rising number of women members in Regional House of Representatives (*Dewan Perwakilan Rakyat Daerah*) hereinafter abbreviated as DPRD. Thus, it reaches the achievement of indicators of the Gender Development Index. The following example is the high work ethic among disaster personnel/volunteers and the strong moral support from the leadership and infrastructure elements of the BNPB (National Disaster Management Agency)

In the socio-cultural aspects, there are inhibiting factors, including the lack of awareness among communities to register their civil documents. This issue must be resolved to support the Movement of the Indonesian Awareness of Population Administration (GISA). Another inhibiting factor is the persistent reluctance among certain women employed in the government to undertake a duty outside of their town or undertake a duty that requires them to stay overnight. Furthermore, this case caused the women to lack professional development opportunities, although the potential achievement of the Gender Empowerment Index can be achieved. Another inhibiting factor from the socio-cultural aspect that has not achieved a performance score of up to 100% is the community's lack of habits to practice Clean and Healthy Living Behavior (*Perilaku Hidup Bersih dan Sehat*) hereinafter abbreviated as PHBS. Consequently, the indicator in the percentage of sanitation access has not reached its maximum.

- *Time Aspect*

The meaning of this time aspect refers to the period in which the implementation of the RPJPD is in accordance with the predetermined target

time or not. There is only one inhibiting factor in terms of time aspect, namely the lack of timeliness in the delivery of regional government financial reports following government accounting standards to support the achievement of audit opinion indicators by Audit Board of Indonesia (*Badan Pemeriksa Keuangan*) hereinafter abbreviated as BPK. The Regional Government Financial Reports (*Laporan Keuangan Pemerintah Daerah*) hereinafter abbreviated as LKPD receive an assessment in the form of an Opinion from BPK annually.

Regarding the five aspects of driving factors and inhibiting factors that can be identified, some dominant factors drive or inhibit the achievement of the RPJPD of Purworejo Regency for 2005-2025.

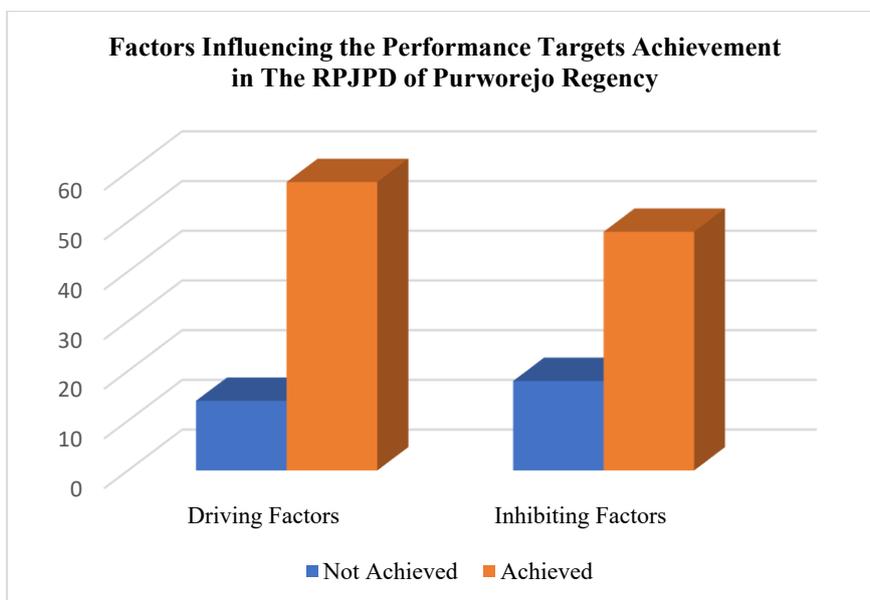


Figure 3: Graph Factors Influencing the Performance Targets Achievement in The RPJPD of Purworejo Regency for 2005-2025

Source: The Calculating Results by Research Team

Whether it can be achieved or not, performance achievement is influenced by the presence of driving and inhibiting factors. The graph above depicts the evaluation results of the RPJPD of Purworejo Regency for 2005-2025, which is evident that the factors influencing the performance achievement of the RPJPD main targets of Purworejo Regency for 2005-2025 are primarily driven by external factors. Furthermore, the driving and inhibiting factors can be further

detailed by identifying the most dominant aspects. These factors are based on the aspects of government, physicality, environment, and infrastructure.

CONCLUSIONS AND SUGGESTIONS

The implementation of the evaluation will show the level of success in the planning process, and it can also facilitate the tracking of future programs/activities to be conducted in the respective field. From the evaluation of the RPJPD documents of Purworejo Regency for 2005-2025, the conclusions can be drawn. First, the process of document evaluation was conducted based on the Regulation of Ministry of Home Affairs Number 86 of 2017. Specifically, it is further regulated in the attachment of the Regulation of Ministry of Home Affairs Number 86 of 2017 related to the standardized format that all regions can use it for conducting evaluations. The evaluation of the RPJPD of Purworejo Regency is regarded as the evaluation of the RPJPD conducted for the first time in Indonesia, specifically at the end of 2022. Second, the evaluation of the RPJPD document of Purworejo Regency for 2005-2025 reveals the alignment of vision and mission, and the quantitative calculations resulted in a performance achievement level of 66.95% for the RPJPD targets of Purworejo for 2005-2025. According to the Regulation of Ministry of Home Affairs Number 86 of 2017, the performance scoring level is in the medium category. Furthermore, some driving factors support the performance targets achievement of the RPJPD main objectives of Purworejo Regency for 2005-2025, including government, economy, infrastructure, and socio-cultural aspects. The government is the dominant aspect that supports the achievement of development performance targets. The inhibiting aspects that hinder the achievement of performance targets in the RPJPD of Purworejo Regency in 2005-2025 are the aspects of economic, infrastructure, socio-culture, and time.

From the results of the evaluation, there are several recommendations, including the need for comprehensive data and information on regional development planning to facilitate the measurement of target achievements, the formulation of the initial draft of the RPJPD should be completed no later than one year before the end of the previous RPJPD period, and the RPJPD document should undergo evaluation at least every five years to ensure adaptability and accommodation to the current situation and conditions.

REFERENCES

- Abis E and Garau C. (2015). *An Assessment of the Effectiveness of Strategic Spatial Planning: A Study of Sardinian Municipalities*. European Planning Studies.
- Ahmad, F., Mohd, I., Maidin, S. L., Zainol, R., & Noor, N. M. (2013). Malaysian Development Plan System: Issues and Problems, One Decade after its reform (2001-2011). *Planning Malaysia, XI*, 1–20.
- Ali, W. N. W., & Ahmad, A. G. (2022). A systematic Evaluation Tool For Heritage Shophouse Facades. *Planning Malaysia, 20(2)*.

- Bellamy, R., Lezaun, J., & Palmer, J. (2017). Public perceptions of geoengineering research governance: An experimental deliberative approach. *Global Environmental Change*, 45(194–202).
- Bryson, J. M., & Crosby, B. C. (2009). Understanding strategic planning and the formulation and implementation of strategic plans as a way of knowing: The contributions of actor-network theory. *International Public Management Journal*, 12(2), 172–207. <https://doi.org/10.1080/10967490902873473>
- Freedman. (2013). *Strategy: A History*. University Press.
- Hamel, G, & Prahalad, C. K. (1994). *Competing for the Future*. Harvard Business School Press.
- Hamzah, E., Rohaizad, N. F. H. M., Hashim, H. A., & Ismail, A. (2022). Qualifying and Quantifying the Intangible Factors that Enhance in Infrastructure Asset Evaluation. *Planning Malaysia*.
- IK Winaya, I. D. Y. (2017). Analisis Perencanaan Dan Penyusunan Anggaran Pendapatan Dan Belanja Desa (Apbdes) Tahun 2017. *No Name*, 2017, 1–8.
- Kaiser et al. (1995). Urban Land Use Planning. In *University of Illinois Press: Urbana*.
- Lim, S., Malek, J. A., Hussain, M. Y., & Tahir, Z. (2019). The Behaviours and Job Positions of Citizens in Smart Cities Development. *Planning Malaysia*, 133–145.
- Lukasiewicz, A., Vella, K., Mayere, S., & Baker, D. (2020). Declining trends in plan quality: A longitudinal evaluation of regional environmental plans in Queensland, Australia. *Landscape and Urban Planning*, 203.
- Nasution, M. A., & Achmad, N. (2021). Model Evaluasi Perencanaan Pembangunan di Sumatera Development Planning Evaluation Model in North Sumatra. *JUPIIS: Jurnal Pendidikan Ilmu-Ilmu Sosial*, 13(1), 210–223.
- Pemerintah Indonesia. (2004). *Undang-Undang Nomor 25 tahun 2004 tentang Sistem Perencanaan Pembangunan Nasional*.
- Pemerintah Indonesia. (2014). *Undang-Undang Nomor 23 Tahun 2014 tentang Pemerintahan Daerah*.
- Pemerintah Indonesia. (2017). *Peraturan Menteri dalam Negeri Nomor 86 Tahun 2017 Tentang Tata Cara Perencanaan, Pengendalian dan Evaluasi Pembangunan Daerah, Tata Cara Evaluasi Rancangan Peraturan Daerah Tentang Rencana Pembangunan Jangka Panjang Daerah dan Rencana Pembangunan Jangka* .
- Rider, R. W. (1983). *Making strategic planning work in local government. Long Range Planning*.
- Riyadi dan Baratakusumah, D. S. (2008). *Perencanaan Pembangunan Daerah: Strategi Menggali Potensi dalam Mewujudkan Otonomi Daerah*. Gramedia Pustaka Utama.
- Roberts, N. (2000). The Synoptic Model of Strategic Planning and the GPRA: Lacking a Good Fit with the Political Context. *Public Productivity & Management Review*, 23(3), 297. <https://doi.org/10.2307/3380721>
- Sriharyati, S., & Sholihannisa, L. U. (2020). Evaluasi Perencanaan Pembangunan Kabupaten Bandung Barat dengan Menggunakan Analytic Hierarchy Procces (AHP). *ATRABIS: Jurnal Administrasi Bisnis*, 6(1), 59–84.
- Syahroni. (2002). *Pengertian Dasar dan Genetik tentang Perencanaan*.
- Tjokroamidjojo, B. (2002). *Pembangunan Desa dan Masalah Kepemimpinannya*. Rajawali.

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ENHANCING QUALITY OF LIFE IN THE CAMPUS COMMUNITY: THE EFFECTIVENESS OF THE GREEN CAMPUS INITIATIVE

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Abstract

This study seeks to investigate the existing green practices implemented at UniSZA to achieve sustainability and enhance the quality of life for campus society. This study employs quantitative methodologies, specifically utilizing questionnaire survey techniques to gather empirical data. The Pearson Correlation and Cluster Analysis were utilized to determine the correlation among the questions. The result indicates that there is a positive correlation between all questions. Only some questions have weak correlations which correlated to the recognition of the significance of sustainability and the adoption of tangible measures to translate its principles into reality. The cluster analysis successfully sorted the 20 questions related to green campus and perceived quality of life into three distinct clusters: high perceived quality of life, moderate perceived quality of life, and low perceived quality of life. The findings indicated that the UniSZA society expressed a good perceived quality of life regarding their mean score. However, in terms of satisfaction with their campus society, UniSZA still lacks the green campus aspect implementation. Therefore, it is imperative to heighten awareness of the green campus aspect through the collaboration of the entire campus society, emphasizing the importance of green technology in achieving sustainable development.

Keywords: Cluster Analysis; Green Campus; Pearson Correlation; Sustainability; Quality of Life

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INTRODUCTION

Sustainable Campus Development in Malaysia

Promoting awareness of green technology and its societal application has the potential to enhance understanding and mitigate adverse environmental effects (Ismail et al., 2023). In the realm of strategic significance, Institutions of Higher Education play a pivotal role in augmenting awareness surrounding sustainable development. The development of campus sustainability involves integrating sustainable environmental practices into institutional processes at the higher education level. The execution of environmentally conscious initiatives in higher education, aimed at fostering sustainability achievements encompassing waste reduction, energy efficiency, diminished water utilization, the promotion of healthy working environments, and the enhancement of indoor air quality (Gomez & Yin Yin, 2019).

The issue of sustainable campus development is emerging as a pivotal concern in Malaysia. To facilitate sustainable campus development, various components necessitate consideration, taking into account the specific needs and requirements distinctive to the university in question (Nifa et al., 2016). The concept of sustainability in higher education institutions was initially broached during the Stockholm Declaration of 1972, where the central focus was on environmental protection. This declaration also introduced the concept of "environmental education" (Sadeli et al., 2002). Fostering a connection between humanity and the environment, and acknowledging their interdependence, is essential for achieving environmental sustainability (see Azinuddin et al., 2022; Azwar et al., 2023). This involves exploring approaches through which universities, including administrators, faculty, researchers, and students, can leverage their resources to tackle the challenges associated with reconciling human endeavours for economic and technological progress with the imperative of environmental conservation (Saad et al., 2023; Salleh et al., 2023; Dawodu et al., 2022; Zhu et al., 2020).

Despite the slower adoption of the green university concept in Malaysia compared to other nations, an increasing number of universities in the country are actively participating in assessments for environmentally-friendly campuses. In alignment with the support provided by the Malaysian government for the advancement of green university campuses in the nation (Anthony Jnr, 2021; Nifa et al., 2016). In the challenges encountered during the establishment of green campuses in universities, researchers have identified that the primary reason for the majority of institutions not embracing green practices is a deficiency in understanding green campus paradigms among Malaysian university management, stakeholders, and practitioners. (Anthony Jnr, 2021; Zhu et al., 2020) and inadequacy of campus infrastructure (Muhiddin et al., 2023).

The UI Green Metric Ranking

The consideration of sustainability aspects has emerged as a crucial determinant, even influencing university rankings. In 2010, Universitas Indonesia, aspiring to attain world-class status, established an online "green" ranking system for global universities. This initiative aimed to provide an overview of the prevailing conditions and policies concerning green campus and sustainability across universities worldwide (Gomez & Yin Yin, 2019; Suwartha & Sari, 2013). The UI Green Metric World University Ranking evaluates the sustainability of universities across environmental, economic, and social dimensions (Muhiddin et al., 2023; Pereira Ribeiro et al., 2021). The UI Green Metric World University Ranking relies on six primary criteria derived from information provided by participating universities, showcasing their dedication to environmental sustainability (Gomez & Yin Yin, 2019; Tiyarattanachai & Hollmann, 2016). These criteria encompass environment and infrastructure, energy and climate change, waste management, water supply, transport, and education (Abakumov & Beresten, 2023). Consequently, these initiatives have the potential to yield an ameliorated quality of life (QoL) for all stakeholders, bolster economic vitality, and contribute to a diminished environmental footprint (Anthony Jnr, 2021).

Enhancing the QoL for the campus society is imperative to support the mindset of the entire academic community and stakeholders in implementing the sustainable development policy for green campuses (Bakaruddin & Idris, 2022). Therefore, this study aimed to examine the existing green initiatives implemented at UniSZA regarding the quality of life of the campus society.

RESEARCH METHODOLOGY

Study Design

This study employs a quantitative approach, utilizing primary data collection through the use of questionnaire techniques. The participants included in this study were randomly chosen from the community of UniSZA. Presently, UniSZA functions across three campuses: the primary campus located at Gong Badak as the main campus, the Medical Campus, and the Besut Campus. The university is currently focused on achieving sustainability with the motto "Green Campus, Bright Minds". From the overall population of campus society, respondents were randomly selected to receive questionnaires via e-mail. Of those sampled, 420 campus society responded to the survey. Per the criteria established by Krejcie and Morgan (1970), the determined sample size is deemed adequate for effectively representing the population.

The survey comprised two sections. The demographic segment of the instrument comprised inquiries about the participants' educational attainment, gender, marital status, and ethnic identity. Furthermore, participants were queried about their experiences in undertaking courses related to green campuses and

participating in sustainability-focused activities. The answers were gauged through the use of multiple-choice queries. The second section of the survey, Part II, comprised 20 questions aimed at eliciting information on Green Campus aspects and gauging respondents' perceptions of quality of life. Primarily, these questions were formulated based on the six categories outlined in the UI Green Metric criteria. To guarantee accurate comprehension and interpretation of the inquiries, all questions were presented in English, accompanied by Malay translations provided beneath each question. The answers were assessed utilizing a five-point Likert scale, where the alternative items were designated from 5 (strongly agree) to 1 (strongly disagree).

Statistical Analysis

Pearson Correlation Analysis

The gathered data underwent entry into an Excel file and subsequent analysis utilizing the XLSTAT software. The demographic information of the respondents was examined and presented through the utilization of descriptive analysis. The determination of the average response level on the five-point Likert scale involved employing the arithmetic mean. The Pearson correlation analysis was then analysed to establish a connection between the questions and define the relationship between them.

The association, or correlation, between the two variables, is represented by the symbol ' r ' and expressed as a numerical value ranging from -1 to +1. A value of zero indicates no correlation, while 1 signifies a complete or perfect correlation. The sign of ' r ' indicates the direction of the correlation, with a negative ' r ' implying an inverse relationship between the variables. The magnitude of the correlation strengthens as it moves from 0 to +1 or 0 to -1 (Kamarudin et al., 2017; Akoglu, 2018).

Cluster Analysis

Cluster analysis (CA) serves as a method to amalgamate observations into groups or clusters, ensuring homogeneity or compactness concerning specific characteristics. This implies that within each group or cluster, the observations exhibit similarity to one another (Toriman et al., 2015). Each group should exhibit dissimilarity from other groups concerning the same characteristics; specifically, the observations within one group should differ from those in other groups. Hierarchical agglomerative cluster analysis was conducted on normalized datasets employing the Ward's method, utilizing single Euclidean distances as a metric for assessing similarity. Subsequently, the classification of objects can be visually represented in a dendrogram to evaluate the cohesion of the formed clusters (Novák et al., 2017). The cluster analysis serves as a complement to Pearson correlation analysis.

ANALYSIS AND DISCUSSION

Socio-Demographic Conditions

The demographic details of the participants were gathered and displayed in Table 1. Respondents were drawn from diverse demographic backgrounds and characteristics, ensuring that the sampling represents the UniSZA society in a random manner.

Table 1: Profile of the respondents

Respondents Profile	Percentage (%)
<i>Sex</i>	
Male	29.286
Female	70.714
<i>Age</i>	
18-24	46.429
25-34	17.857
35-44	24.286
45-54	10.000
55-64	1.429
<i>Educational Level</i>	
Diploma / DKM 4 / DKLM 5	3.571
Postgraduate (Master's Degree /PhD)	37.857
Sijil Tinggi Pelajaran Malaysia (STPM)	0.714
Undergraduate (Bachelor's Degree)	57.857
<i>Experience of taking courses related course ("green campus")</i>	
No	68.571
Yes	31.429
<i>Experience of enrolling activities focused on sustainability</i>	
No	30.714
Yes	69.286

Table 1 presents the percentage distributions based on gender, indicating a higher representation of female respondents (70.71%) in comparison to male respondents (29.29%). A predominant portion of the respondents falls within the age range of 18-24 years old, accounting for 46.43%. It is noteworthy that this age range is indicative of respondents being students at UniSZA. In the realm of education, a significant proportion of the respondents (57.86%) held bachelor's degrees, signifying a relatively high level of education among the

respondents. In this study, it was discovered that despite the majority of respondents not embracing a green campus-related course (68.57%), a higher percentage of them engage in activities associated with environmental sustainability (69.29%). This suggests their keen interest in actively contributing to the success of environmental preservation efforts.

Green Campus and the Perceived QOL

A statistical analysis was conducted to assess the correlations among various facets of the green campus through the utilization of Pearson correlation coefficient (r) model with statistical significance set at $P > 0.05$. This examination was executed employing statistical software, specifically XLSTAT. The correlation matrix in Table 2 Shows all green campus aspects had a significant positive relationship with all other green campus aspects. In the context of this study, we interpret a correlation coefficient surpassing 0.7 as indicative of a robust correlation between the variables (Schober & Schwarte, 2018). From the Pearson correlation, we identified there are strong positive correlation between some questions, SB2 with SB4 ($r=0.763$) and SB13 ($r=0.720$), SB6 with SB9 ($r=0.748$), SB9 with SB10 ($r=0.821$), SB11 ($r=0.720$), SB12 ($r=0.770$), SB10 with SB12 ($r=0.726$) and SB15 with SB16 ($r=0.765$).

The highest strong positive relationship is between SB9 and SB10 ($r=0.821$). The inquiries pertain to how the university's management of a green campus may contribute to the improved Qol within the community. The lack of significant difference in mean scores between question SB9 ($r=4.48$) and SB10 ($r=4.58$) as shown in Table 3, suggests a shared awareness regarding the implementation of green campus practices at the university. The results specify that the proportion of the university's adoption of environmental sustainability management is a contributing factor to the improvement of the Qol life within its community.

Table 2: Pearson's Correlation Matrix Among Green Campus Aspects in The Study Area

	SB 1	SB 2	SB 3	SB 4	SB 5	SB 6	SB 7	SB 8	SB 9	SB 10	SB 11	SB 12	SB 13	SB 14	SB 15	SB 16	SB 17	SB 18	SB 19	SB 20	
SB 1	1																				
SB 2	0.2	1																			
SB 3	0.5	0.3	1																		
SB 4	0.2	0.7	0.2	1																	
SB 5	0.5	0.2	0.5	0.2	1																
SB 6	0.4	0.4	0.4	0.4	0.4	1															
SB 7	0.4	0.2	0.3	0.1	0.6	0.4	1														
SB 8	0.4	0.2	0.3	0.2	0.6	0.4	0.6	1													
SB 9	0.4	0.3	0.4	0.3	0.4	0.7	0.4	0.5	1												
SB 10	0.4	0.3	0.4	0.3	0.4	0.6	0.4	0.5	0.8	1											
SB 11	0.4	0.3	0.4	0.3	0.4	0.6	0.4	0.5	0.8	0.8	1										
SB 12	0.4	0.3	0.4	0.3	0.4	0.6	0.4	0.5	0.8	0.8	0.8	1									
SB 13	0.4	0.3	0.4	0.3	0.4	0.6	0.4	0.5	0.8	0.8	0.8	0.8	1								
SB 14	0.4	0.3	0.4	0.3	0.4	0.6	0.4	0.5	0.8	0.8	0.8	0.8	0.8	1							
SB 15	0.4	0.3	0.4	0.3	0.4	0.6	0.4	0.5	0.8	0.8	0.8	0.8	0.8	0.8	1						
SB 16	0.4	0.3	0.4	0.3	0.4	0.6	0.4	0.5	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1					
SB 17	0.4	0.3	0.4	0.3	0.4	0.6	0.4	0.5	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1				
SB 18	0.4	0.3	0.4	0.3	0.4	0.6	0.4	0.5	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1			
SB 19	0.4	0.3	0.4	0.3	0.4	0.6	0.4	0.5	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1		
SB 20	0.4	0.3	0.4	0.3	0.4	0.6	0.4	0.5	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1	

Table 3: Comparison of mean score regarding to perceived Qol

Item	Question	Mean Score	SD
SB1	Environmental management is important for the university's campus	4.864	0.482
SB2	You are satisfied with the environmental management of your university	3.643	0.987
SB3	The university's available green campus region is important for you	4.543	0.670
SB4	Your university provides enough green space to support a high quality of life/	3.657	1.007
SB5	Energy saving is a very important practice for your university	4.550	0.670
SB6	The university's energy saving practices do support a high quality of life	4.436	0.768
SB7	Climate change mitigation programs (greenhouse gas emission reduction) are very important practices for your university	4.393	0.735
SB8	Waste management (for example, waste separation, waste reduction) is very important for your university	4.593	0.727
SB9	The university's waste management (for example, waste separation and waste reduction) does support a high quality of life	4.479	0.771
SB10	University's water management (water sources saving) does support a high quality of life	4.557	0.721
SB11	The university's transportation conditions (such as the amount of traffic and availability of public transportation) do support a high quality of life	4.264	0.868
SB12	The university's environmental education (academic courses and activities related to environmental issues) does support a high quality of life	4.414	0.775
SB13	You are satisfied with the overall quality of your life on campus	3.707	0.931
SB14	If you are a university applicant, "green campus" status would be one of your selection criteria	4.236	0.790
SB15	University's Green Campus does support a high quality of life on campus	4.457	0.741
SB16	The participation in any sustainability-focused programmes or activities on campus will be give many benefits of having a progressive green university campus both for students and for the broader community	4.500	0.682
SB17	Livable communities: University Sultan Zainal Abidin (UNISZA) community is good and secure has affordable and proper accommodations and transportation choices and offers a steady community features and services	4.043	0.886
SB18	Indoor Air Quality (IAQ): The quality of Indoor air within University Sultan Zainal Abidin (UNISZA) is healthy and comfortable for students and staff	4.057	0.894

Continued...			
SB19	Water conservation: There is adequate preservation, control, and development of water resources at University Sultan Zainal Abidin (UNISZA) such as surface water and groundwater	3.836	0.892
SB20	Energy efficiency: University Sultan Zainal Abidin (UNISZA) uses optimum energy to perform the same task. For example, use of a compact fluorescent bulb than a traditional incandescent bulb, located windows that aid ventilation	3.871	0.902

This study supported by Bakaruddin & Idris (2022) and Tiyyarattanachai & Hollmann (2016), where the findings suggest that incorporating sustainable green campus management contributes to improving the quality of life within the community. The highest mean score by question 1 (4.86), verify that environmental management is important for the university's campus and exhibited a slightly more favourable perception of quality of life. The outcome aligns with the findings of the study by Tamiami et al. (2018). SB9 has highest correlation with SB10, SB11 and SB12 signifying an interconnection between these questions. The questions related to the university's management of green technology imply a positive influence on improving the quality of life within the campus society. The mean score of these questions ranging from 4.41 to 4.56 signifying the campus society expressed greater satisfaction with the aspects of sustainability management on their campus and reported a higher perceived quality of life.

The correlation analysis revealed the absence of negative correlations among the questions. Nevertheless, a few questions exhibit a weak correlation among them. The relationship of SB1 with SB 19 (0.165), SB4 with SB7 (0.163) and SB7 with SB13 (0.116), SB17 (0.183), SB19 (0.164) and SB20 (0.141) had weak correlation which indicates campus society express satisfaction with the institution's environmental management, yet there is a lack of understanding regarding the university's environmental sustainability program. This is supported by numerous scholarly investigations where the campus society perceive sustainability as crucial, yet they do not perceive themselves as sufficiently acquainted with its conceptual framework. This discernible discrepancy suggests a gap between the acknowledgment of the importance of sustainability and the implementation of concrete measures to actualize its principles (Choi et al., 2017; Pereira Ribeiro et al., 2021).

Classification of Green Campus and Perceive Quality of Life

The hierarchical representation of the green campus dendrogram, correlating with the perceived quality of life, as illustrated in Figure 1, has been categorized into three distinct clusters denoted as High Perceived Quality of Life (HPQol),

Moderate Perceived Quality of Life (MPQol), and Low Perceived Quality of Life (LPQol).

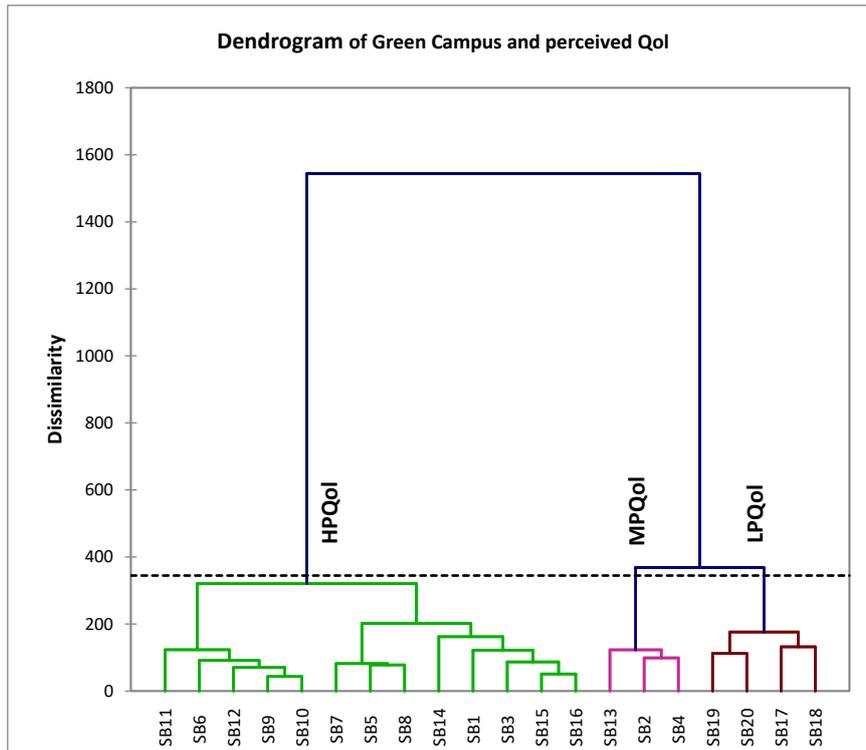


Figure 1: Dendrogram of Green Campus and perceived Qol

The HPQol was found for 13 questions (SB1, SB3, SB5, SB6, SB7, SB8, SB9, SB10, SB11, and SB12). This cluster has the highest mean score among the other cluster which indicate a good perceived quality of life among UniSZA society. The questions are about the management of UniSZA practising a good green campus practice. Many studies reported that a campus designed with green initiatives has the potential to offer comfort to its inhabitants, fostering an improved perception of their quality of life (Bakaruddin & Idris, 2022; Tamiami et al., 2018). In line with the study by Tiyyarattanachai & Hollmann (2016) stated that green campus practice exhibited a markedly superior perceived quality of life.

The second cluster (MPQol) characterized by a mean score ranging from 3.83 to 4.04, with four questions (SB17, SB18, SB19, SB20) reflect the extent of UniSZA society's awareness regarding the implementation of green campus practices at the university. Their awareness level concerning UniSZA

practices is notably commendable. To augment the awareness of campus society regarding the incorporation of green campus practices in the university, certain studies propose disseminating information to all individuals through the integration of a green curriculum (Muhiddin et al., 2023). A preceding investigation revealed that students who had previously enrolled in courses pertaining to sustainability or actively participated in sustainable student activities exhibited a higher level of knowledge regarding green campus strategies and initiatives (Choi et al., 2017).

The designation of the lowest mean score for green campus and perceived Quality of Life as LPQol (SB2, SB4 and SB13) signifies the contentment of the UniSZA society with the implementation of green campus practices at UniSZA. The mean score within the moderate range (3.64 to 3.71) signifies that the UniSZA society expressed a less-than-fulfilled sentiment regarding the green campus practices. According to Tamiami et al. (2018), the concept of quality of life pertains to present contentment. They observe that a Green University not only enhances comfort but also has the potential to significantly improve the quality of life for its society. This study posits the necessity to enhance green campus practices in order to uplift the quality of life within the respective society. These three types of classes (HPQol, MPQol and LPQol) were utilized as reference points for grouping the similarities in variation among 20 questions can be condensed to just three questions for future research. Streamlining and reducing the number of questions related to the green aspect and perceived quality of life will yield efficient outcomes, saving both costs and time.

CONCLUSION

The current investigation has tackled the green campus initiative strives for Qol among UniSZA society is at a level deemed satisfactory. It is noteworthy that the implementation of the green campus aspect at UniSZA remains at a moderate level. In the UI GreenMetric Ranking 2023, UniSZA is positioned at number 245, attaining a total score of 7550 for the comprehensive assessment of established aspects. Hence, UniSZA ought to endorse and strive to incorporate the criteria outlined in the UI GreenMetric World University Ranking for their campuses which requires support from all stakeholders within the university.

This study suggest that the university campus should adopt a resilient green design strategy with the intention of enhancing the quality of life for campus society and fostering an elevated sense of comfort among them. This can be achieved though the optimal collaboration amongst different stakeholders within the realm of university. Such collaboration is important since any university relies on the interdependency of actors within the university system as they need to work together in producing a cohesive output in terms sustainability

derived from the green campus initiative (see Azinuddin et al., 2023). A university integrating a green design concept is poised to enhance the quality of life. A Green University provides heightened comfort and can significantly improve the overall well-being of its community.

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REFERENCES

- Abakumov, E., & Beresten, S. (2023). Green Campus as a Part of Environmental Management of St. Petersburg State University. *Sustainability (Switzerland)*, 15(16).
- Akoglu, H. (2018). User's guide to correlation coefficients. *Turkish Journal of Emergency Medicine*, 18(3), 91–93. <https://doi.org/10.1016/j.tjem.2018.08.001>
- Anthony Jnr, B. (2021). Green campus paradigms for sustainability attainment in higher education institutions – a comparative study. *Journal of Science and Technology Policy Management*, 12(1), 117–148.
- Azinuddin, M., Zain, W. M. A. W. M., & Shariffuddin, N. S. M. (2022). Tourism Sustainability: Perspectives on Past Works, Issues and Future Research Opportunities. In *Environmental Management and Sustainable Development: Case Studies and Solutions from Malaysia* (pp. 39-51). Cham: Springer International Publishing.
- Azinuddin, M., Shariffuddin, N. S. M., Som, A. P. M., Salim, M. A. M., & Eppang, B. M. (2023). Interrelationship of networks, knowledge, and performance of businesses through the lens of coastal destination development. *Planning Malaysia*, 21(4), 376-389.
- Azwar, H., Hanafiah, M. H., Abd Ghani, A., Azinuddin, M., & Shariffuddin, N. S. M. (2023). Community-Based Tourism (CBT) moving forward: Penta helix development strategy through community local wisdom empowerment. *Planning Malaysia*, 21, 72-88.
- Bakaruddin, A. I., & Idris, H. A. (2022). Improving The Quality Of Life Of The Academic Community In The Application Of Green Campus At The Muhammadiyah Riau University. *Journal of Positive School Psychology*, 6(6), 7590–7600.
- Choi, Y. J., Oh, M., Kang, J., & Lutzenhiser, L. (2017). Plans and living practices for the green campus of portland state university. *Sustainability (Switzerland)*, 9(2).
- Dagiliūtė, R., Liobikienė, G., & Minelgaitė, A. (2018). Sustainability at universities: Students' perceptions from Green and Non-Green universities. *Journal of Cleaner Production*, 181, 473–482.
- Dawodu, A., Dai, H., Zou, T., Zhou, H., Lian, W., Oladejo, J., & Osebor, F. (2022). Campus sustainability research: indicators and dimensions to consider for the design and assessment of a sustainable campus. *Heliyon*, 8(12), e11864.
- Gomez, C. P., & Yin Yin, N. (2019). Development of a progressive green university

- campus maturity assessment tool and framework for Malaysian universities. *MATEC Web of Conferences*, 266, 01018.
- Ismail, W. N. A. T., Amin, A., Kamarudin, M. K. A., Ibrahim, A., & Salleh, N. S. N. M. (2023). Community concerns of river pollution spatial model using Geographic Information System (GIS) in Ibai River, Terengganu. *Planning Malaysia*, 21(1), 89-100.
- Kamarudin, M. K. A., Toriman, M. E., Wahab, N.A., Juahir, H., Endut, A., Umar, R., Gasim, M.B. (2017). Development of stream classification system on tropical areas with statistical approval in Pahang River Basin, Malaysia. *Desalination and Water Treatment*, (96), 237-254.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational Psychology Measurement*, 30, 607-610.
- McFarland, A. L., Waliczek, T. M., & Zajicek, J. M. (2008). The relationship between student use of campus green spaces and perceptions of quality of life. *HortTechnology*, 18(2), 232-238.
- Muhiddin, A. A. M., Isa, H. M., Sakip, S. R. M., Nor, O. M., & Sedhu, D. S. (2023). Green Campus Implementation in the Malaysian Public Universities: Challenges and Solutions. *Planning Malaysia*, 21(1), 274-298.
- Nifa, F. A. A., Wan Mohd Rani, W. N. M., Ismail, M. N., & Rahim, S. A. (2016). Towards developing a sustainable campus: Best practice approach. *International Journal of Supply Chain Management*, 5(4), 131-138.
- Novák, M., Palya, D., Bodai, Z., Nyiri, Z., Magyar, N., Kovács, J., & Eke, Z. (2017). Combined cluster and discriminant analysis : An efficient chemometric approach in diesel fuel characterization. *Forensic Science International*, 270, 61-69.
- Pereira Ribeiro, J. M., Hoeckesfeld, L., Dal Magro, C. B., Favretto, J., Barichello, R., Lenzi, F. C., Secchi, L., Montenegro de Lima, C. R., & Salgueirinho Osório de Andrade Guerra, J. B. (2021). Green Campus Initiatives as sustainable development dissemination at higher education institutions: Students' perceptions. *Journal of Cleaner Production*, 312(May).
- Rosli, N. F., Rabe, N. S., & Osman, M. M. (2018). Perception of Quality of Life Among Community in Selangor. *Planning Malaysia*, 16(2), 12-20.
- Saad, M. H. M., Kamarudin, M. K. A., Toriman, M. E., Wahab, N.A, Ata, F. M., Samah, M. A. A., Manoktong, S. N. (2023). Analysis of the Flash Flood Event and Rainfall Distribution Pattern on Relau River Basin Development, Penang, Malaysia. *Planning Malaysia*, 21(1), 58-71.
- Sadeli, S., Ismail, R., Syuhada, E., Ishan, M., Zamilah, S., Hamed, A., Fadil, M. M., & Bahari, R. (2002). Green Campus Awareness Among Diploma Students in Utm Kuala Lumpur: Preliminary Investigation. *Jurnal Teknikal & Kajian Sosial (JUTEKS)*, 20(2), 52-57.
- Salleh, N. S. N. M., Zin, S. M., Abdullah, I. H. T., Sulaiman, W. A. T. W., & Ismail, W. N. A. T. (2023). Developing talent and performance of government employees, capacitate malaysia's development plan. *Planning Malaysia*, 21(6), 144-156.
- Schober, P., & Schwarte, L. A. (2018). Correlation coefficients: Appropriate use and interpretation. *Anesthesia and Analgesia*, 126(5), 1763-1768.
- Suwartha, N., & Sari, R. F. (2013). Evaluating UI GreenMetric as a tool to support green universities development: Assessment of the year 2011 ranking. *Journal of*

- Cleaner Production*, 61, 46–53.
- Tamiami, H., Khaira, F., & Fachrudin, A. (2018). Green design application on campus to enhance student's quality of life. *IOP Conference Series: Materials Science and Engineering*, 309(1).
- Tiyarattanachai, R., & Hollmann, N. M. (2016). Green Campus initiative and its impacts on quality of life of stakeholders in Green and Non-Green Campus universities. *SpringerPlus*, 5(1), 1–17.
- Toriman, M. E., Abdullah, S. N. F., Azizan, I. A., Kamarudin, M. K. A., Umar, R., & Mohamad, N. (2015). Spatial and temporal assessment on drug addiction using multivariate analysis and GIS. *Malaysian Journal of Analytical Sciences*, 19(6), 1361–1373.
- Zhao, H., Xu, Y., Hong, W. C., Liang, Y., & Zou, D. (2021). Smart evaluation of green campus sustainability considering energy utilization. *Sustainability (Switzerland)*, 13(14), 1–21.
- Zhu, B., Zhu, C., & Dewancker, B. (2020). A study of development mode in green campus to realize the sustainable development goals. *International Journal of Sustainability in Higher Education*, 21(4), 799–818.

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TRANSPORT POLICIES, TRANSIT-ORIENTED AND DEVELOPMENT REDISTRIBUTION OF POPULATION IN PERI-URBAN: LESSONS FROM KUALA LUMPUR AND JAKARTA METROPOLITAN AREA

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Abstract

Transit-Oriented Development (TOD) is the representation of a compact land-use management strategy relying on a mixture of land use and transport concepts to manage urban sprawl and population. The concept promotes high-density housing, mixed land use, and integrated mobility. Therefore, this article aims to discuss the incorporation process of TOD concept into urban policies and transport planning in Southeast Asian metropolitan cities. The effects of the policies on population movement patterns are examined, specifically in peri-urban areas, which are the most difficult parts of cities. In addition, the case studies include Jakarta and Kuala Lumpur, representing two of the most rapidly developing metropolitan areas in Southeast Asia where TOD has been progressively adopted. Data and information are collected from documentary reviews and interviews. The results show that the duration of TOD policy implementation gives rise to distinct trajectories in peri-urban population redistribution experiences within the two metropolitan areas.

Keywords: TOD, Transit Policy, Metropolitan Area, Urban Sprawl

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INTRODUCTION

Major cities in Southeast Asia are subjected to a rapid transition in urban development phase characterized by a significant increase in population, building density, and spatial concentration of economic activities. This phenomenon creates a new spatial layout networked by cities and districts close to each other and share similar socio-economic functions known as metropolitan area. In contrast to the conservative model of city development, which relies on a single growth pole, this spatial layout signifies socioeconomic connections among more than two urban centers and the respective supporting peripheries (Moreno 2017).

Urban sprawl usually follows development of metropolitan areas. In this context, physical and population distributions are rapidly extended to create functional boundaries difficult to control within specific proximities. Urbanization occurred with the rapid growth of population as well as the massive development of housing and infrastructure. Meanwhile, peri-urban is developed as a popular area for the working and middle class. This area is characterized as affordable and provides alternative living spaces to individuals who are unable to acquire expensive land in the city center (McGee, 1991; Rustiadi and Panuju, 2002). Generally, the concentration of buildings and people in peri-urban areas exceeds the normal carrying capacity. These areas face serious challenges from daily commuting activities, rapid housing development, economic activities, higher energy consumption, and increased pollution levels, occurring in unorganized and spontaneous ways (Habibi and Asadi, 2011; Oueslati et al., 2015).

Transit-Oriented Development (TOD) is urban planning approach that focuses on a mixed-use, compact, and walkable living space. Development is related to transit nodes or areas where mass rapid transit and other public transportation modes are integrated to create new functional areas. Furthermore, these areas serve more effective socio-economic activities to promote environmental, social, and economic sustainability (Kenworthy, 2006; Wey et al., 2016). The concept has gained significant attention and is increasingly applied in Southeast Asian cities as a model for innovative urban living. In the last decades, large metropolitan cities such as Jakarta, Bangkok, Manilla, and Kuala Lumpur adopted TOD concept to deal with urban sprawl at the peripheries, organizing more effective and efficient area development. This consists of affordable apartments and flats with direct physical connections to transit station surrounded by offices, shopping areas, public spaces, and public services (Gomez et al., 2019; Hasibuan et al., 2014). The objective is to enhance more appealing living conditions (Banai, 1998) and maximize land usage efficiency (Ann et al., 2019).

This article discusses TOD policy and population in two case studies, Metropolitan Jakarta and Kuala Lumpur, representing two of the most rapidly developing urban areas. A historical institutional framework is used with spatial

visualizations to guide the analysis processes. Data and information are gathered through a combination of document reviews and interviews. This article consists of six parts and after the introduction and literature review, a methodology section is provided, followed by two main discussions of the policy process of TOD in Kuala Lumpur and Jakarta as well as the implications for population reorganization in peri-urban areas.

LITERATURE REVIEW

TOD in Urban Metropolitan's Sprawling

TOD is a response to overcome various urban sprawling problems in metropolitan areas and large cities where overpopulated, massive flow of commuting activities, traffic congestion, and sporadic building constructions occur (Xu et al., 2017). This concept was developed at the end of the 20th Century as a form of the New Urbanism Movement in the USA (Carlton, 2009) and an effective alternative to achieving urban sustainability (Cervero and Sullivan, 2011). TOD is linked to compact city where housing, services, and economic facilities are provided within walking proximity (Dittmar and Poticha, 2004). Even though the original concept intends to promote sustainability in area of 2,000 feet (10 minutes on foot) radius (Calthorpe, 1993; Xue et al., 2010; Jerde, 2011), the current development has been translated into various circumstances, including 100—200 meters and 400—800 meters in Kuala Lumpur and Jakarta, respectively.

TOD drives population distribution in urban areas through accessibility and healthy living features (Fol and Gallez, 2014; Pereira et al., 2017). The concept offers the target population a quality of life in the city centre and suburban areas where people can have more flexible time and travel options, as well as served by modern offices and complete urban facilities (Papa and Bertolini, 2015). However, TOD implementations were unanticipated to create new competition and area attracted new populations from rural and other cities. This situation often results in high prices of land and property, which triggers social class segregation (Chava et al., 2018) and pushes low-income populations into suburban areas (Saunders and Smith, 2014). Considering the Curitiba case, TOD has been growing against the expected plan because the high-income population is concentrated around city centers and corridors. Meanwhile, the low-income and middle-class populations who are unable to compete in securing land and property move out into suburban areas. This inequality in access causes new concentrations of population growth beyond the 300-800 m radius (Turbay et al., 2022).

Theoretically, the core area of TOD has a higher density compared to the surrounding (Calthorpe, 1993). The difference in density level is also influenced by the distribution of the typology. TOD serving as a regional center

has a higher level of density at the core area than the suburban centers and urban neighborhoods. Therefore, different layers of urban density and population concentration are created. Tong et al. (2018) suggested that TOD in central stations serving as regional centers with more public transport connections had significant impacts on gathering people to live within a defined walking proximity than suburban and neighborhood settlements. However, more suburban and neighborhood TOD should be provided in the planned peri-urban areas when planners expect to deconcentrate urban population from the city (Higgins and Kanaroglou, 2017). Focusing on TOD concept is important considering the existing challenges in peri-urban areas, namely spontaneous housing, inefficient land uses, and a scarcity of open space. Meanwhile, the implementation of a suburban and neighborhood settlement model can effectively guide population towards enhancing the living quality in these spontaneous peri-urban areas. TOD at regional and city levels should be provided when metropolitan area expects to reduce its commuters and traffic congestion. This allows the concentration of mixed-use developments, including residential spaces, commercial, and public amenities, around transit hubs and promotes compact living with minimum driving habits (Hasibuan & Permana, 2022).

STUDY METHODOLOGY

A case study is analyzed through a mixed-method approach using documentary reviews, semi-structured interviews, and spatial visualizations. The documentary reviews examine the chronological development of TOD policies and the subsequent impact on urban development. These reviews included a wide array of sources, such as existing study publications, policy papers, planning documents, as well as formal and academic records, providing essential data and information for a thorough analysis. Meanwhile, interviews contribute to gaining opinions, expectations, and additional information that is not covered by the existing documents. Spatial visualization includes area and population mapping as well as TOD delineation area to explain urban population trend as well as spatial conditions. This process was facilitated by the use of Geographic Information System (GIS) software.

ANALYSIS AND DISCUSSION

The Institutionalisation of TOD in Kuala Lumpur Metropolitan Areas

TOD concept was initially mentioned in the 10th Malaysia Plan (2010-2015) of 2010 (Economic Planning Unit, 2010). The policies focused on the importance of creating a city that promotes a wide range of activities and facilities within walking distance. To achieve this policy, mixed-use development is promoted with the integration of the public transport system. TOD concept has been widely

adopted at the national, state, and local levels of government documents. Even though the concept was first mentioned in 2010, the Malaysian government implemented the first project in 2001. To understand TOD relevant to the Kuala Lumpur metropolitan area, policies should be reviewed from the national and local levels since the implementation follows a hierarchical order.

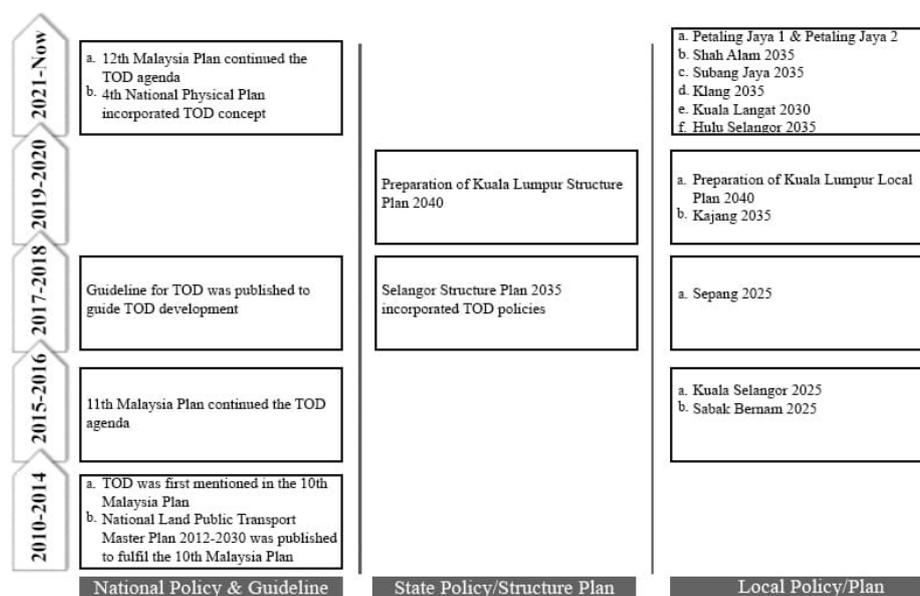


Figure 1: The Institutionalisation of TOD in Kuala Lumpur Metropolitan Areas
 Source: Economic Planning Unit (2010, 2015, 2021); DBKL (2023); Plan Malaysia (2012, 2021); & Plan Selangor (2023)

At the national level, four main policies are included. Firstly, other than the 10th Malaysia Plan, the 11th (2016-2020) and 12th Malaysia Plan (2021-2025) continue the agenda due to persistent challenges such as the lack of first- and last-mile connectivity for public transportation and limited TOD in cities, which has led to a higher cost of living (Economic Planning Unit, 2021). Secondly, the National Land Public Transport Master Plan 2012-2030 was formulated to increase the public transport modal share from 16.4% in 2011 to 40% in 2030 (Land Public Transport Commission, 2012). To achieve this policy, several strategies were proposed, including 1) investment to improve and expand the public transport network, 2) provision of integrated facilities and terminals, and 3) establishment of a mechanism and enforcement system. Thirdly, the fourth National Physical Plan increased the expansion of TOD concept to global and regional transit stations, providing incentives to promote affordable housing in TOD areas (PLANMalaysia, 2021). Finally, the 2018 Planning Guidelines

provide general and detailed guidelines, such as types and intensity of TOD, principles, and detailed design standards, such as land uses, plot ratio, setback, density, height, pedestrian walkways and cycling paths, parking areas, recreational areas, and public facilities (PLANMalaysia, 2018).

TOD policies mentioned at the national level are translated at the state level. The main document included in implementing TOD is the Structural Plan. Since the study is focused on the Kuala Lumpur metropolitan area, the documents reviewed are those pertaining to Kuala Lumpur and Selangor States. Apart from policies to promote TOD, the Kuala Lumpur Structure Plan 2040 identified five (5) categories based on main activities including central business district, main growth centre, neighborhood area, institution and public facilities area, as well as suburban and the location in Kuala Lumpur (Kuala Lumpur City Hall, 2023). In the Selangor Structure Plan 2035, the document shows the policy to integrate transportation system with land use planning through the implementation of TOD and to expand the coverage of railway and Bus Rapid Transit in high-density areas (Department of Town and Country Planning Selangor, 2017). The policy in the Selangor Structure Plan is not detailed since the State covers nine administrative districts. However, the detailed explanation of TOD implementation in Selangor is explained at the local level.

All policies at the state level are translated by the local government into the Local Plan. For example, in the Subang Jaya City Council Local Plan 2035, 15 out of 32 stations in the Subang Jaya area are designated as TOD based on the suitability of the stations and surrounding areas (Subang Jaya City Council, 2021). The designation covers the core area of 500 meters from the station and up to a 1-kilometer radius. To obtain a successful implementation, the proposed TOD should be 1) supported by feeder bus services to connect with surrounding neighborhoods and commercial areas, 2) well-connected and convenient pedestrian walkways and cycling paths, and 3) better road design to enhance safety. Another aspect contributing to the success of TOD is the implementation of mixed-use development surrounding the station, primarily focused on commercial centers (Abdullah, 2020).

The Institutionalisation of TOD in Jakarta Metropolitan Areas

The implementation of TOD policies in the Jakarta metropolitan area started in 2012 before Kuala Lumpur. The policies were marked by the DKI Jakarta Provincial Regulation No. 1 of 2012 concerning Jakarta Spatial Plan. This spatial planning regulation interpreted TOD concept as urban activity centre model designed in a mixed-use - commercial, residential, office, and public space - consisting of a high-density building integrated with an accessible mass public transportation system.

