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THE EFFECTIVENESS OF DIGITAL MEDIA MANAGEMENT BY LOCAL GOVERNMENTS IN TOURISM MARKETING

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Abstract

Local governments as administrators and regulators of the regional development industry are beginning to recognize the potential of digital media in tourism marketing. In Medan City, North Sumatra, Indonesia, the marketing of tourism is managed with care, as indicated by the wide range of digital media employed. Therefore, this study aims to assess the effectiveness of digital media management by the Medan City Tourism Office in marketing tourism. An online questionnaire obtained the main data and was processed using the EPIC Model approach. The results show that all digital media have been managed effectively. Instagram belongs to the very effective category, while YouTube, Facebook, and Website are classified in the effective category. The ineffective category consists of Twitter and Application.

Keywords: Effectiveness, Digital Media, EPIC Model, Local Government, Tourism Marketing

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INTRODUCTION

The fast-paced advancement of technology has had a significant influence on the continually growing tourism sector (Mior Shariffuddin et al., 2023). The presence of technology in the form of digital media has influenced the modern community's lifestyle and serves as a source for information and communication (Ibrahim et al., 2023). These digital media advancements have reshaped tourist behavior, establishing it as the preferred method for travelers to plan, research, and book their trips. With the convenience and accessibility that digital media provides, it has become important for both tourists and tourism stakeholders to collaborate in the growth of the tourism sector (Azwar et al., 2023).

This research is conducted in Medan, one of Indonesia's major cities and one of the entry points for international tourists, particularly from Malaysia and Singapore. Tourism industry is crucial as it is often understood in economic terms and perspectives where it is deemed as one of the crucial contributors to global economic performance with Medan without exception (Azinuddin et al., 2022a; 2022b; 2022c). Medan, 'The Kitchen of Asia' is a tourism tagline promoted by the local government. Furthermore, Medan is one of the most popular tourist attractions because of its rich cultural diversity. Heritage, culture, shopping, nature, as well as culinary and gastronomic tourism, are all possible in this city. In addition, digital media has also been optimized through the Tourism Office.

The combination of the advantages of digital media and extraordinary tourism potential in Medan City, as well as the government's seriousness has not been able to increase the number of tourists. Tourism marketing through digital media needs to be reviewed for the effectiveness of its management. Therefore, this study formulates the objective of examining the effectiveness of digital media for each platform used by the Medan City Tourism Office. It was carried out using several approaches, such as the EPIC Model, including four critical dimensions of empathy, persuasion, impact, and communication (Indah & Maulida, 2017). Empathy is a factor that determines consumers' level of appreciation for an advertisement (Suryaningsih & Widi Nugraha, 2019). This dimension provides valuable information about a brand's attractiveness (Ernestivita & Subagyo, 2020). Persuasion is a factor that informs what digital media may do to enhance or improve a brand's identity (Putra & Lisdayanti, 2020). It is a change in beliefs, attitudes, and behavioral intentions caused by promotional communication. The impact is a criterion that indicates whether a product can distinguish itself from others in its category (Alias et al., 2023; Oktanizar & Kurniawan, 2021).

RESEARCH METHODOLOGY

A descriptive approach was used to observe the effectiveness of digital media by using the EPIC Model and measuring it quantitatively for further interpretation. Data was obtained through the distribution of online questionnaires to measure the effectiveness of each digital media platform used by the Medan City Tourism Office. The population consists of digital media users, whose numbers are listed in Table 1.

Table 1: Sample Determination

Platform	Population	Sample	
		Minimal Cochran	Result
Instagram	24.218	68	75
Facebook	33.332	68	79
Twitter	275	55	71
Aplikasi	1000	64	70
Youtube	6620	68	76
Website	Unknown	69	154
Total			525

The data collection technique is carried out through the distribution of online questionnaires using links and QR Codes to users of each digital media platform. The information is as follows:

Table 2: Questionnaire Links

Platforms	Questionnaire Links	QR Codes
Instagram	s.id/IG2022	
Facebook	s.id/FB2022	
Twitter	s.id/TW2022	
Application	s.id/Aplikasi2022	
Youtube	s.id/YT2022	
Website	s.id/WEB2022	