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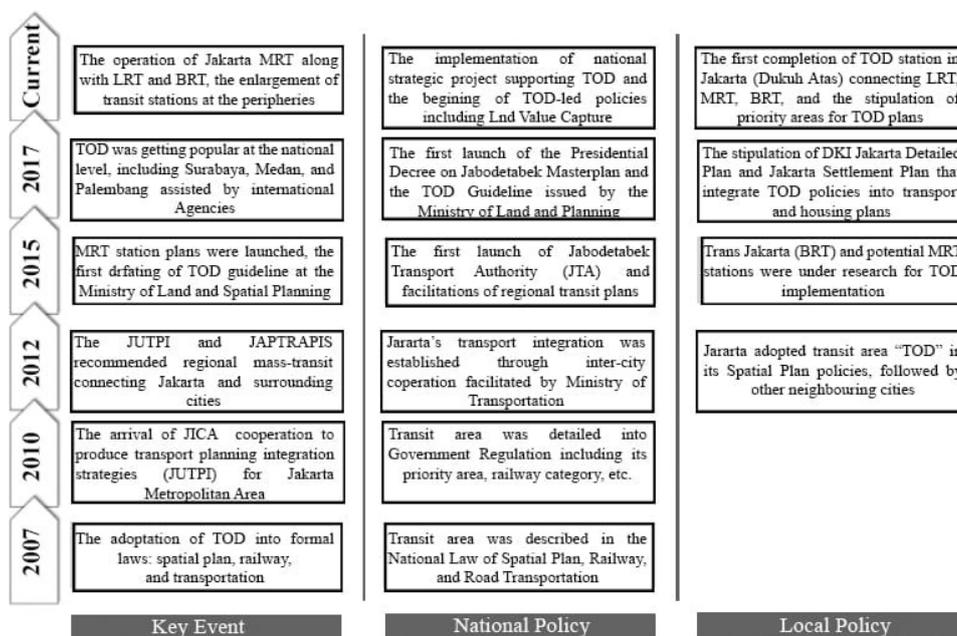


Figure 2: The Institutionalisation of TOD in Jakarta Metropolitan Areas

Source: Hasibuan et al. (2014) & JICA (2012)

Local government initiative was triggered by the national direction that presented the concept of TOD as a national strategic concept to be implemented at the local level. This concept was introduced in various national laws, including Law No. 23/2007 concerning the National Railway, Law No. 26/2007 concerning Spatial Planning, and Law No. 22/2009 concerning Road Transportation. The regulations urged the national and local governments in metropolitan areas to promote spatial use with effective and efficient approaches. However, TOD in Indonesia was not quickly implemented after the launch of the regulations. The initial planning policies lacked specificity, failing to explicitly outline targets such as the reduction in modal share and building intensity, as observed in the case of Malaysia. For instance, the two national laws, including spatial planning and railway primarily only focused on mentioning the importance of transit areas for urban transportation systems. The law also only mentioned the criteria of potential land uses for transit areas where high population density meets transportation modes without any land uses, plot ratio, setback, and pedestrian design.

Detailed explanations and points of reference for TOD plan were presented by a series of Japan International Cooperation Agency (JICA) and

Ministry of Transportation collaborative studies entitled the Jakarta Urban Transport Policy (JUTPI) and the Jakarta Public Transport Policy Implementation Strategy (JAPTraPIS) held in 2010-2012. In these studies, TOD areas were suggested to be constructed with the plan of mass-transit corridors in inner city Jakarta (MRT) and corridors connecting Jakarta with Bekasi, Bogor, Depok, Tangerang, and Tangerang Selatan. These JICA studies were very influential and many local governments referred to the recommendations in the following years. The phase of development is considered a turning point in the serious pursuit of TOD plan in the Jakarta metropolitan region.

The policies to introduce TOD-designated areas in Jakarta was also dynamic and constantly changing. The Jakarta Plan (Jakarta Provincial Regulation No. 1/2014) initially planned TOD to spread across six regions, namely Dukuh Atas and Manggarai as primary activity centers, Blok M, Grogol, and Harmoni as secondary activity centers; and Senen as the trade and service center. However, several changes occurred due to national political preferences, development interests, and urban dynamics. In 2016, TOD designated areas added by including Pulo Gebang and Jatinegara. New detailed criteria were also added, including the increase of the Floor Area Ratio (FAR) with a maximum of 35% and 65% for residential and commercial functions in TOD areas. At the national level, the provision was also introduced by the Ministry of Land and Spatial Planning Regulation No. 16/2017, where TOD was described based on the types, building intensity, transport connectivity, and radius areas, with a slightly different provision.

In 2019, TOD policy was implemented and the project was guided by the DKI Jakarta Governor Regulation No. 67/2019 where most of the standards followed the Ministry of Land and Spatial Planning (Regulation No. 16/2017). However, the national and provincial governments have different focus and interest on the list of TOD areas. Despite the mutual agreement to define TOD areas as managed within the 350—700 meters of transit nodes, there persists a consistent disparity in the list. In 2020, the first project was launched in Dukuh Atas as stipulated by the Governor Regulation No. 107 of 2020. Area connects MRT, LRT, and BRT stations in the proximity of 700 meters.

TOD Influence on Population Changes in Kuala Lumpur Metropolitan Area

The spatial distribution of population in Kuala Lumpur Metropolitan areas shows a clear pattern of population deconcentration. In 2000, Kuala Lumpur's population (1.31 million) was almost similar to Petaling's population (1.18 million). However, in 2020, Petaling's population (2.3 million) exceeded Kuala Lumpur (1.98 million). Population share in Kuala Lumpur significantly declined from 27.2% in 2000 to 23.5% in 2020. On the contrary, Petaling's population share increased from 24.6% in 2000 to 27.3% in 2020. This situation shows that

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Kuala Lumpur has lost its primacy due to limited space for expansion, resulting in a spillover of urban development towards surrounding districts. Another reason is the ribbon sprawl along the main roads, highways, as well as public transportation routes and stations.

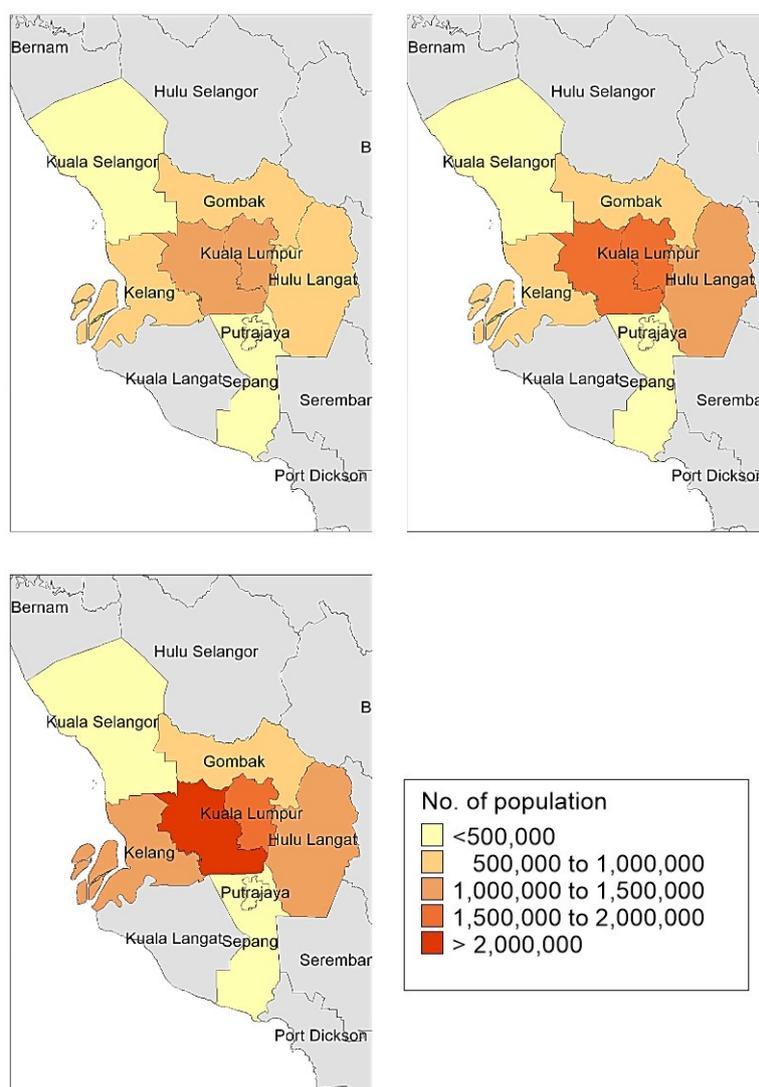


Figure 3: Population Distribution in Kuala Lumpur Metropolitan area (2000-2020)
Source: Department of Statistics Malaysia (2020, 2010 & 2020)

TOD Influence on Population changes in the Jakarta Metropolitan Area

The spatial distribution of population in Jakarta shows a slightly different pattern to Kuala Lumpur. Instead of deconcentration, the case of Jakarta shows a higher concentration in the city centre that affects the increase in two neighboring cities. Population (10.7 million) of the city outperforms its surroundings, but in the last decade, Bekasi (3.7 million) and Depok (2.5 million) have more population than before. In contrast to Petaling and Kuala Lumpur relationship, Jakarta and its surroundings, including Bekasi and Depok did not show a sign of deconcentration or population outflow. The city is stable to share its area for more than 30% while Bekasi, Depok, and Tangerang are still contributing 10%, as shown in the Figure below.

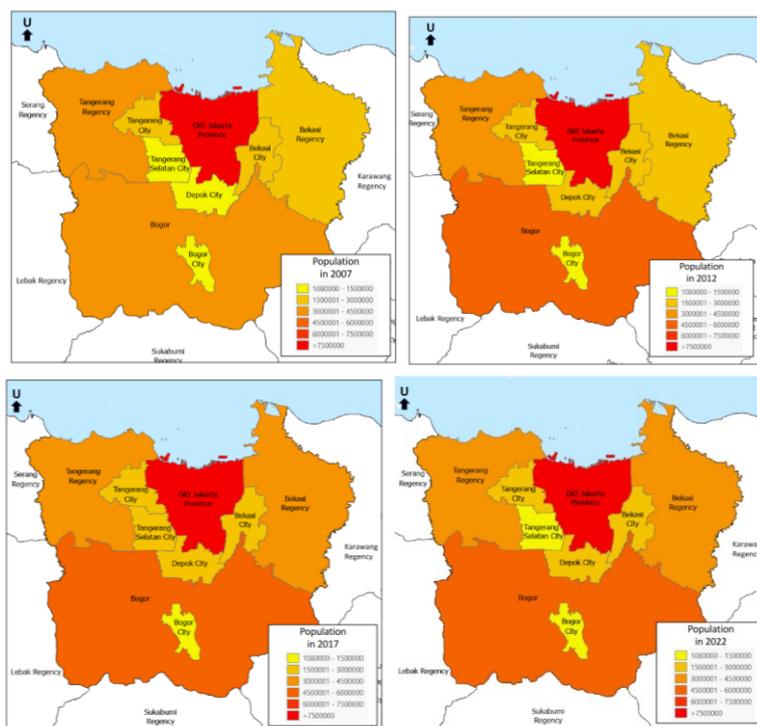


Figure 4: Jabodetabek’s Population Distribution in Four Periods (2007—2022)
Source: Personal Documentation

Jakarta retains supremacy against the surroundings in terms of population concentration. This situation occurs due to the high concentration of jobs and economic opportunities that are unable to be dispersed to the

surrounding area. Workers in Jakarta prefer to stay in boarding houses, flats, commuting from surrounding areas or living in informal houses and slum areas. In several cases, there is also a trend that many people prefer to be registered as residents while living and owning a property in neighboring cities because of the privileges. Therefore, the slow development of a more integrated transport system is also the cause of the phenomenon.

Based on the findings in this research, the phenomenon of sprawling happened both in Kuala Lumpur and in Jakarta to the peripheries. The results of this study are in line with Rosni et al. (2018), stated that Kuala Lumpur has been experiences segregated sprawl, which is the result of the previous land use regulations and policies. On the other hand, the sprawling phenomenon in Greater Jakarta, has resulted from the transport-led infrastructure development (Pratama and Yudistira, 2020). The distribution and concentration of population also similar both in Greater Kuala Lumpur and Greater Jakarta. In Malaysia, the Greater Kuala Lumpur is the fastest-growing metropolitan, increasing by 18-fold between 1970 and 2020 (Tey and Lai, 2022). Based on the results of this study, the implementation of TOD both in Greater Kuala Lumpur and in Greater Jakarta has not significantly influence the development of redistribution of population, as confirmed by Abdullah et al. (2023) and Hasibuan and Mulyani (2022)

CONCLUSION

In conclusion, the institutionalization process of Kuala Lumpur TOD policy was reported to provide a different direction of urban development to Jakarta. Initially, Kuala Lumpur city was the primary population magnet, but the concentration shifted towards suburban areas due to limited space, urban sprawl, and deagglomeration economics. Many incentives were introduced to attract investment and projects in developing TOD areas at the existing and new rail lines. However, property prices, specifically for new developments were unaffordable and barely within reach for low-income and middle-income earners. Jakarta city is continuously serving as the core and the leading city to its six surroundings. The city provided more attractive living in terms of economic opportunity, business prospects, and adequate public infrastructure and services. Even though property prices were very high, the existing population stayed in the region through renting and occupying boarding houses or commuting daily. Therefore, the focus of Jakarta policy did not drive new investment and projects to develop TOD areas.

REFERENCES

- Abdullah, J., Abdul Rashid, K., Baharom Shah, M. I., Ling, O. H. L., Abdul Majid, R., & Ngah, R. (2020). Land Use Development and Ridership At Kelana Jaya LRT Line, Malaysia. *Planning Malaysia: Journal of the Malaysian Institute of Planners*, 18

- (4), 220-238. <https://doi.org/10.21837/pm.v18i14.828>
- Abdullah, Y. A., Zanudin, K., Marzukhi, M. A., Nawawi, F. N., & Jamaluddin, N. B. (2023). Transit Oriented Development (TOD) for early-built rail-based transit stations: possible or plausible?. *Planning Malaysia: Journal of the Malaysian Institute of Planners*, 21 (6), 493-507. <https://doi.org/10.21837/pm.v21i30.1416>
- Ann, S., Yamamoto, T., & Jiang, M. (2019). Re-examination of the standards for transit-oriented development influence zones in India. *Journal of Transport and Land Use*, 12(1), 679–700. <https://doi.org/10.5198/jtlu.2019.1534>
- Banai, R. (1998). The New Urbanism: An Assessment of the Core Commercial Areas, with Perspectives from (Retail) Location and Land Use Theories, and Conventional Wisdom. *Environment Planning B: Planning and Design*, 25 (2), 169--185. <https://doi.org/10.1068/b250169>
- Calthrope, P. (1993). *The Next American Metropolis: Ecology, Community, and The American Dream*. Princeton Architectural Press: Hudson, New York, USA.
- Carlton, I. (2009). Transit Infrastructure Finance through Station Location Auctions. Berkeley Institute of Urban and Regional Development. Working-Paper 2009-004
- Cervero, R. & Sullivan, C. (2011). Green TODs: Marrying Transit Oriented Development and Green Urbanism. *International Journal of Sustainable Development & World Ecology*, 18 (3), 210--218. <https://doi.org/10.1080/13504509.2011.570801>
- Chava, J., Newman, P., & Tiwari, R. (2018). Gentrification of Station Areas and Its Impact on Transit Ridership. *Case Studien on Transport Policy*, 6 (1), 1--10.
- Dittmar, H. & Poticha, S. (2004). Defining Transit Oriented Development: The New Regional Building Block. In Dittmar, H. Ohlan, G. (Eds.), *The New Transit Town: Best Practices in Transit Oriented Development* (Island Press), 19--39
- Economic Planning Unit (2010). Tenth Malaysia Plan 2011-2015: Chapter 5. Putrajaya: Prime Ministers's Department
- Fol, S. & Gallez, C. (2014). Social Inequalities in Urban Access: Better Ways of Accessing Transport Improvements. In *Urban Access for the 21st Century* (pp. 46-86). Routledge
- Gomez, C. P., Omar, M., & Nallusamy, R. (2019). A Study on the Benefits of Transit Oriented Development in Malaysia And Incorporation of Those Benefits in Planning. *MATEC Web of Conferences*, 266, 06016. <https://doi.org/10.1051/mateconf/201926606016>
- Habibi, S. & Asadi, N. (2011). Causes, Results and Methods of Controlling Urban Sprawl. *Procedia Engineering*, 21, 133--141. <https://doi.org/10.1016/j.proeng.2011.11.1996>
- Hasibuan, H. S. & Permana, C. T. (2022). Socio-cultural characteristics of people and the shape of transit-oriented development (TOD) in Indonesia: A mobility culture perspective. *Journal of Transport and Land Use*, 15(1), 295–314. <https://doi.org/10.5198/jtlu.2022.1997>
- Hasibuan, H. S. & Mulyani, M. (2022). Transit-Oriented Development: towards achieving sustainable transport and urban development in Jakarta Metropolitan, Indonesia. *Sustainability*, 14 (9): 5244. <https://doi.org/10.3390/su14095244>
- Hasibuan, H. S., Soemardi, T. P., Koestoer, R., & Moersidik, S. (2014). The Role of Transit Oriented Development in constructing urban environment sustainability,

Hayati Sari Hasibuan, Raldi H Koestoer, Chrisna T Permana, Bellanti Nur Elizandri, Hakim Danial, Jamalunlaili Abdullah
Transport Policies, Transit-Oriented Development, and Redistribution of Population in Peri-urban: Lessons from Kuala Lumpur and Jakarta Metropolitan Area

- the case of Jabodetabek, Indonesia. *Procedia Environmental Science*, 20, 622–631.
- Jerde Places: D-Cube City. Jerde 2011. Available online: <https://www.jerde.com/places/detail/d-cube-city> (accessed on 20 September 2023).
- JICA. (2012). *Project for the Study on JABODETABEK Public Transportation Policy Implementation Strategy (JAPraPIS)*.
- Kenworthy, J. R. (2006). The Eco-city: Ten Key Transport and Planning Dimensions for Sustainable City Development. *Environment & Urbanization*, 18 (1), 67--85. <https://doi.org/10.1177/su10124622>
- McGee TG (1991) The emergence of desakota regions in Asia: expanding a hypothesis. In: Ginsburg
- N, Koppel B and McGee TG (eds) *The Extended Metropolis: Settlement Transition in Asia*. Honolulu, HI: University of Hawaii Press, pp. 3–26.
- McGee, T. G. (1991) The emergence of desakota regions in Asia: expanding a hypothesis. In: Ginsburg, N., Koppel, B., & McGee, T. G. (eds) *The Extended Metropolis: Settlement Transition in Asia*. University of Hawaii Press: Honolulu, HI, pp. 3–26.
- Moreno, L. E. (2017). *Prepared for the United Nations Expert Group Meeting on Sustainable Cities, Human Mobility, and International Migration. 7-8 September*. United Nations Secretariat: New York
- Oueslati, W., Alvanides, S., & Garrod, G. (2015). Determinants of Urban Sprawl in European Cities. *Urban Studies*, 52 (9), 1594--1614. <https://doi.org/10.1177/0042098015577773>
- Papa, E. & Bertolini, L. (2015). Accessibility and Transit Oriented Development in European Metropolitan Areas. *Journal of Transport Geography*, 47, 70--83. <https://doi.org/10.1016/j.jtrangeo.2015.07.003>
- Pereira, R. H., Banister, D., Schwanen, T., & Wessel, N. (2017). Distributional effects of transport policies on inequalities in access to opportunities in Rio de Janeiro. *Journal of Transport and Land Use*, 12(1), 741-764. <https://doi.org/10.31235/osf.io/cghx2>
- Permana, C. T., Chrisnawati, Y., & Hasibuan, H. S. (2018). The institutionalisation process of Transit Oriented Development practices for peri-urban development in Indonesia: Actor network perspective. *IOP Conference Series: Earth and Environmental Science* 202, 1–10. <https://doi.org/10.1088/1755-1315/202/1/012003>
- Pratama, A. P. & Yudhistira, M. H. (2020). Highway expansion and urban sprawl in the Jakarta Metropolitan Area. *LPEM FEBUI Working Papers 202053*, LPEM, Faculty of Economics and Business, University of Indonesia, revised 2020
- Rosni, N. A., Ponrahono, Z., & Noor, N. M. (2018). Segregated land use sprawl: TOD approach for mixed-use housing development in Kuala Lumpur. *Planning Malaysia: Journal of the Malaysian Institute of Planners*, 16 (1), 145-154. <https://doi.org/10.21837/pm.v16i5.418>
- Rustiadi, E. & Panuju, D. R. (2002). *Spatial Pattern of Suburbanization and Land Use Change Process: Case Study of Jakarta Suburb*. In *Land Use Change in*

- Comparative Perspective. Science Publisher, Inc.: Enfield, USA
- Saunders, B. & Smith, K. (2014). *Quality of Live, (E) Quality of Place: Growing Local Economies through Equitable Transit Oriented Development*. Open Communities and the Center for Neighborhood Technology: Chicago
- Tey, N. P. & Lai, S. L. (2022). Population Redistribution and concentration in Malaysia 1970-2020. *Planning Malaysia: Journal of the Malaysian Institute of Planners*, 20 (3), 227-238. <https://doi.org/10.21837/pm.v20i22.1141>
- Tong, X., Wang, Y., Chan, E. H. W., & Zhou, Q. (2018). Correlation Between Transit Oriented Development (TOD), Land Use Catchment Areas, and Local Environmental Transformation. *Sustainability*, 10 (12), 4622. <https://doi.org/10.3390/su10124622>
- Turbay, A. L. B., Pereira, R. H. M., & Firmino, R. (2022). The Equity Implication of TOD in Curitiba. *SocArXiv*. <https://doi.org/10.31235/osf.io/cj87q>
- Wey, W. M., Zhang, H., & Chang, Y. J. (2016). Alternative Transit Oriented Development Evaluation in Sustainable Built Environment Planning. *Habitat International*, 55, 109--123. <https://doi.org/10.1016/j.habitatint.2016.03.003>
- Xue, C. Q. L., Zhai, H., & Roberts, J. (2010). An urban island floating on the MTR station: A case study of the West Kowloon development in Hong Kong. *Urban Design International*, 15, 191–207. <https://doi.org/10.1057/udi.2010.21>

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REGIONALISM IN ARCHITECTURE: A STUDY OF LOCAL PERCEPTIONS ON PUBLIC STATE BUILDINGS IN WEST KALIMANTAN PROVINCE, INDONESIA

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Abstract

Regionalism in architecture opposes the globalized approach that disregards local identity. Understanding regionalism is crucial for preserving a region's identity through architecture. Public state buildings in Indonesia play a pivotal role in expressing regional independence through distinctive features. The architectural regionalism of West Kalimantan is defined by vertical composition, building shape, mass, spatial layout, and envelope. This research aims to examine regionalism characteristics of public state buildings in West Kalimantan by comparing them with public perception. The research involves a descriptive approach using questionnaires based on variables related to architectural regionalism. Out of the 36 iconic state buildings studied, 21 meet the regionalism criteria in West Kalimantan. These buildings share common features such as the use of local materials, responsive design to the climate, and incorporation of historical and cultural values into spatial meaning. The most influential factors in assessing the identity are roof shape, cultural symbols, and ornamentation.

Keywords: Public Perception; Public State Buildings; Vernacular Architecture; West Kalimantan Regionalism Architecture

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INTRODUCTION

Identity determined by a locality is a clue to finding and understanding sense of place (Goldstein & C.D, 1994) (Frey, 1999). The existence of a “place” will have uniqueness or special characteristics that distinguish it from other places. An attractive view and vista, an impressive building, or an important feature that exists could become an orientation and will affect one’s image of a place.

Buildings are manifestations that reflect human culture. Geographically, each region exhibits distinct characteristics influenced by local culture, climate, and existing technology. Thus, every architect in various regions around the world has different thoughts on the theory of regionalism. Regionalism is not an architectural style, but a school of thought about architecture (Curtis, 1986). Regionalism can be defined as an awareness that opens up the uniqueness of tradition in responding to place and climate, then giving birth to formal and symbolic identities into new creative forms according to certain perspectives related to the reality of that time (Beng, 1994). Regionalism leads to regional identity which holds emotive link to the locals (Raja Abdul Kadir, Jahn Kassim, Abdul Majid, & Kamaruddin, 2018).

West Kalimantan is a province in Indonesia, situated on the western side of the island of Borneo, with direct access to Sarawak, East Malaysia. A precise definition of regionalism in architecture of buildings in West Kalimantan Province has not been clearly defined yet. Various forms that characterize the characteristics of vernacular or traditional buildings appear in contemporary modern buildings, especially in state-owned buildings. However, this affirmation of regionalism is inseparable from the locals’ understanding of the buildings they use. Creating identity without *studying on the local cultural heritage will lead to identity crisis* (Yusof, Ibrahim, & Raja Shahminan, 2020). The locals’ perception – i.e., how the community views the building – is crucial in determining the regional character of the architecture. This public perception plays a key role in the architecture's longevity, because it is seen as part of the community's identity. Regionalism is indispensable for the survival of a civilization. (Berry, 2007).

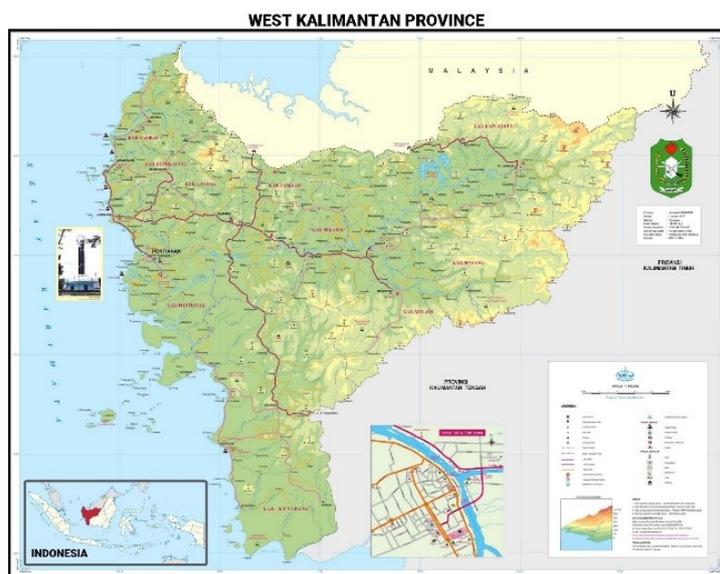


Figure 1: Map of West Kalimantan Province
Source: Bappeda Kalimantan Barat with modification, 2016

The aim of this study is to determine local perception on regional architecture in public buildings in West Kalimantan. The research outcomes will identify which elements of state buildings have high regionalism value. These findings can serve as a reference for identifying the most crucial aspects of identity recognized by the people of West Kalimantan, contributing to the development of West Kalimantan regionalism.

LITERATURE REVIEW

Regionalism in Architecture

Regionalism is believed to have developed around 1960 (Jencks, 1977). Architectural regionalism is a natural movement against Western hegemony which seeks to quickly create architecture with a similar appearance in urban centers in the Third World (Curtis, 1986). This movement primarily flourished in developing countries with distinct regional characteristics closely tied to the local culture, climate, and technology of the period (Ozkan, 1989). Regionalism aims to revive distinctive elements to establish identity within architecture (Curtis, 1986). This means that regionalism is not just about restoring local elements, but also a strong sense of identity (Frampton, 1983). Basically, regionalism involves the fusion/unification of the old and the new, with the goal of creating sustainable buildings (Curtis, 1986). It requires the presence of a local identity that considers environmental potential (Frampton, 1983).

Regionalism is expected to create the identity of a region through architectural buildings. It serves as an effort to stimulate the creativity and innovation of architects in crafting modern architecture using advanced technology and contemporary building materials, while also evoking cultural resonances that connect with the richness of past heritage (Budihardjo, 1997). In this rapidly globalizing world, any research on architecture inevitably leads to reflections on regionalism (Canizaro, 2007; Wang, 2007; Zou, Ge, Liu & He, 2023). A crucial step in developing regionalism is to undertake efforts to transform architecture that embodies regional characteristics or the growth of a particular culture, climate, and technology of that time. Such architectural works are referred to as Vernacular Architecture, emerging from folk architecture with its various traditions, optimizing or utilizing local potentials such as materials, technology, and geographic conditions, including climate (Rapoport, 1969). When regionality is evident in a building, it may reflect the identities or characters of places and cultures where the building is situated (Hidayatun, Prijotomo, & Rachmawati, 2012).

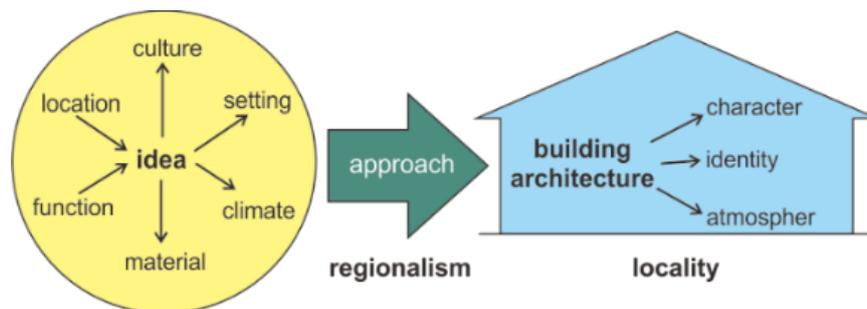


Figure 1: State of the Art of Regionalism in Architecture
Source: Hidayatun, Prijotomo, & Rachmawati, 2012

The main characteristic of regionalism in architecture is the fusion of regional local architectural values with universal modern architecture. This study emphasizes the characteristics of regionalism in architecture, focusing on the meaning and substance of cultural values rather than style. The understanding of regionalism, being inherently regional, utilizes cultural values, beliefs, customs, and philosophical values as guidelines for its application in architecture (Soedigdo, 2010).

RESEARCH METHODOLOGY

Public Buildings

In this study, the term 'public buildings' specifically refers to state-owned buildings. Based on the Regulation of the Minister of Public Works Number

45/PRT/M/2007, state buildings are those used for official purposes, funded by the state budget (APBN) or other legitimate sources, and are part of or will become state assets. These include state residences, office buildings, hospitals, schools, and warehouses.

This study is employed a descriptive research approach to gain an overview of public perception regarding regionalism in the architecture of state buildings in West Kalimantan Province. Descriptive analysis was used to test a hypotheses, answer questions, and examine the percentage of responses obtained from the distribution of questionnaires.

The research instrument was a questionnaire, structured based on the variables involved, specifically focusing on regionalism in the architecture of state buildings in the West Kalimantan Province. The questionnaire results were analyzed further using an explanatory survey to explain the correlation between the studied variables and the influence of one variable on another.

The variables in this study include: (i) Level of Regional Identity in Building Architecture, (ii) Roof Shape, (iii) Building Material (wood or wood motif), (iv) Ornamentation, (v) Raised Platform Structure, (vi) Basic Building Shape (rectangular or circular), (vii) Resemblance to and/or Incorporation of Cultural Symbols (such as totems, caping, bells, hornbills, etc.). The variables are measured using indicators with an ordinal scale (1 – 5).

Sampling was carried out using purposive sampling, considering objects that can be considered as sample members (Sedarmayanti & Hidayat, 2011), and divided into two categories: state building samples and respondent samples.

The sampling of state building objects is based on the following criteria: (a) Located within the study area, namely Pontianak City, Mempawah Urban Area, and Sambas Urban Area, (b) State buildings, (c) Exhibiting regional architectural characteristics, and (d) Possessing iconic value within the area. The sample comprises 20 buildings, as shown in Table 1.

Table 1: Iconic State-owned Public Buildings as Research Samples

No	Building	No	Building
Iconic Public Building in Pontianak City			
1.		2.	
	Governor of West Kalimantan Office		West Kalimantan House of Representative
3.		4.	
	Pontianak City Council Secretariat Office		Mayor of Pontianak City Office

No	Building	No	Building
5.	 PT. PLN (State Electricity Company) UP3 Pontianak	6.	 Auditorium of Universitas Tanjungpura
7.	 Museum of West Kalimantan Province	8.	 Melayu Traditional House of West Kalimantan
9.	 House of Radakng, Pontianak	10.	 State Junior High School 2 Pontianak
Iconic Public Building in Mempawah Regency			
1.	 Melayu Cultural House of Mempawah	2.	 Dept. of Investment, SME Cooperatives, and One-Stop Services of Mempawah Regency
3.	 Dept. of Education, Youth, Sports, and Tourism of Mempawah Regency	4.	 House of Representative of Mempawah Regency
5.	 Mempawah Hilir District Office	6.	 Dept. of Transportation and Environment of Mempawah Regency
7.	 Regional Inspectorate of Mempawah Regency		
Iconic Public Building in Sambas Regency			
1.	 House of Representative of Sambas Regency	2.	 Hajj Dormitory of Sambas Regency
3.	 State Polytechnic of Sambas		

Source: Author's Survey, 2022

The respondents' sample is drawn as part of the population in West Kalimantan Province, using a random sampling method. The sample size was determined based on the population of West Kalimantan Province in 2021, which

was 5,470,797 individuals. Using the Slovin formula (Sujarweni, 2018) with a significance level (α) of 7%, the estimated sample size was 220 respondents.

The analysis methods used include (1) Ordinal regression to explain the relationship between two variables, (2) Factor analysis to explore the correlation among a set of independent variables, and (3) MANOVA (Multivariate Analysis of Variance) to explore the correlation between multiple categorical independent variables and multiple metric dependent variables.

ANALYSIS AND DISCUSSION

Respondents' Assessment of Architectural Regionalism of State Buildings

The respondents, totalling 220 individuals selected through random sampling, have the following demographic information: 96 male (43.6%) and 124 female (56.4%) respondents. Ages range from 15 to 64, with the majority falling in 25 – 34 age group (44.1%). The predominant ethnic group is Malay (Melayu) at 55.5%. Regarding occupation, the majority are government employees (32.3%), followed by private sector employees (26.8%), and students (12.3%). Education levels of the respondents include undergraduate (67.7%), postgraduate (16.4%), high school students (10.5%), and diploma graduates (5.5%). All respondents indicated that the majority (45%) have seen/recognised the buildings being referred to.

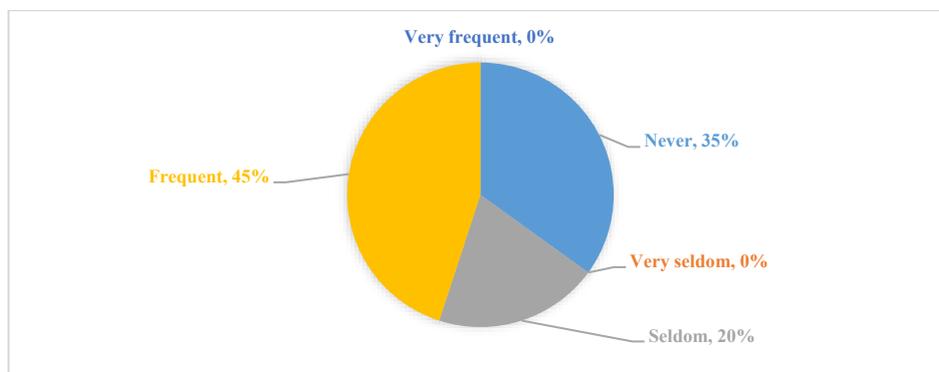


Figure 2: Respondents' Recognition of State Public Buildings

Source: Author's Analysis, 2022

Level of Identity

In general, respondents perceive that all the sampled buildings have a level of identity for West Kalimantan's architecture. The majority of respondents (65%) view 13 buildings as having a moderate level of identity, while 6 buildings (30%) are seen as having a high level of identity. There is one building, namely Rumah Radangk Pontianak, that is perceived to have a very high level of identity.

Roof Shape

Regarding the roof shape, respondents perceive that 10 buildings (50%) exhibit a moderate level of identity, 9 buildings (45%) demonstrate a high level of identity, and 1 building is perceived to have a very high level of identity.

Building Material

Regarding the building material, respondents perceive that 14 buildings (70%) exhibit a moderate level of identity, 5 buildings (25%) demonstrate a high level of identity, and 1 building is perceived to have a very high level of identity.

Ornament

Regarding the building ornamentation, respondents perceive that 14 buildings (70%) exhibit a moderate level of identity, 5 buildings (25%) demonstrate a high level of identity, and 1 building is perceived to have a very high level of identity.

Building on Stilts

Regarding the building on stilts (raised platform structure), respondents perceive that 10 buildings (50%) exhibit a moderate level of identity, 9 buildings (45%) demonstrate a high level of identity, and 1 building is perceived to have a very high level of identity.

Basic Shape

Regarding the basic shape of buildings, respondents perceive that 13 buildings (62%) exhibit a moderate level of identity, 7 buildings (33%) demonstrate a high level of identity, and 1 building is perceived to have a very high level of identity.

Cultural Symbols

Regarding the cultural symbols incorporated in state buildings, respondents perceive that 15 buildings (75%) exhibit a moderate level of identity, 3 buildings (15%) demonstrate a high level of identity, and 2 buildings (10%) are perceived to have a very high level of identity.

Local Perception of Regionalism in the Architecture of State Buildings

The Influence of Building Identity Factors on Assessment of State Building Identity

Based on the scoring of the questionnaire results and subsequent ordinal regression analysis, it can be concluded that several factors influence the assessment of identity characteristics in the studied state buildings. The analysis reveals that the **roof shape** factor is the most significant factor in determining the identity character of the buildings in this research. Subsequent factors, in order

of significance, are **ornamentation, cultural symbols, building on stilts (raised platform structure), building material, and basic building shape.**

Table 2 : Scoring of the Influence of Building Identity Factors on the Assessment of the Identity of Each Building

No.	Buildings	Identity Characteristic Factors					
		Roof Shape	Building Material	Orna-ment	Building on Stilts	Basic Shape	Cultural Symbol
1	Governor of West Kalimantan Office	1	0	0	3	2	4
2	West Kalimantan House of Representative	3	5	2	0	4	1
3	Pontianak City Council Secretariat	1	0	2	3	0	0
4	Mayor of Pontianak City Office	2	0	1	0	0	0
5	PT. PLN (State Electricity Company) UP3 Pontianak	2	3	0	1	0	4
6	Auditorium of Universitas Tanjungpura	3	0	2	1	0	0
7	Museum of West Kalimantan	2	0	4	0	3	1
8	Melayu Traditional House of West Kalimantan	4	1	3	0	0	2
9	House of Radakng, Pontianak	1	0	2	0	0	0
10	State Junior High School 2 Pontianak	1	0	0	0	0	0
11	Melayu Cultural House of Mempawah	3	4	0	2	1	0
12	Department of Investment, SME Cooperatives, and One-Stop Services of Mempawah Regency	1	0	0	0	0	0
13	Dept. of Education, Youth, Sports, and Tourism of Mempawah Regency	2	1	0	0	0	3
14	House of Representative of Mempawah Regency	3	1	0	2	0	4
15	Mempawah Hilir District Office	1	0	2	0	0	0
16	Department of Transportation and Environment of Mempawah Regency	2	0	0	0	0	1
17	Regional Inspectorate of Mempawah Regency	1	5	3	0	4	2
18	House of Representative of Sambas Regency	1	0	3	0	0	2
19	Hajj Dormitory of Sambas Regency	1	0	3	0	0	2
20	State Polytechnic of Sambas	2	0	3	1	0	0

Ranking: 1 lowest – 5 highest

Source: Author's Analysis, 2022

These factors are then grouped using factor analysis to obtain major factor clusters that influence the assessment of the identity of the building. The following are the results of the conducted factor analysis.

The results of the communalities analysis in Table 3 indicate that all factors can explain more than 50% of the variance (e.g., the roof shape variable can explain 78.7% of the variance). It can be concluded that all variables contribute significantly to the factor analysis and effectively explain the factors.

Table 3 : Result of Communalities of Identity Forming Factors

Factors	Initial	Extraction
Roof Shape	1.000	0.787
Building Material	1.000	0.822
Ornaments	1.000	0.567
Building on Stilts	1.000	0.829
Basic Shape	1.000	0.718
Cultural Symbol	1.000	0.834

Extraction Method: Principal Component Analysis

Source: Author's Analysis, 2022

The Total Variance Explained analysis indicates that 6 components can represent the variables. Using the criterion of Eigenvalues greater than 1, the selected components are 1, 2, and 3, as shown in Table 4.

Table 4 : Result of Total Variance Explained for Identity Forming Factors

Component	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.939	32.320	32.320	1.939	32.320	32.320	1.777	29.617	29.617
2	1.426	23.763	56.083	1.426	23.763	56.083	1.426	23.772	53.389
3	1.161	19.356	75.439	1.161	19.356	75.439	1.323	22.050	75.439
4	0.888	14.795	90.234						
5	0.375	5.256	96.490						
6	0.211	3.510	100.000						

Extraction Method: Principal Component Analysis

Source: Author's Analysis, 2022

Each variable is then assigned to either component 1, 2, or 3 based on the magnitude of its correlation with the formed factors, as shown in Table 5. From the analysis, the following can be concluded regarding the membership of each factor group:

- Factor Group 1 : Building Material, Building on Stilts
- Factor Group 2 : Roof Shape, Cultural Symbols, Ornaments
- Factor Group 3 : Basic Shape

Table 5: Result of Rotated Component Matrix of Identity Forming Factors

	Rotated Component Matrix ^a		
	Component		
	1	2	3
MATERIAL	0.900	0.065	0.090
ROOF	-0.867	0.062	-0.036
CULTURAL			
SYMBOL	0.267	0.852	0.193
STILTS	0.290	-0.830	0.237
BASIC.SHAPE	-0.097	0.032	0.841
ORNAMENT	-0.227	0.052	-0.716

Extraction Method: Principal Component Analysis
 Rotation Method: Varimax with Kaiser Normalization

a. Rotation converged in 4 iterations.

Source: Author's Analysis, 2022

When relating it to the previous recapitulation results, it can be observed that Factor Group 2, consisting of **roof shape, cultural symbols, and ornamentation**, is the most influential in assessing the identity characteristics. This is followed by Factor Group 1, consisting of building material and the building on stilts structure. Lastly, there is Factor Group 3, consisting of the basic building shape. These findings indicate that the three main factors shaping the identity are primarily influenced by local cultural elements (Factor Group 2), followed by construction elements (Factor Group 1), and lastly spatial elements (Factor Group 3).

CONCLUSION

Based on the research findings, several conclusions can be drawn. Firstly, the factors of roof shape, ornamentation, and cultural symbols are significant in determining the assessment of regional characteristics in state buildings in West Kalimantan Province. The roof shape, particularly with a saddle or pyramid form, is a prominent feature in the regional architecture of West Kalimantan. The presence of ornamental elements on the building facades further reinforces the perception of regional identity in state buildings. These ornaments can take the form of carvings resembling plant tendrils. Additionally, cultural symbols, such as totems or cultural elements like cannons present in some state buildings, significantly contribute to the formation of architectural regional identity. These factors have a strong association with the cultural aspects, highlighting their importance in shaping the regional identity.

Secondly, the factors of building material and the building on stilts (raised platform structure form) stand as the next significant group in shaping the identity. Both factors are associated with visual construction aspects. State buildings generally exhibit regionalism through the visual appearance of

construction materials, such as materials that resemble or evoke the impression of wood. Additionally, the visual presence of buildings in a raised platform structure or those that give the impression of a raised platform convincingly convey the characteristics of regional architecture to the public.

Thirdly, the basic building shape factor is considered less significant in convincing the assessment of regional architecture in the observed samples. The shape of the building is closely related to the spatial layout, which is difficult to be directly observed by the public. As a result, this factor has relatively less influence in determining the regionalism value of the state buildings.

Through the questionnaire distribution method employed in this research, many have come to know that the regional architecture of West Kalimantan can be identified through roof shape, ornamentation, cultural symbols, material, and the building in stilts. The next step that could be taken is to explore the specific characteristics of the factors that determine the regional architecture of West Kalimantan.

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REFERENCES

- Beng, T. H. (1994). *Tropical architecture and interiors: Tradition-based design of Indonesia, Malaysia, Singapore, Thailand*. Michigan: Page One Pub.
- Berry, W. (2007). The regional motive. In V. B. Canizaro, *Architectural Regionalism: Collected writings on place, identity, modernity, and tradition*. Princeton: Architectural Press.
- Budihardjo, E. (1997). Kepekaan sosio-kultural arsitek. In P. Atmadi, *Perkembangan arsitektur dan pendidikan arsitek di Indonesia*. Yogyakarta: Gadjah Mada University Press.
- Canizaro, V. (2007). *Architectural Regionalism: Collected writings on place, identity, modernity, and tradition*. Princeton: Princeton Architectural Press.
- Curtis, W. J. (1986). Towards an authentic Regionalism. (H.-U. Khan, Ed.) *Mimar 19: Architecture in Development*.
- Farel, R. R., Suroto, W., & Hardiana, A. (2017, October). Aplikasi arsitektur Regionalisme pada perancangan hotel resort di kawasan Wisata Mandeh, Sumatera Barat. *Arsitektura*, 15(2), 439-446. doi:10.20961/arst.v15i2.12802
- Frampton, K. (1983). Towards a Critical Regionalism: Six points for an architecture of resistance. In H. Foster, *The Anti-Aesthetic. Essays on postmodern culture*. Seattle: Bay Press.
- Frey, H. (1999). *Designing the city: Toward a more sustainable urban form*. London: E & Spon. Routledge.

- Goldsteen, J., & C.D. (1994). *Designing America: Creating urban identity*. New York: Van Nostrand Reinhold.
- Hidayatun, M. I., Prijotomo, J., & Rachmawati, M. (2012). Regionality and Regionalism in architectural views. *Journal of Basic and Applied Scientific Research*, 7147-7152.
- Jencks, C. (1977). *The language of Post-Modern architecture*. New York: Rizzoli.
- Ozkan, S. (1989). Regionalism within modernism. In I. Serageldin, *In Space for freedom*. London: Butterworth Architecture.
- Poerwadarminta, W. (1999). *Kamus umum Bahasa Indonesia*. Jakarta: Balai Pustaka.
- PUPR, K. (2007). Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 45/PRT/M/2007 Tahun 2007 tentang Pedoman Teknis Pembangunan Bangunan Gedung Negara. Jakarta, Indonesia.
- Raja Abdul Kadir, T. Q., Jahn Kassim, P. S., Abdul Majid, N., & Kamaruddin, Z. (2018). Classifications of classical Malay aristocratic architecture: Identifying generic and variant forms. *Planning Malaysia*, 16(2), 304-322. doi:<https://doi.org/10.21837/pm.v16i6.485>
- Rapoport, A. (1969). *House form and culture*. New Jersey: Prentice-Hall, Inc.
- Sarwono, S. W. (2012). Psikologi ulayat. *Jurnal Psikologi Ulayat*, 1 - 16.
- Sedarmayanti, H., & Hidayat, S. (2011). *Metodologi penelitian*. Bandung: Mandar Maju.
- Senasaputro, B. B. (2017). Kajian arsitektur regionalisme; Sebagai wacana menuju arsitektur tanggap lingkungan berkelanjutan. *Ultimart: Jurnal Komunikasi Visual*, 10(2), 73-84. doi:<https://doi.org/10.31937/ultimart.v10i2.777>
- Soedigdo, D. (2010, Juli). Arsitektur regionalisme (Tradisional modern). *Jurnal Perspektif Arsitektur*, 5(1), 26-32.
- Stenberg, R. J. (2008). *Psikologi kognitif*. Yogyakarta: Pustaka Pelajar.
- Sujarweni, V. W. (2018). *Statistik untuk bisnis dan ekonomi*. Yogyakarta: Pustaka Baru Press.
- Wang, J. (2007). A study on Chongqing's traditional human settlement form and culture. *Planners*, 5, 67-70.
- Yusof, H., Ibrahim, F. K., & Raja Shahminan, R. N. (2020). Heritage identity conservation of the woodcarving placement and design composition typologies on Johor Malay houses. *Planning Malaysia*, 18(2), 12-23. doi:<https://doi.org/10.21837/pm.v18i12.739>
- Zou, H., Ge, J., Liu, R., & He, L. (2023, February 14). Feature recognition of regional architecture forms based on machine learning: A case study of architecture heritage in Hubei Province, China. *Sustainability*, 15(4), 3504. doi:10.3390/su15043504

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THE EFFECTS OF PASSENGER BEHAVIOUR ON PUBLIC BUS TRANSPORT SELECTION DECISION-MAKING

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Abstract

While the quality of a public transportation system is determined by its sustainability, as well as the regulations governing its operations, the decision-making process of an individual, in terms of his/her selection of a transportation option, is highly influenced by issues related to behaviour. This research delves into the manner in which cultural (CLT), social (SCL), psychological ((PLG) and personality (PLS) issues, affect passenger preference for a transportation mode. The findings, derived through the employment of the SMART partial least squares structural equation modelling (SmartPLS-SEM) approach, clearly indicate that PLS factors, including age and lifecycle stage (PLS1), economic situation (PLS2) and lifestyle (PLS3), significantly influence an individual's public transportation selection (TS). As such, during their efforts to enhance the quality of public bus services, it is essential that transportation operators and policymakers take into consideration the passengers' PLS traits, along with all other influencing factors, and utilize them as the primary guideline for the crafting of policies, aimed at achieving public transportation sustainability.

Keywords: Public Bus Transportation, Passenger Behaviour, Decision-Making, Urban Transportation Planning

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INTRODUCTION

Sustainable urban development is highly dependent on an efficient public transportation system. Recent studies indicate a growing worldwide emphasis, on the promotion of public transport use, through the development of an efficient and reliable public transportation system (Ismael & Duleba, 2022). The Theory of Planned Behaviour (TPB) serves as a useful means, for understanding and predicting the behaviour of passengers, with regards to transportation services (Ajzen, 1991). A good perception of passenger behaviour, paves the way towards the development of effective strategies, for the promotion of public transportation use, which consequently contributes towards the sustainable development of urban areas (Zeithaml et al., 1996).

In urban areas, public transportation operators often disregard the declining use of public buses as a travel option. Such a situation can hamper efforts directed at achieving sustainable urban development. During the formulation of public transportation policies, the government should include the participation of residents in the decision-making process, as these policies will have a significant impact on their daily lives. A questionnaire survey is considered an effective approach for the gathering of public opinion regarding the use of public transportation (Asah Nasrudin et al., 2023). The questionnaire survey should also cover issues related to the public transportation selection (TS) process (Duleba & Moslem, 2018).

LITERATURE REVIEW

Public Bus Transportation

In the urban transportation system, public bus transportation represents an efficient, comfortable, and cost-effective travel option (Saleem et al., 2023). In developing countries such as Africa, Asia, and Latin America, bus rapid transit (BRT) systems provide low-income groups with support in the form of time savings, cost savings, easy accessibility, as well as safety and health benefits. A comprehensive bus transportation performance assessment should cover all aspects of the service, user perspectives, and user behaviour (Bakar et al., 2022).

The Effect of Passenger Behaviour on Public Transportation Selection (TS)

The high number of studies focusing on passenger behaviour, particularly in the context of management and engineering (Sweis et al., 2013), is attributed to the wide-ranging implications of passenger behaviour, on the performance of the transportation industry. The efforts of transportation companies, aimed at boosting customer loyalty by identifying and meeting their demands (Lai & Chen, 2011), has led to a better understanding of passenger preferences, and their decision-making process, with regards to their public TS (Liu et al., 2023). Several methodological approaches have been employed (Hadi et al., 2023), to explain the manner in which factors such as perceived value, service disruptions,

public image and changing costs, influence passenger behaviour. According to Peter and Oslon (2010), several issues influence the decision-making behaviour of passengers. These include the culture (CLT) issue, which emphasizes on the sub-culture and social class; the social (SCL) issue, which emphasizes on reference groups, family roles and status; the personality (PLS) issue, which emphasizes on age and lifecycle stage, economic situation, and lifestyle; as well as the psychological (PLG) issue which emphasizes on motivations/perceptions, education, and beliefs/attitudes with regards to public bus transportation in terms of satisfaction, safety/security, service and accessibility (Asah Nasrudin et al., 2023; Peter & Oslon, 2010).

The Effect of Decision-making on Public Transportation Selection (TS)

In the context of public bus TS decision-making, a comprehensive evaluation of goals, effects, benefits, costs, risks and obstacles is necessary, for arriving at well-informed choices (Henke et al., 2020). During the decision-making process, the upholding of decision consistency is essential for the exclusion of contradictions, as well as for the appropriate assessment of available alternatives. This entails a good comprehension of the physical characteristics involved, and the relevant options (De Andreis et al., 2023). The optimization of the decision-making process by an organization requires the establishment of clear definitions, the identification of alternatives, the use of evaluation methodologies, the recognition of the limitations of the decision-maker, as well as the identification of potential errors. An all-inclusive approach is required to address existing conceptual shortcomings, and to deliver a more accurate explanation regarding the interconnected issues influencing public bus transportation decision-making. Decision-makers are in agreement, that passenger behaviour needs to be taken into consideration, during efforts to enhance the urban public transportation system (Hashimah et al., 2023).

The Effect of Transportation Planning on Public Transportation Selection (TS)

The significant and complex challenges encountered, during the planning phase of an urban public transportation system, can be overcome through a well-organised integration of various transportation modes, including trams, metros, railways and buses. This will also serve to improve the passengers' travel experience. Additionally, with proper planning, transportation companies can deliver high-quality passenger services, while minimizing overall operational costs (Perumal et al., 2022). However, during their efforts to formulate an effective public transportation plan, it is imperative that city government officials and urban transport managers include measures, aimed at the preservation of human health, as well as the health of the environment (Wafa et al., 2023).

METHODOLOGY

A quantitative method, utilizing SMART partial least squares-structural equation modelling (SmartPLS-SEM), was employed for this study, to identify the relationships among interrelated variables, as well as to derive insights regarding the structure and dynamics within the data.

Research Sample

The questionnaire was designed for the measurement of behaviour-related factors associated with (a) CLT, covering sub-culture (CLT1) and social class (CLT2), (b) SCL, covering reference group (SCL1), family (SCL2), role and status (SCL3), (c) PLS, covering age and lifecycle stage (PLS1), economic situation (PLS2), and lifestyle (PLS3), (d) PLG, covering motivation and perception (PLG1), education (PLG2), and beliefs and attitudes (PLG3), and lastly (e) TS, covering satisfaction (TS1), safety and security (TS2), service (TS3), and accessibility (TS4). All 15 items were measured using a Likert scale ranging from 1 to 5, with 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, and 5 = strongly agree. Random sampling was used for the recruitment of public bus transportation passengers, at the minimum sample size recommended by Barclay, which is 10 times the number of constructs (Barclay & Thompson, 1995). Consequently, 250 respondents were recruited for this survey.

Research Location

This study is limited to users of public buses (Trans-Batam) managed by the transportation department of Batam City. Figure 1 depicts the Trans-Batam bus transportation routes, comprising seven active routes operated by Trans-Batam, including Sekupang-Batam Centre (green), Tanjung Uncang-Batam Centre (red), Sekupang-Jodoh (purple), Jodoh-Batam Centre (light brown), Tanjung Piayu-Batam Centre (brown), Nongsa-Batam Centre (yellow), and Pungkur-Jodoh (light green).

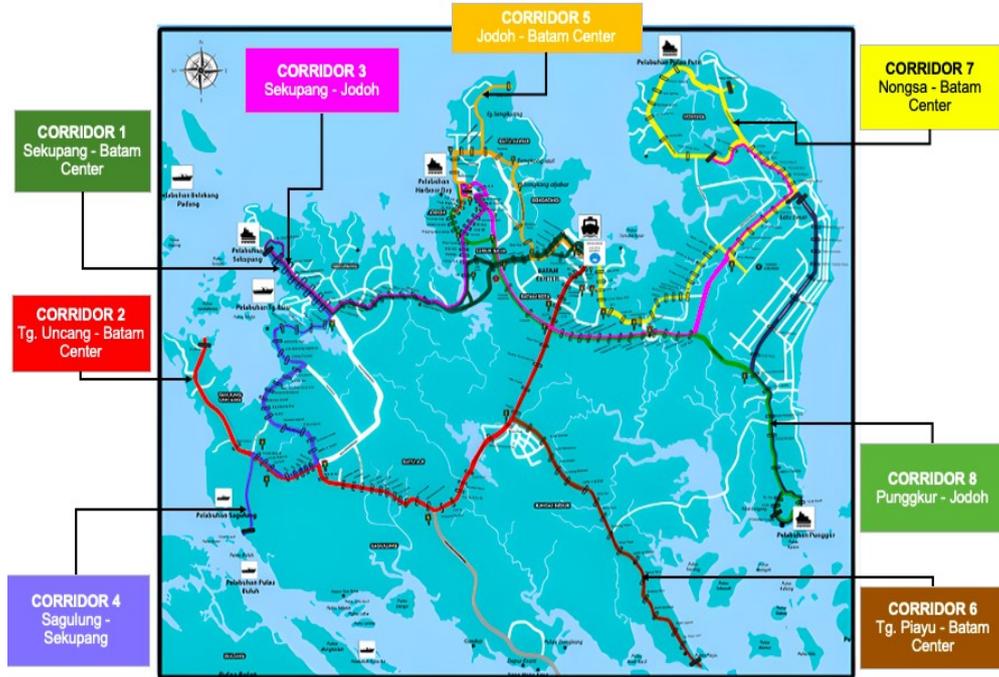


Figure 1: Transport Map of Batam City
Source: Dinas Perhubungan Pemerintah Kota Batam, (2020)

Analysis Analysis Method

The measurement model in PLS-SEM was employed to identify the factor loading (λ), which describes the extent to which the observed variables (χ) contributed, to the latent constructs they represent. Two types of measurement approaches were used; reflective and formative. With the reflective measurement, the relationship between χ and the constructed latent variables (ξ) was established. The λ measured the extent to which the χ contributed to the ξ , which was measured through the χ , while ε represents the unexplained error factor.

The formative measurement assumes that ξ are generated by χ . In this case, the ξ are a linear function of χ , plus the error term (δ). The corresponding weights for each χ are denoted W . The structural model describes the direction and strength of the relationships, between the ξ defined in the model. The structural model includes paths connecting ξ , which depict both direct and indirect influences among the variables. In this context, the ξ are the variables in the structural relationship, while the regression coefficient (β) describes the strength and direction of the relationship between ξ and the other latent variables (ζ), which act as independent variables in the structural relationship. The error, or residual variance (η), is the unexplained variation unaccounted for by the model. In this study, the model proposed was tested with a significance level of 5%. The

minimum sample size for this study, in compliance with the Barclay rule, is 10 times the number of variables in the model.

RESULT

This section focuses on the identification of the key factors, influencing the TS decision-making process of passengers, using public transportation in the city of Batam.

Preliminary Test

The correlation between ξ was analysed to identify the relationship among related variables. The variance-covariance matrix between beliefs and attitudes (PLG3) was observed to be high, with a correlation coefficient (R) of 0.78 with economic situation (PLS2). The R of social class (CLT2), with sub-culture (CLT1), was also recorded as high (0.76). Additionally, a significant correlation (0.74) was detected between economic situation (PLS2) as well as age and lifecycle stage (PLS1). A multicollinearity test was conducted to examine the existence of issues influencing collinearity among the independent variables. Consequently, the existence of such issues was ruled out, as the inner variance inflation factor (VIF) of all the variables is ≤ 5 , which is the threshold, recommended by Hair. In terms of impact, the inner VIFs were recorded as CLT-TS = 1.99, SCL-TS = 2.98, PLS-TS = 2.82, and PLG-TS = 2.23. Data bias, stemming from common method bias in the questionnaire, was ruled out following a scrutiny of the pathological collinearity factors, which revealed a value of ≤ 3.3 , an indication that the data is free from common method bias. All values of the outer variables were recorded as < 3.3 (Table 1), indicating that this undertaking is not affected by data bias (Kock, 2015).

Table 1: Multicollinearity Inner Result

Correlation	Result
Culture --> Public Bus Transport	1.994
Social --> Public Bus Transport	2.982
Personality --> Public Bus Transport	2.828
Psychologist --> Public Bus Transport	2.233

Measurement Model Assessment

Testing for validity and reliability involved the use of composite reliability (CR), which includes Cronbach's alpha (α) and Rho. A, to determine internal consistency, with the recommended values > 0.70 , and average variance extracted (AVE), to assess the convergent validity of each variable, with the recommended average value for constructs set as > 0.50 (Hair et al., 2019). The results deriving from Cronbach's α , CR, and AVE are registered as follows: CLT (CA = 8.866, CR = 0.918, AVE = 0.789), SCL (CA = 0.875, CR = 0.923, AVE = 0.800), PLS

(CA = 0.888, CR = 0.931, AVE = 0.817), PLG (CA = 0.847, CR = 0.907, AVE = 0.766), and TS (CA = 0.874, CR = 0.913, AVE = 0.725). As can be observed, the loading factors were recorded as > 0.70, an indication of data reliability; the Cronbach's α was recorded as > 0.70, an indication of sound data; and the AVE for the variables was recorded as > 0.50, an indication that all convergent validity requirements are met.

The Fornell-Larcker Criterion is utilized, to scrutinize the square root of the AVE on the diagonal axis, for an assessment of discriminant validity (Wong Kay, 2015). The values on the diagonal axis in the Fornell-Larcker Criterion were recorded as > 0.5, with CLT = 0.889, PLS = 0.904, PLG = 0.875, SCL = 0.894, and TS = 0.852, an indication of the reliability of all the values. The next step involves the calculation of the heterotrait-monotrait (HTMT) ratio, with < 0.9 as the recommended value. Consequently, the HTMT ratios were recorded as PLS–CLT = 0.743, PLG–PLS = 0.886, SCL–PLG = 0.784 and TS–SCL = 0.723 (Table 3). Based on the results obtained, discriminant validity is established, and all measurement models can be considered reliable and valid.

Structural Model Assessment

Following the verification of the validity and reliability, the structural model was measured with the utilization of the bootstrapping technique. Five hundred subsamples were used to obtain average values among the constructs, for the average geometric correlation value for items that measure the same construct, indicating a threshold value of 0.90 for the structural model. The relationship between the dependent (endogenous) and independent (exogenous) variables is made clear, through the significance level of the path coefficients (β values).

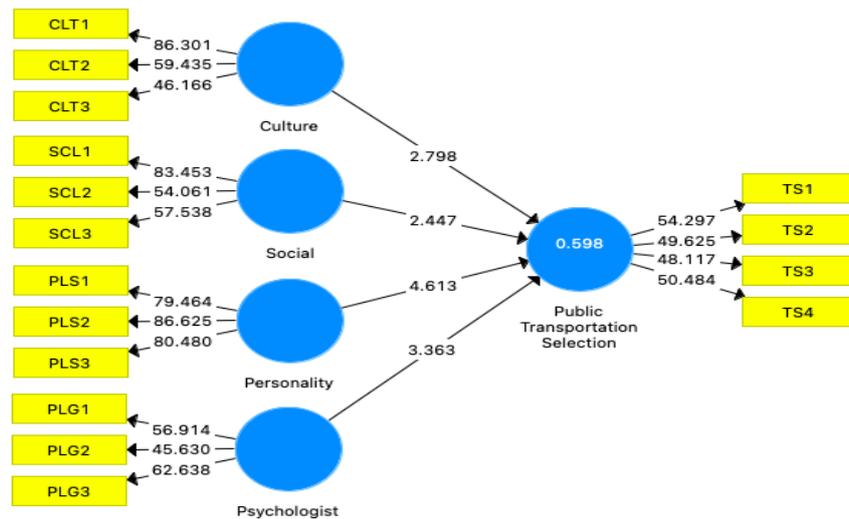


Figure 2: Model Structural

As shown in Figure 2, TS has a strong relationship (59.8%) with a moderate coefficient of determination (R^2) = 0.598. The structural estimation for H1 (CLT–TS) was recorded as $\beta = 0.183$, $t = 2.798$ and $p = 0.005$, indicating that CLT has a significant and positive impact on TS, with an effect size (f^2) of 0.183 and $p < 0.05$. A similar trend was observed for H2 (SCL–TS), where $\beta = 0.145$, $t = 2.447$, and $p = 0.015$; H3 (PLS–TS), where $\beta = 0.319$, $t = 4.613$, and $p = 0.000$; and H4 (PLG–TS), where $\beta = 0.235$, $t = 3.363$, and $p = 0.001$; all of which have significant and positive effects. As such, all the hypotheses are verified acceptable. The f^2 represents the effect sizes of the independent variables on the endogenous variables, where 0.002 = small, 0.15 = medium, and 0.35 = large. Although the f^2 obtained falls within the small effects range for TS, it nevertheless correlates with decision-making as CLT = 0.042, SCL = 0.023, PLS = 0.085, and PLG = 0.049. At a 95% confidence level, the impact of CLT on TS is estimated to be between 0.057 – 0.302. This is an indication that a change in the level of CLT, in urban areas, can increase its influence on TS up to 0.302. Similarly, in terms of the SCL, PLS, and PLG factors, their influence is estimated to range between 0.028 – 0.255, 0.181 – 0.455, and 0.101 – 0.377 respectively. These intervals represent the potential influence ranges for each factor on TS, at the specified confidence level.

Predictive Accuracy Assessment

The interpretation of R^2 serves as a measure of the predictive power of the research model (Sarstedt & Danks, 2022). In this study, the accuracy of the relevance test, according to the R^2 , fits into the moderate range (0.598), which is > 0.33 . Thus, based on relevant literature, predictive relevance (Q^2) > 0 is an indication of predictive relevance between endogenous attributes. As the Q^2 in this study is verified positive (0.427), the predictive relevance of our proposed model can be considered adequate.

Goodness of Fit (GoF) Assessment

The Goodness of Fit (GoF) is used to evaluate the adequacy of the model (Wetzels et al., 2009). Between covariance-based structural equation modelling (CB-SEM) and PLS-SEM, PLS-SEM is considered more effective for determining the GoF, as it is more reliable with regards to the testing and verification of theories (Westland, 2015). While researchers generally favour the use of PLS-SEM for the GoF, it is important to exercise caution regarding issues associated to the recommended threshold values, the standardized root mean square residual (SRMR), and the chi-square (Hair et al., 2019, 2021). The GoF is ascertained through the utilization of the AVE, obtained from the average measurement of R^2 . The formula for this process is as follows: $GoF = \sqrt{(AVE \times R^2)}$ with recommended thresholds of $GoF_{small} = 0.1$, $GoF_{medium} = 0.25$ and $GoF_{large} = 0.36$ (Wetzels et al., 2009). Based on this equation, the GoF index

of this study was determined as 0.682. This value derives from the AVE of each variable: CLT (0.789), SCL (0.800), PLS (0.817), PLG (0.766), and TS (0.725). The value average of 0.779 is an indication that the predictive strength and significance of our conceptual model can be deemed adequate.

DISCUSSION

A good understanding of passenger behaviour, with regards to public transport usage, is essential during research aimed at ensuring the sustainability of public transportation. Behavioural factors, such as CLT, SCL, PLS, and PLG, play a significant role in the moulding of passenger behaviour. This investigation provides insights, regarding the manner in which passenger decision-making, in terms of public TS, is influenced by passenger behaviour. The identification key community behaviour factors, which significantly influence TS, will go a long way towards enhancing the knowledge of the authorities and policymakers in the public transportation sector, regarding the manner in which public transportation users select their preferred services. This knowledge, of significant community behaviour factors, can be utilized for the formulation of effective strategies, aimed at retaining existing passengers, while attracting new ones. In practice, however, the objective of improving the quality of public transportation services is not without its challenges, particularly in the form of differing community behaviours and perspectives.

The findings derived through this investigation indicate that PLS factors most significantly influence passenger decisions regarding TS. Thus, during the formulation of policies directed at increasing the use of public transportation, it is essential that PLS factors, including age and lifecycle stage (PLS1), economic situation (PLS2), and lifestyle (PLS3) be taken into consideration. SCL factors, such as reference group (SCL1), family (SCL2), as well as role and status (SCL3), also play a crucial role in the behaviour moulding of passenger groups and individuals. In the context of PLG factors, alerting passengers through awareness campaigns, regarding the benefits to be gained from public transportation usage, carpooling, or other sustainable travel alternatives, can lead to the realization of more conscientious passengers. As for the CLT factors, these can be enhanced through improvements in the service quality (including in the areas of cleanliness, accessibility, and safety), as well as through the monitoring and curbing of environmental degradation, deriving from urban public transportation operations.

Operators in the public transportation sector need to understand the impact of the abovementioned factors, on the TS decision-making process, in order to respond effectively to each specific factor. Also required is a good grasp of the CLT of the community, which influences the sub-culture (CLT1) and social class (CLT2). Public transportation operators need to acknowledge cultural diversity, and take their underlying values into consideration. It should be noted

that the involvement of individuals from diverse cultural backgrounds, in the public transportation sector, can serve to deter cultural bias. The SCL pressures, deriving from reference group (SCL1) and family (SCL2), as well as role and status (SCL3), need to be taken into consideration as they can influence the decision-making process. The role of the PLS factors courage, caution and openness, which affect age and lifecycle stage (PLS1), economic situation (PLS2) and lifestyle (PLS3), needs to be identified, considering their significant impact on the decision-making process. And lastly, the emotional and psychological condition of individuals involved in the decision-making process, need to be recognized, so that support in the form of motivation and self-assurance can be offered if required. On the whole, public sector officials need to be well-informed about the issues which influence the decision-making process, in terms of the use of public facilities. They should also be open to differences in opinions, and take into consideration the different circumstances of individuals, engaged in the decision-making process.

CONCLUSION AND FUTURE RESEARCH PATH

This investigation delves into the influence of CLT, SCL, PLS, and PLG on passenger behaviour in relation to public bus TS in Batam City. Data gathered from public transportation users was analysed using SmartPLS-SEM. Several critical issues associated to public bus TS were highlighted. We are optimistic that the findings derived through this study will contribute towards a better theoretical and practical understanding of these issues. In terms of the relationship between various behavioural constructs and public TS, the findings derived through this undertaking can serve as a guide, during efforts to improve public bus transportation efficiency, and increase the passenger load, to consequently realize the sustainability of this public transportation mode. According to our findings the observable variables carry more weight than the unobservable variables. These findings suggest that policies aimed at raising the quality of public bus services, need to be focused on the variables with greater potential for increasing the bus passenger load. A deeper understanding, of the factors influencing the public TS decision-making process, can facilitate the designing of more effective strategies, to increase public bus transportation usage, and ensure its sustainability. In order to meet diverse community needs and preferences, it is essential that the future formulation of transportation policies and plans, take the CLT, SCL, PLS, and PLG aspects into consideration. This will serve to reduce the dependence on private vehicles, thus alleviating traffic congestion, air pollution, and other minor urban transportation problems.

The limitations of this study calls for future research in this area. For one, the survey sample size and research area can be increased, to derive more accurate findings. While the influence of age, education, and occupation on public bus TS was highlighted, it is our recommendation that future research

delve deeper into the impact of CLT, SCL, PLS, and PLG aspects on larger groups of passengers as well as non-passengers. In the context of methodology, it is important to note that while the application of SmartPLS-SEM and multi-criteria decision-making (MCDM) differs, both can be used within the Bayesian network (BN) approach, to develop a new research framework, for discerning the relationship among the behaviour-influencing factors. In a situation where the number of respondents in a group (such as passenger and non-passenger groups) is substantial, PLS-MGA (multi-group analysis) can be employed to analyse differences in opinion among each group, regarding CLT, SCL, PLS, and PLG.

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REFERENCES

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Asah Nasrudin, N., Shakila Khalid, N., Abdullah, Y. A., Marzukhi, M. A., & Lim, S. B. (2023). Model of pedestrian crossing behaviour based on road traffic and human factor: A case study of Malaysia Shah Alam City. *Journal of Planning Malaysia*, 21(5), 32–47. <https://doi.org/10.21837/pm.v21i29.1354>
- Bakar, M. F. A., Norhisham, S., Katman, H. Y., Fai, C. M., Azlan, N. N. I. M., & Samsudin, N. S. S. (2022). Service Quality of Bus Performance in Asia: A Systematic Literature Review and Conceptual Framework. In *Sustainability* (Switzerland) (Vol. 14, Issue 13). MDPI. <https://doi.org/10.3390/su14137998>
- Barclay, D. W., & Thompson, R. (1995). The Partial Least Squares (PLS) Approach to Causal Modeling: Personal Computer Use as an Illustration. *Technology Studies*, 2(2), 285–309. <https://www.researchgate.net/publication/242663837>
- De Andreis, F., Curcio, E., Maria Sottoriva, F., & Comite, U. (2023). Multi-criteria decision-making in the transport sector. *Multi-Criteria Decision-Making in the Transport Sector*, 1–19. <https://doi.org/10.5772/intechopen.1001095>
- Dinas Perhubungan Pemerintah Kota Batam. (2020, August 11). Jadwal Keberangkatan Bus Trans Batam semua koridor. Dinas Perhubungan Kota Batam. <https://dishub.batam.go.id/jadwal-keberangkatan-bus-trans-batam-di-semua-koridor-masa-pandemi-covid-19/>
- Duleba, S., & Moslem, S. (2018). Sustainable urban transport development with stakeholder participation, an AHP-Kendall model: A case study for Mersin. *Sustainability* (Switzerland), 10(10). <https://doi.org/10.3390/su10103647>
- Hadi, J. A., Haslimah, A., Nayodi, P., & Nazaruddin, N. (2023). Faktor yang berhubungan dengan perilaku K3 pada sopir angkutan umum dikota Padang Sidempuan. *Media*

- Publikasi Promosi Kesehatan Indonesia*, 6(2), 254–260.
<https://doi.org/10.31934/mppki.v2i3>
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. In *European Business Review* (Vol. 31, Issue 1, pp. 2–24). Emerald Group Publishing Ltd. <https://doi.org/10.1108/EBR-11-2018-0203>
- Hair, Joseph. F., Ringle, Christian. M., Dank, Nicholas. P., Hult, G. T., Sarstedt, M., Bolyai, B., & Ray, S. (2021). *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R*. Springer Nature Switzerland. <https://doi.org/https://doi.org/10.1007/978-3-030-80519-7>
- Hashimah, N., Lim, H., Tsong Teh, B., Hazwani, N., Hashim, N., Supramanian, R. K., Baharudin, U. W., & Rafee Majid, M. (2023). Factor influencing pre-and post-covid-19 transport mode shift in workplace travel. *Journal of Planning Malaysia*, 21(5), 141–154. <https://doi.org/10.21837/pm.v21i29.1361>
- Henke, I., Carteni, A., Moliterno, C., & Errico, A. (2020). Decision-Making in the transport sector: A sustainable evaluation method for road infrastructure. *Sustainability (Switzerland)*, 12(3). <https://doi.org/10.3390/su12030764>
- Ismael, K., & Duleba, S. (2022). A systematic review of the latest advancements on structural equation modelling (SEM) technique focusing on applications in transportation planning. *Periodica Polytechnica Transportation Engineering*, 50(4), 336–343. <https://doi.org/10.3311/PPtr.17523>
- Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of E-Collaboration*, 11(4), 1–10. <https://doi.org/10.4018/ijec.2015100101>
- Lai, W. T., & Chen, C. F. (2011). Behavioral intentions of public transit passengers-The roles of service quality, perceived value, satisfaction and involvement. *Transport Policy*, 18(2), 318–325. <https://doi.org/10.1016/j.tranpol.2010.09.003>
- Liu, C., Bardaka, E., & Paschalidis, E. (2023). Sustainable transport choices in public transit access: Travel behavior differences between university students and other young adults. *International Journal of Sustainable Transportation*, 17(6), 679–695. <https://doi.org/10.1080/15568318.2022.2084656>
- Perumal, S. S. G., Lusby, R. M., & Larsen, J. (2022). Electric bus planning & scheduling: A review of related problems and methodologies. In *European Journal of Operational Research* (Vol. 301, Issue 2, pp. 395–413). Elsevier B.V. <https://doi.org/10.1016/j.ejor.2021.10.058>
- Peter, J. P., & Oslon, Jerry. C. (2010). *Consumer behavior & marketing strategy* (Ninth Edition). McGraw-Hill.
- Saleem, M. A., Afzal, H., Ahmad, F., Ismail, H., & Nguyen, N. (2023). An exploration and importance-performance analysis of bus rapid transit systems' service quality attributes: Evidence from an emerging economy. *Transport Policy*, 141, 1–13. <https://doi.org/10.1016/j.tranpol.2023.07.010>
- Sarstedt, M., & Danks, N. P. (2022). Prediction in HRM research—A gap between rhetoric and reality. In *Human Resource Management Journal* (Vol. 32, Issue 2, pp. 485–513). John Wiley and Sons Inc. <https://doi.org/10.1111/1748-8583.12400>
- Sweis, R. J., Al-Mansour, A., Tarawneh, M., & Al-Dweik, G. (2013). The impact of total quality management practices on employee empowerment in the healthcare sector

- in Saudi Arabia: a study of King Khalid Hospital. In *Int. J. Productivity and Quality Management* (Vol. 12, Issue 3).
- Wafa, W., Hamzah Sharaai, A., Mukhtar, S., Sahak, K., & Afghan, R. (2023). Urban development and waste management planning in Kabul new city, Afghanistan: A case study. *Journal of Planning Malaysia*, 21(5), 96–109. <https://doi.org/10.21837/pm.v21i29.1358>
- Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS Path Modeling for Assessing Hierarchical Construct Models: Guidelines and Empirical Illustration. In *Source: MIS Quarterly* (Vol. 33, Issue 1). <http://www.jstor.orgStableURL:http://www.jstor.org/stable/>
- Wong Kay, K. K. (2015). Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS. *Marketing Buletin*, 24(1), 1–32. <http://www.researchgate.net/publication/268449353>
- Zeithaml, V. A., Berry, L. L., & Parasuraman, A. (1996). The behavioral consequences of service quality. *Journal of Marketing*, 60(2), 31–46. <https://doi.org/10.2307/1251929>

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ENTREPRENEURIAL HUMAN CAPITAL ON THE EMPOWERMENT OF ASNAF ENTREPRENEURS PLANNING IN THE STATE OF SELANGOR

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Abstract

This article investigates the relationship between entrepreneurial human capital and empowerment among asnaf entrepreneurs in Selangor, Malaysia. Drawing on a quantitative research approach, data was collected through surveys to assess entrepreneurial human capital and empowerment levels. Results indicate moderate levels of entrepreneurial competency among asnaf entrepreneurs, with strengths in idea generation and resilience, yet areas for improvement in financial management. Empowerment scores reflect a moderate level of autonomy and proactive engagement in income generation activities. The correlation analysis reveals a positive and statistically significant relationship between entrepreneurial human capital and empowerment. Findings underscore the importance of entrepreneurial skills in fostering empowerment among asnaf entrepreneurs, highlighting the need for ongoing training and support initiatives to enhance their business capabilities and contribute to community development. The study recommends commencing with asset mapping to recognize the potential within marginalized communities, then proceeding with targeted capacity building to foster entrepreneurship-based empowerment, utilizing the identified potential as criteria for selecting asnaf individuals for entrepreneurial projects.

Keywords: entrepreneurial human capital, empowerment, asnaf entrepreneurial, Selangor, zakat

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INTRODUCTION

Zakat, as a fundamental pillar of the Islamic system, assumes a crucial role in mitigating social inequality and poverty by redistributing wealth to *asnaf*. *Asnaf* refers to individuals or groups who are eligible to receive *zakat*, which is an Islamic system of providing assistance to those in need. Scholars such as Al Haq *et al.* (2021) and Muhammad Jauhari and Afta (2023) emphasize its importance in enhancing socioeconomic status and serving as a strategic tool for fair wealth distribution. The *zakat* practice integrates elements of ritual and revenue generation, aiming to alleviate the hardships faced by *zakat* recipients, especially the impoverished (Noor Nafisah *et al.*, 2023).

Zakat is perceived as a means to diminish income disparity and establish a just and prosperous society, with *zakat* funds' distribution supporting economic growth and development (Darvina *et al.*, 2023). There's a notable shift within *zakat* organizations from the traditional focus on immediate financial aid towards fostering entrepreneurship. This paradigmatic shift, elucidated by Noormariana *et al.* (2019) and Amin Mujitaba *et al.* (2022), aims at long-term community development by empowering individuals with limited means.

Initiatives like the *Asnaf Zakat* Entrepreneurship program exemplify this approach, serving as a testament to entrepreneurship's role as a form of capacity-building for the empowerment of *asnaf* (Ikmal Hafiz *et al.*, 2022). Additionally, it underscores the importance of holistic approaches in community empowerment, advocating for a focus on capacity building to cultivate a well-empowered community (Tuan Muhammad Zukri *et al.*, 2023). This acknowledges that nurturing entrepreneurial skills and mindsets is pivotal in fostering lasting empowerment among the *asnaf* community.

Entrepreneurship, recognized as an effective strategy, particularly for marginalized groups, serves as a potent tool in alleviating poverty and catalyzing economic opportunities. Research by Ouyang *et al.* (2023) highlights its positive impact on attitudes, behaviors, job creation, service accessibility, and economic growth among individuals in poverty. Studies affirm the global efficacy of entrepreneurship in poverty reduction, generating socioeconomic value and facilitating the escape from poverty (Azamat *et al.*, 2023; Hina & Johan, 2023).

However, it's essential to recognize that entrepreneurship might not universally address societal issues. Philips and Pittman (2009) and W. A. Amir Zal (2016) stress the importance of evaluating community potential and resources before undertaking external business endeavors. Human capital, encapsulating knowledge, abilities, and mindsets, emerges as crucial for poverty alleviation and wealth creation (Moses *et al.*, 2015; Naminse *et al.*, 2018).

Despite existing programs and training initiatives, the criteria for selecting *asnaf* entrepreneurs based on their entrepreneurial human capital remain ambiguous (Azman *et al.*, 2016; Hamat & Che Nordin, 2012). Shobihah *et al.* (2020) and Abd Rahman *et al.* (2008) identify factors like commitment, drive,

and supervision from *zakat* institutions as potential barriers to the success of *asnaf* in commercial enterprises.

Considering the limited education and exposure among *asnaf* individuals to entrepreneurial opportunities, research endeavors to explore their entrepreneurial human capital's impact on empowerment in the state of Selangor. Through assessing entrepreneurs' knowledge, abilities, and skills, the study endeavors to unravel the intricate relationship between entrepreneurial human capital and the empowerment experienced by *asnaf* entrepreneurs.

HUMAN CAPITAL AND EMPOWERMENT

Asset-Based Community Development (ABCD) is a strategic framework that emphasizes the identification and enhancement of the inherent strengths of communities to promote resilience and adaptability in challenging circumstances (Kretzmann & McKnight, 1993; Mathie & Cunningham, 2003; Green & Haines, 2016). At the core of ABCD lies the recognition and advancement of human capital, encompassing the knowledge, abilities, and skills of individuals within society (Ehrlich & Pei, 2020). This framework heavily relies on human capital as a critical reservoir of resources, knowledge, and abilities essential for the success of the community. It emphasizes the importance of leveraging the diverse range of skills within a community to address local issues and enhance overall well-being (Ria *et al.*, 2022).

Empowerment, a fundamental principle of community development, refers to the degree of autonomy and self-governance granted to individuals and organizations, involving the delegation of authority, benefits, or permission for various tasks or obligations. The positive outcomes of empowerment, such as increased creativity, self-worth, confidence, and overall well-being, underscore its potential to drive significant positive changes (Samir Kumar *et al.*, 2023). In the ABCD framework, empowerment aligns with the primary goal of effectively utilizing and maximizing community resources, involving the provision of tools necessary for individuals and groups to achieve their goals (Tuan Muhammad Zukri & W. A. Amir Zal, 2022).

Empowerment and ABCD are closely intertwined, as ABCD focuses on leveraging the assets and strengths of a community to promote positive change, involving community engagement, asset mapping, asset mobilization, and capacity building (Omodan, 2023; Ria *et al.*, 2023). The complex relationship between human capital and empowerment is evident across various industries, such as the hotel and petrochemical sectors (Triatmanto *et al.*, 2019; Rahimi *et al.*, 2019). Empowering youth and promoting knowledge sharing are crucial for enhancing human capital development and providing individuals with more influence in the workplace (Obeidat *et al.*, 2021). The significance of human capital, technology, and employee empowerment in enhancing organizational

performance is well-documented (Rondeau & Wagar, 2014; Wisedsin *et al.*, 2020).

In the context of ABCD, this study underscores the interconnectedness of human capital, empowerment, and community development, particularly for *asnaf* entrepreneurs. By recognizing and capitalizing on the inherent capabilities of individuals and groups, combined with empowerment, communities can adopt a collaborative, comprehensive, and autonomous approach to problem-solving and well-being improvement. The study emphasizes the importance of considering entrepreneurial human capital, encompassing attributes, drive, orientation, and leadership, in evaluating the abilities of *asnaf* entrepreneurs. It highlights the potential for long-lasting, cooperative community development, aligning with empirical findings that support the study's emphasis on understanding the impact of entrepreneurial human capital on the empowerment of *asnaf* entrepreneurs in Selangor.

In summary, the literature reviewed demonstrates the integral role of human capital and empowerment in community development, particularly within the context of ABCD. The interconnectedness of these concepts underscores the potential for leveraging individual and collective strengths to drive positive change and enhance overall well-being within communities. The empirical evidence presented across various industries further supports the significance of human capital and empowerment in fostering resilience, creativity, and autonomy, ultimately contributing to the success of community-driven initiatives. translate to Malay.

METHODOLOGY

This study employs a quantitative research approach, specifically utilizing a descriptive correlation method through surveys, focusing on *asnaf* entrepreneurs in Selangor, Malaysia. Selangor was chosen due to its pioneering role in efficiently distributing zakat, particularly for business capital, with a substantial aid amount of RM 174.52 million, surpassing other states' support (Wahid *et al.*, 2009; Azman, Ab. Rahman *et al.*, 2014). These entrepreneurs possess significant experience in managing zakat to alleviate poverty, exemplified by the successful Transformasi Usahawan Asnaf (TUAS) initiative in 2015, supported by the Selangor Zakat Board (LZS).

With a population of 178 individuals, the sample size for this study comprises 123 respondents. Non-probability convenience sampling was employed due to the absence of a sampling frame, as per the Selangor Zakat Board's data protection policy, necessitating a convenience sampling method for questionnaire distribution through Google Forms to authorized WhatsApp groups of *asnaf* entrepreneurs.

The questionnaire, developed by the researcher, comprises two sections: empowerment (13 items) and entrepreneurial human capital (23 items).

Pilot research conducted in Johor yielded validity and reliability estimates exceeding Muijs's recommended threshold (.700) (Muijs, 2004). Two community development experts validated and enhanced the study instrument. SPSS software facilitated data analysis, employing Pearson correlation analysis to explore potential relationships between variables. The study's findings are limited to the sampled population and cannot be generalized to the entire populace.

RESULTS AND DISCUSSION

Entrepreneurial Human Capital

The respondents are *asnaf* entrepreneurs in Selangor, and the mean scores shown in Table 1 indicate the level of entrepreneurial human capital they possess. These business owners exhibit a broad range of skills and qualities that are critical to their success as entrepreneurs. The total score represents a moderate level of entrepreneurial competency, indicating a basic understanding of the subject.

Table 1: Entrepreneurial Human Capital

No.	Item	Mean
1	Generating new ideas	3.1
2	Developing an idea	3.0
3	Exploring new business opportunities	3.0
4	Capable of making rational decisions	3.1
5	Making decisions related to risk	3.0
6	Determining the business vision	2.9
7	Eager to achieve a goal	3.1
8	Having perseverance in business	3.1
9	Need patience in uncertainty	3.1
10	Willingness to face business challenges	3.1
11	Handling challenges	3.0
12	Having high self-confidence	3.0
13	Openness to change	3.0
14	Maintaining the drive to continue business	2.9
15	Managing the business well	3.2
16	Business planning	3.1
17	Leading the business	3.2
18	Controlling the business effectively	3.2
19	Establishing good business procedures	2.8
20	Communicating orally	3.0
21	Updating financial records	2.8
22	Preparing budgets	2.9
23	Choosing suppliers	2.9
Total mean		3.0

*Questionnaire Scale

1=Never 3=Sometimes
 2=Rarely 4=Always

Asnaf business owners have a 3.1 idea generation score and a 3.1 score for making logical decisions. These are impressive abilities. This highlights their logical and inventive abilities, which are essential for seeing opportunities and coming to well-informed conclusions. Furthermore, their ability to improve motivation, persistence, and forbearance under unclear conditions (score of 3.1) demonstrates a resilience that might be advantageous in the hard world of business. With a score of 3.0, *asnaf* entrepreneurs exhibit a high degree of competence in managing business challenges as well as a readiness to accept change. These qualities are especially important in the fast-paced business environment of today, where success depends on having the flexibility and resilience to overcome obstacles.

However, there are several industries in which *asnaf* entrepreneurs need to progress even farther. Financial management (scoring 2.8), budgeting (scoring 2.9), and supplier selection (scoring 2.9) are the areas that need improvement. These areas are very important to the long-term sustainability of their businesses and could benefit from targeted support and training. The findings show that *asnaf* entrepreneurs in Selangor may be able to develop their entrepreneurial skills. This highlights how important it is to maintain and enhance their current entrepreneurial traits while also enhancing their financial knowledge and budgeting abilities.

By employing a novel approach, these entrepreneurs can experience a sense of empowerment that leads to increased financial contributions and communal growth. Research studies have shown that efficient working capital management practices, including cash management, receivables management, and inventory management, have a positive impact on small business financial performance (Nyabwanga *et al.*, 2012). Additionally, the adoption of financial management practices such as investment decisions and financing decisions can also contribute to improved financial performance (Veeraraghavan, 2018; Hieu, 2023). These practices help small business maximize resource utilization and ensure long-term profitability and sustainability (Robert, 2011).

In summary, the study highlights the need of helping *asnaf* entrepreneurs develop their entrepreneurial skills. Through concentrating on the particular areas that require enhancement and making use of their current competencies, these entrepreneurs possess the capacity to make a substantial impact on Selangor's socioeconomic development. It is recommended that policymakers, organisations, and stakeholders formulate targeted efforts aimed at providing resources and support to enhance the entrepreneurial capacity of *asnaf* entrepreneurs. This will enable them to thrive in the business setting and contribute significantly to the community's overall growth and prosperity.

Empowerment

The distribution of power and its implementation within the economic system are referred to as empowerment. The degree of empowerment exhibited by *asnaf* entrepreneurs in Selangor is evaluated considering their proactive engagement and self-sufficiency in financial affairs. The information in Table 2 shows mean scores that show how frequently individuals feel empowered.

Table 2: Empowerment

No.	Item	Mean
1.	I am clear about the actual needs in developing my economic income sources.	3.4
2.	I am actively involved in the process of improving my/family's income sources for the long term.	3.5
3.	I actively seek ideas when facing challenges in income sources.	3.5
4.	I am actively involved in enhancing my understanding of knowledge and business skills.	3.3
5.	I pursue a career as a self-employed businessperson successfully.	3.3
6.	I voice opinions to contribute to the improvement of the development of other community entrepreneurs.	3.3
7.	I have the freedom to determine my business.	3.7
8.	I determine my own way of working, without following others.	3.6
9.	I set the price of my business products without being dictated by others.	3.6
10.	I engage in side jobs based on the business skills I possess to further increase my and my family's income sources.	3.2
11.	I explore other methods to further increase sales revenue for my business.	3.4
12.	I can manage the family's financial resources derived from my business.	3.4
13.	I diversify the sales products in an effort to expand the business.	3.4
Total mean		3.4

***Questionnaire Scale**

- 1=Never 3=Sometimes
 2=Rarely 4=Always

With an average score of 3.4, it is clear that empowerment among *asnaf* entrepreneurs occurs infrequently overall. However, these entrepreneurs also exhibit other observable indicators of economic empowerment. They demonstrate independence in running their firm (score of 3.7), working independently without following rules (score of 3.6), and deciding on their own prices for their products (score of 3.6). They also received a score of 3.5 for their proactive efforts to enhance their families and their own long-term revenue streams. Additionally, they receive a score of 3.5 for consistently pursuing

creative solutions to solve revenue-related problems. The data suggests that *asnaf* entrepreneurs have experienced some degree of empowerment.

Nonetheless, several aspects of empowerment are still only sometimes implemented by *asnaf* entrepreneur. These activities include working skill-based side jobs to augment their income (score of 3.2), supporting the growth of other local entrepreneurs (score of 3.3), aiming for a successful career as a business owner (score of 3.3), actively learning new business concepts to increase sales (score of 3.4), expanding the products they offer to grow their businesses (score of 3.4), and occasionally managing family finances with the money they make from their businesses (score of 3.4). These elements indicate a positive development in the direction of economic independence.

Asnaf entrepreneurs have traits of self-reliance and active involvement despite suffering marginalisation and ongoing poverty. The demographic data emphasises that these business owners belong to a cohort of economically challenged individuals who continue to work towards escaping poverty. However, the economic empowerment results show that people are starting to become more self-sufficient and actively participate in entrepreneurial activities. This aligns with the goals of the *Asnaf* entrepreneurs project as zakat distribution aims to enable *asnaf* enterprises to become independent and self-sufficient individuals (Zakaria & Harun, 2019; Meerangani *et al.*, 2023). Even while poverty hasn't completely disappeared, it can be said that LZS's business training and initiatives have helped them.

In summary, the findings indicate that *asnaf* business owners in Selangor are gradually achieving economic empowerment. While inconsistent, there are multiple indicators of empowerment that highlight their ability to independently make choices, increase their revenue streams, and actively participate in economic activities. Despite the challenges they face as a marginalised group, the Selangor Zakat Board's educational programmes and commercial endeavours have helped to promote their independence and economic participation.

Relationship between Entrepreneurial Human Capital and Empowerment of Asnaf Entrepreneurs

Table 1 presents the findings of a study looking at the connection between entrepreneurial human capital and economic empowerment. With a significance value of 0.00 or less than 0.05, the Spearman's rho correlation test between entrepreneurial human capital (X) and economic empowerment (Y) shows a statistically significant relationship. With a score of 0.387, the Spearman correlation coefficient suggests a rather positive association. This suggests that higher levels of entrepreneurial human capital (X) and economic empowerment (Y) are positively correlated. The intensity of the relationship is modest.

Table 3: Entrepreneurial Human Capital and Empowerment Correlation

Variable	Entrepreneurial Human Capital	
Entrepreneurial Human Capital	r	0.387
	Sig. (2-tailed)	0.000
	N	123

**p<0.01

The results of the study corroborate the assertion made by Turner *et al.* (2000) that there is a discernible effect on personal empowerment when human capital skills are linked to the economy. It is not surprising that recipients of zakat occasionally lack the entrepreneurial skills required to make their business ventures successful (Azman, Ab. Rahman *et al.*, 2014; Sanep, 2012). This result highlights the value of entrepreneurial human capital as an essential resource for the growth of entrepreneurial communities.

Therefore, asset mapping is essential to promoting entrepreneurship-based community empowerment. A technique called asset mapping is used to list and organise a community's non-physical and physical resources (Philips & Pittman, 2009). This ensures that one can assume charge and makes it possible for abilities in entrepreneurial human resources to be recognised. It is essential that *asnaf's* entrepreneurs receive ongoing entrepreneurship training to consistently improve their abilities. By equipping *asnaf* entrepreneurs with the requisite information and skills, the aim is to improve their chances of starting profitable businesses.

CONCLUSION

In conclusion, our study underscores the pivotal role of entrepreneurial human capital and asset mapping strategies in fostering economic empowerment among *asnaf* entrepreneurs in Selangor, Malaysia. The findings reveal moderate levels of entrepreneurial competency and economic empowerment among respondents, with notable opportunities for improvement in financial management skills. Policymakers and practitioners are urged to prioritize targeted training programs aimed at enhancing financial literacy and business acumen among *asnaf* entrepreneurs, while also leveraging asset mapping techniques to identify and support individuals with entrepreneurial potential.

Collaborative initiatives that foster partnerships between government agencies, non-profit organizations, and community-based groups are essential for creating an enabling environment for entrepreneurial growth and economic

prosperity. Moreover, future research endeavors should explore longitudinal and qualitative approaches to further understand the sustained impacts of entrepreneurship training programs and contextual factors influencing entrepreneurial success. By addressing these recommendations, stakeholders can advance efforts to promote inclusive development and reduce poverty among marginalized communities in Selangor and beyond.

REFERENCES

- Abd Rahman, R., Ahmad, S., & Wahid, H. (2008). Pelaksanaan Bantuan Modal Zakat: Analisis Perbandingan [Implementation of Zakat Capital Assistance: Comparative Analysis]. In Seminar Kebangsaan Ekonomi Malaysia 2008 (pp. 450–459).
- Al Haq, M.A., Abd Wahab, N., & Alam, M.M. (2021). Understanding the Impact of Institutional Factors on Asnaf Sustainability: A PIS-SEM Approach, *Journal of Islamic Monetary Economics and Finance*, 7(4), 759 – 790. (online) <https://doi.org/10.21098/jimf.v7i4.1289>.
- Amin Mujitaba, Adi Syahid, M.A., Mohamad, N.H., & Mizad, M. (2021). Economic Empowerment Among Asnaf Entrepreneurs in the Context of Self-Reliance. Universiti Tun Hussein Onn Malaysia. Available at: <https://www.abacademies.org/articles/economic-empowerment-among-asnaf-entrepreneurs-in-the-context-of-selfreliance.pdf>
- Azamat, O., Fayzullok, S., & Nilufar, A. (2023). The Impact of Entrepreneurship on Poverty Reduction. *International Journal of Professional Business Review*, 8(3), e01012. <https://doi.org/10.26668/businessreview/2023.v8i3.1012>
- Azman Ab Rahman, Mohamad Yazis Ali Basah, Mahdir Abdullah, M. N. N., & A. A. M. F. (2014). Keberkesanan Program Usahawan Asnaf Oleh Institusi Zakat Dalam Menginterpretasikan Keharmonian Ummah. In *International Conference on Arabic Studies and Islamic Civilization* (pp. 500-509).
- Azman, A. R., Mohamad Yazis, Ali Basah Mohammad Noorizzuddin, N., Mahdir, Ab., & Ahmad Anis, Mohd Fauzi Mohd Faez, A. B. (2016). Program Usahawan Bagi Memperkasakan Ekonomi Golongan Asnaf: Pemantauan Dari Aplikasi Myema. *Jurnal Pengurusan Dan Penyelidikan Fatwa*, 7, 29–38.
- Darvina Darvina, Safrudin Halimy Kamaluddin, Muhammad Ridho Nur. (2020). Zakat and Taxes in Islamic Overview: in terms of Benefit. *Kawanua International Journal of Multicultural Studies*. Vol. 1, No. 2. DOI: <https://doi.org/10.30984/kijms.v1i2.5>.
- Ehrlich, I., & Pei, Y. (2020). Human Capital as Engine of Growth: The Role of Knowledge Transfers in Promoting Balanced Growth within and across Countries. *Asian Development Review*, 37(2), 225-263.
- Green, G., & Haines, A. (2016). The role of assets in community-based development. In *Asset Building & Community Development* (Fourth Edition ed., pp. 1-31). SAGE Publications, Inc, <https://doi.org/10.4135/9781483398631>
- Hamat, M. F., & Che Nordin, M. K. N. (2012). Tinjauan Kepentingan Pembangunan Modal Insan di Malaysia [Review on the Importance of Human Capital Development in Malaysia]. *Jurnal Al-Tamaddun*, 7(1), 75–89.
- Hieu, Minh, Vu., Hieu, Tran, Chi. (2022). The Factors of Financial Performance of SMEs

- (Case of Vietnam). *Contemporary Economics*, doi: 10.5709/ce.1897-9254.486
- Hina, Hashim & Johan, Gaddefors. (2023). The value of entrepreneuring in the context of multidimensional poverty. *The international journal of entrepreneurship and innovation*, 24:88-104. doi: 10.1177/14657503231156338
- Ikmal Hafiz, M.A., Mohd Zain, N., & Mohd Yusof, R. (2022). Optimizing Disbursement of Zakat Funds for Asnaf Entrepreneurs. *ITQAN: Journal of Islamic Economics, Management, and Finance*, 1(1), 1-7. Available at: <https://journal.itqanpreneurs.com/index.php/itqan/article/view/1>
- Kretzmann, J. P., & McKnight, J. L. (1993). Building communities from the inside out: A path toward finding and mobilizing a community's assets. Evanston, IL: Center for Urban Affairs and Policy Research.
- Mathie, A., & Cunningham, G. (2003). From clients to citizens: Asset-based community development as a strategy for community-driven development. *Development in Practice*, 13, 474-486.
- Meerangani, K. A., Badhrullisham, A., Hamid, M. F. A., Hashim, S. N. I., Rameli, M. F. P., & Hamzah, M. R. (2023). The Effectiveness of The Entrepreneur Development Program in Transforming Asnaf Zakat. *International Journal of Academic Research in Business & Social Sciences*, 13(1), 1200 – 1211.
- Moses, Chinonye, Love., Mosunmola, Akinbode., Ayodele, Maxwell, Olokundun., Mayowa, G., Agboola. (2015). Entrepreneurship Education and Action-Oriented Pedagogical Approaches. *International Journal of Educational Science and Research (IJESR)*, 5(5).
- Muhammad Jauhari & Afta Kharisma Wijaya. (2023). Efficiency of Productive Zakat Distribution in Increasing the Prosperity of Mustahik in Amil Zakat, Infaq, and Sadaqah Muhammadiyah Institutions in South Sumatra Province. *I-PHILANTHROPY: A Research Journal On Management Of Zakat and Waqf*. Vol 3 No 1. <https://doi.org/10.19109/iphiv3i1.17309>
- Muijs, D. (2004). *Doing Quantitative Research in Education with SPSS*. London: SAGE Publications Ltd.
- Naminse, E.Y., Zhuang, J. and Zhu, F. (2019), "The relation between entrepreneurship and rural poverty alleviation in China", *Management Decision*, Vol. 57 No. 9, pp. 2593-2611. <https://doi.org/10.1108/MD-11-2017-1153>.
- Noor, Nafisah, Ishak., Mastura, Razali., Nur, Ridhuan, Nor, Mohd., Noraini, Saro., Muhamad, Hasif, Yahaya., Zulaipa, Ruzulan. (2023). The Role of Islamic Financial Institutions in Distributing Zakat Refund (Wakalah). *International journal of academic research in business & social sciences*, doi: 10.6007/ijarbss/v13-i5/17178.
- Noormariana, M., Mohd Zain, N., & Mohd Yusof, R. (2019). Optimizing Disbursement of Zakat Funds for Asnaf Entrepreneurs. *ITQAN: Journal of Islamic Economics, Management, and Finance*, 1(1), 1-7. Available at: <https://journal.itqanpreneurs.com/index.php/itqan/article/download/1/25>
- Nyabwanga, Robert, Nyamao., Ojera, Patrick., Lumumba, Martin., Alphonse, Odondo., Otieno, Simeyo. (2012). Effect of working capital management practices on financial performance: A study of small scale enterprises in Kisii South District, Kenya. *African Journal of Business Management*, doi: 10.5897/AJBM11.1418
- Obeidat, A. M., Wahiby, H. A., Alshammari, D. M., Alzu'bi, S. K., Hadrab, A. F., &

- Samara, M. A. (2021). The Moderat Role Of Knowledge Sharing On The Effect Of Human Capital In Job Empowerment. *Elementary Education Online*, 20(3), 1449-1459.
- Omodan, T. C. (2023). Analysis of Asset-Based Community Development to Transform Rural Schools in South Africa. *Interdisciplinary Journal of Rural and Community Studies*, 5, 13-21. <https://doi.org/10.38140/ijrcs-2023.vol5.02>
- Ouyang, S., Guo, Y., Lin, X., & Tian, Y. (2023). Why Can Entrepreneurial Involvement Encourage the Entrepreneurship of People Experiencing Poverty? —A Study Using China’s Empirical Data. *Sustainability*, 15, 11111. <https://doi.org/10.3390/su151411111>
- Philips, R., & Pittman, R. H. (2009). *An Introduction to Community Development*. Routledge.
- Rahimi, E., Pourzakeri, A., Abbasi Rostami, N., & Safari Shad, F. (2019). Effect of Empowerment on Human and Social Capital. *International Journal of Management, Accounting and Economics*, 6(3), 286-296.
- Ria, Dhea, Nur, Karisma., Heni, Widayani., Achmad, Naschicuddin. (2022). Asset-Based Community Development: Pengembangan Produk Pertanian Sari Jeruk Khas Dusun Precet. *JRCE (Journal of Research on Community Engagement)*, 4(1):54-59. doi: 10.18860/jrce.v4i1.17410
- Robert, Nyamao, Nyabwanga. (2011). *An Assessment of the Effect of Working Capital Management Practices on Financial Performance: A Study of Small Scale Enterprises*. Social Science Research Network,
- Rondeau, K., & Wagar, T. (2014). Employee High-Involvement Work Practices and Voluntary Turnover: Does Human Capital Accumulation or an Employee Empowerment Culture Mediate the Process? Examining the Evidence in Canadian Healthcare Organizations. In *Journal of Technology Management and Innovation* (Vol. 9). <https://doi.org/10.4067/s0718-27242014000300002>.
- Samir Kumar Sen, Prodip Karmakar & Samirranjan Adhikari. (2023). Empowerment and Women’s Empowerment – A Theoretical Basis. *International Journal for Multidisciplinary Research (IJFMR)*. Volume 5, Issue 3. <https://doi.org/10.36948/ijfmr.2023.v05i03.4111>
- Sanep, A. (2012). Membangun Keusahawanan Asnaf : Analisis Konsep Model Pemindahan Teknologi. *Prosiding Perkem Vii*, 1, 709–715.
- Shobihah, D., Abai, Awang, M. D., Mohd Yusoff, A. N., Ab. Majid, A. and Hamli, H. (2020) “Bentuk Bantuan Modal Agihan Zakat Asnaf dan Pencapaian Usahawan Asnaf di Malaysia: Kajian Empirikal”, *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, 5(1), pp. 93 - 99. doi: 10.47405/mjssh.v5i1.353.
- Triatmanto, Boge, Wahyuni, Nanik and Respati, Harianto (2019) Continual human resources empowerment through human capital and commitment for the organizational performance in hospitality industry. *Quality Acces to Sucses*, 20 (173). pp. 84-91. ISSN 2668-4861
- Tuan Muhammad Zukri T.S, Adi Syahid M.A., Abu Hassan Shaari, A., Awang Noh, N., & Sulaiman, S. (2023). Capacity Building Planning For Fishermen Community’s Empowerment. *Planning Malaysia*, 21(30). <https://doi.org/10.21837/pm.v21i30.1409>
- Tuan Muhammad Zukri, TS., & Wan Ismail, W. A. A. Z. (2022). Formal Education,

- Work Experience, and Empowerment of the Fishing Community in Terengganu, Malaysia. *Journal of Nusantara Studies (JONUS)*, 7(1), 366-389. <https://doi.org/10.24200/jonus.vol7iss1pp366-389>.
- Turner, N. J., Ignace, M. B., & Ignace, R. (2000). Traditional ecological knowledge and wisdom of aboriginal peoples in British Columbia. *Ecological Applications*, 10(5), 1275–1287. [https://doi.org/10.1890/1051-0761\(2000\)010\[1275:TEKAWO\]2.0.CO;2](https://doi.org/10.1890/1051-0761(2000)010[1275:TEKAWO]2.0.CO;2).
- Veeraraghavan K. (2018). Effect of Financial Management Practices on Financial Performance of Small and Medium Enterprises in Pudhucherry, India. *The International Journal of Management*, doi: 10.18843/IJMS/V5I4(8)/06.
- W.A. Amir Zal (2016). The practice of community potential mapping as a guideline for community development in Malaysia. *Journal of Community Development*, 48(1), 1-12.
- Wahid, H., Ahmad, S., & Abdul Kader, R. (2009). Pengagihan Zakat oleh Institusi Zakat kepada Lapan asnaf: Kajian di Malaysia. Seminar Kebangsaan Ekonomi Islam, 1–17.
- Wisedsin, T., Jermittiparsert, K., Thitart, P., & Aunyawong, W. (2020). Role of Advanced Manufacturing Technology, Human Capital and Employee Empowerment to Enhance Manufacturing Industry Supply Chain Performance. 9(2), 411–418.
- Zakaria, Faizah Binti, and Azhar Bin Harun. (2019). Skills and Success of Asnaf Entrepreneurs: Islamic Spiritual Practice as Moderators.” *International Journal of Accounting, Finance and Business (IJAFB)* 4(24):98–108.