Data collection is also carried out through a literature review and observation of all digital media included. The data analysis technique is adapted to the EPIC Model protocol. In determining the assessment procedure, the adoption is adjusted to the needs of the study (Amira & Nurhayati, 2019; Indah & Maulida, 2017; Oktanizar & Kurniawan, 2021; Suryaningsih & Widi Nugraha, 2019), including:

Table 3: Data Analysis Technique

Stage	Description
Determining a particular account of the digital platform as the basis for measuring its effectiveness	This is performed specifically for websites, Instagram, and Facebook, which consists of more than 1 account. The determination of the account as the basis for the assessment is conducted based on the activeness of updates on the website and the number of followers on Instagram and Facebook
Measurement of effectiveness is divided according to the variables of Empathy, Persuasion, Impact, and Communication	The scales used are as follows: SA: Strongly Agree (-2 points) A: Agree (score -1) DA: Disagree (score 0) SDA: Strongly Disagree (score 1)
Determination of the perception scale range $R_s = \frac{R}{M}$ Rs:Scale range R:The most significant weight to the smallest weight, where the highest is 1, and the lowest is -2 M:Number of weight categories	Result: $R_s = \frac{2-(-1)}{4} = 0.75$ Therefore, the scale range is: -2 to -1.25 Very Ineffective (VI) -1.24 to -0.50 Ineffective (I) -0.49 to 0.25 Effective (E) 0.26 to 1.00 Very Effective (VE)

The visualization in making decisions using this EPIC Model is as follows:



Figure 1: Measurement Scale

Tourism marketing in Medan City is conducted using 12 digital media as follows:

Table 4: Digital Media Accounts and Platforms for Medan City Tourism Marketing

No	Accounts	Platforms
1	IG : pariwisatakotamedan	Instagram
2	IG :medan.thekitchenofasia	Instagram
3	IG :medancreativemarket	Instagram
4	IG :colourfulmedan.tourism	Instagram
5	FB : Medan The Kitchen Of Asia	Facebook
6	FB : Dinas Pariwisata Kota Medan	Facebook
7	@Disparmedan	Twitter
8	Medan Tourism	Application
9	Dinas Pariwisata Kota Medan	Youtube
10	Pariwisata.pemkomedan.go.id	Website
11	Medantourism.pemkomedan.go.id	Website
12	pariwisatamedan@gmail.com	E-mail

Instagram

Four Instagram accounts are used for different purposes, including:

- a. Pariwisatakotamedan's account provides general information on tourism in Medan City related to events organized by the Tourism Office. The caption is made according to the photo/video display, and there is an invitation to follow other Instagram accounts and digital media owned by the Medan City Tourism Office.
- b. Medan.thekitchenofasia is an Instagram account formed to support the 'Medan the Kitchen of Asia' program initiated by the mayor of the city. This account focuses on informing culinary in Medan, including promoting products from hotels, restaurants, and MSMEs engaged in related fields.
- c. Medancreativemarket is an Instagram account intended as a promotional tool for creative economy Actors in Medan. It is linked to FB groups intended like a local marketplace.
- d. The Colorfulofmedan account promotes social and cultural diversity that strengthens the position of Medan as one of the melting pot cities in Indonesia. In addition, this account describes other ethnic groups in North Sumatra.

Facebook

There are two Facebook accounts, with Dinas Pariwisata Kota Medan having the most followers 33,000. The content is the same as the @pariwisatakotamedan Instagram account, which is shared simultaneously using the 'also post to' feature. In addition, there is a marketplace group to accommodate creative economy actors in Medan City. The management is carried out internally by staff within the Tourism Office.

Twitter

The Twitter account @Disparmedan, managed by the Medan City Tourism Office, has been around since the end of 2017. The names of other digital media accounts are also informed on the initial profile page. However, this account is inactive, as seen from the last post on May 1, 2021. The form of content is only the same as Instagram, and the published name is not the latest.

Application

The Medan Tourism application is available on the Google Playstore, but can only be downloaded through Android-based mobile phones. The last update was in January 2019, and the most updated content is the news menu similar to the website. Many other menus are neglected, while some are inaccessible.