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CO-LIVING AS AN INNOVATIVE REAL ESTATE PRODUCT: INSIGHTS FROM DEVELOPERS

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Abstract

The concept of co-living rose to prominence in the last decade, with people's searches for co-living increasing dramatically since 2015 worldwide. The purpose of this research is to reveal the developer's insights and perceptions about the newly introduced co-living system in Malaysian society. Since co-living in Malaysia is still in its infancy, this study aims to explore the emerging trends in co-living. Twenty-five developers' opinions were collected through face-to-face interviews and thematic analysis was performed to analyze the qualitative data. Key themes for emerging trends in co-living have been identified and organized into four sections: (i) adoption of co-living as a business model; (ii) potential advantages of co-living; (iii) barriers/challenges to co-living projects; and (iv) future trends for a living. Findings are expected to contribute to a better understanding of co-living in Malaysia.

Keywords: Co-living; co-housing; developer; perception; Malaysia

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INTRODUCTION

The advent of the new millennium has seen abrupt changes in population shift in density and divergence to urban areas, leading to a shortage of residential space. This shift has given rise to diversity and variations in living patterns, predominantly introducing cohousing, resident-led cooperatives, community land trusts, and other forms of combined living. Although collective living has long standings in the social world, emerging from rurality in the form of joint and extended family structures, the system of co-living has reshaped such joint living into co-living with some variations, adding new aspects to address the crucial issues of living in the present society (Czischke et al., 2020). Co-living is relatively new to the real estate development industry, the existence of which is heavily prevailing throughout the developed world. Although co-living delimits personal space, it is strongly believed that such a type of living is finance-friendly as it reduces up to thirty percent of the rental rate (Pepper & Manji, 2019). The changing worldly patterns in socio-economic circles have augmented the interest of dwellers and developers in the residential products of co-living. Experts in the field refer to it as combined private living while forming a house having shared facilities, unlike flat living, which only shares the living arrangements; co-living entails social bonds creating and promoting the communal form of living in an urbanized manner (Shafique, 2018). Co-living is attributed to the qualities of cohousing, which, as a specialized form of it, gives priority to residents and communal governance involving them (residents) in its management, planning, and development (Quinio & Burgess, 2018).

Studies have unanimously agreed that co-living is a modernized system of living that has been encouraged by the advent of urbanization. There is a shortage of living facilities in big cities where the existing infrastructure shortens due to urban migration, value for the sharing economy, and delayed marriages in most instances. In such conditions, co-living was deemed one of the solutions to address the issue of residential shortage in urban structures (Pepper & Manji, 2019). As advanced recently, the concept of co-living received prominence during the last decade, and people's search for 'co-living' has exponentially increased since 2015 across the globe. Getting familiar with the term co-living and its attributes are excessively discussed and debated under the academic, administrative, and journalistic circles portrayed in professional reports, academic journals, and discussion panels (Nethercote, 2020). Similarly, in a country like the USA, an estimated number of thirty co-living companies with more than 3000 rooms pervade (Gazdag & Torlegård, 2018).

To address present society's issues, co-living has been adopted and merged into different forms, including co-housing and collaborative housing, where all these intend to serve a single purpose (Vestbro 2010; Fromm 2012). The debate on co-living arises primarily from European structure and has become a global concept to discuss and concern to address. Operations across the globe

and measures on a regional basis are taken, and the researchers are also attempting to address the issue, which has received proper attention in the last decade. The knowledge dissemination has been continuous, yet there is a dire need for further research on the local sector for generalization, which requires notable efforts (Czischke et al., 2020). Similarly, this study is planned to address the issues persisting in co-living in Malaysia. As a developing country, Malaysia is confronted with the challenge of residential issues, especially in urbanized structures (Mustafa Kamal et al., 2020). Migration from rural to urban, along with cross-border immigrants, is approaching the developed sectors, where the need for proper residence has become inevitable. This study is framed to attain the maximum input about the subject issue of co-living from the insights and perspectives of developers. The objective circulates emerging trends in co-living. It is further divided into sub-sections to fully investigate the issue from multiple dimensions, such as co-living as a new business model, potential advantages of co-living, barriers/challenges to co-living projects, and the future of living spaces.

RESEARCH METHOD

The present study is framed under a rigorous research approach following systematic analytical methods to understand the issue of co-living in a scholarly manner. As this study aimed to reveal developers' insight in relation to the co-living concept, it employed a qualitative interview to gather the respondents' opinions towards the co-living concept. A total of 25 respondents (coded as R1-R25) were interviewed face to face via Zoom, where the interview sessions were recorded and transcribed, and thematic analysis was carried out.

The interviews were recorded and transcribed. Thematic content analysis identifies, analyzes, organizes, describes, and reports themes derived from the transcripts (Braun & Clarke, 2006). Thematic analysis has occupied a distinguished status in qualitative research for having evident, authentic, and reliable methods to ensure the authenticity of results (Braun & Clarke, 2013). Researchers believe that thematic analysis is a technical and systematic approach to the smooth organization of complex datasets, which always challenges the skills of researchers with its tough and hard mechanisms yet produces reliable and authentic results (Attride-Stirling, 2001; Braun & Clarke, 2013). A rigorous discussion has been conducted among the researchers to agree on the identified codes and themes derived from the thematic analysis.

FINDINGS AND DISCUSSION

Of the 25 respondents, 64% are male respondents, the majority are over the age of 35 (68%), and the remaining are below the age of 35. Almost 52% of our respondents have more than 10 years of experience, where 76% have handled more than 5 construction projects and 64% have handled projects with a Gross Development Value of more than RM100 million. Majorities of the interviewees

(64%) possessed a postgraduate qualification. This indicates that our respondents are experienced developers and, are deemed to have a basic understanding of development trends and are qualified for this study.

The qualitative dataset for this study is analyzed as per the mentioned qualitative-thematic-analysis methods. Themes are systematically derived from the interview dataset through data coding, categorization, organization, and derivation of themes. The derived themes are thus systematically addressed and discussed with the support of relevant literature and extracts from empirical data to make genuine, original, and reliable findings about the emerging trends in co-living in Malaysia. The details of the themes are:

Adoption of Co-Living as a Business Model

The concept of a co-living strategy is emerging and feasible in Malaysia. It is a growing market, and while the Malaysian context is developing due to the boom in technology and education along with the development of tourism strategies, the incomers and permanent dwellers have exceeded with high potency. As stated by him, “...Possible. But have to see the first location. How much capital do they need? How about the bridging loan? Can I get the loan or not? And then the marketability, there must be a demographic statistic that must be studied in terms of population...” (R2). Such a lucrative addition to the population for different purposes has made the local market more fertile to introduce co-living for more accommodation, facilitation, and attention of clients, as mentioned by R1, “...Feasible? Of course, you’ve got money, surely feasible...”.

From a marketing point of view, the co-living strategy is deemed a gimmick marketing sphere, which needs to be modified from traditional (old) to modern (new) ways to get the most benefit. On the contrary, it is also believed that instead of being beneficial and feasible as a business model, the developers working in traditional manners only focus on building and selling the product, which in turn produces low-quality stuff for the clients and fades its glitters into oblivion. As noted by R5, “I would say it will be a very good marketing gimmick. It is something new, and people would want to try. And especially after this pandemic, people see a potential in this”.

In some instances, it is believed that the entirety of placing and practicing the co-living business in Malaysian circles is difficult to nourish because traditionalism and old-fashioned thoughts still rule the society. The more fertile settings for this new concept circulate the educational setups and industrial zones, where the non-locals, migrants, workers from abroad, and overseas students are found. The development of a co-living market exists in the segments of the population that persist in the unavailability of living spaces at their self-disposal “...Feasible, but for specific markets, not for the open market, like normally they do this for areas close to universities, colleges, or factories...” (R10).

Apart from market orientation, the interview participants also urged the feasibility of co-living as a business model in terms of its income capability. It is presumed a growing business model that can serve multiple purposes like the engagement of masses to increase employability and earning for owners at high rates, as confirmed by R11: (“...*Oh yeah. Yes. Higher yield...*”). Additionally, emphasizing its cruciality, a participant added that this concept is becoming popular among the young generation, which is digitally mastered and mentally sharp with higher entrepreneurship skills. As mentioned by R13, “*It is feasible...It is something that is coming soon already. Nowadays, many young people are digital nomads. They are young entrepreneurs who may seek a contract basis from their employer or client. So, I will say this is feasible*”.

Location, in a real sense, matters for the co-living concept. Research studies undertake the concept as a fact that even the people who are resourced to have self-residence are found unhappy in terms of location, co-habitants, privacy, and space (Klein, 2020). Similarly, the affordability and feasibility of co-living as a business model lies in the specification and selection of a relatively perfect location (“...*Yes, but it's subjective, based on location*”) (R15). Among the participants, a single comment addressed the unfeasibility of co-living as a business model in the Malaysian context, emphasizing the timing and situation of the society because of the transition from traditional to modern. The conflicting and infertile situation is deemed restrictive for the nourishment of it as a business model in the current scenario, i.e., “...*I would say at this point, not really. Especially, I would say Malaysia, not really...*” (R7).

Potential Advantages of Co-Living

Co-living might be advantageous and disadvantageous in the capacity of services delivered and provided. The apartments in a co-living facility are usually designed to meet the dwellers' needs by providing wide space facilitation through maintenance services and many more (Giorgi, 2020). Similarly, this study highlighted the advantages and disadvantages of co-living in almost ten variables. Table 1 summarizes the advantages of co-living as acknowledged by the respondents when they were asked to respond to the quantitative survey questionnaire.

In terms of lower housing costs, most of the response emphasizes neutrality, i.e., (44% of respondents). It shows the midway approach of respondents towards it, which seems that the facility at this point in time is neither considered as purely advantageous nor disadvantageous; rather, the respondents are confused or in some way neutral or unable to respond to such questions. In addition, the concept of ‘getting a first foot on the housing ladder’ is advantageous (36% of respondents). It is strongly believed that co-living enables the dwellers to meet new people (56%). Alongside, it is widely believed that co-living can provide living closer to the city or town center, endorsed by 56% of

the respondents as very advantageous and 44% as advantageous. The findings also highlight that such a facility is highly advantageous in the capacity of less housework/maintenance (64%). Furthermore, the respondents have focused on the provision of high-quality amenities, drawing a frequency of 60% as the majority. While co-living, providing service by being nearer to the workplace or study location is highly advantageous, as marked by 72% of the respondents. Furthermore, the empirical data shows that co-living is less advantageous (44% as neutral) in providing a facility to live near family, while a contrasting frequency of 76% for providing a facility to live near friends. We reckoned that this interesting result could be attributed to the fact that the majority who occupy co-living accommodation are migrants who are moving away from their parents in search of better opportunities in their current stay.

Table 1: Potential Advantages of Co-living

Advantages	VA	A	N	LA	NA
Lower Housing cost	7 (28%)	4 (16%)	11 (44%)	00	3 (12%)
Getting a first foot on housing ladder	9 (36%)	5 (20%)	5 (20%)	3 (12%)	3 (12%)
Ability to meet new people	14 (56%)	6 (24%)	4 (16%)	1 (4%)	00
Ability to live closer to the city/ town centre	14 (56%)	11 (44%)	-	-	-
Less maintenance	16 (64%)	3 (12%)	4 (16%)	-	2 (8%)
Access to high-quality amenities	7 (28%)	15 (60%)	2 (8%)	-	1 (4%)
Ability to live closer to work/studies	18 (72%)	6 (24%)	1 (4%)	-	-
Ability to acquire an asset that can appreciate	3 (12%)	5 (20%)	10 (40%)	4 (16%)	3 (12%)
Ability to live nearer to family	3 (12%)	4 (16%)	11 (44%)	5 (20%)	2 (8%)
Ability to live nearer to friends	9 (36%)	10 (40%)	4 (16%)	2(8%)	-

Note: VA – very advantageous; A – advantageous; N – neutral; LA – less advantageous; NA – not at all advantageous

Barriers to Co-Living Projects

The finding also illustrates that co-living is one of the biggest challenges of the modern world in traditional and developing societies. “Okay. Number one, the public will need to buy into this idea. I think that is the biggest challenge. You need to be able to sell this idea to the public, and it's not an easy sell. From my response, I'm like, ‘Hell no, man.’ I won't stay in a co-living unless it's Crystal beside me...” (R1). The members' interests, including the residents, are most likely at stake. At the same time, the larger community comprising external stakeholders is also a challenge in ensuring balance in the system (Thompson,

2020). Similarly, the tension arising from a legal perspective also hinders the philosophy of co-living (Bengtsson et al., 2017). It is strongly believed that governmental policies consisting of legislation, internal and external conflicts, and acceptability in the market are among the core challenges in promoting co-living in Malaysia. For instance, as acknowledged by R6, *"I think the market is not ready for that. It's what I can see..."* and further added by R14, *"Yeah, legislation, competition and I guess social conflict. That's one thing we have to manage. If you have a building and there are 100 people, I can guarantee you all 100 people don't get along..."*

Residents of the co-living or communal living are found frightened about security issues. The security concern is felt in multiple forms: physical, financial, and mental security. The conception and perception of living in a stranger place at the disposal of others (mostly strangers) threaten the security of dwellers, who consider it a temporary and insecure locality to live in. Such a lack of ownership leads to a more vulnerable status of co-living, victimizing the basic essence for which it is deemed to be introduced (Corfe, 2019). For instance, *"...Security, I think, would be my main concern..."* (R3), *"Will be the market acceptability...I think a lot of people will be thinking of security issues..."* (R9).

Co-housing or living is a resident-centric concept that requires sophisticated levels of planning, management, construction, and design-related elegance because it demands rigorous management strategies to make an affordable dwelling for residents (Hoppenbrouwer, 2019). Good management and manager are primarily the dire needs for smooth operations of co-living as a new concept, making it a presentable product and enhancing its productivity to the masses *"...But I think the main challenge will be trying out a new product, this is for sure a new product. Another challenge is to get a really good manager/management team to run the place..."* (R5). In addition, building construction is not a big deal; the issue persists in managing it well with elegance, control, and supervision. The system of sequential and systematic progress and order means a lot to the operation of such a business where one needs to develop the trust and gain the confidence of the consumers/customers/residents/tenants. In a similar context, the participants asserted that management is the primary challenge for co-living in Malaysia, *"...Challenges is actually to manage the building after you have completed. So, it's a continuing obligation. If you sell the apartment, are you selling an investment where people invest and lease it back to you, or do you own the whole building yourself? So, if you own the whole building, you don't sell; we just collect rental. So, it's for recurring income. So, the question should be whether you want to hold it for recurring income or whether you want to sell and get your profits straight away..."* (R11); *"...Foreseeable challenge, I think, is a management experience. We, as developers, are very good at planning and constructing until the stage of the certificate of completion and compliance. But the real challenges are not during*

the construction or the planning, but how are we going to manage it and make it, so-called property sustainability that people know this building... ” (R13)

Besides, some mixed forms of challenges were also identified during the analysis of data, including the layout challenges by developers, the process of construction and selling of the property, cost-associated challenges, scarcity of buyers for a co-living space, the utility of building materials during construction and most prominently the location of the building. It is widely believed that the finances and costs of such projects are heavily required because co-living is not a traditional form of living. Rather, it requires a construction of a different and specialized nature “...I think it will be the cost to build. If you're talking about five, each unit having its own bathroom, the plumbing system will be different now because each unit will need to get its own toilet, and then as far as laundry place where you (occupants) do your laundry. So that is a challenge in itself...” (R1). Along with that, the building materials were taking care of Halal (legitimate) and Haram (illegitimate) items – to take care of society's religious values – are also among the challenges. The co-living systems are usually constructed for multipurpose to accommodate diversity and not be exclusive in any format, promoting inclusivity, explained as “...The materials you use to build up the co-living also depend on what kind of co-living will be. Let's say it is high-end; your charges will be higher, right? Then, if it is moderate, we have to foresee that material-wise, in the construction way, we need to choose it properly. And then, we need to choose very sustainable materials and Halal materials because you don't want to have frequent maintenance...” (R12)

More so, the most commonly placed and faced challenge that floats on the surface is the selection of a location for placing the building of such a facility. Several parameters need to be addressed while selecting the location, such as accessibility, affordability, nearness to the market, stations, and detachment from local or conventional residences along with busy markets, bazaars, and hustling areas. “...Yeah. It always depends on location. The biggest challenge is the location of the building. Any developer can build..., but one of the biggest challenges will be the location for you to get a buyer...” (R15)

The Future Trends for Living

Future trends for living predominantly lie in the present trends with support from the previous ones. Experts in co-living assert that ensuring flexibility in designing the units of co-living spaces entails the future orientation of advancing the subject system into a more sophisticated one or diverging it into conventional family units (Pepper & Manji, 2019). In a similar context, the empirical analysis also emphasizes the flexibility of such a concept. Flexibility is defined as space and opportunities for communal gatherings and interaction. Interaction is the soul of living and the foundation for creating a sense of togetherness (Abdul Rahman et al., 2012), often scarce in urbanized living formats, especially co-living, where

strangers are more likely to reside. While urging togetherness and communal association, an interview participant reiterated, “...Trend for a future living? Um, yeah, flexibility on the use of the space, like a co-living space and more communal facilities where people can get together and get to know each other, your neighbors...” (R9)

Social interactionism is hastily disappearing in the modernized complex world. People are getting more engaged in their spheres, which has adverse effects on association with their social environment, which is a moment of immense concern for scholarship in this domain. The same is reiterated in participants' responses during this study, for instance, “...More engagement with people is important. The co-living people nowadays, my observation, don't know their neighbors, and engagement with the public is very low, especially after work. Saturday, Sunday, they didn't engage with people...” (R2). Contrary to this, as trends of other life-associated patterns tend to change, the living patterns are also changing. Humans, by nature and nurture, are both adoptive and change-lover. They get tired of the same objects and even lifestyles and residences. It is believed that the future trend will be a shift from a static, constant, and stable lifestyle to a mobile, agile, and transitioning lifestyle, as is evident in the statement from a participant: “...I believe people will continue to want more and more flexibility. So, they will be less and less inclined to want to buy their property. People may want to be a lot more geographically untethered. They will just keep moving around to whatever suits them...” (R14)

The more the world and life get busier and complex, the more individuals' privacy is at stake. People's personal lives and privacy are overtaken by the advent of modern values, gadgets, and more exploration of self through social media and other platforms. It is widely accepted that the present-day the individual is getting monotonous from more self-projection and wants some privacy and openness to nature because nature is also overtaken by artificiality “...The trend for future living is private space. People want a space where they have their privacy. They're not looking for communal spaces, by the way. They're looking for big private spaces. What I mean by that is they're looking for balconies, they're looking for lawns, they're looking for places where even under lockdown, and they still have a place to exercise, stretch their legs, that kind of thing...” (R1). Open spaces are barely available to people because of a petrifying increase in population. The streets, markets, and especially residential areas are over-occupied, and humans might be found everywhere in bulk. Hence, the open air, ventilated, natural, and comfortable spaces are barely available to people, which is desired, and a shift tends to occur to such a system that teaches the trend of landed property instead of high-rise buildings. As noted by R5, “...I'm seeing a trend of people preferring landed property over condominium right now. I think it moves two ways for people with families. They're switching from high rise, residential to landed residential because they want more spaces for the kids to

have their activities and to run around in...". In addition, it is reckoned that COVID-19 does affect the demand on ventilation, as acknowledged by R3, "...Again, now, we must learn from COVID. For me, ventilation must be good, especially since developments encourage sustainable development. They want the developer to integrate a green building concept. So, ventilation is very important for the unit itself..." (R3)

Alongside, because of abrupt climate change across the globe, the need for green (contextualized as greenery or natural outlook) is heightened. "...I think, a green building as well. I think the reason is that, with our climate changes and things like that..." (R7). Apart from the likeness for open and natural spaces, it is also believed that those concepts have either got older or become ideal. Older in the sense that open, joint, and spacious spaces were the requirements in traditional structures or norms of primitive society, while the modernized world has its values, where space has become scarce. With more construction and an increase in population due to migration and movement for work, education, and other needs, providing those idealized spaces might not be practical. In this scenario, the future is believed to lie in co-living instead of conventional settlement forms, mostly found in rural and primitive societies. For instance, according to R10, "... So that will continue to help as well because our property matter compared to the peers in the region, even Singapore, we are still very much affordable, but very much affordable to the region, but not affordable to Malaysians. So sooner or later, we will catch up".

CONCLUSION

This study concludes that co-living is quite a new and emerging concept in Malaysia. Being a new and emerging concept, the co-living system is not in a strong position to influence the property market. It is still struggling to adjust and cope with the traditional structure and overcome the religious fundamentalism and racial polarization hurdles. More so, the role of developers is also nullified in this research in terms of exhibiting, promoting, and nourishing the concept of co-living in society, as the developers focus primarily on earning, have less facilitation from their clients, and prioritize less value to co-living. There are fewer deliberations for co-living in forthcoming or ongoing projects, with some exceptions where some developers have intentions and play roles to include the concept in their project. The weaknesses in management, scarcity of good managers, developers' layout, and limited market are among the potential challenges to co-living in Malaysia. The advent of co-living primarily finds its basis in the development of cities, internal migration and movement of people, and the influx of foreigners into Malaysian society. The findings predominantly point to the fact that the owners and tenants are included in the list of beneficiaries of co-living, which is further extended to overseas residents, outsiders, foreigners, and migrants specifically. Consumers and space-seekers are motivated by the

cost-effectiveness of co-living, which is attributed to sustainability, socializing, and reducing the travel fatigue and charges of the beneficiaries.

Co-living can be best adopted as a new business model in Malaysia because there is a vast space for such business. On the contrary, challenges do prevail apart from the positives of co-living. Still, they are not insatiable and are pretty solvable, including security, governmental policies, and legislation, which requires rigorous nourishment, proper attention, and prioritization both in the private and public sectors for building understanding, awareness, and acceptance of the masses. Awareness about co-living in Malaysia is still below the standard, where most people are unaware of the facility, its dos and don'ts, and its worthiness. The detailed findings point to the fact that awareness shall be brought especially among the developers for inclusion of this concept into their forthcoming projects and ensure its promotion and sustenance. The co-living structures should have private and shared living spaces to provide more ownership and comfort in life. The building directions and designs shall be framed to facilitate the proper sunlight, be flexible to any future amendments, have a life-friendly interior design, and awareness of the co-living concept among the masses, which are deeply engraved needs of the day. The more the facility is equipped with life-saving, life-nourishing, life-supporting, and life-enhancing models, the higher would be the persistence, promotion, nourishment, and triumph of co-living in Malaysian social structure, and because co-living primarily circulates 'life'.

ETHICAL STATEMENT

We declare that we have no conflicts of interest that could jeopardize the objectivity or integrity of this research and that any potential conflicts have been fully and openly declared. This complies with international publication requirements and our obligation to respect research ethics. All study participants gave informed consent and voluntarily agreed to be interviewed; participant anonymity and confidentiality were preserved. Throughout the research process, including the phases of design, data collecting, analysis, and dissemination, we have carefully reviewed and handled potential ethical issues. The risks and benefits of the research have been thoroughly evaluated, precautions have been taken to minimize potential harm, and the welfare of the researchers, participants, and other stakeholders has been prioritized. Our research's possible effects on the larger community have been considered, and efforts to disseminate and exchange knowledge have been planned to guarantee the ethical and significant sharing of findings. When the data gathered for this study is used again in the future, ethical standards will be carefully considered to ensure that any secondary use complies with applicable ethical principles and fits with the original purpose. This ethical statement demonstrates our commitment to carrying out research that is scientifically robust, socially responsible, and ethically sound.

REFERENCES

- Abdul Rahman, N., Omar, D., & Salleh, A. G. (2012). Determinant factors of Neighbourhood Quality. *Planning Malaysia Journal*, 10(3).
- Attride-Stirling, J. (2001). Thematic networks: an analytic tool for qualitative research. *Qualitative research*, 1(3), 385-405.
- Bengtsson, B., Ruonavaara, H., & Sørvoll, J. (2017). Home ownership, housing policy and path dependence in Finland, Norway, and Sweden. In *Housing wealth and welfare*. Edward Elgar Publishing.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
- Braun, V., & Clarke, V. (2013). Successful qualitative research: A practical guide for beginners.
- Corfe, S. (2019). Co-living: A solution to the housing crisis. *The Social Market Foundation*.
- Czischke, D., Carriou, C., & Lang, R. (2020). Collaborative housing in Europe: Conceptualizing the field. *Housing, Theory and Society*, 37(1), 1-9.
- Fromm, D. (2012). Seeding community: Collaborative housing as a strategy for social and neighborhood repair. *Built Environment*, 38(3), 364-394.
- Gazdag, N., & Torlegård, A. (2018). Micro Apartments: A Potential Solution for the Severe Shortage of Small Affordable Apartments in Stockholm Nóra Gazdag and Anna T.
- Giorgi, E. (2020). The Co-Housing Phenomenon: Environmental Alliance in Times of Changes. *Springer Nature*.
- Hoppenbrouwer, B. (2019). The Community Effects of Co-living: Exploring opportunities for Dutch developer-led co-living in fostering community building among residents.
- Mustafa Kamal, E., Seng Lai, K., & Yusof, N. A. (2020). The Low-Middle Income Housing Challenges in Malaysia. *Planning Malaysia Journal*, 18(11).
- Nethercote, M. (2020). Build-to-Rent and the financialization of rental housing: future research directions. *Housing Studies*, 35(5), 839-874.
- Pepper, S., & Manji, A. (2019). *Co-living as an emerging market: an assessment of co-living's long-term resiliency* Doctoral dissertation, Massachusetts Institute of Technology.
- Quinio, V., & Burgess, G. (2018). Is co-living a housing solution for vulnerable older people. *Cambridge Centre for Housing & Planning Research: Cambridge, UK*.
- Shafique, A. (2018). Co-living and the common good. *RSA: London, UK*.
- Thompson, M. (2020). From co-ops to community land trusts: Tracing the historical evolution and policy mobilities of collaborative housing movements. *Housing, Theory and Society*, 37(1), 82-100.
- Vestbro, D. U. (Ed.). (2010). Living together: Cohousing ideas and realities around the world. *Stockholm: KTH*.

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IDENTIFYING BARRIERS TO WALKABILITY WITHIN THE HERITAGE CITY OF MYSORE, KARNATAKA, INDIA

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Abstract

Historically, streets have served a range of functions, primarily those associated with shopping and social interactions. However, in the 20th century, the street design became centred on traffic movement. It enhanced the space for automobiles, while public lives were marginalized to sidewalks, not to forget the problems faced by the street hawkers, quintessential to the Street scene in India. The historic core of Mysore, a metropolitan city in the Southern state of Karnataka in India, has had various attempts to enhance its mobility but has not had much success. The paper summarises a pilot study carried out on Asoka Road in the city of Mysore to investigate its walkability. A descriptive quantitative technique was adopted, in which a random sample of respondents who happened to walk down Asoka Street were given questionnaires and surveys to complete to collect data. The results revealed that the level of comfort of the street amounted to 51.8% and that the pedestrian path was quite uncomfortable.

Keywords: Walkability, Streets, Historic Core, Pedestrians

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INTRODUCTION

A high level of pedestrian activity is often associated with more sustainable urban form (Gehl, 2013),(Speck, 2013), robust local economies (Glaeser, 2012), better public health outcomes (Asah Nasrudin et al., 2018), (Rundle et al., 2007) and stronger social networks (Rogers et al., 2011). Pedestrian areas have been minimised to allow for better road opening (Mohd Isa et al., 2019). Growing evidence indicates that land use patterns in many countries do not facilitate the healthy development of human beings as well as that of the economy (Wang & Yang, 2019). Environmental elements, such as the weather and season, are mentioned by scholars as having an impact on travel behaviour and non-motorized forms of transportation (Aboelata & Sodoudi, 2020).

Objectives

1. To analyse the pedestrian mobility pattern in a select street in the Planning District-1 (PD-1) in the city of Mysore. To calculate the Comfort Level of walking at the roadside in a selected street.

Walkability in Mysore: a brief background

Mysore, the second-most populous city in Karnataka, has a population of 0.983 million as per the 2011 Indian census and a projection of 1.65 million for 2021- (Census of India 2011 - Karnataka - Series 30, 2014) and is expected to grow rapidly. Mysore's physical and social infrastructure is under great pressure due to the city's expanding population and rising car ownership from 0.2 million in 2001 to 0.4 million in 2011 (Directorate of Urban Land Transport, n.d.).

LITERATURE REVIEW

How streets become walkable

Planning, transportation, the environment, and even the professions of health and wellness have all given attention to the issue of walkability. Traditionally, a person who is on foot is considered a pedestrian; but, more lately, people who use wheelchairs or additional devices have been included in this definition. The term "walkability" describes the actual physical setting in which people walk. It characterised the area made up of streets, buildings, and streetscape. When an area is conducive to walking, it is considered a pedestrian environment. According to (Speck, 2013), there are four key factors of the general Theory of Walkability'. More crucially, the book describes what makes a street "pedestrian friendly" and further detail what makes a city appealing to pedestrians. Walkability is broadly impacted by Accessibility, Pedestrian Surface Conditions and Cleanliness of the pathway. Walkability is essential to urban design since it benefits liveability, sustainability, and health on three different levels. Reducing transportation-based consumption and individualistic goals, such as the desire to own and operate a private vehicle, can be reconciled conceptually and practically

by embracing walkability as an urban solution. The following are important elements that help make pathways more walkable:

- a) Sidewalks: Having continuous, well-kept walkways on both sides of the road promotes pedestrian traffic.
- b) Crosswalks: At junctions, well defined crosswalks improve accessibility and pedestrian safety.
- c) Encouragement of mixed-use zoning within walking distance, cutting down on the need for lengthy automobile excursions.
- d) Benches, Shelters, and Lighting: Adding features like benches, shelters, and enough lighting improves pedestrian comfort and safety.
- e) Trash Containers: Having trash cans helps keep the area tidy and conducive to walking.
- f) Pedestrian Bulbs: Increasing sidewalk length at crosswalks can improve pedestrian safety and visibility.
- g) Integration of Public Transportation facilitates a smooth transition between walking and public transportation.

METHODOLOGY

Study area: Mysore Local Planning District 1 (PD-1)

Mysore's City centre covers an area of 300.15ha (Figure 1). Four satellite picture tiles are needed for obtaining the Site Plan using ArcGIS 10.2.2 environment. The four tiles have the row and path (76°38',12°19'), (76°39', 12°19'), (76°39', 12°18') and (76°38', 12°18') were Geo-referenced respectively.

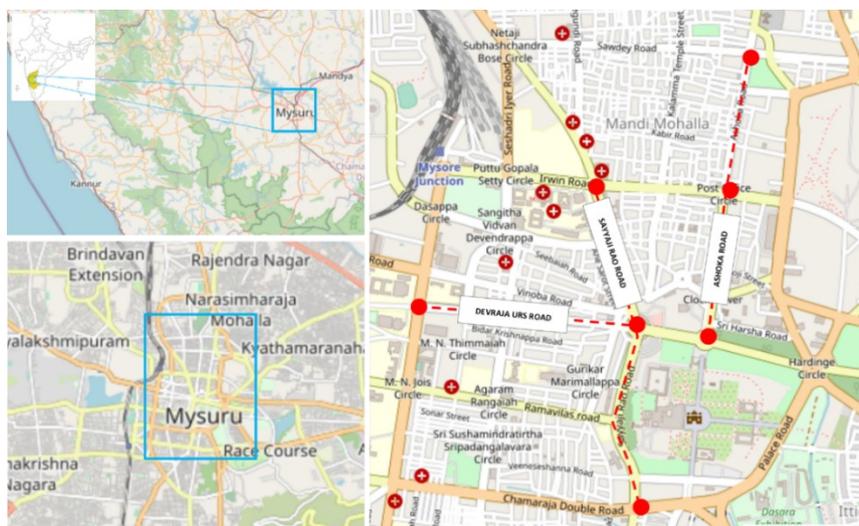


Figure 1: Location of Mysore in the Indian State of Karnataka
Source: Open Street Maps

MATERIALS & METHODS

The study developed a set of standards to evaluate the feasibility of turning former commercial routes into pedestrian areas, as indicated in **Table 6**. Then, this was implemented on a selected historic centre street. In addition to the five main criteria (street characteristics, traffic, commercial structure, environmental challenges, and community engagement), there are about 19 sub-criteria. Each component in this approach is assigned a grade based on how likely it is to influence the conversion of a commercial street into a pedestrian one.

- The items in the first category are those that require six points.
- Each element in the second category is worth four points.
- The items that require two points for each are represented by the third one.

In the case of Commercial Street, if the total evaluation result is greater than 76 points, the decision is to make the street a pedestrian-oriented street by utilising the toolkit and adding the weights. The street's potential does not meet the requirements to be designated as a pedestrian-only commercial street if the total score exceeds 76 points. (**Figure 2**).

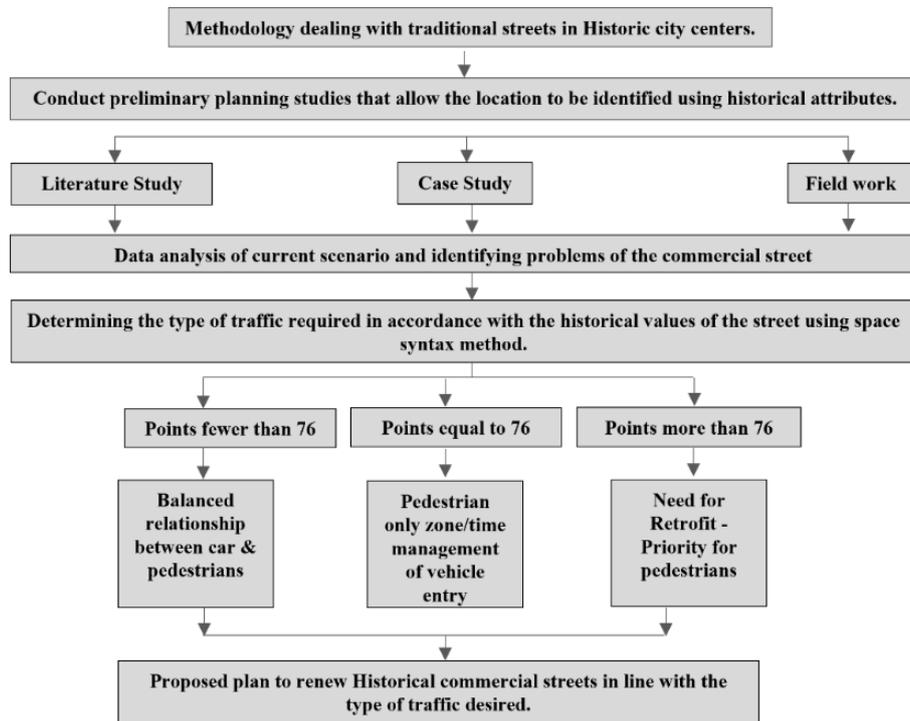


Figure 2: Showing the flowchart of the Methodology
 Source: compiled by author

Sampling and Sampling Procedures

Using Fisher's method, a judgmental sampling technique was used to determine the sample size of 96 pedestrians (age group limited to 15–59 years old) who were randomly questioned on Ashoka Street.

$$n = \frac{Z^2 P(1 - P)}{I^2}$$

Where: n = Sample size [where population > 10,000]

Z = Normal deviation at the desired confidence interval. In this case, it will be taken at 95%

Z = Normal deviation at the desired confidence interval. In this case, it will be taken at 95%, Z value at 95% is 1.96.

P = Proportion of the population with the desired characteristic.

Q = Proportion of the population without the desired characteristic.

I = Degree of precision; will be taken to be 10%. Since the proportion of the population with the characteristic is not known, then 50% will be used i.e.

$$n = \frac{196^2 0.5(1-0.5)}{0.1^2} = 96$$

Class Intervals and Sidewalk Comfort Level Criteria

Many factors affect how pleasant walkers find the pedestrian path, including the degree of circulation and accessibility, the quality of the surface, the degree of cleanliness, the level of beauty, and the quantity of obstacles. To analyse the data obtained from respondents, the following steps were taken:

- a) Determine the respondent's score by multiplying the number of items, the number of respondents, and the maximum and minimum scores that result from multiplying the lowest and highest scores.
- b) The calculation of the respondent's score and the percentage of pedestrian comfort level was then arrived at.
- c) Class Intervals and Sidewalk Comfort Level Criteria were then arrived at as follows:

Table 1: Sidewalk Comfort Level Criteria

Score Intervals	Percentage Interval	Comfort Level Criteria
$7200 \leq X < 6048$	$84\% \leq X < 100\%$	Very comfortable
$6048 \leq X < 4896$	$68\% \leq X < 84\%$	Comfortable
$4896 \leq X < 3744$	$52\% \leq X < 68\%$	Quite Comfortable
$3744 \leq X < 2592$	$36\% \leq X < 52\%$	Uncomfortable
$2592 \leq X < 1440$	$20\% \leq X < 36\%$	Very Uncomfortable

Source: Author's calculations

The instruments employed in this investigation are a modification of the comfort factor that researchers (Hidayat et al., 2020) developed and modified.

Table 2: Main Themes of Survey Questions Towards Pedestrian Survey

Criteria	Response	Description and Role	
Respondents' personal information	Open	Demographic characteristics	
Accessibility (A)	Likert Scale	To determine the respondents understanding of the physical attributes of the street.	
			A1 Pedestrian paths can be accessed by all pedestrians, including those with special needs.
			A2 The pedestrian paths surface is in good condition
			A3 The pedestrian paths are wide enough for walking
			A4 The pedestrian path is interrupted with modal conflicts.
A5 There is a sufficient difference in the surface height of the pedestrian path and the traffic lane.			
Pedestrian Conditions (PC)	Likert Scale	To understand respondents awareness of activities along the street	
			P1 The walkway paving surfaces are broken
			P2 Flowerpots / trash block the pedestrian path
			P3 Parking of vehicles block the pedestrian paths
			P4 Pedestrian paths are not well connected to Subway Facility
P5 The Central Business District needs re-development.			
Cleanliness (C)	Likert Scale	To understand respondents' attitude on how cleanliness may affect walkability.	
			C1 The surface of the pedestrian path is not slippery.
			C2 The slope of the pedestrian path is quite gentle.
			C3 Pedestrian path is clean from trash
			C4 The surface of the pedestrian path is overgrown with shrubs.
C5 Odorless environment			

Source: author

25 street vendors between December to February 2021 were subjected to convenience sampling between the hours of 8:00 to 9:00 a.m. and 6:00 to 7:00 p.m.

Table 3: Main Themes of Survey Questions Towards Street Vendor Survey

Criteria	Response	Description and Role
Hawking Experience	Likert Scale	To understand hawkers' attitude towards pedestrianisation
		Would you prefer a designated space for hawking?
		What is your opinion of pedestrianisation?

Source: Author

Statistical Analysis

The authors used Statistical Package for Social Scientists (SPSS) series 24 and Microsoft Excel tools to analyse data. The A numerical coding of the qualitative

responses was done for analysis and storage. Data analysis involved simple descriptive statistics such as frequency counts and percentages to summarize the data and inferential statistics such as Correlation and Regression Analysis.

RESULTS AND DISCUSSION

Validity Test

There are fifteen questions in the questionnaire, each of which represents three factors. The question item is deemed legitimate if the value of $r_{count} > r_{table}$, and vice versa. Given that $n = 96$ has a 5% significance level, the value of r_{table} is known to be 0.205.

Table 4: Test of the Validity of Accessibility Instrument (A), Pedestrian Condition (PC) and Cleanliness (C) instruments.

	A1	A2	A3	A4	A5	P1	P2	P3	P4	P5	C1	C2	C3	C4	C5
A1 Pears on Correlation	1	.457**	.485**	.420**	.382**	.921**	.464**	.498**	.408**	.484**	.537**	.260*	.270**	.478**	.538**
A2 Pears on Correlation	.457**	1	.684**	.573**	.383**	.533**	.994**	.693**	.498**	.840**	.542**	.628**	.398**	.712**	.652**
A3 Pears on Correlation	.485**	.684**	1	.610**	.419**	.562**	.673**	.993**	.532**	.728**	.667**	.546**	.471**	.693**	.711**
A4 Pears on Correlation	.420**	.573**	.684**	1	.464**	.488**	.575**	.619**	.920**	.637**	.643**	.635**	.539**	.785**	.558**
A5 Pears on Correlation	.382**	.383**	.419**	.464**	1	.465**	.392**	.433**	.417**	.433**	.536**	.507**	.601**	.538**	.461**

Source: Author

Table 4 shows that the Pearson Correlation value for each question item in Accessibility (A), Pedestrian Condition (PC) and Cleanliness (C) variable instruments is greater than $r_{table}=0.205$. The overall significance value is less than 0.05. Hence, the question indicator of all accessibility variables has a valid construct.

Performance assessment-Reliability Test

A reliability test was conducted to measure the measuring instruments' consistency level. The results of the variable instrument reliability testing are presented in **Table 5**.

Table 5: Instrumental Reliability Test for Variables

Variable	No of items	Cronbach Alpha	Reliable Limit	Information	KMO test	Significant level	Percentage of Variance Explained
Accessibility (A)	5	0.825	0.6	Acceptable level of Reliability	0.829	0.000	59.4%
Pedestrian Conditions (PC)	5	0.883	0.6	Acceptable level of Reliability	0.845	0.000	68.7%
Cleanliness (C)	5	0.886	0.6	Acceptable Internal Consistency	0.846	0.000	68.8%

Source: author

The reliability test using Cronbach's Alpha for all variables is well above the acceptable level of 0.6. The results of KMO test for all variables are well beyond 0.5 and are deemed acceptable. All results from Bartlett's Test of Sphericity are significant, indicating the data's suitability for factor analysis.

FINDINGS AND ANALYSIS

Pilot study-Ashoka Road

The current streetscape is a thin section of 2183 m that ranges in width from 12 to 15 m (Figure 12). Buildings are arranged closely without any side setbacks. The proposed Toolkit in **Table 6** for guiding the decision-making process was applied to Ashoka Street as a pilot project. Summing the weights, the assessment of the street is more than 76 points; hence the decision is to turn the street into a pedestrian-oriented street.

Table 6: The Proposed Toolkit for Guiding the Decision-Making Process for Ashoka Road (indicated by ✓)

Criteria	Sub-Criteria	Number of points per item		
		6	4	2
Street Characteristics	Location	✓Historic Centre	City Centre	Beyond City Limits
	Width	≤10 m	✓Between 10 m and 15 m	≥15m
	Street Length	≤1.5 km	✓Between 1.5km & 3km	≥3 km
Traffic	Street scale	✓Friendly	Human	Unfriendly
	Accessibility	High	Average	✓Low
	Functional Continuity	Good	Acceptable	✓Low
	Vehicle Intensity	✓High	Average	Low
	Pedestrian Intensity	✓High	Average	Low
	Parking	✓Within 800m	≥800m	≥1500m

Criteria	Sub-Criteria	Number of points per item		
	Access	✓Hard	Average	Easy
	Car-pedestrian relationship	✓Conflicted	Balanced	No conflict
	Car absorption in parallel streets	✓Low	Average	High
Commercial structure	Type of shop	✓Suitable for pedestrian streets	Some pedestrian needs	Fewer than 4 activities
	Diversity of activities	✓High (≥10)	Between 4 and 10	< 4 activities
Environmental factors	Street orientation	Favourable Wind	✓Average	Bad
	Street shading	✓ Not available	Can be solved	Can be solved
	Ventilation	✓Bad	Average	Good
Community participation	Hawker's opinion on pedestrianisation Pedestrian Satisfaction	An approval rate of 60-100% ✓36% ≤ X < 52%	An approval rate of 50-59% 52% ≤ X < 68%	Less than a 50% approval rate 68% ≤ X < 84%
Total points of street		90 points		

Source: compiled by author

Analysis of Pedestrian Comfort Level on Asoka Road

The overall comfort level of the pedestrian path is obtained as follows (Hidayat et al., 2020):

Percentage of pedestrian comfort level =

$$\frac{\text{Total Score of Respondents} \times 100\%}{\text{Total Maximum score}}$$

$$= 51.8\%$$

Overall, 51.8% respondents agree that the pedestrian path on Ashoka Street is uncomfortable, as can be seen in the **Table 1**.

RESULTS AND DISCUSSION

Table 7 Presents a summary of the social demographic of the study respondents. Most of the respondents were female, with 49% and 47% male. Most of those interviewed were between the age of 15 and 24 years.

Table 7: Social Demographics

Gender	Frequency	Percentage	Age Group	Frequency	Percentage	Education	Frequency	Percentage
Female	47	49.0	>55	7	7.3	Pre-University College	13	13.5
			15 - 24	48	50.0			
Male	45	46.9	25 - 34	28	29.2	Primary	4	4.2
			35 - 44	9	9.4	Secondary	2	2.1
			45-54	4	4.2	University	77	80.2
Prefer not to say	4	4.2						
Total	96	100.0	Total	96	100.0	Total	96	100.0

Source: compiled by author

Accessibility

38.5% respondents felt that Pedestrian paths couldn't be accessed by all pedestrians (A1) while 39.6% disagreed that paths were in good condition (A2).

Table 8: Frequency Counts for A1 and A2

A1	Frequency	Percent	A2	Frequency	Percent
1	13	13.5	1	9	9.4
2	37	38.5	2	38	39.6
3	36	37.5	3	34	35.4
4	6	6.3	4	12	12.5
5	4	4.2	5	3	3.1
Total	96	100.0	Total	96	100.0

Source: Compiled by Author

Cleanliness

43.8% of respondents said that there was rubbish on the pedestrian pathways. (C3) while 40.6% respondents disagreed with the path being overgrown with shrubs (C4). Accessibility has been negatively impacted as demonstrated in Figure 5(a).

Table 9: Frequency Counts for C4 and C3

C4	Frequency	Percent	C3	Frequency	Percent
1	6	6.3	1	6	6.3
2	39	40.6	2	42	43.8
3	38	39.6	3	36	37.5
4	9	9.4	4	9	9.4
5	4	4.2	5	3	3.1
Total	96	100.0	Total	96	100.0

Source: Compiled by Author

Regression Analysis

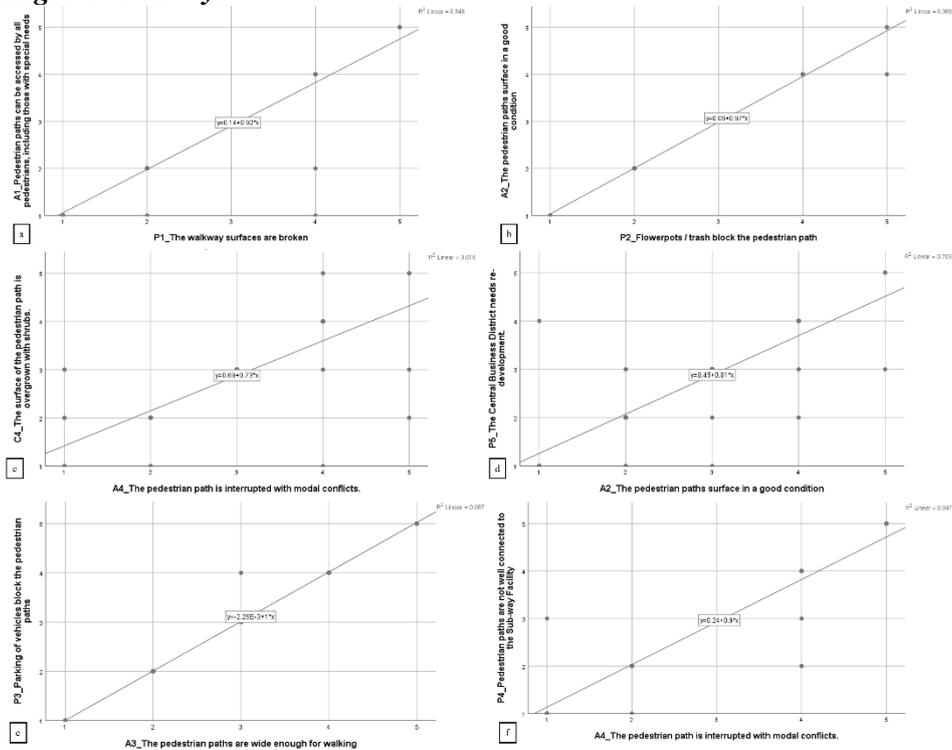


Figure 5: A High Correlation Exists Between (a)P1-A1, (b)P2-A2, (c) C4-A4, (d) P5-A2, (e) P3-A3 and (f)P4-A4.

Source: compiled by author

The regression analysis in **Figure 5** yields a relatively high R-squared of 0.6 and above, indicating that the independent variable (Accessibility) and dependent variables (Pedestrian Conditions and Cleanliness) confirm their strong influence on each other. This means that:

- The Accessibility of Ashoka Street correlates positively to the paving surfaces of the pathways ($R^2=0.848$) given by the equation $y=0.14+0.92*x$.
- The Pedestrian path surface condition was highly influenced by the placement of obstructions/trash cans ($R^2=0.989$) given by the equation $y=0.06+0.97*x$.
- The Pedestrian path surface overgrown with shrubs positively correlates positively to modal conflicts ($R^2 =0.616$) given by the equation $y=0.69+0.73*x$.
- The Pedestrian path surfaces correlates positively to the development of the Central Business District ($R^2=0.705$) given by the equation $y=0.45+0.81*x$.

- e) The pedestrian surface walkway width was influenced by the on-street parking ($R^2=0.987$) having a negative correlation given by $y=-2.5E-3+1*x$.
- f) The lack of Subway connectivity has a positive correlation to the modal conflict on the pathway ($R^2=0.847$), given by the equation $y=0.24+0.9*x$.

CONCLUSIONS

Based on a study of 96 respondents' data, Ashoka Street had a 51.8% total level of discomfort. This is corroborated by the absence of numerous metrics, including the degree of accessibility and circulation, the surface's state, the degree of cleanliness, and the degree of obstructions to pedestrian paths. The study concludes that restoring the pavement's functionality is essential to raising people's comfort levels.

REFERENCES

- Aboelata, A., & Sodoudi, S. (2020). Evaluating the effect of trees on UHI mitigation and reduction of energy usage in different built-up areas in Cairo. *Building and Environment*, 168, 106490. <https://doi.org/https://doi.org/10.1016/j.buildenv.2019.106490>
- Ponrahono, Z., Mohd Isa, N., Aris, A. Z., & Harun, R. (2019). The Traffic Volume and Level of Service (LOS) of Universiti Putra Malaysia (UPM) Serdang Campus Main Access. *Planning Malaysia*, 17(10). <https://doi.org/10.21837/pm.v17i10.628>
- Census of India 2011 - Karnataka - Series 30. (2014). *Census of India 2011 - Karnataka - Series 30 - Part XII B - District Census Handbook, Mysore*.
- Directorate of Urban Land Transport. (n.d.). *Comprehensive Traffic and Transportation Plan –Mysore, Karnataka, India*. Retrieved April 4, 2023, from https://dult.karnataka.gov.in/uploads/media_to_upload1643374573.pdf
- Gehl, J. (2013). *Cities for people*. Island press.
- Glaeser, E. (2012). *Triumph of the city: How our greatest invention makes us richer, smarter, greener, healthier, and happier*. Penguin. <https://doi.org/10.2307/41474071>
- Hidayat, I., Hidayat, B., & Ophiyandri, T. (2020). PENENTUAN PRIORITAS PEMELIHARAAN JALAN STUDI KASUS KOTA PAYAKUMBUH PROVINSI SUMATERA BARAT. *Rang Teknik Journal*, 3(2), 186–194. <https://doi.org/10.31869/rtj.v3i2.1776>
- Abd Rahim, S. A., Ismail, N. H., & Abd Latip, N. S. (2022). Analysis of current condition of heritage masjid in Negeri Sembilan. *Planning Malaysia*, 20(21). <https://doi.org/10.21837/pm.v20i21.1102>
- Rogers, S. H., Halstead, J. M., Gardner, K. H., & Carlson, C. H. (2011). Examining Walkability and Social Capital as Indicators of Quality of Life at the Municipal and Neighbourhood Scales. *Applied Research in Quality of Life*, 6(2), 201–213. <https://doi.org/10.1007/s11482-010-9132-4>
- Rundle, A., Roux, A. V. D., Freeman, L. M., Miller, D., Neckerman, K. M., & Weiss, C. C. (2007). The Urban Built Environment and Obesity in New York City: A

Multilevel Analysis. *American Journal of Health Promotion*, 21(4_suppl), 326–334. <https://doi.org/10.4278/0890-1171-21.4s.326>

Speck, J. (2013). *Walkable city: How downtown can save America, one step at a time*. <https://doi.org/10.5565/rev/dag.274>

Wang, H., & Yang, Y. (2019). Neighbourhood walkability: A review and bibliometric analysis. *Cities*, 93, 43–61. <https://doi.org/https://doi.org/10.1016/j.cities.2019.04.015>

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THE PERFORMANCE OF KUALA LUMPUR'S CARBON EMISSIONS IN THE CONTEXT OF URBAN PLANNING

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Abstract

Cities are responsible for 70% of greenhouse gas (GHG) emissions on a global scale, and cities play an important role in reducing GHG emissions. It is essential for Kuala Lumpur to consider reducing the city's GHG emissions. The city's GHG emission inventory can track and monitor the effectiveness of the climate action plans that has been implemented. The aim of this study is to identify the performance level of GHG emissions in Kuala Lumpur between 2010 and 2019. It is also to identify the performance of Kuala Lumpur's GHG emissions in 2019 in comparison to the global and Malaysian level. Data is calculated using the Global Protocol for Community-Scale Greenhouse Gas Emissions Inventory (GPC), which is recognised and utilised globally. Secondary data for the years 2010 and 2019 was analysed as well as the performance of the Kuala Lumpur GHG emission profile in 2019. With three (3) identified sources of emissions, Kuala Lumpur managed to reduce its GHG emission intensity from 2010 by 74.07% in 2019. The city's GHG emission was recorded at 15,675 ktCO₂eq in 2019. The stationary energy sector contributes higher GHG emission than other sector, with 12,043 ktCO₂eq (76.83%), followed by the transportation sector with 3,180 ktCO₂eq (20.29%) and the waste sector with 452 ktCO₂eq (2.88%). As of 2019, Kuala Lumpur's absolute carbon contribution to the global average is 0.03%, whereas Malaysia's absolute carbon contribution is 4.74%. Additionally, the city contributes just 0.07 kgCO₂eq/RM (30.17%) to Malaysia's total GHG emission intensity.

Keywords: Carbon Emission, Greenhouse Gas Emission, Gross Domestic Product, Greenhouse Gas Intensity, Kuala Lumpur

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INTRODUCTION

Global warming and climate change are mostly caused by GHG emissions. The estimated amount of net anthropogenic GHG globally in 2019 is 59 ± 6.6 GtCO₂eq, resulting from a variety of gas types, according to Climate Change 2022 Mitigation of Climate Change Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2022).

Table 1: Global Average Annual Emission for Year 2019

Gases Type	Average Annual Emissions (GtCO₂eq)
CO ₂ FFI	38 ± 3.0
CO ₂ LULUCF	6.6 ± 4.6
CH ₄	11 ± 3.2
N ₂ O	2.7 ± 1.6
Fluorinated gases	1.4 ± 0.41
GHG	59 ± 6.6

Source: Climate Change 2022 Mitigation of Climate Change Working Group III Contribution to the Sixth Assessment Report of the IPCC

Approximately 34% (20 GtCO₂eq) of net globally GHG emissions come from the energy sector, 24% (14 GtCO₂eq) from industry, 22% (13 GtCO₂eq) from AFOLU, 15% (8.7 GtCO₂eq) from transport, and 6% (3.3 GtCO₂eq) from buildings (IPCC, 2022).

In 2019, Malaysia recorded total GHG emissions of 330,358.21 Gg CO₂eq, excluding LULUCF. LULUCF activities have the potential for carbon stocks to be reversible and non-permanent. The CO₂ stored in soil and vegetation can be reversed by human activity, natural disturbances, or both. It is also exposed to the effects of climate change. Based on the Malaysia Fourth Biennial Update Report Under the United Nations Framework Convention on Climate Change (BUR4, 2022), the overall GHG emissions, excluding LULUCF, are 259,326.11 Gg CO₂eq from the energy sector, 32,853.80 Gg CO₂eq from the IPPU sector, 28,256.59 Gg CO₂eq from the waste sector and 9,921.71 Gg CO₂eq from the agriculture sector. The total GHG emissions, including LULUCF, were 115,643.68 Gg CO₂eq, with the LULUCF sector contributing -214,714.54 Gg CO₂eq. Hence, the Malaysia's GHG intensity against GDP (0.2320 kgCO₂eq/RM) in 2019 reduced by 35.90% compared to 2005 values (BUR4, 2022). Malaysia is a very dynamic country where land use is rapidly changing as the country's economy grows. As a result, land has frequently been changed within and between land-use categories multiple times throughout the course of a 20-year transition period.

Table 2 Malaysia's GHG emission

Sector	Emissions/Removals (Gg CO ₂ eq)
Energy	259,326.11
IPPU	32,853.80
Agriculture	9,921.71
LULUCF	-214,714.54
Waste	28,256.59
Total (Excluding LULUCF)	330,358.21
Total (Including LULUCF)	115,643.68

Source: Malaysia Fourth Biennial Update Report Under the United Nations Framework Convention on Climate Change

Kuala Lumpur, the capital of Malaysia, has developed to be one of the biggest cities in the country and is experiencing the effects of climate change as a result of increasing carbon emissions. It had seen extraordinary amounts of rain, frequent flash floods, and rising temperatures. In line with that, Kuala Lumpur has set a target of reducing GHG emissions intensity by 70% by 2030 (Kuala Lumpur Low Carbon Society Blueprint 2030, 2018) in order to achieve carbon neutrality (Kuala Lumpur Climate Action Plan, 2021) and become a net zero carbon emission city by 2050 (2020 Kuala Lumpur City-Wide Greenhouse Gas Inventory, 2022). At the 2021 United Nations Climate Change Conference of Parties (COP26), in Glasgow, Scotland, Kuala Lumpur pledged to achieving Carbon Neutrality by 2050 in order to make sure the city might withstand these challenges. This pledge demonstrates Kuala Lumpur commitment to mainstreaming climate action into the city's long-term planning. Hence, Kuala Lumpur City Hall has developed several of master plans and blueprints, including the Kuala Lumpur Structure Plan 2040 (2023), Kuala Lumpur Local Plan 2040 (Draft) (2024), Kuala Lumpur Low Carbon Society Blueprint 2030 (2018) and Kuala Lumpur Climate Action Plan 2050 (2021) that aim to achieve the vision. The Kuala Lumpur Low Carbon Society Blueprint 2030 (2018) established an ambitious interim target of reducing carbon emission intensity by 70% by 2030, which was expanded to the Kuala Lumpur Climate Action Plan 2050 (2021) to incorporate adaptation measures and prioritise inclusive and wider benefits to residents. The mitigation and adaptation programmes of climate action have been integrated into all of these masterplans and blueprints, and the initiatives are currently being mainstreamed into the Kuala Lumpur Local Plan 2040 (2023), which is being prepared in accordance with the Federal Territory (Planning) Act 1982 (Act 267, 1982) and will serve as the main tool for development control in the city.

Kuala Lumpur was recorded that rapid urbanization process impacted trends on land use (Norzailawati Mohd Noor, et al., 2013). Since climate change is here to stay, Kuala Lumpur is entitled to a proactive role in handling it. Kuala Lumpur City Hall began implementing city hall-focused initiatives through the

Kuala Lumpur City Hall's Carbon Management Plan (2017), using the approach to lead by example strategy. Programmes at the city level under the Kuala Lumpur Low Carbon Society Blueprint 2030 (2018) followed subsequently. This Blueprint is focused on 245 green programmes, 10 actions, and 3 major thrusts. The outcome of these programmes showed how urgently city-scale programmes were needed to address Kuala Lumpur's unexpected climate hazards. More significantly, it is necessary to make sure that the comprehensive plans and initiatives to make the city more resilient, vibrant, and inclusive are in line with the climate action. To address the next phase of the climate action journey, the Kuala Lumpur Climate Action Plan 2050 (2021) was developed. Together with the involvement of numerous government agencies, residents associations, professional associations, and non-profit organisations, all of these plans and masterplans were developed.

The importance of gathering information and data is crucial for the success of programmes because there is a lack of data quality and inventory to measure GHG emissions. According to Grafakos et al. (2016a), one of the challenging tasks of integrated climate change policy is monitoring actions. As a result, the Kuala Lumpur City Hall has a comprehensive 2020 Kuala Lumpur City-Wide Greenhouse Gas Inventory (2022). Nonetheless, Kuala Lumpur didn't publish any GHG emissions report in 2019, making comparisons of Kuala Lumpur GHG emissions to the rest of the global and Malaysia level were not practicable. However, the number of GHG emissions in 2010 will be utilised as the baseline, which is 22,852 ktCO₂eq with a 0.27 emission intensity of GDP. Some analysis will be conducted to describe Kuala Lumpur's GHG emissions for the year 2019 using the GPC approach in accordance with global and Malaysian regulations in order to determine the percentage of Kuala Lumpur's GHG emission contribution. In addition, several cities in Malaysia had documented their GHG emissions to support in the reduction of carbon emissions. Putrajaya had measured 1,459 ktCO₂eq in 2021. In the meantime, Seberang Perai's GHG emissions in 2019 were 6,620.38 ktCO₂eq.

LITERATURE REVIEW

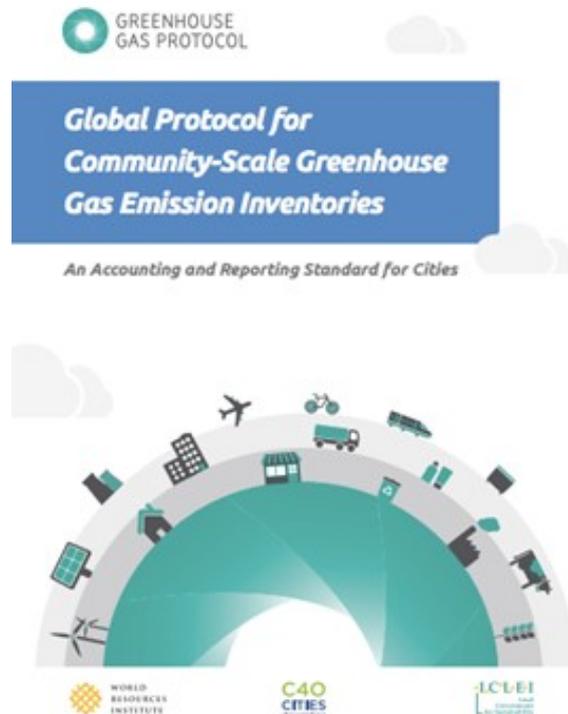
The earth's surface temperature rises by 1.1°C between 2011-2020 compared to 1850-1900, showing clearly that human activity caused global warming (IPCC, 2023). This was primarily due to GHG emissions. Unsustainable energy use, changes in land use, patterns of consumption and production within and between countries, and individual behaviours have all contributed historically and currently to the continual rise in GHG emissions worldwide. From Wagg (2015), human activities or anthropogenic can produces GHG emissions that serve as a blanket around the planet, trapping heat from the sun and increasing temperatures (Wagg, 2023). Before the industrial age began in Europe, the atmospheric CO₂ concentration was 180 ppm (Kyle Whittinghill, 2023) and in 2019, the

atmospheric CO₂ concentration has increased to 410 ppm (IPCC, 2023). Reducing the urban heat island effect, improving air quality, increasing resource efficiency in the built environment and energy systems, and enhancing carbon storage related to land use and urban forestry are all strategies to help reduce GHG emissions while enhancing a city's resilience. These strategies can be better understood in order to identify greater opportunities for their integration in urban areas (Grafakos, et al., 2018). According to the United Nations, the world's population will increase from 7.7 billion in 2019 to 8.5 billion in 2030, 9.7 billion in 2050 and 10.9 billion in 2100 (Population Division, 2019). In 2019, approximately 48% of the global population lives in urban area (IPCC, 2023) and accounted for 70% of global GHG emissions (KASA, 2021).

Due to their dense populations, cities are not only major contributors to global GHG emissions but also extremely prone to the effects of climate change, including heat waves, floods, severe storms, and droughts (Lucon et al., 2014; Revi et al., 2014; Balaban & de Oliveira, 2013; Fishedick et al., 2012). In the process of spatial planning, development plans such as Structure Plan are essential for demonstrating how policies should be implemented. Delivering the comprehensive urban GHG emission requirement requires a comprehensive approach (Wee-Kean Fong et al., 2008).

The GPC (GPC, 2014) was developed in 2014 by the World Resource Institute (WRI), Climate C40 Cities Leadership Group and ICLEI-Local Government for Sustainability (ICLEI) as a method for preparing a GHG inventory to enable reliable measurement and uniform GHG reporting. Cities all across the world, including Malaysian cities, have begun to submit their own GHG readings using GPC. The importance of GPC method was:

- i. To assists the authorities on how to calculate and report local GHG emissions in compliance with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 2016).
- ii. GHG emissions are calculated consistently, transparently, and internationally recognised throughout all cities.



Picture 1: GPC Guideline for Accounting and Reporting
Source: Global Protocol for Community-Scale Greenhouse Gas Emission Inventories

The GPC is designed to take into consideration the city's GHG emissions for one reporting year. The GHG emissions from cities are categorised into five (5) main sectors, as well as stationary energy, transportation, waste, industrial processes and product use (IPPU) and agriculture, forestry and other land use (AFOLU). The stationary energy sector is involved with energy usage, the transportation sector is focused with transport types use, the waste sector is concerned with waste generation, the IPPU sector is involved with industrial activities, and the AFOLU sector is concerned with agriculture and forestry activity.

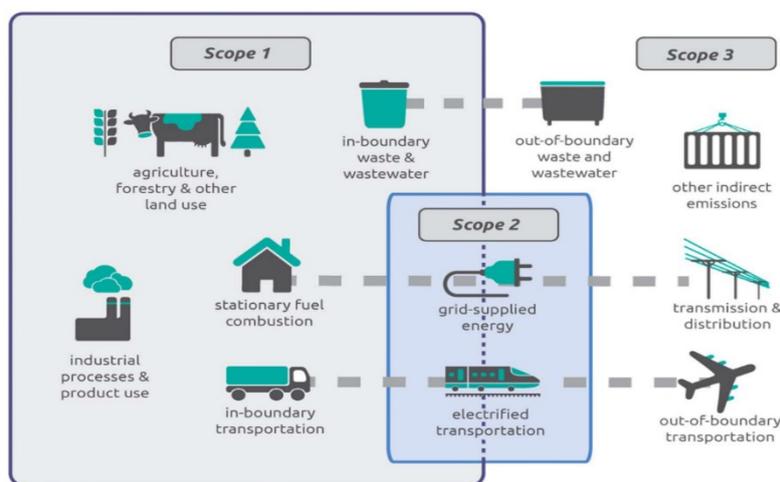
Table 3: GHG Emissions by Sectoral

Sector	Details
Stationary Energy	For most cities, stationary energy is the main source of emissions. This relates to the use of energy of various types in the building sector.
Transportation	The resulting GHG emissions from private and public vehicles on land, sea, and air.
Waste	Emissions from organic material decomposition when waste is disposed to a landfill, composted/digested anaerobically, or burned.
Industrial Processes and Product Use (IPPU)	This industry refers to industrial operations and has two parts, process industrialization and product utilisation.
Agriculture, Forestry and Other Land Use (AFOLU)	This sector must be captured for cities that have agricultural and forestry areas with sufficient data.

Source: The Global Protocol for Community-Scale Greenhouse Gas Emissions Inventory

In order to reconcile the variances among all operations, the source of GHG emissions released into the atmosphere has been divided into three (3) scopes, namely Scope 1, Scope 2, and Scope 3. By referring to 2006 IPCC Guidelines for National Greenhouse Gas Inventories, the GHG values relative to CO₂ sources is:

- i. Scope 1: GHG emissions occurring within area boundaries including the transportation, electricity generation and open burning.
- ii. Scope 2: Only for electrical grid purchases from outside the border.
- iii. Scope 3: GHG emissions that occur outside the border; activities within the border such as waste disposal and intercity transport.



Picture 2 Scope-Based Emission Estimation

Source: Garis Panduan Perancangan Bandar Rendah Karbon dan Berdaya Tahan Perubahan Iklim (PLANMalaysia, 2023)

The GPC provides a clear GHG reporting system for the entire city. In the GHG reporting system, cities can report GHG emissions using two approaches, BASIC or BASIC +. BASIC reporting includes emissions from stationary energy, transportation (in-boundary), and waste. Meanwhile, BASIC + reporting includes emissions from stationary energy, transportation (including in-boundary and transboundary), waste, IPPU, and AFOLU.

Table 4: Types of Reporting

Types of Reporting	Details
BASIC	BASIC reporting covers emission sources that occur in most cities (stationary energy, in-boundary transportation, and in-boundary generated waste), and methodology estimates and data are more easily accessible.
BASIC +	BASIC+ covers a broader range of GHG emission sources (source BASIC add IPPU, AFOLU, and transboundary transportation). However, more difficult data collecting and calculation is required.

Source: The Global Protocol for Community-Scale Greenhouse Gas Emissions Inventory

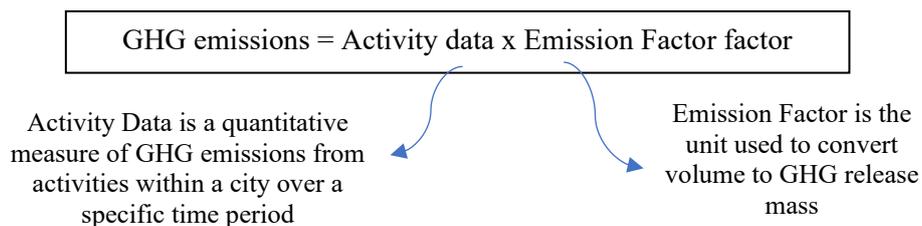
The IPCC states that there is a hierarchy of tiers for calculating greenhouse gas emissions. The levels of hierarchy are:

Tier 1: Globally available data with simplifying assumptions

Tier 2: Substituting country-specific value for disaggregated activity data character

Tier 3: Detailed modelling or inventory measurement system

Hence, the formula for calculating GHG emissions (GPC, 2014).



GHG emissions are measured in two types as well as absolute carbon reduction and intensity carbon reduction. The absolute carbon reduction is the actual amount of GHG emission, which is easy to detect but difficult to achieve in accordance with national plan. Meanwhile, intensity carbon reductions are amount targets on a specific scale, difficult to monitor, and consistent with national strategy.

Table 5 Types of GHG Emissions Measure

Absolute Carbon Reduction	Intensity Carbon Reduction
The actual amount of GHGs released	Target compared to a certain parameter/scale, such as GDP
Easy to monitor or detect	More information and more difficult monitoring
Difficult to tie to the national strategy	Parallel to the national strategy

Source: *Garis Panduan Perancangan Bandar Rendah Karbon dan Berdaya Tahan Perubahan Iklim (PLANMalaysia, 2023)*

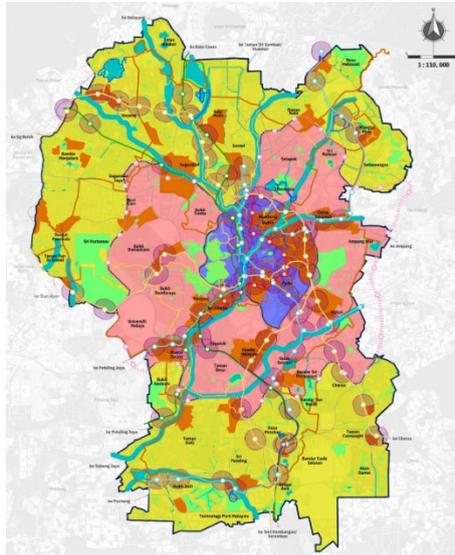
METHODS AND DATA

The GPC framework will be used in calculating Kuala Lumpur's 2019 GHG emissions. The GPC method for calculating carbon footprints is in line with the IPCC 2006 standards. There are three (3) sectors that are included in this calculation which is the stationary energy, transportation and waste sectors. Emissions from Agricultural, Forestry, and Other Land Use (AFOLU) and Industrial Processes and Product Use (IPPU) are not included in this calculation due to their minimal impact on GHG emissions in Kuala Lumpur. These exclusions are allowed by IPCC 2006 standards since these emissions have been identified to be less conducive to mitigation measures, hence their exclusion from the emission reduction action plan is unlikely to have a significant impact. Emission scope 1, 2, and 3 includes emission sources such as electric use, fuel use, and decomposition.

Table 6: Kuala Lumpur GHG Emissions Scope and Sources

Sector	Emission Scope	Emission Source
Stationary Energy	2	Electricity use
Transportation	1	Fuel use
Waste	3	Decomposition

All activities data occurring within the Kuala Lumpur boundary, which has a geographical area of 243km² and a population of 1.78 million people with GDP RM233,794 million, between January until December 2019, are included in the GHG emission calculation.



Picture 3 Map of the Kuala Lumpur City Boundary
Source: Kuala Lumpur City Hall

The capacity to calculate Kuala Lumpur's GHG emissions is strongly dependent on the quality of data obtained from various data providers. The Department of Statistics Malaysia was the source of the population, GDP, and area size data required for the city-wide category. Quantity of power used is the data type for the stationary energy category, and it comes from Performance & Statistical Information on the Malaysian power Supply Industry 2019. The data for the transportation category is available from Kementerian Perdagangan Dalam Negeri dan Kos Sara Hidup. The data type is the volume of diesel sold at petrol stations. The data type for the waste sector is waste tonnage in landfills, which is provided by Perbadanan Pengurusan Sisa Pepejal dan Pembersihan Awam.

Table 7: Kuala Lumpur GHG Emissions Data Sources

Category	Types of Data	Source
City-Wide	Population, GDP, Area Size	Department of Statistic Malaysia (DOSM, 2023)
Stationary Energy	Quantity of electricity used (kWh/year)	Performance & Statistical Information on the Malaysian Electricity Supply Industry 2019 (Energy Commission, 2022)
Transportation	Volume of diesel sold at petrol stations (litres of fuel)	Kementerian Perdagangan Dalam Negeri dan Kos Sara Hidup (KPDN, 2023)

Category	Types of Data	Source
Waste	Tonnage of waste treated in landfills (tonnes)	Perbadanan Pengurusan Sisa Pepejal dan Pembersihan Awam (SWCorp, 2023)

There are several emission factors involved in calculating GHG emissions. The emission factor for stationary energy is based on the Malaysian Green Technology Corporation (MGTC) Grid Emission Factor (GEF), whereas the emission factor for transport and waste is based on a report published by the Department for Environment, Food and Rural Affairs (DEFRA) 2019.

Table 8: GHG Emissions Factor Sources

Sector	Emission Factor Source	Emissions Factors
Stationary Energy	Malaysian Green Technology Corporation (MGTC); Grid Emission Factor (GEF)	Tonnes of CO ₂ produced per kWh of electricity consumed
Transportation	Department for Environment, Food & Rural Affairs (DEFRA) 2019	Kilograms of CO ₂ produced per litre of diesel consumed
Waste		Tonnes of CO ₂ produced per kilometre travelled

ANALYSIS AND RESULT

Kuala Lumpur's GHG emissions in 2019 were approximately 15,675 ktCO₂eq, with the stationary energy sector accounting for 12,043 ktCO₂eq (76.83%). It was followed by the transportation sector, which produced 3,180 ktCO₂eq (20.29%), and the waste sector, which produced 452 ktCO₂eq (2.88%).

Table 9: Kuala Lumpur GHG Emission for Year 2019

Sector	GHG Emission	%
Stationary Energy	12,043 ktCO ₂ eq	76.83
Transportation	3,180 ktCO ₂ eq	20.29
Waste	452 ktCO ₂ eq	2.88
Total (ktCO₂eq)	15,675 ktCO₂eq	100.00

Kuala Lumpur's 2019 calculation were used Tier 1 and Tier 2 approach that in line with 2010 baseline method. As a result, in 2019, while the overall population grew by 6.44%, total GHG emissions decreased by 31.41%. Kuala Lumpur also managed to reduce GHG emission intensity by 74.07% when compared to the level in 2010. In 2019, the GHG intensity per capita is also going to decrease to 35.60%.

Table 10: Kuala Lumpur GHG Emission Performance in Year 2019

Description	Details	
	2010	2019
Population Kuala Lumpur (persons)	1,674,621	1,782,500 (+6.44%)
Total GHG Emission (ktCO ₂ eq)	22,852	15,675 (-31.41%)
GDP at constant 2015 price (RM Million)	84,852	233,794
Emission Intensity of GDP (kgCO ₂ e/RM)	0.27	0.07 (-74.07%)
Emission Intensity Per Capita (tCO ₂ e/capita)	13.65	8.79 (-35.60%)

Based on overall GHG emission performance in Kuala Lumpur compared to the rest of globally and Malaysia level in 2019, Kuala Lumpur contributes only 0.03% absolute carbon to the rest of the global and 4.74% absolute carbon to Malaysia. Meanwhile, Kuala Lumpur's GHG emission intensity contributed only 0.07 kgCO₂eq/RM (30.17%) to Malaysia's total GHG emission intensity.

Table 11: Overall Kuala Lumpur's GHG Emission Performance

Item	Global	Malaysia	Kuala Lumpur	% KL's Carbon
Absolute Carbon	59 ± 6.6 GtCO ₂ -eq (59,000,000 ktCO ₂ eq)	330,358.21 Gg CO ₂ eq (330,358.21 ktCO ₂ eq)	15,675 ktCO ₂ eq	Global - 0.03% Malaysia - 4.74%
Emission Intensity of GDP	-	0.2320 kgCO ₂ eq/RM	0.07 kgCO ₂ eq/RM	30.17%

DISCUSSION

The right GHG emission calculation method is necessary to utilise as a tool in doing check and balance for justifying the climate effects in reducing emissions and removals of different GHG sectors, such as for city GHG emission reporting between the development of mitigation plans for the city. Carbon footprints are different each country, due to differences in development levels, economic structure, economic cycle, public infrastructure availability, climate, and residential lifestyles (Bruckner et al., 2021). It is also possible that different countries and regions within countries will have different emission patterns as a result of differences in income, lifestyle, geography, infrastructure, political and economic status (O'Neill, B.C., 2010). Urban area contributes more emissions than rural area (Liu et al, 2011). As Malaysia's capital city, Kuala Lumpur generates a lot of activity, which pattern of results in increased GHG emissions. However, higher density of population is related with lower per capita emissions

(Liddle et al, 2014) (Liu et al, 2017). Beyond from international reporting and accounting, countries or cities might consider other GHG emission strategies to assist in achieving of specific policy objectives. A clear calculation assessment might assist decision-makers in determining the consistency between policy targets and performance in order to avoid possibly unexpected implications of alternative strategies. Significant reductions in emissions from all sectors will necessitate a shift from the previous priority on important but incremental gains, such as in the energy sector, to revolutionary changes in energy and feedstock supply, materials efficiency, and more circular material flows.

CONCLUSION

To combat climate change, immediate actions must be carried out to cut GHG emissions. Everyone has a role to play to support Kuala Lumpur achieve its targets for reducing GHG emissions intensity. It is essential to evaluate any target changes that have occurred since the start of the goal duration to establish whether the changes are the results of mitigating activities or other reasons, like air pollution from adjacent borders. Goal achievement will ultimately be measured using inventory data in the target year. Any difference in emissions must be tracked in order to determine if Kuala Lumpur is on track to achieve the target goal. Kuala Lumpur must also work with industry players that have pledged to reduce carbon intensity by 70% by 2030 and achieve net zero emissions by 2050. Kuala Lumpur needs to reduce more absolute carbon to support Malaysia achieve a 45% reduction in GHG emission intensity by 2030. As a result, the barriers to a low-carbon transition are not limited to a single category; it includes both technological and behavioural concerns. Taking on the various components of the challenges to low-carbon efforts might require a variety of approaches. Kuala Lumpur will remain a sustainable, vibrant, and liveable city for current and future generations as a result of carbon reduction initiatives and steps taken to adapt to the effects of climate change.

REFERENCES

- Bahagian Kawal Selia Petroleum Sektor Barang Kawalan dan Subsidi Kementerian Perdagangan Dalam Negeri dan Kos Sara Hidup (KPDN) (2023). Malaysia
- Balaban, O., and de Oliveira, J. A. (2013). *Understanding the links between urban regeneration and climate-friendly urban development: Lessons from two case studies in Japan*. *Local Environment* 19(8), 868–890
- Bruckner, B., K. Hubacek, Y. Shan, H. Zhong, and K. Feng (2021). *Impacts of poverty alleviation on national and global carbon emissions*. *Nat. Sustain.*, doi:10.1038/s41893-021-00842-z, 5(4), 311-320
- Climate C40 Cities Leadership Group, and ICLEI-Local Government for Sustainability (ICLEI), (2014). *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories*. World Resource Institute (WRI), 9-10 & 48
- Department of Statistics Malaysia (2023). Retrieved December 4, 2023, from

- https://v1.dosm.gov.my/v1/index.php?r=column/cthree&menu_id=Q2FvVINLTm9JVG MvZXlrNkYyY2FOdz09
- https://v1.dosm.gov.my/v1/index.php?r=column/cthree&menu_id=UmtzQ1pKZHBjY1 hVZE95R3RnR0Y4QT09
- Energy Commission (2022). *Performance & Statistical Information on the Malaysian Electricity Supply Industry 2019*, Malaysia, 15
- Fischedick, M., Schaeffer, R., Adedoyin, A., Akai, M., Bruckner, T., Clarke, L. and Wright, R. (2012). *Mitigation potential and costs*. In Edenhofer, O., et al. (eds.), IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation (791-864)
- Grafakos, S., Gianoli, A., and Tsatsou, A. (2016a). *Towards the development of an integrated sustainability and resilience benefits assessment framework of urban green growth interventions*. Sustainability 8(5), 461; doi: 10.3390/su8050461.
- Grafakos, S., Pacteau, C., Delgado, M., Landauer, M., Lucon, O., and Driscoll, P. (2018). *Integrating mitigation and adaptation: Opportunities and challenges*. In Rosenzweig, C., W. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal, and S. Ali Ibrahim (eds.), *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*. Cambridge University Press. New York. 101-138
- Institute for Global Environmental Strategies (2006), *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Intergovernmental Panel on Climate Change
- Jabatan Perancangan Bandar dan Desa (PLANMalaysia) (2023). *Garis Panduan Perancangan Bandar Rendah Karbon dan Berdaya Tahan Perubahan Iklim*. Kementerian Pembangunan Kerajaan Tempatan, Malaysia, 32 & 35
- Kuala Lumpur City Hall (2017). *Kuala Lumpur City Hall's Carbon Management Plan 2017-2022*. Malaysia
- Kuala Lumpur City Hall (2018). *Kuala Lumpur Low Carbon Society Blueprint 2030*. Malaysia
- Kuala Lumpur City Hall (2021). *Kuala Lumpur Climate Action Plan 2050*. Malaysia
- Kuala Lumpur City Hall (2022). *2020 Kuala Lumpur City-Wide Greenhouse Gas Inventory*. Malaysia
- Kuala Lumpur City Hall (2022). *Kuala Lumpur Local Plan 2040 (Draft)*. Malaysia
- Kuala Lumpur City Hall (2023). *Kuala Lumpur Structure Plan 2040*. Malaysia
- Kyle Whittinghill (2023). *Environmental Science*. University of Pittsburgh, 9.1.5
- Liddle, B. and S. Lung (2014). *Might electricity consumption cause urbanization instead: Evidence from heterogeneous panel long-run causality tests*. Glob. Environ. Change, doi:10.1016/j.gloenvcha.2013.11.013, 24, 42-51
- Liu, H. and X. Fan (2017). *Value-Added-Based Accounting of CO2 Emissions: A Multi-Regional Input-Output Approach*. Sustainability, doi:10.3390/su9122220, 9(12), 2220
- Liu, L.-C., G. Wu, J.-N. Wang, and Y.-M. Wei (2011). *China's carbon emissions from urban and rural households during 1992-2007*. J. Clean. Prod., doi:10.1016/j.jclepro.2011.06.011, 19(15), 1754-1762
- Lucon O., Üрге-Vorsatz, D., Zain Ahmed, A., Akbari, H., Bertoldi, P., Cabeza, L. F., Eyre, N., Gadgil, A., Harvey, L. D. D., Jiang, Y., Liphoto, E., Mirasgedis, S. Murakami, S., Parikh, J., Pyke, C., and Vilariño, M. V. (2014). *Buildings*. In

- Edenhofer, O., Pichs-Madruga, R., Sokona, Y., Farahani, E., Kadner, S., Seyboth, K., Adler, A., Baum, I., Brunner, S., Eickemeier, P., Kriemann, B., Savolainen, J., Schlömer, S., von Stechow, C., Zwickel, T., and Minx, J. C. (eds.), *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (671-738)
- Ministry of Environment and Water (2021). *First Edition 2021 National Low Carbon City Masterplan*. Malaysia, 25
- Ministry of Natural Resources, Environment and Climate Change (2022). *Malaysia Fourth Biennial Update Report Under the United Nations Framework Convention on Climate Change*, Malaysia, 40 & 57
- Norzailawati Mohd Noor, Alias Abdullah & Mohd Nasrul Hanis Manzahari (2013). *Land Cover Change Detection Analysis on Urban Green Area Loss Using GIS and Remote Sensing Techniques. Planning Malaysia: Journal of the Malaysian Institute of Planners* Volume XI (2013), Page 125-138
- O'Neill, B.C. (2010). *Global demographic trends and future carbon emissions*. Proc. Natl. Acad. Sci., doi:10.1073/pnas.1004581107, 107(41), 17521-17526
- Perbadanan Pengurusan Sisa Pepejal dan Pembersihan Awam (SWCorp) (2023). Malaysia
- Population Division (2019). *Population Facts December No.2019/6*. United Nations Department of Economic and Social Affairs, 1
- Putrajaya Corporation (2022). *Putrajaya Low Carbon Green City Initiatives Report*. Malaysia
- Revi, A., Satterthwaite, D. E., Aragón-Durand, F., Corfee-Morlot, J., Kiunsi, R. B. R., Pelling, M., Roberts, D. C., and Solecki, W. (2014). *Urban areas. In Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (535-612)
- Seberang Perai City Council (2020). *Seberang Perai Climate Action Strategy*. Malaysia
- The Intergovernmental Panel on Climate (2023). *Climate Change 2023 Synthesis Report Change*. Intergovernmental Panel on Climate Change, 4 & 44
- Wagg (2030). *Greenhouse Effect and Anthropogenic Warming*. Retrieved from <https://mrgeogwagg.wordpress.com/2015/06/24/greenhouse-effect-andanthropogenic-warming/>
- Wee-Kean Fong, Hiroshi Matsumoto, Chin-Siong Ho & Yu-Fat Lun (2008). *Energy Consumption and Carbon Dioxide Emission Considerations in the Urban Planning Process in Malaysia. Planning Malaysia: Journal of the Malaysian Institute of Planners* (2008) VI, 99-128
- Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2022). *Climate Change 2022 Mitigation of Climate Change*, Intergovernmental Panel on Climate Change, 229 & 236

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ASSESSING THE RELIABILITY AND VALIDITY OF KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) ASSESSMENTS ON COVID-19 TRANSMISSION KNOWLEDGE AND PREVENTIVE MEASURES AMONG ECOTOURISM OPERATORS

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Abstract

This cross-sectional study conducted in rural Pahang state, Malaysia, aimed to validate a questionnaire examining ecotourism operators' Knowledge, Attitude, and Practice (KAP) regarding COVID-19 transmission and preventive measures. Data collection utilised the snowball technique. The questionnaire, comprising 34 items covering knowledge, attitude, and practice constructs, underwent rigorous validation and piloting before the actual fieldwork. All factor loading scores (>0.65) and Cronbach's alpha ($\alpha \geq 0.69$) were greater than the reference value, relaying indicators of reliability and internal consistency of the measured latent variables. The findings revealed that the KAP model met the goodness-of-fit criteria (HTMT <0.90 , SRMR <0.08 , NFI >0.90) and convergent validity was achieved (AVF ≤ 0.50). The study confirms the meticulous instrument validation, ensuring the survey tool's effectiveness in gauging KAP among ecotourism operators. This study's novelty lies in its focus on the KAP spectrum vis-à-vis COVID-19 among operators engaged in these ecotourism domains. By bridging this gap, the research aspires to inform tailored interventions, ultimately fortifying resilience against future health crises in ecotourism communities.

Keywords: Reliability; Validity; Knowledge, Attitude, and Practice (KAP); COVID-19; Transmission Knowledge; Preventive Measures; Ecotourism Operators; Malaysia

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INTRODUCTION

Recent studies highlight the vulnerability of tourism sectors, including ecotourism, to the disruptions caused by the COVID-19 pandemic (Nordin et al., 2023; Salman et al., 2023). The pandemic has drastically affected the tourism industry worldwide, posing significant challenges to the livelihoods of ecotourism operators (Salman et al., 2023). Puspitasari et al. (2020), emphasised the importance of evaluating the knowledge, attitudes, and practices (KAP) of tourism operators to understand their preparedness and response to COVID-19 pandemic. However, the absence of targeted interventions tailored to the KAP of tourism operators impedes the optimisation of prevention strategies and undermines their efficacy in curtailing COVID-19 transmission (Bumyut et al., 2022). It is well acknowledged that KAP studies are scarcely employed in the tourism and health perspectives (Shrestha & Shrestha, 2021). The study also found issues and gaps in this context, which revolve around the shortage of comprehensive insights into the specific KAP patterns regarding COVID-19 among tourism operators.

Understanding ecotourism operators' KAP concerning COVID-19 transmission and prevention is critical, yet studies focusing on this specific demographic subset are scant (Duro et al., 2021). Notably, the lack of validated and context-specific assessment tools catering specifically to the ecotourism operator demographic hampers the accurate evaluation of their understanding, attitudes, and practices concerning COVID-19 (Abdullah et al., 2020). Without a comprehensive understanding of the KAP spectrum, there's a deficiency in actionable data that can inform the design and implementation of targeted educational programs or interventions tailored to address the specific needs and challenges faced by operators in ecotourism areas. The existing scarcity in understanding the intricacies of COVID-19 transmission within ecotourism areas also underscores the importance of this study. Prevailing data often lacks granularity in assessing the specific KAP dimensions of ecotourism suppliers operating in these unique settings (Dasan et al., 2022; Hosseini et al., 2021).

This study aspires to fill a crucial gap by examining the Knowledge, Attitudes, and Practices (KAP) regarding COVID-19 among ecotourism operators in Rural Pahang State, going beyond symptomatic awareness to understand their daily behaviours and attitudes. It seeks to identify areas for intervention and enhancement by exploring the KAP in this demographic subset rarely studied in COVID-19 research, offering insights that can inform tailored interventions and strengthen resilience against the pandemic. This research not only contributes to understanding specific KAP dynamics in ecotourism settings but also holds promise in developing KAP measurements for managing health crises, thereby amplifying the effectiveness of public health initiatives in these communities.

LITERATURE REVIEW

Knowledge, Attitude, and Practices Concept

The triumvirate of knowledge, attitude, and practices (KAP) within business operations constitutes a complex interplay essential for organisational success. Notably, the relationship between knowledge, attitude, and practices is symbiotic. Knowledge is the foundation upon which attitudes are built (Che Ibrahim & Belayutham, 2020). For instance, informed knowledge about market trends and consumer behaviour can shape positive attitudes towards innovative business strategies. Attitudes, in turn, influence the application of acquired knowledge into practices (Kwol et al., 2020). A positive attitude towards embracing technological advancements can lead to implementing new operational methods. This cyclical relationship forms the core framework of effective business operations.

Extensive research has delved into understanding the dynamics of KAP within business operations. Studies by Shezad et al. (2024) highlighted that organisation fostering a culture of continuous learning and knowledge sharing witnessed enhanced operational efficiency. Conversely, a lack of knowledge dissemination impeded innovation and growth. Furthermore, the study by Tran et al. (2018) emphasised the pivotal role of attitudes in managerial decision-making. It was found that leaders with a proactive and adaptable attitude were more inclined to implement transformative strategies, resulting in increased organisational resilience. However, critiques within the literature indicate a gap in understanding the interplay between these variables (Tran et al., 2018). While studies have highlighted the significance of each element independently, limited research exists on the intricate relationships and feedback loops among knowledge, attitudes, and practices.

Ecotourism Operators and COVID-19

Ecotourism, renowned for its commitment to sustainability, biodiversity conservation, and community involvement, represents a responsible and environmentally conscious travel approach (Azinuddin et al., 2022; Nordin et al., 2023; Salman et al., 2023). Ecotourism operators, as key service providers, play a crucial role in orchestrating experiences that connect travelers with natural environments while delicately balancing conservation and economic development (Fennell, 2020). The COVID-19 pandemic, however, posed unprecedented challenges, disrupting operations, altering consumer behavior, and jeopardizing the fragile ecosystems ecotourism aims to protect.

Past literature extensively examines crises' impact on tourism, shedding light on ecotourism operators' resilience and adaptive capacity (Gabriel-Campos et al., 2021). Diversified revenue sources and robust contingency plans are imperative for weathering external shocks (Gabriel-Campos et al., 2021). Technological integration, as emphasized by Nautival et al. (2022), is pivotal in

mitigating pandemic effects, utilizing digital platforms for marketing, communication, and virtual experiences.

The pandemic, while initially disruptive, prompted reflection and transformation within the ecotourism sector. Enhanced cooperation among communities and stakeholders is crucial, emphasizing collaborative efforts to generate unified tourism products and services (Azinuddin et al., 2023). Research by Samdin et al. (2022) advocates for ecotourism operators to pivot towards regenerative tourism practices, fostering stronger community partnerships and enhancing conservation efforts during the recovery phase. These findings underscore the importance of collaborative efforts and adaptive approaches in both community-tourism stakeholder relationships and broader ecotourism management.

Knowledge, Attitude, and Practices of Ecotourism Operators

The effective management of COVID-19 transmission and ensuring business continuity have become critical aspects for ecotourism operator's post-pandemic (Salman et al., 2023). This necessitates a comprehensive understanding of three primary facets: knowledge, attitude, and practices (KAP) among ecotourism operators. The interconnectedness of knowledge, attitude, and practices among ecotourism operators forms the cornerstone of effective pandemic management and business resilience (Kwol et al., 2020). Knowledge is foundational, empowering operators with information about the virus, transmission dynamics, and mitigation strategies. However, knowledge alone is insufficient without a congruent attitude towards implementing necessary measures (Islam et al., 2021). The attitude of ecotourism operators shapes their perception of risks, willingness to adapt, and commitment to stringent health protocols. This, in turn, influences the practices adopted within their establishments or services. This is evident as effective practices, informed by knowledge and a positive attitude, manifest in comprehensive COVID-19 management protocols, ensuring visitor safety and operational sustainability (Koščak & O'Rourke, 2021).

METHODOLOGY

This cross-sectional study in rural Pahang, Malaysia, aimed to validate an ecotourism operator's Knowledge, Attitude, and Practice (KAP) questionnaire on COVID-19 transmission and preventive measures. The 34-item questionnaire covered knowledge, attitude, and practice, adapted from existing literature (Alqahtani et al., 2021; Robina-Ramírez et al., 2021; Teng et al., 2021). Ethical clearance was obtained from the IIUM Research Ethics Committee (IIUM/504/14/11/2/ IREC 2023-199).

Sections A, B, and C assessed demographic information, COVID-19 knowledge, and attitudes, drawing from prior studies (Bonfanti et al., 2021; Li et

al., 2022). Section D gauged respondents' practices, referencing established works (Bonfanti et al., 2021; El-Said et al., 2023; Li et al., 2022). The survey was translated into Malay, validated through backward and forward translation, face validity by experts, and pilot tested with 30 respondents.

Data collection utilized the snowball technique (Sarker and Al-Muaalemi, 2022). The study adhered to a minimum sample size ($N > 127$) for generalizability, emphasizing participant consent and confidentiality in the introductory statement. The KAP model was then examined via the Partial-least Square–Structural Equation Modelling (PLS-SEM) with the help of SmartPLS 4.0 software. PLS-SEM is a simultaneous modelling technique capable of analysing latent variables, indicators, and measurement errors in real-time. PLS-SEM can be used with a few samples and applied to all data scales (Hair et al., 2019).

ANALYSIS AND FINDINGS

Study Demographics

Trained enumerators ensured questionnaire completeness onsite, resulting in a 100 percent response rate, with each questionnaire taking approximately 15 minutes to complete. Notably, 60.1 percent ($n=119$) of respondents were male, and 39.9 percent ($n=79$) were female. At least 18.7 percent ($n=37$) of the respondents were holders of a diploma. In comparison, 10.6 percent ($n=21$) of the respondents were holders of a degree and a majority (52.5 percent: $n=104$) of the respondents were secondary school graduates. Among the respondents, 31 (15.7 percent) were employers and the rest, 167 (84.3 percent) were employees of the premise. Regarding the number of minimum working hours, approximately 60.1 percent ($n=119$) of the respondents had been working for more than 25 hours a week. Moreover, for the monthly income, approximately 24.7 percent ($n=49$) of the respondents were paid less than RM1000 per month and the number of respondents who were paid more than MYR1000 per month was 75.3 percent ($n=149$).

Descriptive Analysis

Table 1 encapsulates the comprehensive descriptive analysis findings obtained from the study to evaluate ecotourism operators' COVID-19-related knowledge, attitudes, and practices within a specific premise.

Table 1: Survey Items Mean Score and Standard Deviation (SD)

Code	Items	Mean Score	S.D.
<i>Knowledge</i>			
KQ2	An infected person may show symptoms within 2-14 days after exposure to COVID-19.	4.10	1.14
KQ3	An infected person may have symptoms ranging from mild e.g. fever to severe e.g. pneumonia, depending on their body immunity.	4.14	1.09
KQ4	The COVID-19 virus spreads via respiratory droplets and can be transmitted from person to person.	4.10	1.14
KQ5	Severity of COVID-19 increases for people with other chronic diseases such as diabetes, hypertension, and heart diseases.	3.92	1.25
KQ6	Quarantine is an effective way to reduce the spread of COVID-19.	4.29	0.87
KQ7	Alcohol-based hand sanitiser is an important disinfectant to reduce the virus from spreading.	4.22	1.06
KQ8	All disinfectant solutions should be covered and cannot be exposed to direct sunlight.	3.78	1.41
KQ9	The minimum recommended personal protective equipment when disinfecting in non-healthcare settings is rubber gloves, waterproof aprons, and closed shoes.	3.94	1.33
KQ10	The MySejahtera application introduced by the government is very helpful in dealing with the spread of the COVID-19 virus.	4.24	1.10
<i>Attitude</i>			
AQ1	I believe that vaccination will prompt the immune system to fight against the virus.	3.76	1.12
AQ2	I believe that the implementation of online check-in systems can reduce the probability of the virus spreading.	3.80	1.06
AQ3	I believe our team is well-equipped with knowledge to contain the COVID-19 outbreak.	3.87	1.01
AQ4	I believe effective communication with guests, employees, travellers, the local community, and other organisations can help manage the outbreak.	3.93	0.94
AQ5	I am not worried about COVID-19 spreading on my premises.	3.13	1.13
AQ6	I believe preventive measures such as hand hygiene and cough etiquette can reduce the spreading of the virus.	3.93	0.92
AQ7	I believe the implementation of early warning systems by the Ministry of Health such as forecasting and public announcement is crucial for crisis management strategies.	3.94	0.92
AQ8	I believe this premise is financially stable to effectively respond to any health crises in the future.	3.55	1.27

Code	Items	Mean Score	S.D.
AQ9	I am ready to adapt to the ecotourism industry revolution such as embracing contactless technology to sustain the ecotourism industry.	3.77	1.07
AQ10	I believe data analysis from previous outbreaks can be helpful in handling any potential health crisis in the future.	3.91	0.94
<i>Practice</i>			
PQ1	This premise cleans common facilities such as doors, handrails, toilets and lobby using disinfectants minimum three times daily for every 8 hours of operations.	4.30	1.05
PQ2	This premise carries out periodic thorough cleaning and disinfecting of fittings such as air conditioning and ventilation systems, carpets, and other fabric-based items.	4.38	0.88
PQ3	This premise provides guests with hand sanitiser as an amenity.	4.39	0.84
PQ4	This premise plans standard operating procedure (SOP) and provides personal hygiene guidelines.	4.48	0.80
PQ5	This premise provides informative signage about preventive actions that can amplify the key messages among guests and staff.	4.29	0.98
PQ6	This premise conducts staff training on the implementation of cleaning the common areas and frequently touched objects such as door knobs and switches.	4.39	0.85
PQ7	This premise has updated its social media by publishing hygiene and protection measures to reassure guests on the safety of the premise.	4.30	1.05
PQ8	This premise encourages the staff to clean their hands regularly to reduce the chance of virus transmission.	4.50	0.73
PQ9	This premise tracks and documents actions performed during the outbreak which will improve the standard operating procedure (SOP).	4.34	1.06
PQ10	This premise stays in contact with the local public health authorities to obtain updated information on COVID-19 or any future outbreaks with similar scale as COVID-19.	4.33	1.10

N=198

The descriptive analysis of the survey results on knowledge, attitude, and practice regarding COVID-19 presents a comprehensive overview of perceptions and actions related to the pandemic. These findings reflect the ecotourism operators' understanding, beliefs, and implemented measures. For knowledge, participants exhibited a high level of awareness regarding the importance of quarantine (KQ6), scoring 4.29 (SD = 0.87). Regarding attitudes, participants displayed a moderately positive outlook, with the highest belief in

the implementation of early warning systems by the Ministry of Health (AQ7), scoring an average of 3.94 (SD = 0.92). In terms of practices, the premise displayed the highest score on the staff to clean their hands regularly to reduce the chance of virus transmission (PQ8) with a mean score of 4.50 (SD = 0.73).

Instruments Validity Assessment

In crafting the questionnaire, content validity was established through a process rooted in social cognitive theory, delineating concepts, and their associated items. This framework incorporated elements such as knowledge, attitude and practices. Three experts' opinions were sought to assess content validity, and the questionnaire underwent face validity checks through interviewer training. These meticulous steps were undertaken to enhance the questionnaire's validity and practicability (Bolarinwa, 2015).

Instruments Reliability Assessment

The outcomes concerning item-total correlations and Cronbach's alpha coefficients across the knowledge, attitude, and practice domains related to the study setting. Cronbach's alpha coefficients were employed to gauge internal consistency within each domain. The knowledge subscale consisted of 14 items ($\alpha = .762$), the attitude subscale consisted of 10 items ($\alpha = .856$), and the practices subscale consisted of 10 items ($\alpha = .646$) (Nunnally & Bernstein, 1994).

PLS-SEM Measurement Model Assessment

The confirmatory factor analysis's first step is to examine and refine the measurement model's adequacy (Figure 1), followed by examining the model fit. Table 2 presents the outer loading scores, composite reliability, convergent reliability, and Cronbach's alpha for reflective measurement model assessment.

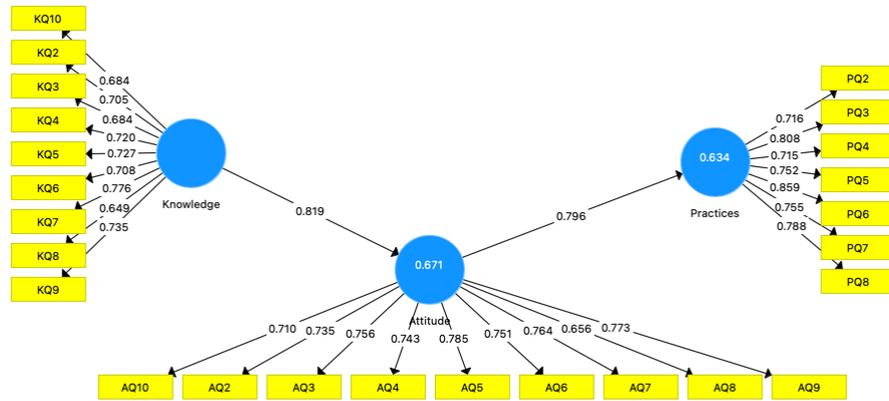


Figure 1: Measurement model assessment

Table 2: Measurement Model Assessment

Latent Variable	Code	VIF	Outer Loading	Cronbach Alpha	Composite Reliability	AVE
Knowledge	KQ2	1.785	0.705	0.877	0.902	0.505
	KQ3	1.662	0.684			
	KQ4	1.673	0.720			
	KQ5	1.874	0.727			
	KQ6	1.671	0.708			
	KQ7	2.036	0.776			
	KQ8	1.482	0.649			
	KQ9	1.889	0.735			
	KQ10	1.750	0.684			
	Attitude	AQ2	1.820			
*AQ1		1.899	0.756			
AQ3		1.899	0.756			
AQ4		2.176	0.743			
AQ5		2.387	0.785			
AQ6		1.907	0.751			
AQ7		2.039	0.764			
AQ8		1.642	0.656			
AQ9		2.140	0.773			
AQ10		1.862	0.710			
Practices	PQ2	1.808	0.716	0.886	0.911	0.596
	*PQ1, PQ9 & PQ10	PQ3	2.181			

Latent Variable	Code	VIF	Outer Loading	Cronbach Alpha	Composite Reliability	AVE
	PQ4	1.757	0.715			
	PQ5	1.855	0.752			
	PQ6	2.697	0.859			
	PQ7	1.942	0.755			
	PQ8	1.954	0.788			

**Removed*

The study's initial phase involves evaluating collinearity in PLS-SEM by examining the Variance Inflation Factor (VIF) (Hair et al., 2019). Common guidelines propose a VIF of 5 or higher may signal collinearity issues; however, in this study, all items exhibit VIF values below three, indicating no substantial collinearity concerns within the framework.