YouTube

YouTube had 7,000 subscribers when the observation was conducted on June 10, 2022. The most recent type of content was the live stream of the Medan Creative Home activity and other Tourism Office events. The most popular video with the highest number of views is “Ahooi, Ikon Baru Kota Medan (the New Icon of Medan City)”, uploaded 3 years ago with a total of 454,000 viewers.

Website

The Medan Tourism Office also manages two website accounts, including medantourism.pemkomedan.go.id and pariwisata.pemkomedan.go.id. For medantourism.pemkomedan.go.id, information is constantly updated through the latest news menu, which becomes the landing page. Meanwhile, other menus are neglected, as in the Medan Tourism application.

E-mail

The official e-mail of the Tourism Office is pariwisatamedan@gmail.com. This account is used for electronic mail communication regarding tourism promotion.

ANALYSIS AND DISCUSSION

The Effectiveness of Digital Media for Tourism Marketing in Medan City

Before explaining the effectiveness of digital media, the results of the instrument test are described as follows:

Table 5: SPSS Test Summary

		N	%
Cases	Valid	30	100.0
	Excluded ^a	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Based on the table above, the number of respondents in the validity and reliability tests is 30. The determination in this initial test is related to the r-table value that does not change after the number (Wolf et al., 2013). The reliability test results in this instrument are as follows:

Table 6: Reliability Test Results

Variable	Cronbach's Alpha
Empathy	0.963
Persuasion	0.951
Impact	0.936
Communication	0.973

Based on the table above, Cronbach’s Alpha in this instrument is 0.977, more significant than 0.600. Therefore, it can be interpreted that this instrument is reliable.

Table 7: Validity Test Results

Variable	Item	r-count	r-table	Interpretation
Empathy	E1	0.965	0.374 (df28 = 30 – 2)	Valid
	E2	0.938		Valid
	E3	0.892		Valid
Persuasion	P1	0.842		Valid
	P2	0.863		Valid
	P3	0.908		Valid
	P4	0.880		Valid
	P5	0.885		Valid
Impact	I1	0.911		Valid
	I2	0.897		Valid
	I3	0.857		Valid
Communication	C1	0.909		Valid
	C2	0.924		Valid
	C3	0.958		Valid
	C4	0.956		Valid
	C5	0.889		Valid

The table above shows that the validity and reliability test results for all variables related to the effectiveness of digital media have fulfilled the requirements. It can be seen that $r\text{-count} > r\text{-table}$.

The next step is to analyze the effectiveness of digital media using the EPIC Model protocol from a questionnaire distributed to 525 main respondents. This is conducted per platform, and the focus test is carried out on the account selected by the respondent. The assessment results for the effectiveness of digital media per platform are as follows:

Instagram

In implementing the EPIC Model for the Instagram platform, it is necessary to determine the account that will be tested. Based on the number of followers, the account that underlies the effectiveness assessment with the EPIC model approach is @pariwisatakotamedan. The effectiveness assessment with the EPIC Model approach is shown as follows:

Table 8: Instagram Effectiveness Assessment

Aspect	Result	Interpretation
Empathy	0.51	Very effective
Persuasion	0.344	Very effective
Impact	0.13	Effective
Communication	0.18	Effective
EPIC Score	0.29	Very effective

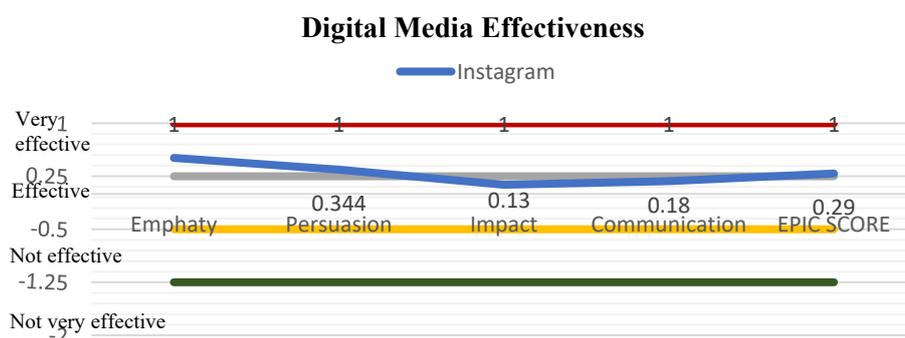


Figure 2: Instagram EPIC Test Visualization

Based on the table and visualization above, empathy and impact have the highest and lowest values of 0.51 and 0.13. In general, Instagram @pariwisatakotamedan is considered very effective, with a score of 0.29.