To assess the reflective measurement model, following Hair et al. (2019) guidelines, emphasis is placed on scrutinizing indicator loads. They advocate for loadings surpassing 0.65 for reliable indicator performance, and the model in this study meets this criterion, with loadings ranging from 0.656 to 0.859. Items with loadings below 0.65, such as AQ1, PQ1, PQ9, and PQ10, were excluded.

Distinguishing between composite reliability and Cronbach's alpha, as highlighted by Hair et al. (2019), reveals that composite reliability offers greater precision. Values above 0.70 signify reliable measures, and this research discloses values ranging from 0.866 to 0.967 across the nine constructs, exceeding the 0.70 benchmarks. Both Cronbach's alpha and composite reliability affirm the internal consistency of items within each construct.

Convergent validity, assessed through Average Variance Extracted (AVE), determines if constructs explain at least 50 percent of item variance (Hair et al., 2019). AVE values in this study range from 0.505 to 0.596, surpassing the 0.50 threshold, indicating satisfactory convergent validity.

Discriminant validity, crucial for ensuring constructs remain distinct within the structural model, is evaluated using Heterotrait-Monotrait Ratio of Correlations (HTMT) analysis (Henseler et al., 2016). The findings reveal no collinearity concerns among latent constructs, displaying values below 0.90 and significantly differing from 1.00 (Hair et al., 2011). These outcomes strongly support the model's discriminant validity.

The SRMR serves as an index gauging the standardized residuals' average between observed and expected covariance matrices, providing an estimated assessment of model adequacy. In this particular estimation, an SRMR of 0.066 denotes a strong fit, complemented by a chi-square value of 631.329 and

an NFI of 0.990, both considered satisfactory for factor models (Cheung et al., 2023). Additionally, the geodesic (dG) inconsistency at 0.628 suggests the model's superior suitability for this investigation (Schuberth et al., 2023).

DISCUSSION AND IMPLICATION

The study rigorously established the validity and reliability of the questionnaire. Content validity was ensured by expert evaluation and face validity checks. The reliability analysis, employing Cronbach's alpha coefficients, revealed satisfactory internal consistency across knowledge, attitude, and practice domains, confirming the reliability of the items. Moreover, the PLS-SEM measurement model assessment validated the reflective measurement model, showcasing adequate convergent validity and reliability. The discriminant validity analysis further affirmed the distinctness of constructs within the structural model. The confirmatory factor analysis affirmed the robustness of the model fit, as indicated by satisfactory SRMR, chi-square, and NFI values. Collinearity issues were absent, and the model demonstrated consistency, emphasising its suitability for the study. These findings underscore the model's robustness in explicating the relationships between latent variables, further supporting the validity and reliability of the instrument used.

This study has several notable implications. In term of theoretical implications, the study's focus on the knowledge, attitudes, and practices (KAP) of ecotourism operators during the COVID-19 pandemic offers targeted insights. This fills a gap in understanding the unique challenges, risks, and opportunities faced by these operators. Understanding their KAP spectrum helps tailor interventions and strategies specific to their needs. Besides, by examining KAP, the study offers a unique perspective on pandemic preparedness within ecotourism areas. It underscores the importance of having information (knowledge), positive attitudes, and effective practices to manage a crisis like COVID-19 effectively. On the other hand, the meticulous validation process of the questionnaire and the analysis of the Partial Least Square-Structural Equation Modelling (PLS-SEM) showcases the robustness of the research framework. This adds credibility to this specific study and sets a methodological standard for future research in similar domains.

Looking at the practical implications, the findings suggest a need for customised educational programs targeting ecotourism operators. Crafting specialised interventions based on the KAP identified in this study can greatly enhance the effectiveness of preventive strategies. These interventions could encompass targeted training sessions, educational campaigns, or workshops specifically addressing the gaps and areas for improvement identified among the operators. Besides, the insights from this study can contribute significantly to the design and implementation of more effective health campaigns, guidelines, or

policies specifically tailored to the unique challenges faced by operators in ecotourism settings.

CONCLUSION

The study addresses a critical gap in understanding COVID-19's impact on ecotourism operators, emphasizing the interconnectedness between ecotourism, conservation, and local community livelihoods. By examining Knowledge, Attitudes, and Practices (KAP) dynamics, the study highlights the importance of preventive measures within ecotourism operations to safeguard ecosystems and support indigenous communities reliant on tourism. Insights gained can inform long-term planning for health crises, advocating for measures like communication channels and updated Standard Operating Procedures (SOPs) to enhance preparedness. Despite its contributions, the study has limitations, including its regional focus and sampling technique, which may limit generalizability. Future research should consider longitudinal studies, diverse geographic locations, and qualitative methods to offer a more comprehensive understanding of KAP concerning COVID-19 among ecotourism operators globally.

ETHICAL STATEMENT

This research maintains strict adherence to ethical standards to safeguard participant rights and research integrity. Informed consent was obtained, ensuring participants understood the study's purpose, procedures, and data usage. Compliance with the Malaysian Personal Data Protection Act 2010 was ensured. Approval from the International Islamic University research ethics committee was obtained prior to data collection. Rigorous citation practices were followed, and risks to participants were minimized. This study upholds the highest standards of ethical conduct and respects participant autonomy and well-being.

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REFERENCES

- Alqahtani, J.S., Oyelade, T., Aldhahir, A.M., Mendes, R.G., Alghamdi, S.M., Miravittles, M., Mandal, S. and Hurst, J.R. (2021). Reduction in hospitalised COPD exacerbations during COVID-19: a systematic review and meta-analysis. *PLoS One*, 16(8), e0255659.
- Abdullah, S. I. N. W., Samdin, Z., Ho, J. A., & Ng, S. I. (2020). Sustainability of marine parks: Is knowledge–attitude–behaviour still relevant? *Environment, Development and Sustainability*, 22, 7357-7384.
- Azinuddin, M., Shariffuddin, N. S. M., Som, A. P. M., Salim, M. A. M., & Eppang, B. M. (2023). Interrelationship of networks, knowledge, and performance of businesses through the lens of coastal destination development. *Planning Malaysia*, 21(4), 376-389.
- Azinuddin, M., Zain, W. M. A. W. M., & Shariffuddin, N. S. M. (2022). Tourism Sustainability: Perspectives on Past Works, Issues and Future Research Opportunities. In *Environmental Management and Sustainable Development: Case Studies and Solutions from Malaysia* (pp. 39-51). Cham: Springer International Publishing.
- Azwar, H., Hanafiah, M. H., Abd Ghani, A., Azinuddin, M., & Shariffuddin, N. S. M. (2023). Community-Based Tourism (CBT) moving forward: Penta helix development strategy through community local wisdom empowerment. *Planning Malaysia*, 21, 72-88.
- Bolarinwa, O. A. (2015). Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. *Nigerian Postgraduate Medical Journal*, 22(4), 195-201.
- Bonfanti, R. C., Lo Coco, G., Salerno, L., & Di Blasi, M. (2022). The thin ideal and attitudes towards appearance as correlates of exercise addiction among sporty people during the COVID-19 Pandemic. *Behavioral Sciences*, 12(6), 187.
- Borges-Tiago, T., Silva, S., Avelar, S., Couto, J. P., Mendes-Filho, L., & Tiago, F. (2021). Tourism and COVID-19: The show must go on. *Sustainability*, 13(22), 12471.
- Bumyut, A., Thanapop, S., & Suwankhong, D. (2022). Exploring readiness towards effective implementation of safety and health measures for COVID-19 Prevention in Nakhon-Si-Thammarat community-based tourism of southern Thailand. *International Journal of Environmental Research and Public Health*, 19(16), 10049.
- Che Ibrahim, C. K. I., & Belayutham, S. (2020). A knowledge, attitude and practices (KAP) study on prevention through design: a dynamic insight into civil and structural engineers in Malaysia. *Architectural Engineering and Design Management*, 16(2), 131-149.
- Cheung, G. W., Cooper-Thomas, H. D., Lau, R. S., & Wang, L. C. (2023). Reporting reliability, convergent and discriminant validity with structural equation modeling: A review and best-practice recommendations. *Asia Pacific Journal of Management*, 1-39.
- Dasan, J., Ahmedy, F., Shamsul, S., Godoong, E., Sipaut, C. S., & Jeffree, M. S. (2022). Post-COVID-19 Challenges for a Sustainable Community-Based Ecotourism: A

- Case Study of Rural Community in Sabah, North of Borneo. *SAGE open*, 12(4), 21582440221138814.
- Duro, J. A., Perez-Laborda, A., Turrion-Prats, J., & Fernández-Fernández, M. (2021). Covid-19 and tourism vulnerability. *Tourism Management Perspectives*, 38, 100819.
- El-Said, O. A., Smith, M., Al-Yafaai, Y., & Salam, S. A. A. (2023). From complexity to evolution: Mapping resilience management practices in the hospitality industry during the COVID-19 crisis. *International Journal of Hospitality Management*, 110, 103435.
- Fennell, D. A. (2020). *Ecotourism*. New York, NY: Routledge.
- Gabriel-Campos, E., Werner-Masters, K., Cordova-Buiza, F., & Paucar-Caceres, A. (2021). Community ecotourism in rural Peru: Resilience and adaptive capacities to the Covid-19 pandemic and climate change. *Journal of Hospitality and Tourism Management*, 48, 416-427.
- González-Torres, T., Rodríguez-Sánchez, J. L., & Pelechano-Barahona, E. (2021). Managing relationships in the Tourism Supply Chain to overcome epidemic outbreaks: The case of COVID-19 and the hospitality industry in Spain. *International Journal of Hospitality Management*, 92, 102733.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, 31(1), 2-24.
- Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, 40, 414-433.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2016). Testing measurement invariance of composites using partial least squares. *International Marketing Review*, 33(3), 405-431.
- Hosseini, S. M., Paydar, M. M., & Hajiaghaei-Keshteli, M. (2021). Recovery solutions for ecotourism centers during the Covid-19 pandemic: Utilising Fuzzy DEMATEL and Fuzzy VIKOR methods. *Expert Systems with Applications*, 185, 115594.
- Islam, M. S., Siddique, A. B., Akter, R., Tasnim, R., Sujan, M. S. H., Ward, P. R., & Sikder, M. T. (2021). Knowledge, attitudes and perceptions towards COVID-19 vaccinations: a cross-sectional community survey in Bangladesh. *BMC Public Health*, 21(1), 1-11.
- Košćak, M., & O'Rourke, T. (2021). *Post-pandemic sustainable tourism management: the new reality of managing ethical and responsible tourism*. Routledge.
- Kwol, V. S., Eluwole, K. K., Avci, T., & Lasisi, T. T. (2020). Another look into the Knowledge Attitude Practice (KAP) model for food control: An investigation of the mediating role of food handlers' attitudes. *Food Control*, 110, 107025.
- Li, L., Wang, F., Shui, X., Liang, Q., & He, J. (2022). Knowledge, attitudes, and practices towards COVID-19 among college students in China: A systematic review and meta-analysis. *PloS one*, 17(6), e0270038.
- McCartney, G., Ung, C. O. L., & Pinto, J. F. (2022). Living with COVID-19 and sustaining a tourism recovery—adopting a front-line collaborative response between the tourism industry and community pharmacists. *Tourism and Hospitality*, 3(1), 47-68.

- Nautiyal, R., Polus, R., Tripathi, A., & Shaheer, I. (2023). "To use or not to use"-Mobile technology in nature-based tourism experience. *Journal of Outdoor Recreation and Tourism*, 43, 100667.
- Nordin, D. S. N. D., Latip, N. A., Mansur, K., Hussin, R., & Shah, J. M. (2023). Challenges in implementation of community-based-tourism and homestay post-Covid-19 movement control order (MCO) at Kundasang, Sabah. *Planning Malaysia*, 21.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric Theory* New York, NY: McGraw-Hill.
- Puspitasari, I. M., Yusuf, L., Sinuraya, R. K., Abdulah, R., & Koyama, H. (2020). Knowledge, attitude, and practice during the COVID-19 pandemic: a review. *Journal of Multidisciplinary Healthcare*, 727-733.
- Robina-Ramirez, R., Medina-Merodio, J. A., Moreno-Luna, L., Jimenez-Naranjo, H. V., & Sánchez-Oro, M. (2021). Safety and health measures for COVID-19 transition period in the hotel industry in Spain. *International Journal of Environmental Research and Public Health*, 18(2), 718.
- Salman, A., Jaafar, M., Mohamad, D., Khoshkam, M., Rahim, R. A., & Mohd Nor, S. A. (2023). Stakeholder management for sustainable ecotourism destinations: a case of Penang Hill Malaysia. *Journal of Ecotourism*, 1-26.
- Samdin, Z., Abdullah, S. I. N. W., Khaw, A., & Subramaniam, T. (2022). Travel risk in the ecotourism industry amid COVID-19 pandemic: ecotourists' perceptions. *Journal of Ecotourism*, 21(3), 266-294.
- Sarker, M., & AL-Muaalemi, M. A. (2022). *Sampling techniques for quantitative research. In Principles of Social Research Methodology* (pp. 221-234). Singapore: Springer Nature Singapore.
- Schubert, F., Rademaker, M. E., & Henseler, J. (2023). Assessing the overall fit of composite models estimated by partial least squares path modeling. *European Journal of Marketing*, 57(6), 1678-1702.
- Shehzad, M. U., Zhang, J., Dost, M., Ahmad, M. S., & Alam, S. (2024). Knowledge management enablers and knowledge management processes: a direct and configurational approach to stimulate green innovation. *European Journal of Innovation Management*, 27(1), 123-152.
- Shrestha, B., & Shrestha, A. (2021). Assessment of nature guide's perception towards biodiversity conservation in Chitwan national park using knowledge, attitude and practice (KAP) Approach. *Journal of Environmental Sciences*, 7(August), 61-73.
- Teng, Y. M., Wu, K. S., Wang, W. C., & Xu, D. (2021, June). Assessing the knowledge, attitudes and practices of COVID-19 among quarantine hotel workers in China. *Healthcare*, 9(6), 772.
- Tran, H., Nguyen, Q., & Kervyn, M. (2018). Factors influencing people's knowledge, attitude, and practice in land use dynamics: A case study in Ca Mau province in the Mekong delta, Vietnam. *Land Use Policy*, 72, 227-238.

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ON RELOCATION OF SETTLEMENT AFTER THE CIANJUR EARTHQUAKE AND LANDSLIDE 2022

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Abstract

An Earthquake and landslide occurred in Cianjur, Indonesia, in November 2022. This resulted in a lot of losses, both fatalities and the disappearance of some settlements. Relocation would be obligatory as post-disaster mitigation policies for areas with highest disaster threats. This research was conducted to find its relocation areas. The method used is overlay and scoring by utilizing GIS applications. The used data are rainfall data, slope, geological maps, Cianjur earthquake hazard maps, fault line buffering, and supervised classification of land cover/use maps. Analysis of the results in the form of landslide hazard maps and disaster safety maps. The search for the expected relocation area is carried out by overlaying a disaster-safe map with residential areas, so that a post-disaster residential relocation recommendation map is produced with five classes, namely very good, good, medium, bad, and very bad. An analysis is also carried out for directions for the use of the affected area for the very bad class used as a protected area and no buildings are allowed on it. Bad class is not allowed to live on it, but can be used for social activities, plantations and paddy fields. The moderate vulnerability class can still be used as a residence, economic centre, or other social activities. Meanwhile, the safe and very safe vulnerability classes do not have any land use restrictions.

Keywords: Relocation, Settlement, Earthquake, Landslide, Cianjur

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INTRODUCTION

Indonesia is one of the countries with considerable potential for natural disasters. The potential for natural disasters is inseparable from Indonesia's geographical conditions at the confluence of three major tectonic plates, namely the Eurasian plate, the Indo-Australian plate and the Pacific plate (Ahmad & Ali, 2017; BMKG, 2017). Natural disasters are natural phenomena that can occur anytime and anywhere, and cause various material and immaterial losses for the affected community. One of the natural disasters that often occurs is earthquakes, such as the earthquake that occurred in Cianjur, West Java in 2022. The Cianjur earthquake occurred on 21 November 2022 at 13.21 WIB with a magnitude of 5.6 and an earthquake depth of 11 KM below the ground surface triggered by the movement of the Cugenang fault. Recorded until 06 December 2022 at 08.00 WIB as many as 390 (three hundred and ninety) aftershocks that caused a lot of concern for people living around the disaster site. The disaster resulted in at least 327 fatalities, 13 people missing, 68 people with serious injuries and 39,985 people displaced (BNPB, 2022).

One of the impacts of the Cianjur earthquake was another natural disaster that followed such as landslides. The movement of the fault resulted in strong ground motion. Landslides occur due to two main factors: controlling factors and triggering factors (Naryanto, 2018). Controlling factors are factors that affect material conditions such as slope, geological conditions, faults, lithology. While the trigger factor is a factor that causes the material to move such as rainfall, earthquakes, human activities that cause slope erosion (Naryanto, 2016). Landslides caused by the Cianjur earthquake resulted in many houses and public facilities being covered by landslide material. In addition, road access to the evacuation site was hampered due to piles of material.

After earthquakes and landslides, disaster mitigation needs to be carried out related to logistical assistance and the provision of a built environment and shelter for affected victims (Utami et al., 2019). Mitigation efforts are carried out by considering the risk of disasters that can occur in the future (Rahma et al., 2021). The condition of the settlements where the victims live, which are severely damaged and located near the centre of the disaster, certainly requires relocation of residential areas to avoid the post-disaster cycle that will occur in the future (Imura & Shaw, 2009). Relocation options for affected communities located in high vulnerability areas are the best alternative due to the nature of disasters that have a certain recurring period (Smith, 2008).

Spatial analysis to determine disaster-prone areas and disaster-safe areas is a key requirement in post-disaster management (Chang & Wang, 2020). Both analyses can be utilized in the determination of relocation areas for affected communities (Rodriguez & Perez, 2022). Determining the area for relocation is not only concerned with these two parameters. Relocation must be concerned with the needs of the community to be able to move in the future (Garcia &

Rodriguez, 2021). It must consider the ease of accessibility of the community to public facilities and social facilities. The similar research on relocation after disasters has also been conducted for flood disasters in Kelantan (Abdul Tharim et al., 2021) and tsunami in Kedah (Isa et al., 2021).

Hence, the research question is, where is the right location to relocate settlements due to earthquake and landslide disasters in Cianjur in 2022. This study goes beyond merely drawing lessons from the Cianjur earthquake (Park & Kim, 2022) and offers novelty by utilizing Geographic Information System methods to assist in identifying suitable relocation sites.

MATERIALS AND METHODS

The research was conducted in districts or part of districts: Cugenang, Cianjur, Pacet, Mande, Warungkondang, Gekbrong, Cilaku, Karang Tengah, Cipanas, Cibeber, Sukaresmi, Cikalong Kulon, and Bojongpicung of Cianjur Regency, West Java Province, Indonesia.



Figure 1: Location of the Study Area

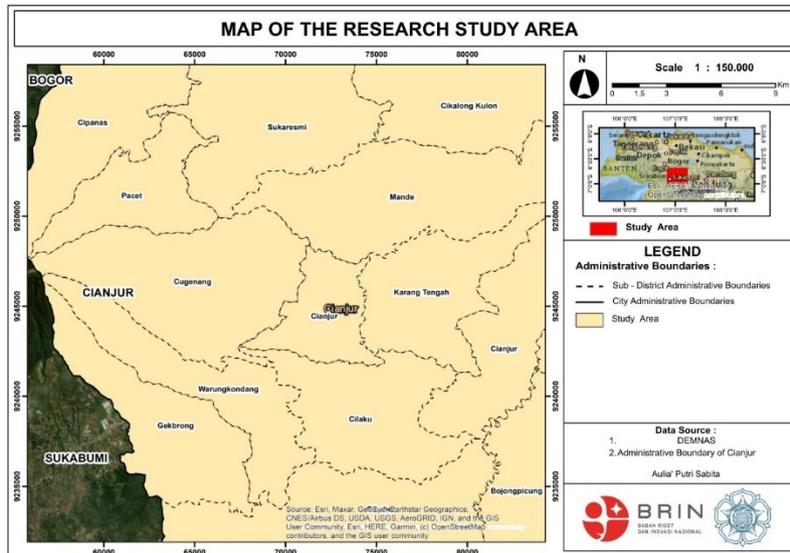


Figure 2: Study Area

Materials:

For this reason, the data needed includes topographical maps of Indonesia (RBI), the National Digital Elevation Model (DEMNAS), geological maps, fault-line maps, landcover/landuse maps, rainfall maps (Martinez & Lopez, 2018; Yang, & Wu, 2021).

Topographical Map

Topographic map data of 1:25,000 for the Cianjur area is available free of charge on the Geospatial Information Agency's website. From the topographic map, data on administrative boundaries, geographical names, road and river network elements are taken. This is to facilitate orientation in the research area

DEMNAS and Slope Map

DEMNAS data is also available free of charge on the BIG website (Amhar, 2016). From this data a slope map can be generated. The slope map is generated by 3D Analyst slope processing. The map classifies the slope into five classes with a certain percentage. The slope percentage represents slopes ranging from flat to steep. The higher the percentage of slope, the redder the color. Generally, the largest percentage of slope is located in mountainous and hilly areas, while low slope is located in lowland areas. According to (Krisnandi et al., 2021; Irvan et al., 2019) the weighting score for slope class can be seen in the following table:

Table 1: Slope Percentage Class

No.	Slope Percentage Class	Score
1.	< 8%	1
2.	8% - 15%	2
3.	15% - 25%	3
4.	25% - 45%	4

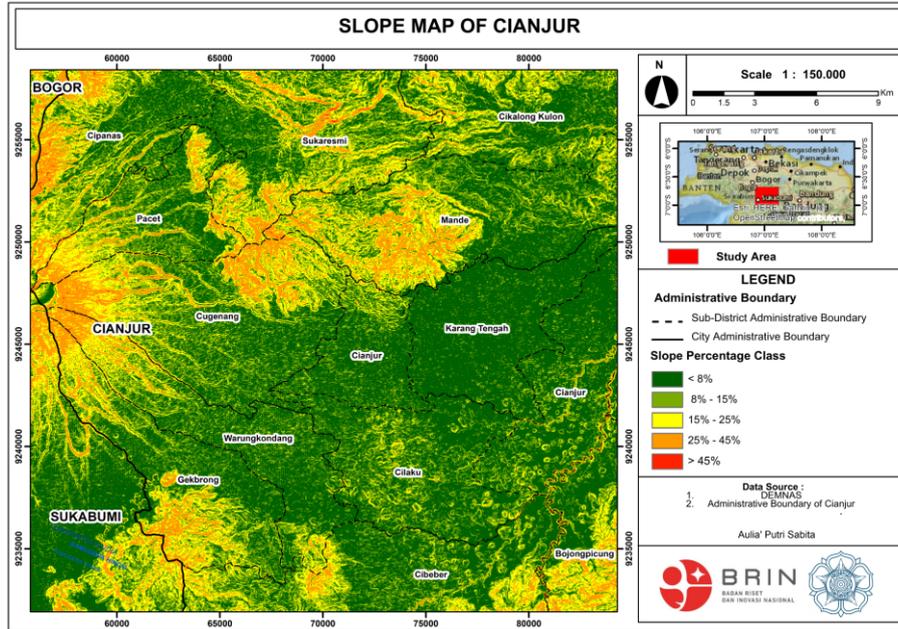


Figure 3: Slope Map

Geological map

The map was obtained from the Indonesian Geological Agency. Each shapefile polygon informs the constituent rock formations, which are classified into three main constituent rock, namely alluvial rocks, sedimentary rocks and volcanic rocks. The constituent rocks in the study area are dominated by volcanic rocks influenced by volcanic activity. Alluvial rocks are the result of deposition of hydrological activities, so that the distribution of alluvial rocks follows the pattern of river flow. While sedimentary rocks are formed due to sedimentation which then hardens. Sedimentary rocks can be found in the northern Sukaresmi and southern Bojongpicung districts. The three constituent rocks have scores that are used to weight the parameters for making landslide vulnerability maps. Based on (Yassar et al., 2021) the geological weighting score can be seen in the following table:

Table 2: Geological Weighting

No.	Type of constituent rock	Score
1.	Alluvial	1
2.	Volcanic	2
3.	Sediment	3

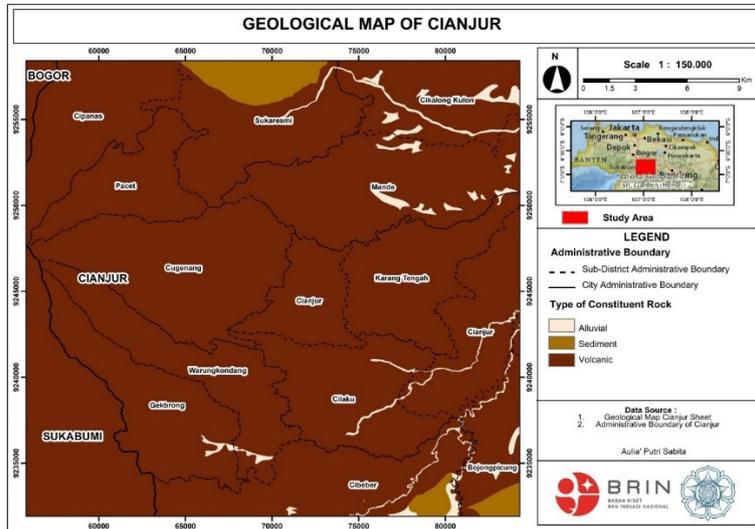


Figure 4: Geological map

Fault-line Map.

The fault line map which was later named Cugenang was obtained from the Meteorology, Climatology and Geophysics Agency (BMKG) which was made together with the National Disaster Management Agency (BNPB) and the Bandung Institute of Technology. This can be seen as the seismic hazard map (Kim & Park, 2020; Smith & Brown, 2020). The Fault-line may not intersect an infrastructure structure (Nguyen & Tran, 2017).

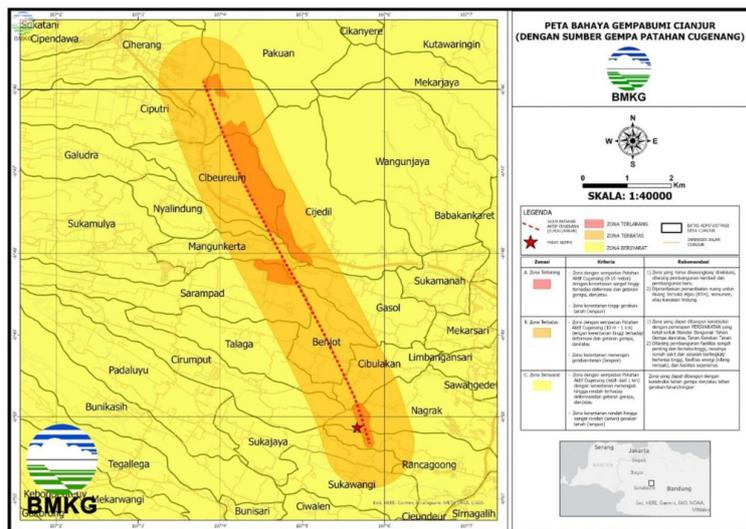


Figure 5: Fault-line map

Land Cover/Landuse Map.

The land cover/land use map was generated from a supervised classification process of Landsat 8/OLI satellite images using Google Earth Engine. Guided classification is a classification by giving direction to grouping with criteria that determine the class (Purwanto & Lukiawan, 2019). According to Nawangwulan et al. (2013) guided classification is a classification that is carried out based on pixel values that have been modeled on object types and their spectral values. So that the classification process requires Region of Interest (ROI) or examples of objects from each class. ROI retrieval is based on interpretation of Landsat 8/OLI imagery with respect to hue/color, pattern, texture, shape, association, and site. Classification is done using the Smile Cart algorithm on Google Earth Engine. The CART algorithm works by building a decision tree that will be divided at each node, so that decisions are made at each node. The results of the classification of land cover/use obtained four classes, namely in the form of built-up land (Kumar & Sharma, 2018), water bodies, agricultural land, and high-density vegetation (dense). The study area is dominated by agricultural land and high-density vegetation (Liu & Wang, 2019).

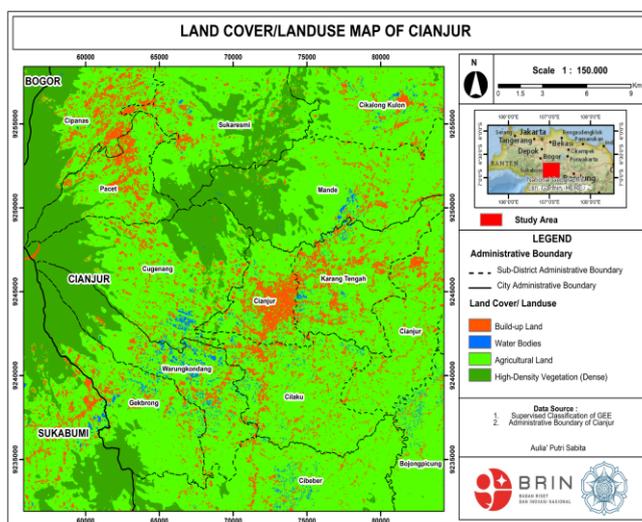


Figure 6: Land Cover/Landuse Map

Rainfall Map

The rainfall map was obtained from PDIR CHRS data in 2022. According to Taufik et al., 2016 rainfall data is classified into five classes: The rainfall map was classified using natural breaks classification and bilinear visualization. This is because the rainfall in the study area has a value $> 3,000$. On the rainfall map, the more towards the northern region, rainfall is higher.

Table 3: Annual Rainfall

No.	Annual Rainfall (mm/year)	Score
1.	< 1000	1
2.	1000 – 2000	2
3.	2000 – 2500	3
4.	2500 – 3000	4
5.	> 3000	5

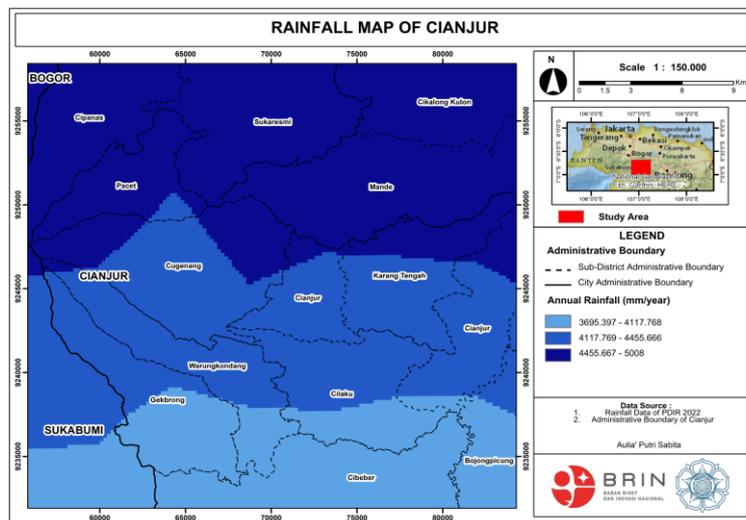


Figure 7: Rainfall Map

Rainfall data, slope data, and geological data were then synthesized using overlay and scoring techniques using the Weighted Overlay tool in ArcGIS. 10.8. Parameter weighting uses the following values:

Table 4: Parameter weighting for overlay and scoring

No.	Parameters	Classification Class	Score
1	Geology (30%)	Alluvial Rocks	1
		Volcanic Rocks	2
		Sedimentary Rocks	3
2	Annual Rainfall (40%)	< 1000 mm/year	1
		1000 - 2000 mm/year	2
		2000 - 2500 mm/year	3
		2500 - 3000 mm/year	4
		> 3000 mm/year	5
3	Slope	< 8%	1
		8% - 15%	2
		15% - 25%	3
		25% - 45%	4
		> 45%	5

Source: Author

This study utilizes GIS applications in the form of ArcGIS 10.8 to process data as overlays, scoring, and map making (Chen, & Wang, 2019). Google Earth Engine for land cover/use classification and Google Earth Pro for advanced analysis of disaster safe areas with settlements (Tan & Lee, 2017).

The result of the synthesis of several parameters is a landslide vulnerability map in the study area. The map was then overlaid with earthquake vulnerability data and fault line buffering to produce disaster safe area data. The overlay process uses the Combine Overlay tool in ArcGIS 10.8, which is useful to combine several parameter classes on the same pixel. The combination results will be categorized into five disaster safety classes (Garcia & Hernandez, 2018).

Safe area data from disasters can provide information related to areas that are in areas with severe disasters. Then the safe area data is added to Google Pro to identify residential areas that are in the disaster hazard classification class. For the relocation recommendation map, land use parameters and disaster safe area maps were overlaid using the Weighted Overlay tool in ArcGIS 10.8.

RESULTS AND DISCUSSION

The result of the synthesis of geological map, rainfall map, and slope map parameters is the following landslide vulnerability map (Figure 8). All parameters were classified and weighted according to the determined weights. Weighting and overlaying data using Weighted Overlay method with the percentage of rainfall parameter of 40%, geological data of 30%, and slope of 30%.

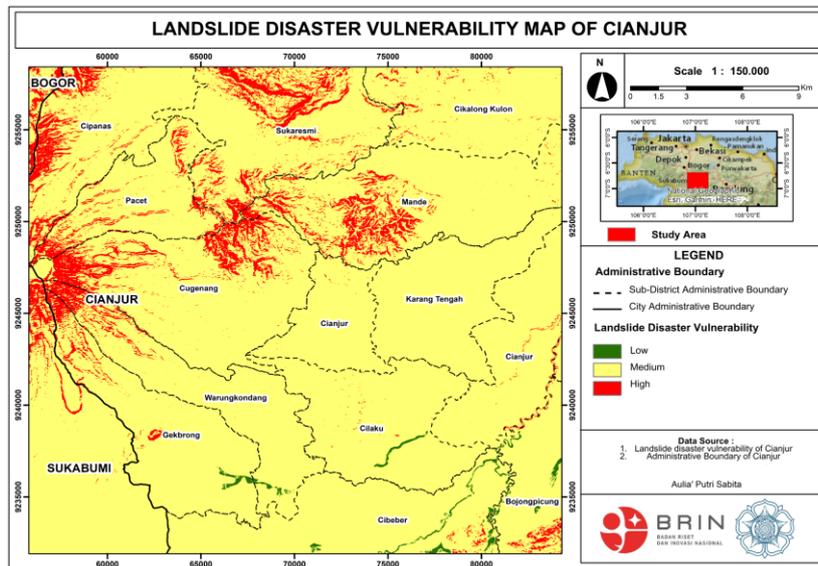


Figure 8: Landslide Disaster Vulnerability Map

Landslide disaster vulnerability map has vulnerability classes classified into three KRB (“Kawasan Rawan Bahaya” Indonesian term for “Danger Zone”) classes namely low, medium, and high. Landslide vulnerability in the study area is dominated by medium KRB class. Based on the analysis of the parameters used, most of Cianjur Regency is dominated by volcanic soil types formed due to volcanic activities. The annual rainfall is very heavy with > 3000 mm/year throughout the study area. High vulnerability is generally found in areas with high elevations such as peaks and slopes of mountains and hills. This is due to the slope and high rainfall. Meanwhile, the low vulnerability class is found in parts of Bojongpicung Sub-district and Cibeber Sub-district.

The result of the synthesis of data on earthquake disaster vulnerability, landslide vulnerability, and buffering against fault lines is the following map of safe areas (Figure 8). The earthquake disaster vulnerability map of Cianjur in 2022 was obtained from a map published by BMKG with information related to the location of the forbidden zone, restricted zone, conditional zone, and Cugenang fault line.

Buffering of the Cugenang fault line with a distance of 60 and 100 meters is in accordance with the regulatory direction applied in the United States since 1977, as well as a distance of 250 meters based on the Decree of the Governor of West Java Number 2 Year 2016. Landslide disaster vulnerability map, earthquake disaster vulnerability map, and spatial buffering with Cugenang fault line were overlaid according to the score classification.

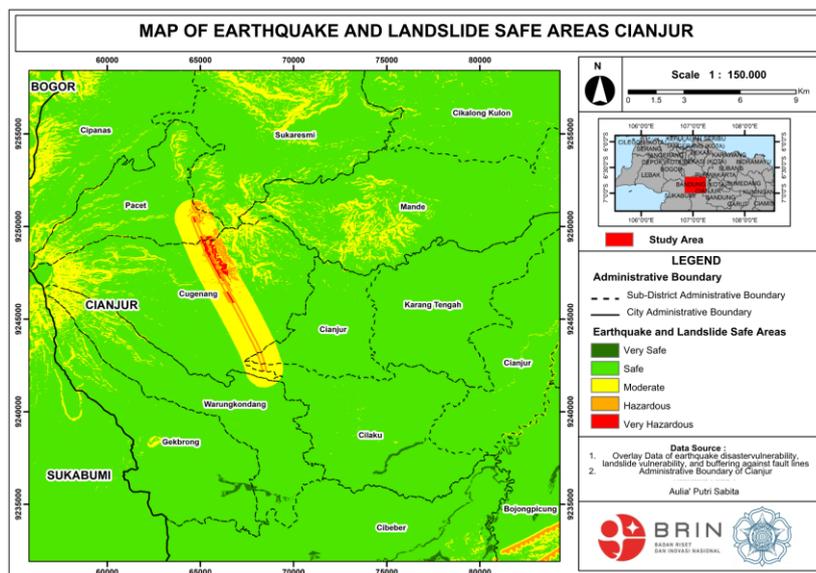


Figure 9: Map of Earthquake and Landslide Safe Areas

The results of the classification of earthquake and landslide safe areas are categorized into five classes: very safe from disasters, safe class, moderate class, hazardous class and very hazardous class. The most hazardous class is based on areas with high landslide vulnerability and located in areas with large earthquake impacts. The highest hazard area is located in Cugenang Sub-district, Cianjur Regency, more precisely in Cibeureum Village, Mangunkerta Village and Cijedil Village. However, the study area is still dominated by safe classes from earthquakes and landslides.

The result of the synthesis of disaster and settlement safety data is an overlay of settlement areas and disaster areas (Figure 10). This overlay is used to determine which settlements should move from their residential locations due to disasters.

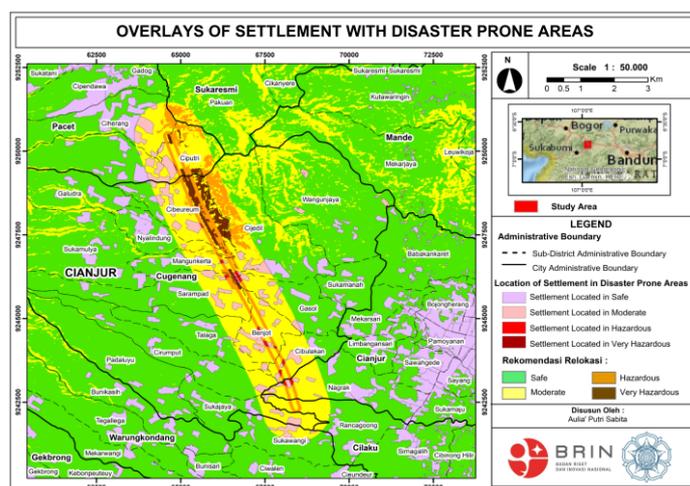


Figure 10. Overlay of Settlement with Disaster Prone Areas

The research focuses on the condition of settlements, so an analysis of the location of settlements located in hazardous to very hazardous disaster-prone areas was conducted. Settlements located in hazardous disaster areas are located in several villages in Cugenang Sub- district. One of the settlements located in the Very Dangerous KRB is in Mangunkerta Village and Cijedil Village. More precisely located in a residential complex around Jl. Pembangkit, Mangunkerta Village, Cugenang District, Cianjur Regency and one of the residential complexes located on Jl. Raya Cipanas - Cianjur, Cijedil Village, Cugenang District, Cianjur Regency. These residential areas are located very close to the Cugenang fault line. So that people who live and are in areas of very high disaster vulnerability must move both houses for living, work buildings and move the location of existing public facilities. In this vulnerability class, buildings are not allowed to be built, so the area can be used as a plantation or pasture area.

Another disaster vulnerability class with high vulnerability is the hazard vulnerability class, in this vulnerability class it is expected not to erect buildings to be occupied as residences and other social activities. So that people who live in the area are expected to move. Buildings can only be used for activities that are carried out in the morning to evening and are not used permanently.

This is done because it is feared that there will be subsequent disasters with greater or lesser strength. The direction to move the location of residence and activities is carried out to avoid casualties due to the natural disaster. Settlement locations with hazard vulnerability are located in Cijedil, Mangunkerta, Benjot and Cibulakan Villages. The moderate vulnerability class can still be used as a residence, economic center, and other social activities. However, in these areas, people are encouraged to always be aware of the same disasters that will occur in the future. While the safe and very safe vulnerability classes have no restrictions on land use in the area, the community is still advised of disasters that can occur anytime and anywhere.

The following are examples of some residential areas that are in the very hazardous vulnerability class coloured in dark red in (Fig. 11 and 12).



Figure 11.

Figure 12.

Location of Disaster Prone Areas Highly Hazardous Settlements in Mangunkerta (Figure 11) and Cijedil (Figure 12), Cugenang sub-district) (Source: analysis with Google Earth

The following are examples of some residential areas that are in the hazard vulnerability class coloured red in (Fig. 13, 14, 15, 16 and 17).



Figure 13.



Figure 14

Figure 13 and Figure 14. Hazard area settlements in Ciputri and Pacet district (Source: analysis with Google Earth)



Figure 15.



Figure 16.



Figure 17.

Location of High Hazard Area settlements in Cijedil (Figure 15), Mangunkerta (Figure 16), and Mangunkerta (Figure 17). Kec. Cugenang, Kab. Cianjur

The result of the synthesis of disaster-safe data and land cover/use is a recommendation map for settlement relocation after the Cianjur earthquake and landslide in 2022 (Fig. 18). The settlement relocation recommendation map is generated by overlaying techniques and scoring the classes of the two maps.

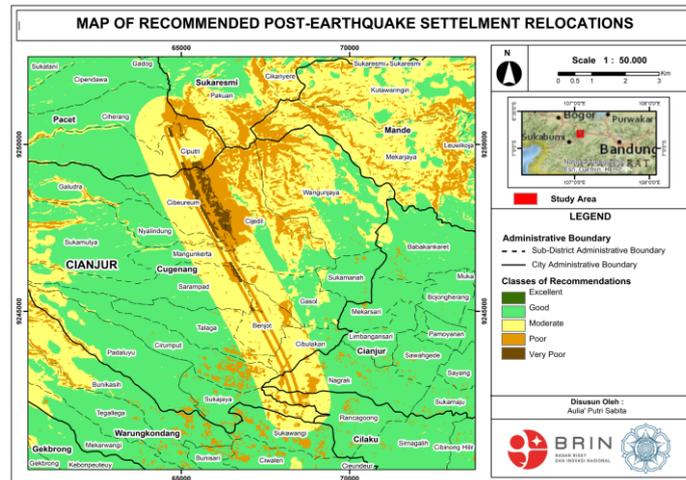


Figure 18. Map of Recommendation Post-Earthquake Settlement Relocations

The relocation recommendation map produces five classes of recommendations for location safety from disasters that are prioritized based on their level of safety. On the land cover/use map, the agricultural land class is the top priority relocation location. This is because building a village/settlement complex on agricultural land is easier than other land cover/use classes. Land that has been cleared will easily build buildings from scratch, without the need to demolish other buildings or logging/burning land. The second priority class of relocation location is the built-up land class, because building buildings on built-up land requires stable land conditions and easier accessibility for community activities. The third priority class is the high-density vegetation class. The construction of a civilisation in high-density areas such as forests or mixed gardens takes a long time because it requires clearing the land to become open land. The last class is water bodies, where it is certainly not possible to make water bodies a place to live. So, water bodies are not prioritized for building structures on them.

The results of the overlay classification resulted in five classes of relocation recommendations, namely excellent, good, moderate, poor, and very poor recommendation classes. The excellent relocation recommendation class is located in KRB areas that are very safe from disasters and are located on agricultural land. In Cugenang Sub-district itself, there is no such relocation recommendation class due to the dominance of landforms that are at the foot of the mountain and there are several hills. The good relocation recommendation class is located in areas with safe KRB and land use as agricultural land and settlements. The class is depicted in green color on the map and is still dominant. So the location for relocation is quite extensive and easy to find. The moderate relocation recommendation class can still be utilized as a relocation location but

with various restrictions on existing activities. While the bad and very bad recommendation classes are locations that should not have buildings built on them.

Based on the data, settlements that are encouraged to move, such as settlements in Ciputri Village, Pacet Sub-district, can be directed to move to Ciherang Village or the western part of Ciputri Village, which is in green color. Settlements that must move in Mangunkerta Village can be directed to the western part of Mangunkerta Village. Settlements that must move in Cijedil Village, Benjot Village, and Cibulakan Village can be directed to Gasulakan Village. Cibulakan can be directed to the eastern part of Gasol Village which still has a large enough area with good relocation recommendations. The direction of the relocation location is to cover areas that are still in the form of agricultural land or open land with a good recommendation area class. The direction is adjusted to the proximity between the old residential settlement and the new relocation recommendations.

CONCLUSION

The earthquake disaster on the active Cugenang fault affected various locations, especially villages in Cugenang sub-district and several villages in Pacet sub-district, Sukaesmi sub-district, Cianjur sub-district, Cilaku sub-district and Warungkondang sub-district. The determination of disaster-affected areas was generated from several parameters, namely slope, rainfall, soil type, zoning for the impact of the Cugenang earthquake and distance to faults using overlay, scoring and weighting methods. The disaster-prone area produces five classes with very safe and safe classes that can still be used for activities without regulatory restrictions. The moderate class can still be used as a place to live, but with rules and restrictions on activities. While the dangerous and very dangerous classes are advised not to build buildings on them. However, the land can still be used as agricultural land or other commodity land.

The results of the relocation area recommendation analysis were conducted using various parameters such as earthquake disaster vulnerability map due to the Cugenang main fault, landslide disaster vulnerability map, and land cover/use map. The relocation recommendations resulted in five classes of relocation recommendations, namely excellent, good, moderate, poor, and very poor. Areas with moderate, poor, and very poor recommendations are not recommended as residential relocation areas. This is because there are still impacts caused by the disaster that struck, both aftershocks and disasters caused by the movement of the previous earthquake disaster. Relocation recommendations are prioritized in areas with good to very good relocation classes. Relocation of settlements in Ciputri village, Pacet sub-district can be directed to Ciherang village and the western part of Ciputri village, which are in the green color. Settlements that must relocate in Mangunkerta Village can be

directed to the western part of Mangunkerta Village. Settlements that must move in Cijedil Village, Benjot Village, and Cibulakan Village can be directed to Gasulakan Village. The provision of recommendations for relocation areas is carried out to avoid material or immaterial losses (casualties, mental health, etc.) caused by disasters that will occur in the future.

This research was conducted based on seismicity data from BMKG. This is because the seismicity map is public and can be accessed at the beginning of the research, which belongs to the BMKG. So that the results of the research can be different from other agencies. If this research is continued, it is necessary to conduct further analysis with Cianjur seismic data from other agencies.

AUTHORS' CONTRIBUTIONS

Aulia' Putri Sabita (APS), Fahmi Amhar (FA), and Hendy Fatchurohman (HF) has an equal role as the main contributors to this article. They participated in conceptualization (APS, FA), methodology (FA, HF), investigation (APS), manuscript writing (APS, FA), and manuscript writing revision (APS, FA), while also providing feedback (HF). All authors have read and agreed to the published version of the manuscript.

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DISCLOSURE STATEMENT / ETHICAL STATEMENT

The authors declares that this research is free from any conflicts of interest and has complied with all existing ethical standards. All data and research findings presented in this paper are solely for academic and scientific purposes.

REFERENCES

- Abdul Tharim, A. H., Che Ahmad, A., Mohamed Saraf, M. H., & Muhammad Nasir, N. A. (2021). Satisfaction Analysis of Flood Victims towards Housing Relocation Scheme During Post Occupancy At Kuala Krai, Kelantan. *Planning Malaysia*, 19 (16). <https://doi.org/10.21837/pm.v19i16.951>
- Ahmad, S., & Ali, I. (2017). Earthquake Early Warning Systems: Advances and Challenges. *Earthquake Engineering and Engineering Vibration*, 16, 441-454.
- Amhar, F. (2016). Quality test various existing dem in Indonesia toward 10-meter national DEM. *ISPRS Archives*, Vol 41, Pages 111-116.
- BMKG (2017). Accessed on was 10 February 2023 from <https://balai3.denpasar.bmkg.go.id/tentanggempa>

- BMKG (2023). Peta Bahaya Gempabumi Cianjur (dengan Sumber Gempa Patahan Cugenang) | BMKG <https://www.bmkg.go.id/berita/?p=peta-bahaya-gempabumi-cianjur-dengan-sumber-gempa-patahan-cugenang&lang=ID>
- BNPB. (2022, 29 November). [UPDATE] 327 Orang Meninggal Dunia Pasca Gempa Cianjur. accessed on 10 February 2023, from <https://www.bnpb.go.id/berita/-update-327-orang-meninggal-dunia-pasca-gempa-cianjur->
- Chang, M., & Wang, L. (2020). Disaster Risk Reduction Strategies for Urban Areas. *International Journal of Disaster Risk Science*, 11, 136-149.
- Chen, L., & Wang, X. (2019). GIS-Based Landslide Susceptibility Mapping in Mountainous Regions. *Natural Hazards*, 98, 873-892.
- Garcia, L., & Hernandez, A. (2018). Landslide Risk Reduction through Structural Measures. *Engineering Geology*, 240, 56-65.
- Garcia, M., & Rodriguez, C. (2021). Post-Disaster Residential Relocation Strategies: A Review. *International Journal of Disaster Risk Reduction*, 54, 102017.
- Imura, M., & Shaw, R. (2009). Challenges and Potentials of Post-Disaster Relocation. *Asian Journal of Environment and Disaster Management*, 1(2), 199-221. doi:10.3850/S1793924009000029.
- Irvan, M., Poerwanto, B., Nasser, R., & Prasti, D. (2019). Pemetaan Daerah Rawan Bencana Longsor di Desa Cendana Kecamatan Burau. *Seminar Nasional Teknologi Informasi Dan Komputer 2019*, 282-291.
- Isa, M. I., Marzbali, M. H., & Azizan, I. H. (2021). Safety, Social Relations and Satisfaction in Postdisaster Resettled Communities: A Case of Kedah, Malaysia. *Planning Malaysia*, 19(19). <https://doi.org/10.21837/pm.v19i19.1065>
- Kim, J., & Park, M. (2020). Seismic Hazard Assessment in Indonesia: Recent Advances. *Natural Hazards*, 110, 263-280.
- Krisnandi Reza, Obrin Trianda, al Hussein Flowers Rizqi, Luziana Febby, & Makruf Nur Hanafi. (2021). Identifikasi Kawasan Rawan Bencana Longsor Metode Skoring Daerah Mojotengah Dan Sekitarnya, Kecamatan Reban, Kabupaten Batang, Provinsi Jawa Tengah. *Prosiding Nasional Rekayasa Teknologi Industri Dan Informasi XVI*, 501-508.
- Kumar, R., & Sharma, R. (2018). Assessment of Building Vulnerability to Earthquakes. *Earthquake Engineering and Structural Dynamics*, 47, 1296-1317.
- Liu, X., & Wang, Q. (2019). Earthquake-Induced Landslides in Tropical Environments. *Natural Hazards and Earth System Sciences*, 19, 2317-2331.
- Martinez, C., & Lopez, M. (2018). Integrated Geospatial Technologies for Disaster Management. *Computers, Environment and Urban Systems*, 72, 15-27.
- Naryanto, H. S. (2016). Penerapan Ilmu Pengetahuan dan Teknologi dalam Pengurangan Risiko Bencana Tanah Longsor (Gerakan Tanah) di Indonesia. Jakarta: BPPT Press.
- Naryanto, H. S., Prawiradisastra, F., Kristijono, A., & Ganesha, D. (2019). Penataan Kawasan Pasca Bencana Tanah Longsor di Puncak Pass, Kecamatan Cipanas, Kabupaten Cianjur Tanggal 28 Maret 2018. *Jurnal Pengelolaan Sumberdaya Alam Dan Lingkungan (Journal of Natural Resources and Environmental Management)*, 9(4), 1053-1065. <https://doi.org/10.29244/jpsl.9.4.1053-1065>.
- Nguyen, T., & Tran, Q. (2017). Seismic Vulnerability Assessment of Infrastructure. *Soil Dynamics and Earthquake Engineering*, 97, 126-140.

- Park, J., & Kim, H. (2022). Lessons Learned from the 2022 Cianjur Earthquake and Landslide. *Disaster Prevention and Management*, 31, 255-270.
- Purwanto, E. H., Lukiawan, R. (2019). Parameter Teknis dalam Usulan Standar Pengolahan Penginderaan Jauh: Metode Klasifikasi Terbimbing Technical Parameter on Proposed of Remote Sensing *Processing Data: Supervised Classification. Jurnal Standardisasi*, 21(1), 67-78.
- Rahma Said, S. L., Sarifuddin, & Takwim, S. (2021). Arahan Kesesuaian Penggunaan Lahan Pasca Bencana di Kelurahan Lere Kota Palu. *Jurnal Ruang*, 15(1), 20-29.
- Rodriguez, M., & Perez, J. (2022). Community Resilience and Disaster Recovery: A Case Study of Cianjur. *Disaster Management*, 12, 45-62.
- Smith, J., & Brown, M. (2020). A Comprehensive Study of Earthquake-Induced Landslides. *Geophysical Research Letters*, 47(e2020GL091329).
- Smith, K, Petley, D. N. (2008). *Environmental Hazards: Assessing Risk and Reducing Disaster*. France: Taylor & Francis e-Library.
- Tan, W., & Lee, H. (2017). Remote Sensing and GIS Applications in Landslide Hazard Mapping. *Remote Sensing*, 9(1013).
- Taufik, M., Kurniawan, A & Putri, A.R. (2016). Identifikasi Daerah Rawan Tanah longsor menggunakan SIG (Sistem Informasi Geografis) *Jurnal Teknik ITS*, Vol. 5, No. 2, (2016) ISSN: 2337-3539
- Yang, K., & Wu, C. (2021). Geospatial Analysis of Landslide Prone Areas in Indonesia. *Applied Geography*, 87, 102108.

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FACTORS IMPACTING THE WELLBEING OF RURAL HOUSEHOLDS IN MALAYSIA'S RURAL SETTLEMENTS

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Abstract

A rural development process could have a direct impact on the wellbeing of rural households. This wellbeing assessment needs to be addressed adequately in Malaysia. The aim of this paper is to investigate the factors impacting the wellbeing of rural households in Malaysia's rural settlements. The Iskandar Malaysia region in Johor was selected as a study area because of its diverse settlements, consisting of seven types of rural settlements in Johor. A quantitative approach was adopted by means of a household survey involving 282 heads of households as respondents. The finding reveals that different types of rural settlements were affected by different factors that influence the wellbeing of the rural households. This paper can provide an understanding of the factors that affect wellbeing, specifically income generation and job opportunities for rural households based on different types of rural settlements.

Keywords: Wellbeing, Rural Settlement, Rural Planning, Rural Development

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INTRODUCTION

Wellbeing has been extensively explored across various research fields, often overlapping with concepts such as quality of life, happiness, and life satisfaction. At the community level, wellbeing is described as satisfaction with the local place of residence, considering attachment, social, and physical environment, and available services (Medvedev et al., 2018). Another perspective defines wellbeing as both a state and a process, encompassing social connections, interaction with the natural environment, fulfilment of human needs, pursuit of meaningful goals, and overall life satisfaction (Rashid et al., 2020; Brown et al., 2021).

The impact of development on wellbeing is often linked to socioeconomic factors. Rapid developments in both developed and developing countries affect rural areas, leading to new societal needs for public goods and changes in rural territories (Rashid et al., 2019).

Previous studies have shown the importance of wellbeing in rural areas, particularly in developing countries, emphasizing the need for comprehensive approaches to support the wellbeing and overall prosperity of rural communities. Hence, the objective of this paper is to investigate the factors influencing the wellbeing of rural households in Malaysia's rural settlements.

LITERATURE REVIEW

Rural Settlements in Malaysia

Rural areas in Malaysia are defined as regions outside of urban centers. Based on PLANMalaysia (2017), rural encompass villages and communities with populations below 10,000 comprising agricultural and natural landscapes. This classification is based on a rural density level of 150 people per square kilometer and lower across all districts. PLANMalaysia (2017) further categorizes villages into eight types based on various factors such as geographical characteristics, predominant economic activities, settlement patterns, ethnic composition, proximity to urban centers, and population density (see Table 1).

In Malaysia, urbanization and economic development have prompted significant transformations within rural communities (Razali & Rashid, 2021). As societies endeavour to achieve development and economic growth, environmental preservation and wellbeing may not always receive adequate attention or consideration (Shafii & Miskam, 2011). The impact of development on wellbeing is often linked socioeconomic factors. Rapid development in both developed and developing countries affects rural areas such as shifts in land use and the emergence of new societal needs. This leads to demographic shifts due to in-migration and the identification of “excluded groups” facing poverty and social exclusion vulnerabilities (Choon et al., 2011).

Table 2: Types of villages in Malaysia

Types of Villages	Topology	Main Economic	Settlement Pattern	Majority Race	Proximity Urban Area	Density
Traditional Village	Unplanned existence near an urban area	Agriculture	Linear Or Clustered	Malay and Chinese	Near	High
Fishery Village	Natural factors such as rivers, estuaries, and beaches	Fisheries	Scattered	Malay and Chinese	-	High
Planned Village	Village resettlement, land grants and natural disasters	Services sector	Organised	Mixed race	-	Low and Moderate
Aboriginal Village	Settlements that exist unplanned and have their own identity	Agriculture, Forest products, Hunting and Fishing	Scattered	indigenous people	Far From City	Low
New Village	Village settlements that existed during the emergency (1948-1960)	Agriculture or Mining	Concentrated (Grid Iron)	Chinese	Near	Low
Land Settlement Scheme	Planned village due to land development on a large scale (self-contained village)	Agriculture	Concentrated or Clustered	Malay	Far	Moderate
Estate Settlement	Farm worker housing provided by the farm management employer	Agriculture	Concentrated	Indian	Far From City	Low
Water Village	Located on the water, either in rivers, lakes or seas houses are built vertically above the water	Fisheries	Linear	Malay and Chinese	Far From City	Various Densities Based on Location

Source: PLANMalaysia (2017)

Current policies in Malaysia have established several initiatives and strategies aimed at enhancing the wellbeing of rural areas. Dasar Rancangan Fizikal Desa Negara 2030 and Dasar Pembangunan Luar Bandar 2030 highlight the importance of rural wellbeing and address various aspects such as security, cybercrime, unity, culture, and disaster resilience. district-level plans such as Rancangan Struktur Negeri Johor 2030 prioritize wellbeing, striving for equitable growth, regional development, and the wellbeing of people. Special development plans focusing on economic corridors, such as Pelan Induk ECER 2.0 and Rancangan Pembangunan Wilayah Ekonomi Pantai Timur (WEPT), play a pivotal role in narrowing development disparities and fostering socioeconomic progress in the East Coast Economic Region (ECER).

In Iskandar Malaysia, the Comprehensive Development Plan (CDP) 2006–2025 incorporates strategies like the Village Enhancement Program to stimulate rural economic activities through infrastructure enhancements and built environment upgrades. These policies collectively underscore Malaysia's dedication to community wellbeing and socioeconomic advancement, contributing significantly to the holistic development of both urban and rural areas in the country.

Framework For Factors Impacting Wellbeing of Rural Community

The focus of studies on community wellbeing, both in urban and rural areas, has shifted from singular concerns to encompassing a variety of aspects. Holtz (1995) and Yusoff et al. (2021) have identified five dimensions of wellbeing: physical, economic, social, emotional, and developmental. Table 2 shows the framework used in this study to analyse factors impacting rural community’s wellbeing.

Table 2: Framework for rural community wellbeing

Component	Indicators	References
Social wellbeing		
Interpersonal Relationship/Relational	Trust in neighbours	Scott et al. (2018)
	No discrimination between the people inside the village	Sánchez-Zamora et al. (2014)
Community Involvement/Organisational	Involved in social organisations inside the village	Roberts & Townsend (2016); Rashid et al. (2023)
	Engaging in Activities and event	Roberts & Townsend (2016). Razali & Rashid (2021)
Economic Wellbeing		
Occupation / Income	Have good income	Roberts & Townsend (2016); Razali & Rashid (2021); Kamarudin et al. (2020)
	Able to support a family well	Rashid et al. (2023); Razali & Rashid (2021); Kamarudin et al. (2020);
	Able to get an additional source of income	Roberts and Townsend (2016)
Housing	Residence environment	Abdullah et al. (2019); Harun & Idris (2012); EPU (2013)
	Road infrastructure	Harun & Idris (2012); Roberts & Townsend (2016)
Meals	Enough food for the family	Abdullah et al. (2019); Katiman et al. (2011)
	Practice a balanced diet	Abdullah et al. (2019); Mohd Harun & Idris (2012)
Transportation	Public transports services	Lättman et al. (2016); EPU (2013)
	Easy to get the goods and services	Lättman et al. (2016); Rashid et al. (2021); EPU (2013)
Security of Job Possession	Stable in occupation	Sánchez-Zamora et al. (2014); Musa et al (2018)
	Ownership of electronic equipment	Rosnon et al., (2019)
	Land ownership	Bunkus et al. (2020); Musa et al (2018); Rosnon et al. (2019)
	Vehicle’s ownership	Bunkus et al. (2020); Rosnon et al. (2019)
Physical Wellbeing		
Mobility	The ability to move	Schwanen & Ziegler (2011); Smith & Diekmann, (2017)
	Able to do heavy work	Schwanen & Ziegler (2011); Smith & Diekmann, (2017)
Health	Good level of health	Sørensen (2018); EPU (2013)
	Accessible and adequate health Care facilities	Sørensen (2018); EPU (2013)
Personal Safety	Perceived criminality	Musa et al (2018)
Fitness	Healthy lifestyle	Sørensen (2018); Sánchez-Zamora et al. (2014);
Emotional Wellbeing		
Satisfaction	Satisfied with life	Smith & Diekmann, (2017)
Fulfilment	Fulfilment of basic needs	Smith & Diekmann, (2017)
Belief/Religious	Local cultural activities involvement	Rashid et al. (2019)
	Frequency to places of worship	Katiman et al. (2011); Razali & Rashid (2021)

Component	Indicators	References
Development Wellbeing		
Competence	Government's Welfare assistance	Sánchez-Zamora et al. (2014); Roberts & Townsend (2016)
	Private sector or government in assistant business/agriculture	Rashid et al. (2019)
Job	An additional source of income	Rashid et al. (2019); Razali & Rashid (2021)
Leisure	Distance of recreational area	Mansfield et al. (2020)
Education	Access to basic knowledge	EPU (2013)
	Accessible to school	EPU (2013)

In the social wellbeing dimension, social interactions, social networks, group participation, reciprocity, trust, and civic engagement are some of the fundamental aspects of social capital that have emerged as potential factors that can influence the performance of villages and households (Putnam, 2000). Economic wellbeing has been identified as a fundamental determinant of rural wellbeing performance. Economic wellbeing is important to life satisfaction and can be defined as a monotonic rising function of income (Razali et al., 2022).

Physical wellbeing means having good health and enough energy to run daily errands (Smith & Diekmann, 2017). Several components are related to physical wellbeing, i.e. mobility, health, personal safety and fitness. Emotional wellbeing is an overall positive state of emotions, self-esteem, and resilience that leads to self-actualisation (Sørensen, 2018). Positive emotions refer to the expression of feelings of happiness, optimism, and general satisfaction with one's life, as opposed to the expression of negative emotions such as worry, fear, anger, and overall dissatisfaction (World Health Organisation, 2019). Development and activity are concerned with the possession and use of skills in relation to self-determination, competence, or independence. Wellbeing can be related to the development of a person to improve their quality of life (Felce & Perry, 1995).

The framework developed in this study is used to measure wellbeing at household levels. The framework was developed to emphasise the relationships between all the contributory factors within and between the social dimension, the economic dimension, the physical dimension, the emotional dimension, the development dimension and the rural area.

RESEARCH METHODOLOGY

This research identified rural density level as an appropriate tool to categorise the rurality level as it is significantly related to the changes and development of rural areas (Rashid et al., 2023; Yusoff et al., 2022). This tool is used to categorise the rurality level because the only available data in mukim or subdistrict level in Malaysia is the number of population and acreage. Rural density levels were used to identify rural subdistricts in Johor based on three levels: (1) 0–50 people/km² (*low-density level*); (2) 51–100 people/km² (*medium-density level*); and (3) 101–150 people/km² (*high-density level*). The following four subdistricts were

categorised as a rural level in 2020: Sungai Tiram, Tanjong Kupang, Sedenak and Sungai Karang (Figure 1).

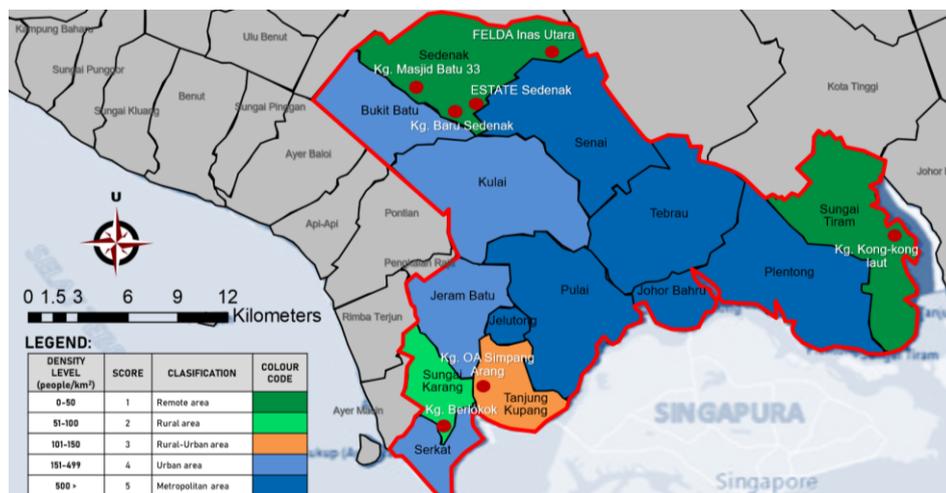


Figure 1: Location of seven (7) villages in Iskandar Malaysia

This research compares the wellbeing performances of the selected villages in Iskandar Malaysia. Primary data were obtained using a questionnaire to assess the wellbeing of households in rural communities. The survey was based on multiple sampling methods selected from four (4) selected subdistricts (Figure 1) and seven types of villages, namely traditional villages, fishery villages, planned villages, aboriginal villages, new villages, land settlement schemes, and estate settlements. In Johor, water villages are not identified in any location. The sample size consisted of 282 heads of households, using average of 4 households in Johor, with a 95% confidence level and 5% margin of error (Table 3).

Table 3: Selection of study area based on types of settlement.

Types of settlement	Sub-district	Name of village (kampung)	Total of population	Total respondent
Traditional village	Sungai Karang	Belokok	480	32
Land settlement scheme	Sedenak	FELDA Inas Utara	1209	81
Fishery village	Sungai tiram	Kong Kong Laut	224	15
Aboriginal village	Tanjung Kupang	Simpang Arang	738	50
Planned village	Sedenak	Jalan Masjid Batu 33	330	22
New village	Sedenak	Baru Sedenak	1100	74
Estate settlement	Sedenak	Ladang Sedenak	110	8
Total			4,191	282

The study assessed the differences in wellbeing using a scale based on mean score analysis. The scale has five levels of overall household wellbeing

satisfaction: 0.00–2.00 (*very low*), 2.01–4.00 (*low*), 4.01–6.00 (*moderate*), 6.01–8.00 (*high*), and 8.01–10.00 (*very high*). An F-test analysis (ANOVA) was employed to determine whether significant variations were present in wellbeing among different types of villages.

FINDINGS AND DISCUSSION

Demographic profiling of the respondents indicates that 36.88 percent are under the age group of 60–74 years, and 32.27 percent are under the age group of 45–59 years. In terms of level of education, 42.55 percent of the respondents are in the secondary-school category.

Table 4: Respondent Profiling

Variables	Variables	KSA	KKL	KBL	KLS	KJM	KFU	KBS	Total	%
Age	15-29	1	0	0	2	1	0	1	5	1.77
	30-44	23	3	10	2	9	16	17	80	28.37
	45-59	22	9	10	4	8	17	21	91	32.27
	60-74	4	3	10	0	4	48	35	104	36.88
	75 & Above	0	0	2	0	0	0	0	2	0.71
Education	No schooling	10	2	5	0	2	8	8	35	12.41
	Primary school	16	4	10	3	5	25	45	108	38.30
	Secondary School	23	8	16	5	14	48	6	120	42.55
	University and above	1	1	1	0	1	0	15	19	6.74

KSA (Kampung Simpang Arang), KKL (Kampung Kong Kong Laut), KBL (Kampung Belokok), KLS (Kampung Ladang Sedenak), KJM (Kampung Jalan Masjid Batu 33), KFU (Kampung FELDA Inas Utara), KBS (Kampung Baru Sedenak)

Recognising the differentiation of rural areas is crucial to ensure the effectiveness of any programme aimed at village revitalisation planning. Table 5 shows the findings based on five dimensions of rural community wellbeing in the seven villages.

Table 5: Analysis and findings of rural community's wellbeing

Dimension	Villages							F-test
	KSA	KKL	KBL	KLS	KJM	KFU	KBS	
Social Wellbeing	6.12	6.03	6.45	7.28	6.94	7.20	4.95	0.000*
Trust in neighbours	7.72	7.80	7.62	8.25	8.18	8.30	7.35	0.000*
No discrimination between the people inside the village	6.60	7.13	7.87	7.62	7.50	7.69	7.22	0.016*
Involved in social organizations inside the village	5.18	2.93	4.81	6.75	5.95	6.52	1.82	0.000*
Engaging in activities and events	5.00	6.27	5.50	6.50	6.14	6.31	3.42	0.000*
Economic Wellbeing	5.18	6.31	5.90	5.64	6.40	7.17	5.81	0.000*
Have good income	6.26	7.00	6.38	6.25	6.09	7.80	5.55	0.000*
Able to support a family well	5.90	7.20	6.47	6.63	6.59	7.81	5.54	0.000*
Residence environment	4.02	6.80	6.22	6.75	7.14	7.62	7.27	0.000*
Road infrastructure	8.02	8.33	7.41	4.13	8.23	8.70	8.01	0.000*
Have enough food for the family	6.22	7.67	7.06	7.13	7.64	7.89	7.15	0.000*
Practice balance diet	5.18	6.20	5.28	6.13	5.45	6.67	6.73	0.000*

Dimension	Villages							F-test
	KSA	KKL	KBL	KLS	KJM	KFU	KBS	
Public transports services	1.04	1.00	2.75	1.75	3.50	1.00	2.04	0.000*
Easy to get the goods and services	5.95	6.67	6.47	7.00	7.32	7.52	6.77	0.000*
Stable in occupation	5.84	7.00	5.91	6.88	5.95	7.72	5.16	0.000*
Ownership of electronic equipment	6.28	7.40	6.53	7.50	7.77	7.89	6.93	0.000*
Land ownership	1.72	3.20	4.13	1.75	3.68	7.90	2.86	0.000*
Vehicle ownership	5.84	7.27	6.28	5.88	7.50	7.59	5.82	0.000*
Physical Wellbeing	6.10	6.32	6.00	7.21	6.91	5.90	5.77	0.000*
The ability to move	6.26	6.27	6.06	6.88	6.95	5.80	5.15	0.000*
Able to do heavy work	6.18	5.40	4.72	7.13	6.14	4.07	4.16	0.000*
Good level of health	8.50	7.47	6.63	8.38	7.05	6.69	6.93	0.000*
Accessible and adequate healthcare facilities	5.96	5.20	5.84	7.25	7.55	8.11	7.57	0.000*
Perceived criminality	5.54	8.67	7.50	7.25	8.14	4.58	5.84	0.000*
Healthy lifestyle	4.20	4.93	5.25	6.38	5.64	6.17	4.97	0.000*
Emotional Wellbeing	5.99	5.41	5.97	5.81	6.06	7.17	4.76	0.000*
Satisfied with life	6.52	6.33	6.03	6.63	5.77	7.79	5.03	0.000*
Fulfilment of basic needs	6.98	7.73	7.25	7.38	7.36	9.00	7.30	0.000*
Local cultural activities involvement	5.06	1.20	4.22	3.00	5.14	5.11	1.74	0.000*
Frequency to places of worship	5.42	6.40	6.38	6.25	6.00	6.79	4.99	0.000*
Development Wellbeing	4.86	4.13	4.09	4.77	5.24	5.86	4.19	0.000*
Government's welfare assistance	6.30	6.27	6.34	6.25	7.27	6.21	3.72	0.000*
Private sector or government in assistant business/ agriculture	4.22	1.67	1.38	1.00	1.59	3.81	1.39	0.000*
An additional source of income	1.38	1.00	1.00	1.00	1.00	3.81	1.39	0.007
Distance of recreational area	5.58	2.60	3.53	6.88	7.77	6.90	5.03	0.000*
The family has complete formal education	5.14	6.40	5.75	5.88	6.64	6.79	5.95	0.000*
Accessible to school	6.58	6.87	6.56	7.62	7.18	7.69	7.69	0.000*
Total	5.65	5.64	5.68	6.14	6.31	6.66	5.09	0.000*

*Significant value at 0.05

KSA (Kampung Simpang Arang), KKL (Kampung Kong Kong Laut), KBL (Kampung Belokok), KLS (Kampung Ladang Sedenak), KJM (Kampung Jalan Masjid Batu 33), KFU (Kampung FELDA Inas Utara), KBS (Kampung Baru Sedenak)

Kampung FELDA Inas Utara, classified as a land settlement scheme village, achieved a score of 6.66. Similarly, Kampung Jalan Masjid Batu 33, categorized as a planned village, received a score of 6.31, while Kampung Ladang Hadapan, designated as an estate settlement, attained a score of 6.14. These scores indicate commendable performance at a very high level. Notably, Kampung FELDA Inas Utara is under land settlement scheme village recorded a high level of wellbeing satisfaction, particularly due to its exceptional performance across multiple dimensions, contributing to a remarkable overall performance index at the village level.

The finding implies that the village with the highest level of wellbeing comprises three essential dimensions: social wellbeing, economic wellbeing, and emotional wellbeing. In contrast, the remaining villages, including Kampung

Simpang Arang (5.65), Kampung Kong Kong Laut (5.64), Kampung Belokok (5.68), and Kampung Baru Sedenak (5.09) demonstrated relatively moderate levels of performance. The F-test analysis showed a significant difference between the types of villages in Malaysia through the indicators of economy (0.000*), social (0.000*), people (0.000*), culture (0.000*), and environment (0.000*). Thirty-two indicators were found to contribute to significant differences in the wellbeing of rural communities in different villages. The following key findings were based on five indicators of wellbeing:

a) Social Wellbeing Dimension

The involvement of household in social organisations within Kampung Kong Kong Laut (2.93) and Kampung Baru Sedenak (1.82) is notably low. This due to the absence of actively established social organizations in these villages, such as youth associations, women's groups, village councils, and others. Additionally, the low score in social activities at Kampung Baru Sedenak (3.42) could be attributed to the lack of active organizations that typically organize community events.

b) Economic Wellbeing Dimension

Economic wellbeing in Kampung Simpang Arang (5.18) is moderate due to the primary economic sector is fisheries. According to Tok Batin, the fish catch is uncertain due to developments around the village, such as sea embankments and high-impact projects. 20 percent of respondents work in the industrial sector show improvement in job opportunity. Electronic appliances also show improvement in rural communities, with all villages scoring moderately. Most houses have washing machines, televisions, refrigerators, and cell phones.

c) Physical Wellbeing Dimension

Physical wellbeing in both Kampung FELDA Inas Utara and Kampung Baru Sedenak is rated as moderate. A significant proportion of respondents, 70 percent in Kampung FELDA Inas Utara and seventy 3 percent in Kampung Baru Sedenak, are aged 45 years and above. This demographic profile suggests that there may be various physical challenges and health-related issues affecting their wellbeing. The higher proportion of older residents in these villages might contribute to a moderate score in physical wellbeing due to the potential presence of age-related health concerns.

d) Emotional Wellbeing Dimension

Kampung Baru Sedenak shows a lack of cultural activities within their community, as indicated by a low score of 1.75 in the local cultural

activities involvement indicator. In contrast, other villages actively preserve and promote their cultural heritage through various activities, including traditional music, attire, and wedding ceremonies.

e) Development Wellbeing Dimension

A significant majority of respondents, approximately 95 percent, receive government welfare assistance such as “*Bantuan Sara Hidup*” (cost of living aid). Furthermore, the agricultural sector benefits from support provided by the Department of Agriculture Malaysia, which aims to enhance productivity and create income opportunities for farmers. Registered fishermen also receive essential financial aid through the “*Elaun Sara Hidup Nelayan*” program by the Department of Fisheries Malaysia to sustain their livelihoods. However, despite these welfare efforts, nearby high-impact development projects have not translated into additional income for rural communities across all types of villages.

CONCLUSION

Gaining a comprehensive understanding of the wellbeing of rural communities who were impacted by regional economic growth corridors is of utmost importance. There is differentiation in factors impacting household wellbeing based on different types of rural areas due to different locations, main economic activities and infrastructure. By addressing the specific needs and challenges faced by these communities, the goal is to contribute significantly to an improved quality of life and overall wellbeing because each village has its unique strengths, challenges, and development needs. This endeavour has the potential to create positive and sustainable impacts on the lives of the rural community due to achieving the aims of the policy.

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REFERENCES

- Brown, K., Schirmer, J., & Upton, P. (2021). Regenerative Farming and Human Wellbeing: Are Subjective Wellbeing Measures Useful Indicators for Sustainable Farming Systems? *Environmental and Sustainability Indicators*, 11, 1-6. <https://doi.org/10.1016/j.indic.2021.100132>
- Bunkus, R., Soliev, I., & Theesfeld, I. (2020). The Density of Resident Farmers and Rural Inhabitants' Relationship to Agriculture: Operationalizing Complex Social Interactions with a Structural Equation Model. *Agriculture and Human Values*, 37(1), 47-63. <https://doi.org/10.1007/s10460-019-09966-7>
- Choon, S.W., Siwar, C., Pereira, J.J., Jemain, A.A., Hashim, H.S., & Hadi, A.S. (2011). A

- Sustainable City Index for Malaysia. *International Journal of Sustainable Development and World Ecology*, 18(1), 28–35. <https://doi.org/10.1080/13504509.2011.543012>
- Department of Statistics Malaysia (DOSM) (2017). *Report of Household Income and Basic Amenities Survey 2016*. Malaysia, Putrajaya.
- Economic Planning Unit, Prime Minister Department (EPU) (2013). *Malaysia Quality of Life Index*. Malaysia, Putrajaya.
- Felce, D., & Perry, J. (1995). Quality of Life: Its Definition and Measurement. *Research in Developmental Disabilities*, 16(1), 51-74. [https://doi.org/10.1016/0891-4222\(94\)00028-8](https://doi.org/10.1016/0891-4222(94)00028-8)
- Holtz-Eakin, D., & Schwartz, A. E. (1995). Infrastructure in a Structural Model of Economic Growth. *Regional Science and Urban Economics*, 25(2), 131-151. [https://doi.org/10.1016/0166-0462\(94\)02080-Z](https://doi.org/10.1016/0166-0462(94)02080-Z)
- Kamarudin, K. H., Untari, R., & Rashid, M. F. (2020). Sustaining Rural Livelihood Through Entrepreneurship and Creative Village Development: Malaysia and Indonesia Experience. *Scientific Papers Series-Management, Economic Engineering in Agriculture and Rural Development*, 20(3), 303–309.
- Katiman Rostam, Er, A. H., Zaini Sakawi, Abdul Rahim Mohd Nor, and Aishah@Esah Hj. Muhammad. (2011). Pemandangan di Pinggir Wilayah Metropolitan Lanjutan: Beberapa implikasi terhadap Corak dan Kualiti Kejiranan. *Akademika*, 81(3), 19-29.
- Lättman, K., Friman, M., & Olsson, L. E. (2016). Perceived Accessibility of Public Transport as a Potential Indicator of Social Inclusion. *Social inclusion*, 4(3), 36-45. <https://doi.org/10.17645/si.v4i3.481>
- Mansfield, L., Daykin, N., & Kay, T. (2020). Leisure and Wellbeing. *Leisure Studies*, 39(1), 1–10. <https://doi.org/10.1080/02614367.2020.1713195>
- Medvedev, O. N., & Landhuis, C. E. (2018). Exploring Constructs of Wellbeing, Happiness and Quality of Life. *PeerJ*, 6, e4903. <https://doi.org/10.7717/peerj.4903>
- Musa, H. D., Yacob, M. R., Abdullah, A. M., & Ishak, M. Y. (2018). Enhancing Subjective Wellbeing through Strategic Urban Planning: Developing and Applying Community Happiness Index. *Sustainable Cities and Society*, 38 (2018), 184-194. <https://doi.org/10.1016/j.scs.2017.12.030>
- PLANMalaysia (2017). *National Rural Physical Planning Policy 2030* (DPF Desa Negara 2030). Putrajaya.
- Putnam, R. (2000). *Bowling Alone-The Collapse and Revival of American Community*. New York: Simon and Schuster, 17(1299), 3-26. <https://doi.org/10.3390/ijerph17041299>
- Rashid, M., F., Ngah, I., & Misnan, S., H. (2019). Revitalizing Rural Areas in Malaysia: A Framework for Economic Revitalization. IOP Conference Series: *Earth and Environmental Science*, 385(1), 2-6. <https://doi.org/10.1088/1755-1315/385/1/012004>
- Rashid, M., F., Sulaiman, N., K., Misnan, S., H., Samsudin, N., A., & Ngah, I. (2020). Application of Rural Web in Analyzing the Economic Performance of Rural Areas in Johor. IOP Conference Series: *Earth and Environmental Science*, 447(1), 1-6. <https://doi.org/10.1088/1755-1315/385/1/012004>
- Rashid, M. F., Sulaiman, N. K., Kamarudin, K. H., & Zanudin, K. (2023). Assessing Socioeconomic Differentiation of Rural Household Groups in Malaysia. *Planning*

- Malaysia, 21(1), 415-426. <https://doi.org/10.21837/pm.v21i25.1247>
- Rashid, M. F. A., Muhamad, A. K., Rashid, K., Ahmad, A. L., & Azman, M. A. A. (2021). Formulation of a Malaysia modern rural development framework: Synergising rural for change. *Planning Malaysia*, 19(2), 14-26. <https://doi.org/10.21837/pm.v19i16.948>
- Razali, N. M., & Rashid, M. F. (2021). A Framework for Incorporating the Global Environment of Rural Community. IOP Conference Series: *Earth and Environmental Science*, 881(1), 3-7. <https://doi.org/10.1088/1755-1315/881/1/012057>
- Roberts, E., & Townsend, L. (2016). The Contribution of the Creative Economy to the Resilience of Rural Communities: Exploring Cultural and Digital Capital. *Sociologia Ruralis*, 56, 197-219. <https://doi.org/10.1111/soru.12075>
- Rosnon, M. R., Gill, S. S., Badari, S. A. Z., Ab Rahman, N. A. F. W., & Goh, A. D. H. (2019). Petunjuk Pembangunan Komuniti Orang Asli: Suatu Analisis Penggunaan Barangan dan Perkhidmatan. *Geografia*, 15(1), 132-146. <https://doi.org/10.17576/geo-2019-1501-10>
- Sánchez-Zamora, P., Gallardo-Cobos, R., & Ceña-Delgado, F. (2014). Rural Areas Face the Economic Crisis: Analyzing the Determinants of Successful Territorial Dynamics. *Journal of Rural Studies*, 35, 11-25. <https://doi.org/10.1016/j.jrurstud.2014.03.007>
- Schwanen, T., & Ziegler, F. (2011). Wellbeing, Independence and Mobility: An Introduction. *Ageing & Society*, 31(5), 719-733. <https://doi.org/10.1017/S0144686X10001467>
- Scott, K., Rowe, F., & Pollock, V. (2018). Creating the Good Life? A Wellbeing Perspective on Cultural Value in Rural Development. *Journal of Rural Studies*, 59, 173-182. <https://doi.org/10.1016/j.jrurstud.2016.07.001>
- Shafii, H., and Miskam, N. (2011). Pembentukan penunjuk dan indeks kualiti hidup bagi mengukur kesejahteraan hidup masyarakat di Pekan Parit Raja, Johor.
- Smith, M. K., & Diekmann, A. (2017). Tourism and Wellbeing. *Annals of Tourism Research*, 66, 1-13. <https://doi.org/10.1016/j.annals.2017.05.006>
- Sørensen, K., Karuranga, S., Denysiuk, E., & McLernon, L. (2018). Health Literacy and Social Change: Exploring Networks and Interests Groups Shaping the Rising Global Health Literacy Movement. *Global Health Promotion*, 25(4), 89-92. <https://doi.org/10.1177/175797591879836>
- World Health Organization. (2019). The WHO Special Initiative for Mental Health (2019-2023): Universal Health Coverage for Mental Health (No. WHO/MSD/19.1). World Health Organization.
- Yusoff, N. S., Rashid, M. F., & Halim, N. A. (2021). The Impact of Regional Development Towards the Wellbeing of Rural Communities. In IOP Conference Series: *Earth and Environmental Science* 881(1), 2-9. <https://doi.org/10.1088/1755-1315/881/1/012056>
- Yusoff, N. S., Rashid, M. F., & Halim, N. A. (2022). The Impact of Covid-19 Pandemic Towards Socioeconomic Wellbeing of Rural Community in Malaysia. IOP Conference Series: *Earth and Environmental Science*, 1064(1), 3-11. <https://doi.org/10.1088/1755-1315/1064/1/012054>

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TEMPORAL ANALYSIS AND PREDICTIVE MODELING OF AMBIENT AIR QUALITY IN HULU LANGAT DISTRICT, SELANGOR, MALAYSIA: A CHEMOMETRIC APPROACH

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Abstract

One of the most important environmental problems facing the globe today is air pollution. The centre area for the local populace is the Hulu Langat district, which borders Kuala Lumpur, the capital. The purpose of this study is to look at how the ambient air quality varies in Hulu Langat, Selangor. The Air Quality Division of the Malaysian Department of Environment provided five years' worth of secondary data on the air quality at Hulu Langat. The database included five primary air pollutant characteristics sulphur dioxide (SO₂), carbon monoxide (CO), ozone (O₃), nitrogen dioxide (NO₂), and particulate matter with a diameter of 10 microns or less (PM₁₀), in addition to data from the Air Pollutant Index (API). Chemometric analysis was used to examine the results. According to the results, SO₂, NO₂ and PM₁₀ had the greatest correlations with API readings. A statistical process known as statistical control (SPC) showed that certain PM₁₀ values were over national recommendations and control limits. The artificial neural network method's air quality prediction model demonstrated good accuracy with real data ($R^2 = 0.9$). The results of this investigation indicated a strong correlation between the Hulu Langat air quality data. In order to achieve sustainable environmental practices in the future, it is imperative to engage in extensive collaboration across environmental departments and relevant authorities and engage in continuous monitoring of air quality.

Keywords: Air quality; Artificial neural network; Chemometrics; Correlation; Principal component analysis

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INTRODUCTION

Air pollution refers to the contamination of the indoor or outdoor ambient by chemical, biological or physical agents (WHO, 2016). Air pollution has been one of the world's most pressing environmental concerns. Exposure to air pollution can have immense damaging effects on the health of humans, livestock, plants, buildings, and the global environment (Azmi et al., 2010; Mustaffa et al., 2023; Saad et al., 2023). The main causes of air pollution in Malaysia include open burning, fixed sources, and mobile sources (Abdullah et al., 2012). Approximately 70% - 75% of total air pollution was caused by either public or privately owned motor vehicles, 20% - 25% by industrial and power generation plants and 3% - 5% by forest fires and transboundary haze (Abdullah et al., 2012; Azhari et al., 2016). It is widely reported that air pollution has harmful effects on human health. Studies have indicated that pollution haze is associated with impaired lung function and respiratory symptoms.

One of Malaysia's main districts is Hulu Langat, which has been subjected to potential poor air quality as it is located near Kuala Lumpur (Ling et al., 2010; 2014), the most populated city in the country. A study conducted in Hulu Langat found that pre-school kids living in the urban areas located close to industrial zones were more likely to experience coughing, chest tightness, and phlegm compared to kids in the non-urban areas (Kamaruddin et al., 2015). Urban regions in Malaysia tend to experience unhealthy air exposure and higher reported cases of respiratory-related illnesses.

Furthermore, with a population of approximately 1.5 million citizens, Hulu Langat is the fifth largest district in the state of Selangor. Hulu Langat's population is continuously rising as more urbanization in the region produces more housing and jobs. The population increase in certain areas directly influences the demand for basic needs and energy resources such as electricity, petrol, natural gases, and coal (Zabel, 2009). Therefore, there are more emissions of toxic air pollutants in the atmosphere that might also be affected by the transboundary dust and smoke from other industrially active regions. This study was conducted to determine the significant air quality parameters and investigate the trend of the main air pollutants that affect the ambient air quality status at Hulu Langat, Selangor, using chemometrics technique.

RESEARCH METHODOLOGY

Study area

The Hulu Langat district is located between Kuala Lumpur and Negeri Sembilan, in the southeastern corner of Selangor (Latitude: 3° 03' 18.5" N; Longitude: 101° 50' 43.5" E) with an area of 840 km² and a population of nearly 1.5 million people. Hulu Langat is the fifth largest district in the state of Selangor. As most people live in towns near Kuala Lumpur, it has both urban and rural settlements. These

population centers have essentially become suburbs of the greater metropolitan area, such as Cheras and Ampang.

Data collection

The Department of Environment's (DOE) Air Quality Division provided secondary air quality data for this investigation, consisting of a four-year database (2014-2018) of the Hulu Langat air quality. Five primary air pollutant parameters: carbon monoxide (CO), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), ozone (O₃), and particulate matter with a diameter of 10 microns (PM₁₀) or less as well as data from the Air Pollutant Index (API) were included in the database. The total amount of data obtained was 251,094 data sets (41,849 hourly observations x 6 parameters).

Data analysis

The chemometrics technique was used for the statistical analysis of the database in this study. Chemometrics is an analytical method that utilises multivariate statistical modelling to solve huge and complex environmental databases (Shafii et al., 2019). Initially, the significant association between the parameters and the strength of the relationships was found using Spearman's correlation test. Consequently, the most important air contaminants influencing the API readings in Hulu Langat may be examined thanks to Principal Component Analysis (PCA).

Combusted pollutant patterns were examined using time series analysis based on the Statistical Process Control (SPC) to determine the air quality status in Hulu Langat. A prediction model of Hulu Langat's air quality was conducted using the Artificial Neural Network (ANN) utilising the actual data (2014 - 2018).

(a) Spearman's Correlation Test

The correlation test measured the important relationship between two variables and the strength of the relationship, denoted as the coefficient of correlation, r . In positive correlations, r showed that the two variables increased together in linear correlation, while negative correlations showed an increase of one variable and a decrease in the linear correlation (Saudi et. al., 2015).

The correlation of r values equal to or greater than 0.75 was deemed as a "strong correlation"; "moderate correlations" had r values ranging from 0.50 to 0.74; "fair correlations" had r values ranging from 0.26 to 0.49; and finally, a "weak correlation" was when r values range less than 0.26.

(b) Principal Component Analysis (PCA)

This method can trim down a large data set and was used to explain the variance of a wide set of interrelated variables by converting them into a smaller group of

uncorrelated variables, known as Principal Components (PCs) (Sarwat & Elshanshoury, 2018). The equation is expressed as shown below:

$$Z_{ij} = \alpha_{i1}\chi_{1j} + \alpha_{i2}\chi_{2j} + \alpha_{i3}\chi_{3j} + \dots + \alpha_{im}\chi_{mj}(1)$$

Where, Z is the component score, α is the component loading, X is the variable's measured value, i is the component number, j is the sample number, m is the total number of variables. In this study, the interrelated variable was interpreted using PCA to identify the parameter with the most significant influence on changing the API readings in Hulu Langat, Selangor.

(c) Statistical Process Control (SPC)

In this analysis, a five-year database time series (2014–2018) was utilised to assess the trend of the most important air contaminants affecting Hulu Langat, Selangor's air quality using statistical probability. The PCA's factor loading was used to extract the most important air contaminants. A straight line connected the subsequent points on the control graph, which displayed the characteristic levels of the air pollution over time. The Lower Control Limit (LCL), Central Line (CL), and Upper Control Limit (UCL) are represented by straight lines.

The Control Chart reveals trends and patterns, showing real data deviations from the historical baseline and the dynamic limit, identifying irregular usages of resources (Saudi et. al., 2015). It is thought to be the most effective baseline for illustrating how real data differs from the historical baseline. The national air quality standard limit and the control limitations were compared to the air pollution patterns.

(d) Artificial Neural Network (ANN)

Based on historical and present training data, an ANN algorithm is a machine learning algorithm that mimics human neural networks for prediction, grouping, and pattern recognition (Lee, 2019). In this study, ANN analysis was applied between the API and the air pollutant parameters to predict the air quality at Hulu Langat. The API as the air quality benchmark was analysed using 50% of the test set of the selected parameters to compute the predicted values. Both real data and the new predicted data were analysed using the ANN to measure the prediction models' fitness.

The Root Mean Square Error (RMSE) values were displayed alongside each trend's coefficient of determination (R²) scores in the model. The statistical measure of R² indicates how closely the actual data points fit the regression predictions. The regression predictions nearly exactly match the actual data, as demonstrated by an R² of 0.98 (Bloomenthal, 2020).

RESULT AND DISCUSSION

This The variables involved were API, CO, NO₂, SO₂, PM₁₀, and O₃, which were successfully analysed using XLSTAT software. The statistical analysis included descriptive analysis, Spearman’s correlation test, PCA, SPC, and ANN.

Overview Descriptive Analysis of Hulu Langat’s Air Quality Data

The results in Table 1 showed that the API recorded maximum and minimum values of 323.00 and 1.00, respectively. The mean for API was $56.431 \pm (17.883)$. The maximum and minimum value of O₃ was 0.149 ppm and 0.00 ppm, respectively. The mean value for O₃ was $0.022 \text{ ppm} \pm (0.022)$. Meanwhile, CO recorded the maximum and minimum values of 5.658 ppm and 0.00 ppm, respectively. The mean value for CO was $0.702 \text{ ppm} \pm (0.359)$. SO₂ registered a mean value of $0.003 \text{ ppm} \pm (0.003)$ with a maximum value of 0.084 ppm and a minimum value of 0.00 ppm. NO₂ recorded the maximum and minimum values of 1.325 ppm and 0.00 ppm, respectively.

The mean value for NO₂ was $0.013 \text{ ppm} \pm (0.026)$. Lastly, PM₁₀ recorded a mean value of $51.886 \text{ } \mu\text{g}/\text{m}^3 \pm (33.742)$ with a maximum value of $438.610 \text{ } \mu\text{g}/\text{m}^3$ and a minimum value of $0.114 \text{ } \mu\text{g}/\text{m}^3$. The mean values for all parameters were within the Recommended Malaysia Air Quality Guidelines (RMAQG) permissible levels. However, both the API and the PM₁₀ hit their maximum values on 14th March 2014, which were classified as heavily polluted. Smoke from a forest fire in Indonesia caused the API to increase (Lim, 2014; Ministry of Education (MOE), 2014).

Table 1: Descriptive statistics of Hulu Langat air quality data

Parameter	Minimum	Maximum	Mean	Standard Deviation	RMAQG
API	1.000	323.000	56.431	17.883	50.000
O ₃ (ppm)	0.000	0.149	0.022	0.022	0.100
CO (ppm)	0.000	5.658	0.702	0.359	30.000
SO ₂ (ppm)	0.000	0.084	0.003	0.003	0.130
NO ₂ (ppm)	0.000	1.325	0.013	0.026	0.170
PM ₁₀ ($\mu\text{g}/\text{m}^3$)	0.114	438.610	51.866	33.741	150.000

Note: RMAQG=Recommended Malaysia Air Quality Guidelines; API=Air Pollutant Index

Spearman’s Correlation Between Air Quality Parameters and API in Hulu Langat

The non-parametric Spearman's correlation test was used to identify the parameters with the strongest positive associations with changing API readings. The result in Table 2 shows that PM₁₀ has the highest value recorded with moderate positive correlation scores ($r = 0.490$, $p < 0.0001$). SO₂ has the second-highest value affecting the API reading with ($r = 0.266$, $p < 0.0001$), followed by NO₂ ($r = 0.220$, $p < 0.0001$). The parameters that have the lowest impact on API

readings were CO with moderate negative correlation scores ($r = -0.028$, $p < 0.0001$) followed by O₃ ($r = -0.016$, $p < 0.0001$).

Table 2: Spearman’s correlation between parameters and Air Pollutant Index (API)

Parameter	API
API	1
O ₃	-0.016
CO	-0.028
SO ₂	0.266
NO ₂	0.220
PM ₁₀	0.490

Note: API=Air Pollutant Index

Identifying the most significant air quality parameters that contribute to the API readings

In this study, PCA determined the factor loading scores of the parameters that significantly impact the API. The resulting analysis of PCA in Figure 1 shows that F1 (2.721) and F2 (1.506) gained an eigenvalue of more than one (> 1.0), and the cumulative variability justified the value of 70.439%. Therefore, after determining the stable number of eigenvalues, the PCs were picked to carry out the varimax rotation operation. The varimax rotation approach was used because it streamlines the factor's structure, facilitating a more straightforward and precise examination. Due to the primary factors' duplication, PCs with eigenvalues less than one (< 1.0) were eliminated (Azid et al., 2015). The threshold for the strong criteria chosen for interpretation was found using the scree plot diagram (Figure 1).

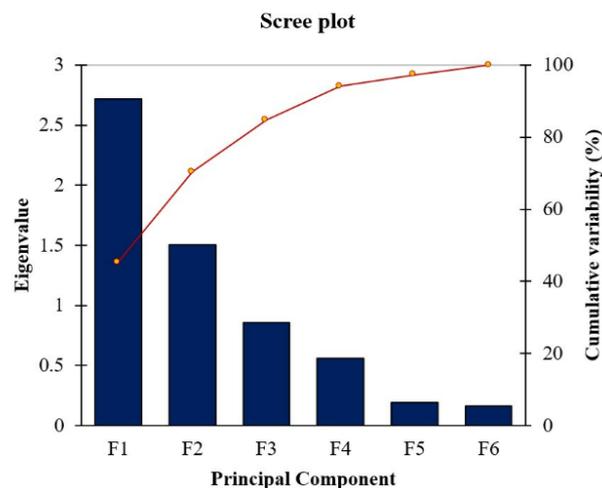


Figure 1: The resulting analysis of PCA

Findings shown in Figure 2 presents factor loadings after Varimax Rotation. In the first factor-loading (F1), O₃ is the highest, corresponding to the component changes with the positive correlation of coefficient scores (0.845) followed by CO (0.812). Meanwhile, PM₁₀ has a moderate value that corresponds to the coefficient score (0.734). In this factor, NO₂ has a strong negative value that corresponds to the component changes correlating to coefficient scores (-0.825).

Regional tropical factors, such as the consequences of burning biomass and solar UV radiation, were primarily responsible for the high coefficient connection found between O₃ and PM₁₀ levels in Hulu Langat (Binyehmed et al., 2016). Generally speaking, photochemical oxidation and the primary cause of haze were linked to O₃ aggregation into the atmosphere (Banan et al., 2013). Along with SO₂ emitted by industrial activities, there were air pollutants such as mononitrogen oxide (NO_x), which is frequently caused by urban and suburban activities (Wei et al., 2014). It was discovered that these two pollutants raised the atmospheric concentrations of O₃ (Hua, 2018).

The second factor-loading (F2) group shows that API has the highest factor loadings (0.927). At the same time, PM₁₀ showed the highest positive correlation of coefficient affecting API reading changes (0.565) followed by SO₂ with a medium positive coefficient (0.482). PM₁₀ pollutions in the Lembah Klang area were potentially caused by industrial pollution, heavy construction projects, and transboundary haze (Abdullah et al., 2012). Meanwhile, the elevated SO could be associated with the power plants' activities and industrial pollution, as well as the great traffic congestion of Kuala Lumpur (Binyehmed et al., 2016).

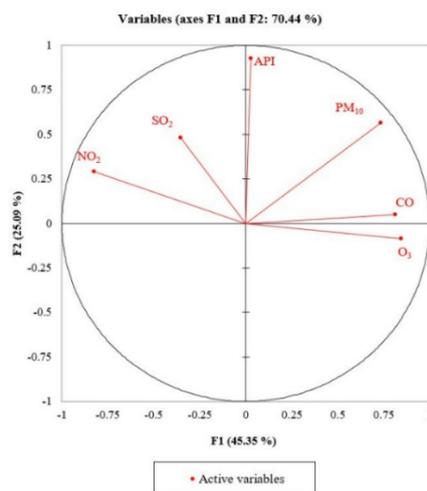


Figure 2: The factor loadings after Varimax Rotation

Pattern of the main air pollutants affecting API readings in Hulu Langat, Selangor

Based on the PCA, this study was able to analyse the most significant parameters in affecting API readings. Therefore, SPC analysis was carried out, and the control chart set the limit control. Accordingly, the SO₂ and PM₁₀ were identified as the main factors contributing to the reading of API in the study area. The control chart (Figure 3) of each parameter was extracted to evaluate the time series of concentrations of real-time air pollutants and distinguish the presence of any alarming pollutant values exceeding the permissible values.

Figure 3(a) illustrates the control chart's findings in monitoring the trend of SO₂ at Hulu Langat (2014 - 2018). With an upper control limit (UCL) and lower control limit (LCL) ranging from 0.006 ppm to 0.001 ppm, the control limit (CL) value for SO₂ was 0.003 ppm. The highest value of SO₂ was 0.084 ppm on 6th April 2018, which was mainly associated with industrial activities and traffic congestions across the city in hot weather (Azid et al., 2015).

Besides, there were at least 20 metal, electrical and chemical industries within a 5 km radius of the monitoring station. According to the findings, SO₂ pollutant drastically rise in early 2017, probably due to a 7.9% growth in Selangor's manufacturing industry in 2017, compared to the 4.3% in 2016, where industries are mainly powered by sub-sectors of electrical and electronic goods, motor vehicles and transport equipment (DOSM, 2017). From 2000 to 2010, Selangor experienced an annual population increase of 3.17%, and of 2.78% in Hulu Langat. Likewise, motor-powered vehicles increased in 2017 with approximately 1.5 million units compared to 2016 (Mahidin, 2018).

Findings in Figure 3(b) indicate that the PM₁₀ concentration control chart had a few significant spikes. PM₁₀ had a CL of 51.866 µg/m³, an LCL of 43.460 µg/m³, and a UCL of 60.273 µg/m³. More than 934 observations exceeded the acceptable levels of the RMAQG, 150 µg/m³. The highest peak of PM₁₀ occurred on 14th March 2014, with a PM₁₀ concentration of 438.61 µg/m³. Figure 4 below illustrates the result of the PM₁₀ trend in Hulu Langat (2014 - 2018).

The highest PM₁₀ spike recorded was influenced by the transboundary smoke from the Indonesian forest fire, which caused increased air pollution in the Malaysian atmosphere [15]. The same incident caused a second high spike of PM₁₀ readings in October 2015 that reached 386.49 µg/m³ (DOE, 2015). However, the PM₁₀ pollution started to decline drastically in mid-2017, because the Indonesian government started to implement a stricter judicial system aimed at changing the long-lived tradition of slashing and burning and gave more incentives in order to switch to a more expensive land-clearing method (Haan, 2017). In addition, interventions decreased the number of fires from 5,000 fires (2001) to 647 fires (2017).

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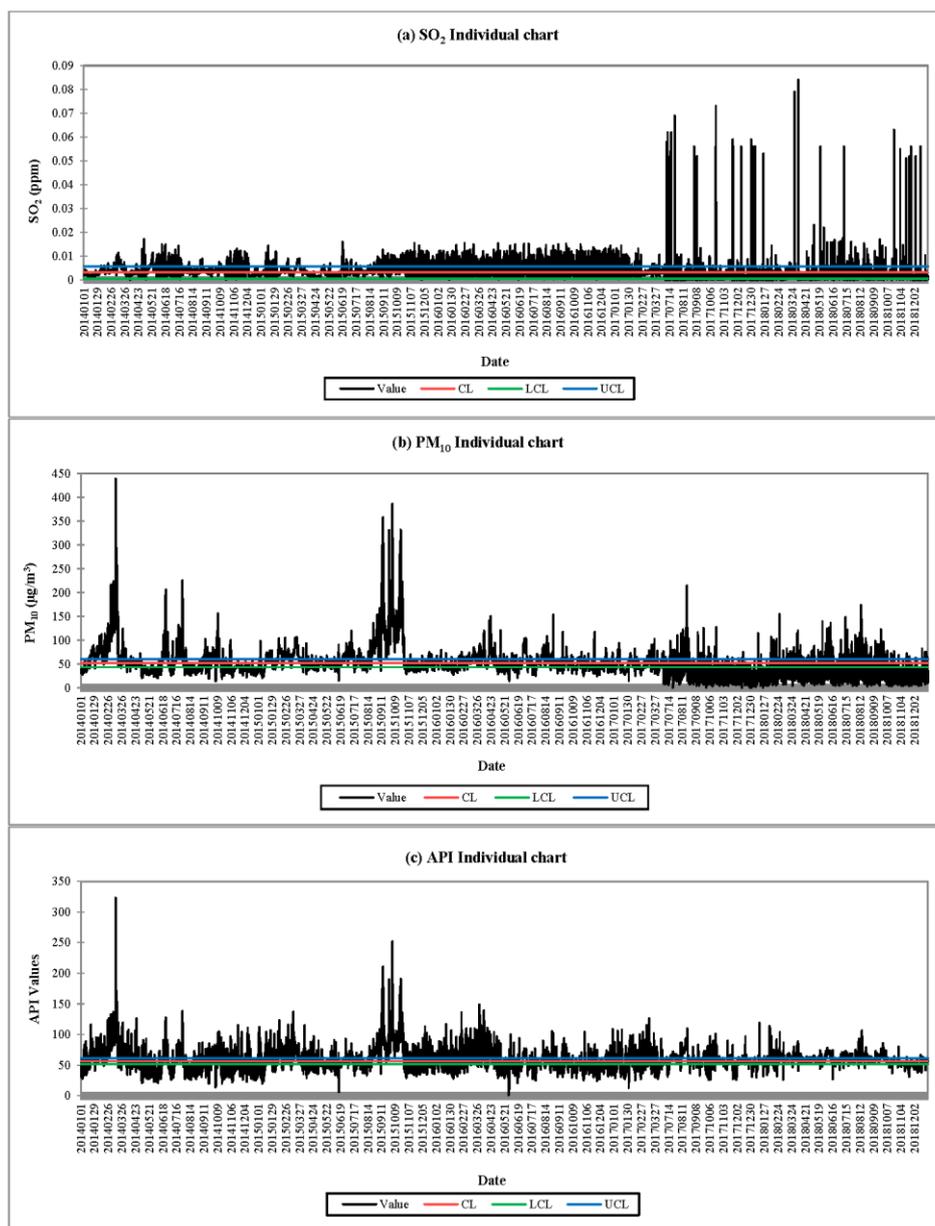


Figure 3: The control chart of each parameter for the time series of concentrations of real-time air pollutants

Figure 3(c) illustrates the control chart in monitoring API's trend at Hulu Langat (2014 - 2018). The CL value for API was 56.431, while the UCL and the LCL were 61.143 and 51.720, respectively. The highest API value was 323.0 on 14th March 2018, and the highest PM₁₀ was recorded on the same date. There was a strong correlation of PM₁₀ that affected API readings, as shown in factor loading (F2). In observation number 15526, the API spiked again to 252 in October 2015, due to the haze but later gradually declined at the end of the month after heavy rains in Sumatran that significantly reduced the size and number of forest fires (Cochrane, 2018). According to the results, from 2017 to 2018 there were only 44 observations with APIs higher than 100. These were due to the massive reduction of forest fire occurrences in the Sumatran rainforest because of the Indonesian government's intervention (Haan, 2017).

Additionally, this study shows that transboundary haze pollution, a persistent problem in South East Asia since 1997, has an impact on the air quality in Hulu Langat, Selangor. In order to maintain ASEAN as a haze-free region, the Association of Southeast Asian Nations (ASEAN) developed the ASEAN Peatland Management Strategy 2006 - 2020 (APMS) and the Agreement on Transboundary Haze Pollution (AATHP) (ASEAN, 2014; 2016). Even though the AATHP lacked enforceable mandatory provisions, it remained a valuable tool for regional cooperation in fighting transboundary haze pollution (Nazeer & Furuoka, 2017). These interventions showed that the collaboration between regional countries was effective and bringing more promising future results.

Prediction Models of Hulu Langat Air Quality

Based on the PCA, the API was the standard for observing the correlation of other parameters' coefficient values towards the component changes. In this study, the Artificial Neural Network (ANN) was conducted between API readings and parameters to predict the pollution trend of parameters. The process was performed separately, one parameter after another. Approximately 50% of each parameter's total actual data was analysed with API, and a set of predicted data was later produced. The predicted data was combined with the other 50% of the actual data to form a parameter's complete data set. The ANN analysed the new data set again with the parameter's actual data set. This process produced new predicted data for the respective parameter.

The study found that the prediction model through this technique had almost 90% accuracy with the actual data. This was proven as 50% of the predicted data produced was very similar to the actual data when compared together statistically with a coefficient of determination value, R^2 of 0.9 (Table III). Coefficient of determination (R^2) is a statistical measure of how well the regression predictions match the real data points. An R^2 of 0.98 indicates that the regression predictions almost perfectly match the actual data.

In Figure 4, the predicted trends by the ANN were later plotted on the graphs of the actual data (2014 - 2017) to observe the comparison between the actual data and the predicted data. These future predictions of the parameters' pollutions would be used in the future. If the existing data is used for a period of four years with this method, it is only possible to predict the data trend for four years ahead. In this study, a four-year existing air quality data (2014 - 2017) was utilised in the ANN analysis. Therefore, the prediction of air quality trend for the next four years (2018 - 2021) was referring to the new predicted data produced from this analysis. To produce prediction data, the historical data needed to have the same amount of data as those predicted.

This study found that the prediction model was remarkably as accurate as the prediction trend of air parameters, which almost perfectly matched the actual data. Environmental monitoring and modelling using chemometrics were conclusively determined the sources of contaminants for air pollutants which mainly originated from emissions of transportation and industrial activities as well as transboundary haze pollution in Indonesia. Therefore, this environmental modelling is very useful and beneficial to the industry as it could be implemented for other environmental aspects for future monitoring purposes.

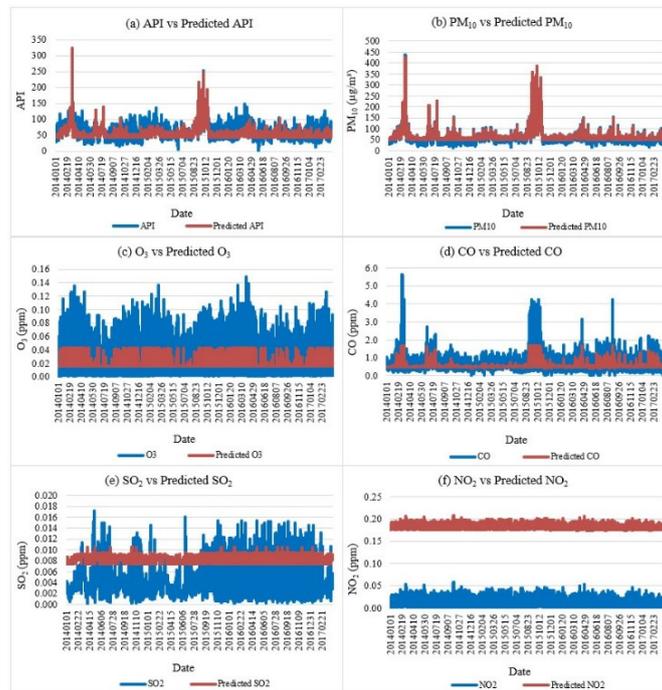


Figure 4: The predicted trends by the ANN of the actual data (2014 - 2017)

Limitations and Future Recommendation

This study utilised the secondary data that was provided by the DOE to analyse air quality in Hulu Langat, Selangor for 5 years (2014 - 2018). Although the air quality status in Hulu Langat varied between good and moderate levels for the period, the trends of air quality should be constantly monitored in order to prevent and control air pollution effectively. Besides, the analysis was based on five major air quality parameters that were accessible throughout the 5 years. The air quality parameters included were API, PM₁₀, CO, O₃, SO₂, and NO₂. The data for atmospheric particulate matter (PM) with a diameter of less than 2.5 micrometres (PM_{2.5}) was omitted because it was limited and only recently available from the second half of 2017. Nonetheless, it was suggested that future research incorporate other air pollutants such as PM_{2.5}, which has been shown to have greater impacts on human health and the environment compared to PM₁₀ (How & Ling (2016). Additionally, more statistical and environmental techniques should be applied for future studies to gain a better insight and understanding of Malaysia's environmental issues, particularly air quality and pollution.

CONCLUSION

The results of this investigation indicated a strong correlation between the Hulu Langat air quality data. The study shows that SO₂, NO₂ and PM₁₀ were positively correlated with API readings, whereas O₃ and CO negatively correlated with API readings. Furthermore, the API level in Hulu Langat correlated significantly with PM₁₀ compared to other parameters. According to PCA, the two main air pollutants influencing the API readings at Hulu Langat were PM₁₀ and SO₂. The primary sources of these toxins are industrial and transportation emissions, as well as pollution from transboundary haze.

All air pollution levels, with the exception of PM₁₀, which was caused by many transboundary haze pollution episodes in Indonesia and by intense traffic congestion emissions in Hulu Langat, were overall in compliance with the RMAQG. The results of this investigation also showed that the PM₁₀ and API patterns in Hulu Langat were extremely similar. The methodology used in this study to predict models was considered as accurate as of the prediction trend of air parameters, which almost perfectly matched the actual data. Thus, active collaboration between all environmental agencies and departments is required to ensure efficient air quality management to guarantee a safer and healthier environment in the future.

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REFERENCES

- Abdullah A. M., Abu Samah M. A., Jun T. Y. (2012). An overview of the air pollution trend in Klang Valley, Malaysia. *Open Environ. Sci.* 6, 13–19. doi: 10.2174/1876325101206010013.
- ASEAN (Association of Southeast Asian Nations), (2014). ASEAN Peatland Management Strategy 2006-2020. ASEAN Secretariat, Jakarta, April 2014.
- ASEAN (Association of Southeast Asian Nations), (2016). ASEAN Agreement on Transboundary Haze Pollution. ASEAN Secretariat, Jakarta, July 2016.
- Azhari A. Z., Mohamed A. F., Latif M. T. (2016). Carbon emission from vehicular source in selected industrial areas in Malaysia. *International Journal of the Malay World and Civilisation.* 4(1), 89-93.
- Azid A., Juahir H., Toriman M. E., Endut A., Kamarudin M. K. A., Rahman M. N. A... (2015). Source apportionment of air pollution: A case study in Malaysia. *J. Teknol.*, 72, 83–88. doi: 10.11113/jt.v72.2934.
- Azmi S. Z., Latif M. T., Ismail A. S., Juneng L., Jemain A. A. (2010). Trend and status of air quality at three different monitoring stations in the Klang Valley, Malaysia. *Air Qual., Atmos. Health.* 3, 53–64. doi: 10.1007/s11869-009-0051-1.
- Banan N., Latif M. T., Juneng L., Ahamad F. (2013). Characteristics of surface ozone concentrations at stations with different backgrounds in the Malaysian Peninsula. *Aerosol Air Qual. Res.* 13, 1090–1106. doi: 10.4209/aaqr.2012.09.0259.
- Binyehmed F. M., Abdullah A. M., Zainal Z. (2016). Trend and Status of SO₂ Pollution as a Corrosive Agent at Four Different Monitoring Stations in the Klang Valley. *Int. J. Adv. Sci. Res.* 3, 302–317.
- Bloomenthal A. (2020). [Internet] Coefficient of Determination: Overview. Investopedia, July 2020. Available from: <https://www.investopedia.com/terms/c/coefficient-of-determination.asp>
- Cochrane J. (2018). Rain in Indonesia Dampens Forest Fires That Spread Toxic Haze. The New York Times, New York, October 2018. Available from: <https://www.nytimes.com/2015/10/29/world/asia/indonesia-forest-fire-toxic-haze.html>

- DOE (Department of Environment), (2015). [Internet]. KENYATAAN MEDIA. Available from: <http://apims.doe.gov.my/v2/>
- DOSM (Department of Statistics Malaysia), (2017). [Internet]. State Socioeconomic Report 2017. Department of Statistics Malaysia Official Portal, Malaysia, 2017. Available from: <https://www.dosm.gov.my/v1/>
- Haan J. (2017). [Internet]. Indonesia: Fire Count at Record Low for 2017. Future Directions International, Australia, November 2017. Available from: <https://www.futuredirections.org.au/publication/indonesia-fire-count-record-low-2017/>
- How C. Y, Ling Y. E. (2016). The influence of PM_{2.5} and PM₁₀ on Air Pollution Index (API). Environmental Engineering, Hydraulics and Hydrology: Proceeding of Civil Engineering, Universiti Teknologi Malaysia, Johor, Malaysia. 2016 Jun;3:132.
- Hua K. (2018). Applied Chemometric Approach in Identification Sources of Air Quality Pattern in Selangor, Malaysia. *Sains Malays.* 47, 471–479. doi: 10.17576/jsm-2018-4703-06.
- Kamaruddin A. S., Jalaludin J., Choo C. P. (2015). Indoor air quality and its association with respiratory health among Malay preschool children in Shah Alam and Hulu Langat, Selangor. *Adv. Environ. Biol.* 9, 17-26.
- Lee S, Jung S, Lee J. (2019). Prediction model based on an artificial neural network for user-based building energy consumption in South Korea. *Energies*, 12, 608. doi: 10.3390/en12040608.
- Lim S Y. (2014). [Internet]. Forest fires contributing to haze in Selangor. Malaymail. Available from: <https://www.malaymail.com/news/malaysia/2014/03/13/forest-fires-contributing-to-haze-in-selangor/633995>
- Ling O. H. L, Musthafa S. N., Mohamed N. (2014). Air Quality and Land Use in Urban Region of Petaling Jaya, Shah Alam and Klang, Malaysia. *EnvironmentAsia*, 7(1), 1-12.
- Ling O. H. L, Tin, K. H, Shaharuddin A, Kadaruddin A, Yaakob M. J. (2010). Urban Growth and Air Quality in Kuala Lumpur City, Malaysia. *Environmentasia*, 3, 123-128.
- Mahidin M. U. (2018). *Malaysia Statistical Handbook*. 53, 1689–1699.
- Ministry of Education (MOE). 2014. [Internet]. Kenyataan media: Kenyataan Akhbar oleh KPPM berkaitan tindakan pihak sekolah menangani fenomena jerebu yang melanda negara 2014. Ministry of Education, Malaysia, Mac 2014. Available from: <https://www.moe.gov.my/pemberitahuan/kenyataan-media/kenyataan-akhbar-oleh-kppm-berkaitan-tindakan-pihak-sekolah-menangani-fenomena-jerebu-yang-melanda-negara-2014>
- Mustaffa, H., Kamarudin, M. K. A., Toriman, M. E., Rosli, M. H., Sunardi, S. (2023). Impact of Suspended Sediment on Pahang River Development using Geographic Information System. *Planning Malaysia*, 21(1), 116 – 133.
- Nazeer N, Furuoka F. (2017). Overview of ASEAN environment, transboundary haze pollution agreement and public health. *International Journal of Asia-Pacific Studies*. 13, 73–94. doi: 10.21315/ijaps2017.13.1.4.

Aiman Abdullah, Ahmad Shakir Mohd Saudi, Nur Zahidah Shafii, Mohd Khairul Amri Kamarudin, Firdaus Muhammad-Sukki
Temporal Analysis and Predictive Modeling of Ambient Air Quality in Hulu Langat District, Selangor, Malaysia: A Chemometric Approach

- Saad, M. H. M., Kamarudin, M. K. A., Toriman, M. E., Wahab, N.A, Ata, F. M., Samah, M. A. A., Manoktong, S. N. (2023). Analysis of the Flash Flood Event and Rainfall Distribution Pattern on Relau River Basin Development, Penang, Malaysia. *Planning Malaysia*, 21(1), 58-71.
- Sarwat E., El-shanshoury G. I. (2018). Estimation of Air Quality Index by Merging Neural Network with Principal Component Analysis. *Int. J. Comput. Appl.* 1, 1-12. doi: 10.26808/rs.ca.i8v1.01.
- Saudi A. S. M, Juahir H., Azid A., Toriman M. E., Kamarudin M. K. A., Saudi M. M. (2015). Flood risk pattern recognition by using environmetric technique: a case study in Langat river basin. *J. Teknol.* 77, 145–152. doi: 10.11113/jt.v77.4142.
- Shafii N. Z., Saudi A. S. M., Pang J. C., Abu I. F., Sapawe N, Kamarudin M. K. A... (2019). Application of chemometrics techniques to solve environmental issues in Malaysia. *Heliyon*, 5:e02534. doi: 10.1016/j.heliyon.2019.e02534.
- Wei J, Guo X, Marinova D, Fan J. (2014). Industrial SO₂ pollution and agricultural losses in China: Evidence from heavy air polluters. *J. Cleaner Prod.* 64, 404–413. doi: 10.1016/j.jclepro.2013.10.027.
- WHO (World Health Organization). (2016). Ambient Air Pollution: A global assessment of exposure and burden of disease. World Health Organization: Geneva, Switzerland, 1-131. Available from: <https://apps.who.int/iris/handle/10665/250141>
- Zabel G. (2009). Peak People: The Interrelationship between Population Growth and Energy Resources - Resilience. Energy Bulletin. Available from: <https://www.resilience.org/stories/2009-04-20/peak-people-interrelationship-between-population-growth-and-energy-resources/>

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PROPERTY MARKET AND THE FINANCIAL SECTOR: EXPLORING MALAYSIA'S SCENARIO IN TIMES OF CRISIS

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Abstract

Amidst the global economic crisis caused by the COVID-19 pandemic, the financial sector faces an uncertain path due to various policy measures. This paper delves into the spillover effects of the relationship between Malaysia's property market and the financial sector. Using the Autoregressive Distributed Lag (ARDL) cointegration bound test, utilizing time-series data from Q12009 to Q32021, the empirical findings reveal a notable spillover effect of the pandemic on the relationship between the property market and financial sector development in Malaysia. Moreover, the marginal impact of the housing market and rental market on the development of the financial sector is elucidated by factors such as risk-averse behaviour, slower GDP growth, and government intervention through policy initiatives. It is crucial to consider this scenario as a precautionary measure, highlighting the potential for crisis prevention, despite the expansionary financial and monetary measures adopted in response to the pandemic-induced crisis.

Keywords: COVID-19, spillover, property market, financial sector, Malaysia

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INTRODUCTION

Malaysia's economy contracted by 17% in Q2 2020 due to the COVID-19 pandemic (Kadhim et al., 2021). Movement Control Orders (MCOs) and shifts in consumer behaviour disrupted consumption, posing significant challenges. Measures like social distancing and remote work affected demand for office space and hotels, creating uncertainty in the real estate sector (Balemi et al., 2021). The significant impact of the rise in the unemployment rate to 4.5% in 2020 from 3.3% in 2019, as reported by the Department of Statistics Malaysia (2020), is evident in its effect on individuals' financial capacities. During the Movement Control Orders (MCO), Malaysia experienced a daily loss of RM2.4 billion, amounting to RM63 billion in total, as reported by Hashim et al. (2021). This significant financial toll directly impacted various financial obligations. However, the government swiftly implemented measures such as stimulus packages and an economic recovery plan to mitigate the impact of COVID-19 challenges, particularly during the multi-phase Movement Control Orders (MCOs) as outlined in Table 1. Initiatives like the introduction of loan moratoriums starting April 1, 2020, provided crucial relief to individuals and SMEs. These efforts, coupled with ongoing vaccination campaigns, played a pivotal role in alleviating MCO restrictions, reviving Malaysia's economy, and alleviating economic strain.

Table 1: Chronology of Movement Control Order (MCO) in Malaysia

Event	Start Date	End Date
Lockdown orders		
Movement Control Order 1.0 (MCO 1.0)	18 March 2020	3 May 2020
Conditional Movement Control Order 1.0 (CMCO 1.0)	4 May 2020	9 June 2020
Recovery Movement Control Order (RMCO)	10 June 2020	13 October 2020
Conditional Movement Control Order (CMCO 2.0)	14 October 2020	12 January 2021
Movement Control Order (MCO 2.0)	13 January 2021	4 March 2021
Conditional Movement Control Order (CMCO 3.0)	5 March 2021	6 May 2021
Movement Control Order (MCO 3.0)	7 May 2021	31 May 2021
Full Movement Control Order (FMCO)	1 June 2021	14 June 2021

Source: Authors' own data

Over the past two decades, Malaysia's property market has experienced rapid growth, presenting substantial investment opportunities. Despite maintaining stability through previous challenges, the market has exhibited a gradual decline since 2015, with a persistent downtrend even preceding the onset of the pandemic. With the announcement of the pandemic in 2020, the market experienced a further disruption. Concerns about affordability have emerged as potential disruptors to real estate demand, and responses from fiscal and monetary

policies are critical considerations amidst these evolving dynamics. Between 1990 and 2019, the property industry in Malaysia experienced remarkable growth, with the total number of transactions more than doubling from 148,000 to over 328,000. According to PropertyGuru (2021), these transactions were valued at RM141.40 billion in 1990. The performance of the property market exhibited a modest improvement in 2021 but has not yet exceeded the pre-pandemic levels noted before 2020. With over 300,000 transactions amounting to nearly RM145 billion recorded, there was a 1.5% uptick in volume and a 21.7% increase in value compared to the figures in 2020 (refer to Figure 1). These figures highlight the remarkable resilience of the property markets, which have navigated through various crises, including the Asian financial crisis in 1997, the Global Financial Crisis in 2007, as well as outbreaks of diseases such as SARS, Avian Flu, Swine Flu, and Ebola.

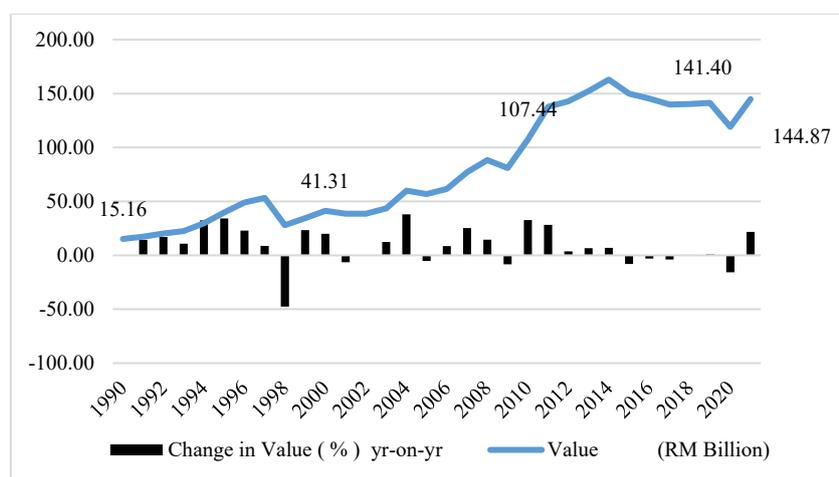


Figure 1: Value of Property Transaction and Annual Changes 1990 – 2021
Source: National Property Information Centre (NAPIC), Malaysia

The current literature on the property market extensively delves into house price dynamics and their repercussions (Khan et al., 2022; Geng, 2018; Kok et al., 2018), alongside exploring the volatility within the housing market (Deng et al., 2018). While preliminary studies have examined the impact of COVID-19 on the real estate sector (Tanrıvermiş, 2020; Allen-Coghlan et al., 2020; Qian et al., 2021), the interconnectedness of various economic sectors necessitates further investigation into the spillover effects. This understanding is pivotal for crafting effective risk management strategies and policies that cater to the needs of both property investors and policymakers. The imbalance in asset price development often contributes to financial distress, affecting the overall

financial stability of a country (Barua and Barua, 2021). The expansion of the financial sector has created numerous opportunities for the real estate market.

Existing evidence supports the idea that financial development positively influences economic growth, as evidenced in many literature (Benhabib and Spiegel, 2000; Christopoulos and Tsionas, 2004; Levine, 2005; Hassan et al., 2011). Specifically, the spillover effects of well-developed financial institutions and systems can benefit a country, promoting capital mobilization which in turn, bolsters consumption, investment, as well as both exports and imports, thereby contributing to economic growth. Conversely, the stability of the financial sector remains a crucial consideration in monetary policy formulation. This investigation is particularly pertinent given the contemporary significance of financial sector stability, aiming to prevent future crises akin to the 2008 subprime mortgage crisis. The urgency is underscored by the need to attract foreign investors and foster domestic growth within the real estate industry.

LITERATURE REVIEW

Scholarly interest in understanding the economic impact of pandemics has led to the emergence of two distinct strands of literature: the intersection of pandemics with the financial sector, and with the real sector. The theoretical connection between the financial and real sectors, as discussed by monetarist scholars such as Friedman and Schwartz (1963), often relates crises to disruptions in the money supply. Despite these theoretical foundations and the recent crisis triggered by health issues, findings in the literature have not provided a clear prediction of its economic effects. Su et al.'s (2020) study comparing the connectedness of stock returns in four recent financial crises revealed a contrasting scenario during the COVID-19 outbreak. Unlike the first three crises, market factors could not adequately explain the co-movement of stock returns, resulting in a substantial increase in network connectedness in financial networks in March and April 2020. This heightened connectedness implies a significant increase in systemic risk in the financial system during the COVID-19 outbreak, aligning with Ali et al.'s (2020) compilation of daily prices and returns of MSCI indices for the top nine COVID-19 most affected countries.

The coronavirus has proven to be detrimental to financial markets, inducing unforeseen levels of uncertainty and high volatility. Within a mere 100 days, nearly 30% of wealth globally eroded off bourses. A study on the Shariah Bank financial performance during the COVID-19 pandemic from 2011 to 2020 found that Capital Adequacy Ratio (CAR), Operating Costs to Operating Income (BOPO), and Financing to Deposit Ratio (FDR) positively and significantly affected financial performance (ROA). Conversely, the pandemic is believed to have instigated irrational panic (Shanaev et al., 2020), supported by Ali et al.'s

(2020) study showing a negative and significant relationship between the return of most financial securities and COVID-19 deaths from January 2020 to March 2020. Haroon and Rizvi (2020) noted a positive association between the panic index and world index volatility, illustrating the link between media-induced panic and heightened uncertainty in financial markets. Moreover, negative sentiment in news communications is correlated with increased volatility in the US market returns, suggesting that panic generated by news outlets contributes to higher volatility in equity markets.

In the real sector, the consistent negative impact on the economy has been observed, particularly due to labour market disruptions caused by Movement Control Order (MCO) implementations (Almeida and Santos, 2020). Germany, Spain and the UK experienced a significant positive change in unemployment due to COVID-19, indicating a causal relationship between COVID-19 cases and unemployment in these countries (Su et al., 2021). Studies focusing on ASEAN countries, such as Ozili and Arun (2020) and Chong et al. (2021), reveal that increasing lockdown days, monetary policy decisions, and international travel restrictions had severely affected economic activities. Mustafa et al. (2021) further indicate that COVID-19 has prominently impacted various economic indicators in Malaysia, including the unemployment rate, gross domestic product (GDP), consumer price index (CPI), foreign exchange rate (FOREX), and stock market index performance, although evidence of the spillover effect of the pandemic remains relatively scarce.

METHODOLOGY

The baseline analysis starts with a basic model modified by Batuo et al. (2018), where the study focuses on the issue of financial sector stability. The estimated model is shown in Equation (1)

$$\begin{aligned} \text{Financial sector development} = & \beta_0 + \\ & \beta_1 \text{Financial sector development}_{t-1} + \beta_2 \text{Macro}_t + \beta_3 \text{PP}_t + \\ & \beta_3 \text{Pandemic}_t + \varepsilon_t(1) \end{aligned}$$

where financial sector development is the financial sector condition, Macro is the macroeconomic variables representing the current economic conditions, and are the control variables in the model which would affect the financial sector in the economy. Additionally, PP is the property market and ε_t is the error term. The model incorporates a pandemic variable, represented by the World Pandemic Uncertainty Index (WPUI) to examine the impact of the pandemic specifically COVID-19 on Malaysia's financial sector. In further exploration of stability conditions, an interaction term is introduced, involving the pandemic, property market indices, and macroeconomic indicators. This

inclusion aims to scrutinize the complementary roles of the pandemic in influencing not only financial sector development, but also the property market. Table 2 provides a comprehensive list of variables utilized in the analysis.

The dependent variable, which is the financial sector development, is gauged through money supply (M2), liquid assets ratio, liquid assets to short-term liability, and credit-to-GDP variables. Macroeconomic variables include real GDP growth rates, inflation rate, government expenditure, and changes in the term of trade. The property market is represented by the House Price Index and the Purpose-Built Office Rental Index (PBO-RI) for both the city center and areas outside the city center. The pandemic is quantified using the World Pandemic Uncertainty Index (WPUI) from the Economist Intelligence Unit (EIU).

The dataset comprises quarterly observations spanning from Q1:2009 to Q3:2021 for Malaysia's economy, with an exception for PBO-RI, which extends up to Q2:2021. Equation (2) demonstrates the spillover effect of the pandemic on the relationship between the property market and the financial sector development.

$$\begin{aligned} \text{Financial sector development}_t = & \beta_0 + \\ & \beta_1 \text{Financial sector development}_{t-1} + \beta_2 \text{Macro}_t + \beta_3 \text{PP}_t + \\ & \beta_4 \text{Pandemic}_t + \beta_5 \text{PP}_t * \text{Pandemic}_t + \varepsilon_t \quad (2) \end{aligned}$$

To explore the complementary roles of the pandemic in influencing the property market's effects on financial sector development and capture the spillover effect, an interaction analysis between the pandemic and the property market is conducted. The analysis then progresses to cointegration tests, employing the Autoregressive Distributed Lag (ARDL) cointegration bound test developed by Pesaran et al. (2001). This approach involves the Wald test, which is an F-statistic version of the bound testing approaches for lagged level variables in an Unrestricted Error Correction Model (UECM). The procedure unfolds in two stages before establishing the long-run relationship. A joint significance test on lagged level variables is conducted to assess the null hypothesis of a non-cointegrating relationship ($H_0: \delta_1 = \delta_2 = \delta_3 = \dots = \delta_n = 0$).

In the first stage, the F-test examines the asymptotic distribution of the F-statistic, which is non-standard under the null hypothesis of non-cointegrating relationship. Irrespective of whether the explanatory variables are purely I(0) or I(1), if the Wald test statistic falls outside the critical bounds at conventional significance levels (10 %, 5 %, and 1 %), a conclusive inference can be drawn without considering the order of integration. Rejection of the null hypothesis of no cointegrating relationship occurs if the F-statistic exceeds the upper critical bound. Conversely, if the test statistic falls below the lower critical bound, the

null hypothesis of non-cointegration cannot be rejected. When the F-statistic falls between the upper and lower bounds, a conclusive inference cannot be made. Moving to the second stage, the ARDL approach involves estimating coefficients on the long run cointegrating relationship and the corresponding error correction model. The lagged error correction term (et-1) derived from the error correction model plays a vital role in the dynamics of the cointegrated system, enabling adjustments back to the long-term equilibrium relationship following deviations from the previous year.

Table 2: Variable Definitions

Variable	Data source
M2; Ln(M2)	Bank Negara Malaysia
Liquidity assets ratio	IMF- Financially Sound Indicator
Liquidity assets to short-term liabilities	IMF- Financially Sound Indicator
Credit to GDP	Bank of International Settlement (BIS)
World Pandemic Uncertainty Index (WPUI)	https://worlduncertaintyindex.com/data/
Real GDP; ln(RGDP)	Department of Statistics Malaysia (DOSM)
Real GDP growth rate	Department of Statistics Malaysia (DOSM)
Real Effective Exchange Rate (REER)	Department of Statistics Malaysia (DOSM)
Consumer Price Index (CPI)	Department of Statistics Malaysia (DOSM)
Government consumption growth (GOVTCONSG)	Department of Statistics Malaysia (DOSM)
Change in terms of trade (CTOT)	Department of Statistics Malaysia (DOSM)
Overall House Price Index (HPI)	National Property Information Centre (NAPIC)
Terrace	National Property Information Centre (NAPIC)
High-rise	National Property Information Centre (NAPIC)
Detached	National Property Information Centre (NAPIC)
Semi-detached	National Property Information Centre (NAPIC)
PBO-RI city center	National Property Information Centre (NAPIC)
PBO-RI outside the city center	National Property Information Centre (NAPIC)

The Spillover Effects of the Pandemic

To examine the spillover effects, the study employs the Bound Test and marginal effects. In Table 3, the Bound Test results indicate a long-run relationship between the property market indicator, macroeconomic indicator, pandemic indicator, and financial sector development. The F-statistics calculated for Models 1a), 1d), 2a), 2b), 3b), 4a), 4b), 4c), 4d), 4e), 4f), and 4g) in Table 3 surpasses the upper bound critical values at a 5% significance level, leading to the rejection of the null hypothesis of non-cointegration among the variables.

Table 3: The Bound Test

Dependent variable		Model 1	Model 2	Model 3	Model 4
		Ln(M2)	Liquidity assets ratio	Liquidity assets to ST liability	Credit-to-GDP
Independent variable	Property market indicators	Test statistics (F-bound test)			
WPUI, LRGDP, CPI, GOVTCONSG, CTOT	a) Overall HPI	4.714*	4.913*	4.104	7.064*
	b) Terrace	3.658	9.702*	7.498*	8.035*
	c) Detached	3.569	2.390		13.497*
	d) Semi-detached	10.098*	2.507	1.815	11.271*
	e) High rise	1.521	2.426	2.951	9.294*
	f) PBO-RI city center	1.306	2.354	1.894	8.380*
	g) PBO-RI outside the city center	0.843	2.343	1.826	8.472*

The results show the existence of a long-run relationship where the variables are moving together and will not deviate from each other. It also indicates that the independent variable plays a significant role in influencing the movement of financial development indicators. However, further investigation of the error correction models shows an insignificant effect, implying that there is no long-run relationship for Models 1a) and 1d). Meanwhile, there is robust evidence of a long-run relationship for Models 2a), 2b), 3b), 4a), 4b), 4c), 4d), 4e), 4f) and 4g).

The baseline models show that WPUI has a positive and significant effect in all of the models (except Model 3d) on the financial sector indicator at least at a 5 % significance level. Intuitively, as the pandemic hits the country, and coupled with government restrictions to control the spread of the disease, it shows an increase in financial soundness indicator reflected by the precaution measure by the financial sector. The pandemic is placing enormous strains on cash buffers and involves uncertainty on how long it will have to be prolonged, which has led to an increase in the liquid ratio of the financial sector. This is to buffer or promote the resilience of the banking sector. Initially, the measures are meant to affect credit growth in the domestic and foreign markets. However, this liquid property of assets and liabilities can change drastically during a crisis period (Hardy and Hochreiter, 2014).

The coefficient of error correction model that is explained by the speed of adjustment in the event of shock shows that it will take around 30.3 to 84.1 % (3 quarters or the fastest 1 quarter) to converge to equilibrium in the event of a shock. All model passes the diagnostic test, which implies that there is no evidence of serial correlation and heteroscedasticity problem in the estimated model.

Looking into the property market indicator which represents by HPI, PBO-RI for the city center and PBO-RI for outside the city center, our estimation shows a positive relationship with the financial sector development indicator (Models 4a to 4g) at a 5 % significance level. In addition, the coefficient of the PBO-RI city center shows the highest effect with 1.038, which implies that an increase in the PBO-RI city center would promote financial sector development at the highest rate as compared to other property market indicators. Overall, the impact of the pandemic on financial sector development is sensitive to the financial sector development indicator used. Besides that, the effect of the property market on financial sector development is robust across various indicators employed in the study.

To further investigate the spillover effect on financial sector development, the marginal effect is presented in Table 4. Without the pandemic indicator, the financial sector indicator namely the liquid asset ratio in Model 2a has a negative sign, explaining one %age change in HPI will affect the liquid asset ratio by -0.22. The data seems to suggest that even before the pandemic, the financial sectors are facing a higher risk. Bank risk is influenced by housing prices - higher house prices lead to higher bank risk (Banai and Vago, 2018). Further interaction of WPUI indicates that liquid asset ratio was further affected. This deterioration of liquidity position and financial health of the financial institutions may worsen during the emergence of this pandemic. In the event of a pandemic, an increase in the house price reflects the stability of the bank. The interactions indicate a decline in liquid to-assets ratio as banks' expected loan losses to increase for two reasons: (1) the value of collateral decreases, which raises the loss given default (LGD); and (2) the probability of default (PD) increases as it becomes less worthwhile for the borrower to continue servicing the debt. Thus, if a bank tries to elevate its lending volume, borrowers may borrow at a lower interest rate. Then, the present value of the property investment may rise as the discount rate falls (Che et al., 2011). This procedure considers not merely loan interest rates, but also macroeconomic indicators like GDP growth rate, price level, and business cycles.

Table 4: Marginal Effect

Variable	Marginal effect	Min	Max	Mean
Long-run coefficient of model 2a				
<u>Dependent variable:</u> Liquid assets ratio				
<u>Property Market Indicator:</u> Overall HPI				
Overall HPI	-0.224- 0.767(WPUI)	-0.22	-18.72	-1.82
Long-run coefficient of model 3b				
<u>Dependent variable:</u> Liquid assets to Short term liability				
<u>Property Market Indicator:</u> Terrace Price Index				
Terrace price index	-5.782(WPUI)	0.00	-139.40	-12.02
Long-run coefficient of model 4a				
<u>Dependent variable:</u> Credit-to-GDP				
<u>Property Market Indicator:</u> Overall HPI				
Overall HPI	0.562- 0.251(WPUI)	0.56	-5.49	0.04
Long-run coefficient of model 4f				
<u>Dependent variable:</u> Credit-to-GDP				
<u>Property Market Indicator:</u> PBO-RI city center				
PBO-RI city center	1.528- 0.376(WPUI)	1.53	-7.54	0.75
Long-run coefficient of model 4g				
<u>Dependent variable:</u> Credit-to-GDP				
<u>Property Market Indicator:</u> PBO-RI outside the city center				
PBO-RI outside the city center	1.482(WPUI)	0.00	35.73	3.08

Moreover, as HPI quantify the residential real estate prices, the market will then integrate direct or indirectly which then enables them to move together (Yusof et. al., (2019), Gao and Topuz 2020; Mohan et. al., 2019). Thus, the cross-market information will be used by the investors in making an investment decision. Although in the absence of an asymmetric long-run relationship, the cross-market information will still be risky, particularly in dealing with the

COVID-19 pandemic which gripped the global markets in an unprecedented manner and caused a high level of uncertainty in the economy. Given this, banks will not take the risk particularly related to anything associated with the willingness and ability of their customers to perform their obligation which then affects their non-performing loan level. Also, the bank will liquidate and minimize its liquid assets. On the other hand, Model 3b indicates that although the terrace price index is not significantly affecting the liquid assets to short-term liability, if the pandemic persists indicated by the interaction term at the maximum point of WPUI, the total effect of the terrace price index on the liquid assets to short term liability will be negative. In the event of a pandemic, an increase in house prices is associated with a slight increase in liquid assets to short-term liability. It suggests that a rise in house prices, particularly terraces are associated with financial institutions which are risk-averse to implementing a restrictive policy and limiting financing activities.

Additionally, from the consumer behavior perspective, financial standing uncertainties and business closures are among the reasons for holding cash rather than depositing it in bank accounts. Specifically, rising real estate prices may put banks at greater risk. It is possible to produce moral hazard and the problem of adverse selection (Bernanke et al., 1996). When real estate values rise, risky borrowers who believe the trend will continue will demand more loans. Banks will then provide loans at abnormally low-interest rates if they predict real estate values will continue to climb, as banks believe that the risk of mortgage financing is negligible. The deviation hypothesis states that if the price of real estate declines in this instance, the bank will indeed be in financial difficulties. As real estate values vary too far from fundamentals and price volatility rises, banks' possibilities of default rise as well. As a result, real estate price variations may have both a positive and negative influence on a bank's performance.

Further, overall HPI was included in Model 4a. The pandemic indicator represented by the WPUI suggests a positive relationship with the financial sector indicator, namely the credit-to-GDP. However, as the interaction of WPUI is considered, the negative coefficients of the interaction term indicate that any increase in one point of WPUI would reduce the positive effect of overall HPI. At the maximum point of WPUI, the total effect of overall HPI becomes negative. Thus, it shows that during the pandemic, an increase in house prices is associated with a slight decrease in credit to GDP. This predicament arose as a result of the drop in GDP. During the pandemic, banks will expand their current liquidity facilities by lowering interest rates, expanding the types of eligible collateral, and broadening the number and types of eligible clients, as it is customary. The key distinction between current and new lending policies was that a substantial portion of the new facilities was aimed at the private sector, including lending measures to help households and non-financial corporations in getting credit.

After accounting for the pandemic effect, Model 4f demonstrates that the total effect of PBO-RI city center on Credit-to-GDP is negative. Therefore, in a steady economy, consumption which is represented by rental income rises. In consequence of the capacity and desire to commit to financing facilities supplied by banks, credit to GDP will be stimulated. Meanwhile, in a poor economy, consumers' capacity, and willingness to commit to financial facilities provided by the financial institution will dwindle due to decrease in rental income. Moreover, the average asking rentals in the city center localities have declined because of lower occupational demand among expatriates and corporate tenants as Malaysia has temporarily closed its borders to incoming foreign nationals or expatriates, temporary work visa holders, and employment pass holders. PBO-RI outside the city center stated in Model 4g proves that the interaction effect will boost credit to GDP as the pandemic is prolonged. Given this, the situation can be explained through the decrease in GDP while credit to GDP increases. Also, due to MCO and business closures, most of the businesses are possibly moving to the outside of city center which has lower rental expenses. Thus, the ability to operate the business as usual will stimulate the ability and willingness of the borrower to apply for more loans which then boosts the credit demand in the banks.

CONCLUSION

Governments worldwide responded to the COVID-19 pandemic by implementing national or local lockdown orders, restricting business operations and urging households to observe social distancing by staying at home. These measures, designed to curb the spread of the virus, obviously altered property purchasing behaviours and impacted businesses reliant on face-to-face interactions such as property agencies. The search processes of property buyers were disrupted, leading to prolonged sale completions. COVID-19 introduced market friction to the property market, negatively affecting transacted prices and liquidity. Mobility declined almost entirely during the lockdown orders, reflecting market frictions akin to a negative demand shock, where traditional bidding processes became challenging. Limited studies have directly observed real estate price dynamics during the COVID-19 pandemic, and most analyses remained at an aggregate level.

The global spread of the COVID-19 virus disrupted economies, financial systems, and societies. Given the uncertainty about the pandemic's impact on the property market, this study aims to provide fresh evidence on its spillover effect on both the property market and the financial sector. Specifically, this research explores the dynamic interrelationship between the property market and the financial sector resulting from the pandemic. The results indicate a significant spillover effect between the pandemic, the property market, and the

financial sector. Additionally, it is observed that there is a negative marginal effect for all interaction variables between property market indicators and the pandemic.

Notably, the negative marginal effect between the property market and the financial soundness indicator, which is represented by the liquid assets ratio, suggests a risk to financial sector stability. Similarly, the negative marginal effect of the property market on financial sector growth signals risk-averse behaviour in the banking sector, indicating slow growth in the country. The Government and the central bank measures, including loan moratoriums, have disrupted the market and made banks more risk averse. The Movement Control Order (MCO) has ushered in a new working norm of remote work, reducing occupational demand in the rental market. These findings provide valuable insights for policymakers, aiding their understanding of changes in spillover effects caused by COVID-19 and guiding the formulation of post-pandemic recovery policies. The evolving financial sector landscape shifts in industrial player behaviour, and emerging norms should be considered when designing robust post-recession recovery measures. Policy formulation needs to safeguard not only the property market against the effects of the pandemic, but also be cognizant of spillover effects on the financial sector, recognizing the critical role of financial sector stability in promoting sustainable development for both banking and the real economy.

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REFERENCES

- Ali, M., Alam, N., & Rizvi, S. A. R. (2020). Coronavirus (COVID-19)—An epidemic or pandemic for financial markets. *Journal of Behavioral and Experimental Finance*, 27, 100341
- Allen-Coghlan, M., McQuinn, K., & O’Toole, C. (2020). Assessing the impacts of COVID-19 on the Irish property market: An overview of the issues. *Quarterly Economic Commentary*, 93.
- Almeida, F., & Santos, J. D. (2020). The effects of COVID-19 on job security and unemployment in Portugal. *International Journal of Sociology and Social Policy*, 40(9–10), 995–1003. <https://doi.org/10.1108/IJSSP-07-2020-0291>
- Friedman, M., & Schwartz, A. J. (2008). *A Monetary History of the United States, 1867-1960*. Princeton University Press.
- Balemi, N., Füss, R., & Weigand, A. (2021). COVID-19’s impact on real estate markets:

- review and outlook. *Financial Markets and Portfolio Management*, 35(4), 495-513.
- Banai, Á., & Vágó, N. (2018). The effect of house prices on bank risk: empirical evidence from Hungary. *National Bank of Poland Education & Publishing Department*.
- Barua, B., & Barua, S. (2021). COVID-19 implications for banks: evidence from an emerging economy. *SN Business & Economics*, 1(1), 1-28.
- Batuo, M., Mlambo, K., & Asongu, S. (2018). Linkages between financial development, financial instability, financial liberalisation and economic growth in Africa. *Research in International Business and Finance*, 45, 168-179.
- Benhabib, J. & Spiegel, M. (2000). The Role of Financial Development in Growth and Investment, *Journal of Economic Growth*, 5, 341-360.
- Bernanke, B., Gertler, M. & Gilchrist, S. (1996). The Financial Accelerator and the Flight to Quality. *The Review of Economics and Statistics*.78, 1–15.
- Bernanke, B., Gertler, M. & Gilchrist, S. (1996). The Financial Accelerator and the Flight to Quality. *The Review of Economics and Statistics*.78, 1–15.
- Che, X., Li, B., Guo, K., & Wang, J. (2011). Property prices and bank lending: some evidence from China's Regional Financial Centres. *Procedia Computer Science*, 4, 1660-1667.
- Chong, T. T. L., Li, X., & Yip, C. (2021). The impact of COVID-19 on ASEAN. *Economic and Political Studies*, 9(2), 166-185.
- Christopoulos, D. K., & Tsionas, E. G. (2004). Financial development and economic growth: evidence from panel unit root and cointegration tests. *Journal of development Economics*, 73(1), 55-74.
- Deng, Y., Girardin, E., & Joyeux, R. (2018). Fundamentals and the volatility of real estate prices in China: A sequential modelling strategy. *China Economic Review*, 48, 205-222.
- Gao, X. and Topuz, J. (2020), Firm Location and Systematic Risk: The Real Estate Channel, *Review of Accounting and Finance*, 19(3), 1-23.
- Geng, M. N. (2018). *Fundamental drivers of house prices in advanced economies*. IMF Working Paper, International Monetary Fund, WP/18/164
- Hardy, M. D. C., & Hochreiter, P. (2014). *A simple macroprudential liquidity buffer*. International Monetary Fund.
- Hashim, J. H., Adman, M. A., Hashim, Z., Mohd Radi, M. F., & Kwan, S. C. (2021). COVID-19 epidemic in Malaysia: epidemic progression, challenges, and response. *Frontiers in public health*, 9, 560592.
- Hassan, M. K., Sanchez, B., & Yu, J. S. (2011). Financial development and economic growth: New evidence from panel data. *The Quarterly Review of economics and finance*, 51(1), 88-104.
- Kok, S.H., Ismail, N.W. & Lee, C. (2018), The sources of house price changes in Malaysia, *International Journal of Housing Markets and Analysis*, 11(2), 335-355.
- Koren, M., & Pető, R. (2020). Business disruptions from social distancing. *Plos one*, 15(9), e0239113.
- Levine, R. (2005) Finance and Growth: Theory and Evidence. in Handbook of Economic Growth, ed. Philippe Aghion and Steven N. Durlauf, 865–934. Amsterdam: Elsevier.
- Mohan, S., Hutson, A., Macdonald, I. & Lin, C.C. (2019), “Impact of Macroeconomic

- Indicators on Housing Prices”, *International Journal of Housing Markets and Analysis*, Vol. 12 No. 6, pp. 1055-1071.
- Mustaffa, A. H., Zainal Abidin, N. B., Ahmad, N., & Ogundare, E. A. (2021). Influence of COVID-19's active cases on Malaysia's key economic performance indicators. *Journal of Emerging Economies & Islamic Research*, 9(1), 68-87.
- National Property Information Centre (NAPIC), Malaysia. (2022) Retrieved from <https://napic.jpoh.gov.my/portal/key-statistics>
- Olanrewaju Ahamed, M. & Mallick, S.K., (2019). Is financial inclusion good for bank stability? International evidence. *Journal of Economic Behavior & Organization*, 157, 403-427.
- Ozili, P. K., & Arun, T. (2020). Spillover of COVID-19: impact on the Global Economy. Available at SSRN 3562570.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of long-run relationships. *Journal of Applied Econometrics*, 16,289-326.
- PropertyGuru (2021). What Analysing 20 Years of Malaysian Property Market Data Reveals. Retrieved from <https://www.propertyguru.com.my/property-guides/analysing-20-years-of-malaysian-property-market-data-45918>
- Qian, X., Qiu, S., & Zhang, G. (2021). The impact of COVID-19 on housing price: Evidence from China. *Finance Research Letters*, 43, 101944.
- Shanaev, S., Shuraeva, A., & Ghimire, B. (2020). The financial pandemic: COVID-19 and policy interventions on rational and irrational markets. Available at SSRN 3589557.
- Su, C. W., Dai, K., Ullah, S., & Andlib, Z. (2021). COVID-19 pandemic and unemployment dynamics in European economies. *Economic Research-Ekonomska Istraživanja*, 1-13.
- Tanrıvermiş, H. (2020). Possible impacts of COVID-19 outbreak on real estate sector and possible changes to adopt: A situation analysis and general assessment on Turkish perspective. *Journal of Urban Management*, 9(3), 263-269.
- Kadhim, K. G., Harun, A., Hamawandy, N. M., Qader, A. N., Khudhur, H. A., Kakil, R. M., & Ali, R. M. (2021). The Measures to Overcome the Impact of Covid-19 On Malaysia Economy. *Turkish Online Journal of Qualitative Inquiry*, 12(8).
- Haroon, O., & Rizvi, S. A. R. (2020). COVID-19: Media coverage and financial markets behavior—A sectoral inquiry. *Journal of behavioral and experimental finance*, 27, 100343.
- Khan, S. J. M., Yusof, R. M., Lim, H. E., & Mahudz, A. A. (2022). Alternative Home Financing: A Simulation Approach. *Journal of Economics and Sustainability*, 4(1), 1-17.
- Yusof, R. M., Aliyu, S., Khan, S. J. M., & Majid, N. H. A. (2019). Supply overhang of affordable homes: a survival analysis on housing loans application. *Planning Malaysia*, 17.

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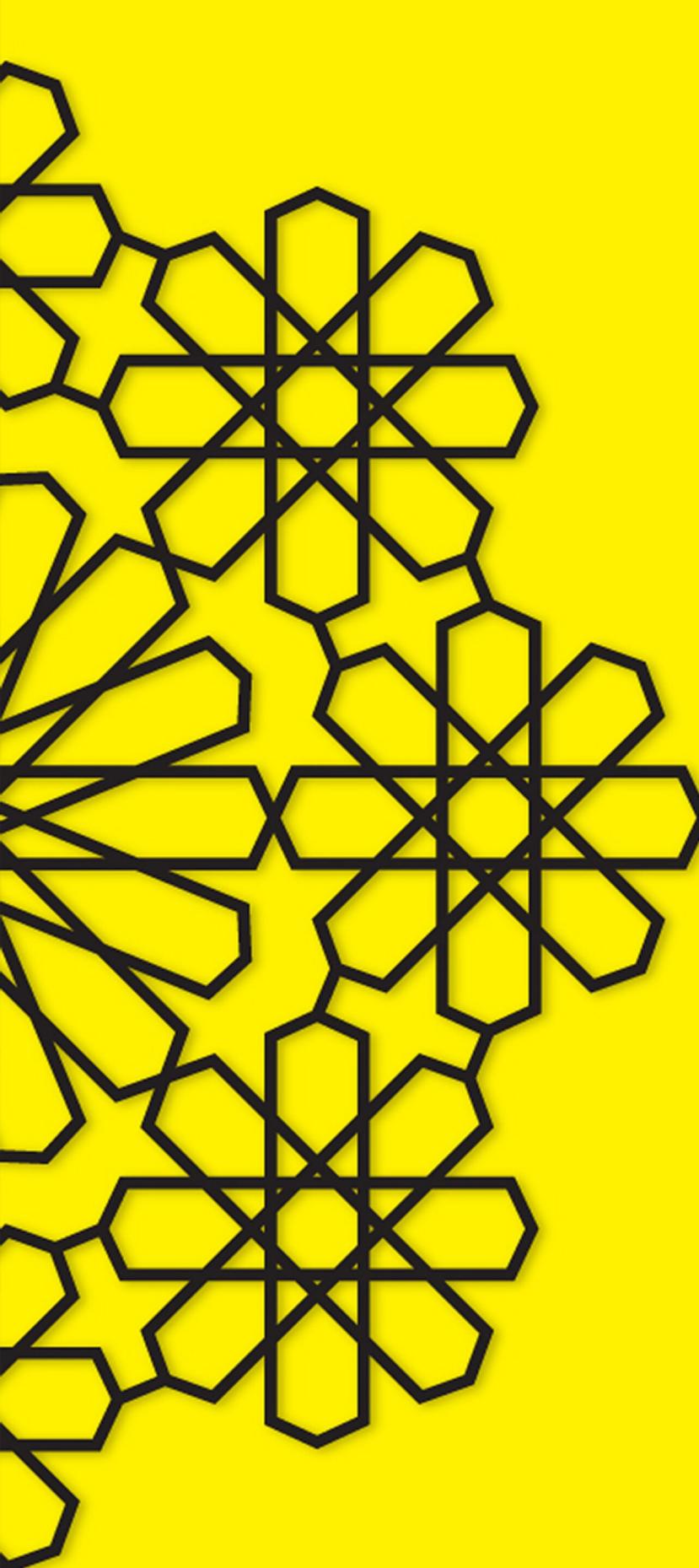
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