Facebook

To assess the effectiveness of Facebook, the Dinas Pariwisata Kota Medan account becomes the reference based on the number of followers. The results of the account using the EPIC model approach are shown as follows:

Table 9: Facebook Effectiveness Assessment

Aspect	Result	Interpretation
Empathy	0.43	Very effective
Persuasion	0.28	Very effective
Impact	0.07	Effective
Communication	0.10	Effective
EPIC Score	0.22	Effective

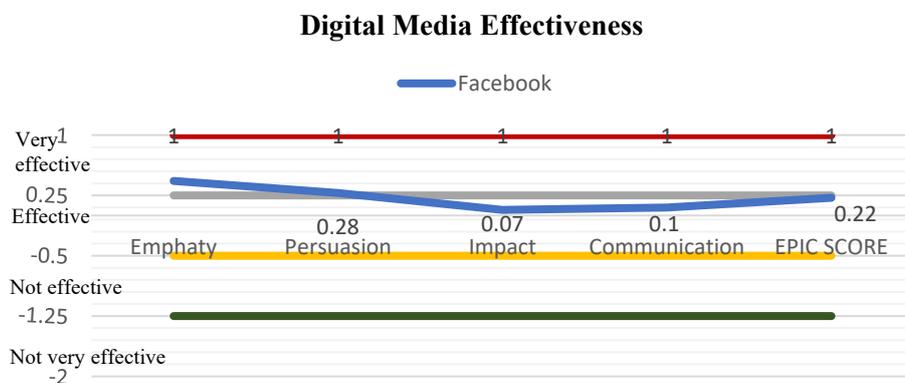


Figure 3: Instagram EPIC Visualization

Based on the table and visualization above, empathy and impact have the highest and lowest values of 0.43 and 0.07. The Dinas Pariwisata Kota Medan Facebook account is considered adequate, with a score of 0.22.

Twitter

The effectiveness assessment results of Twitter media management are shown in the following table:

Table 10: Twitter Effectiveness Assessment

Aspect	Result	Interpretation
Empathy	-0.51	Ineffective
Persuasion	-0.69	Ineffective
Impact	-0.56	Ineffective
Communication	-0.30	Effective
EPIC Score	-0.52	Ineffective

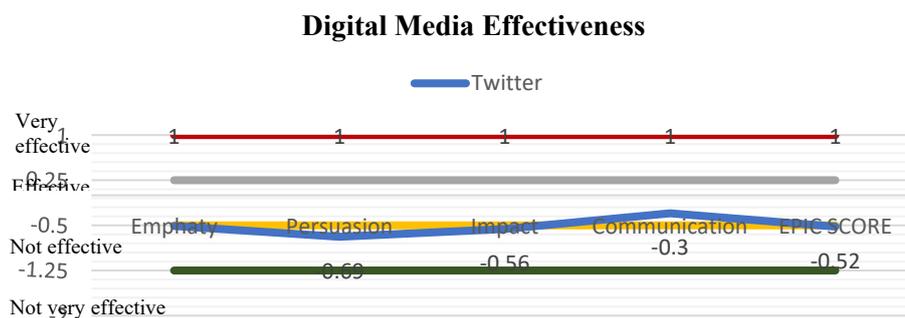


Figure 4: EPIC Twitter Visualization

The table and visualization above show that communication and persuasion have the highest and lowest values of -0.30 and -0.69. In general, the @disparmedan Twitter account has an EPIC value of -0.52 with an ineffective category.

Application

The effectiveness assessment results of the Medan Tourism Application management are shown in the following table:

Table 11: Application Effectiveness Assessment

Aspect	Result	Interpretation
Empathy	-0.56	Ineffective
Persuasion	-0.48	Effective
Impact	-0.61	Ineffective
Communication	-0.51	Ineffective
EPIC Score	-0.54	Ineffective

Digital Media Effectiveness

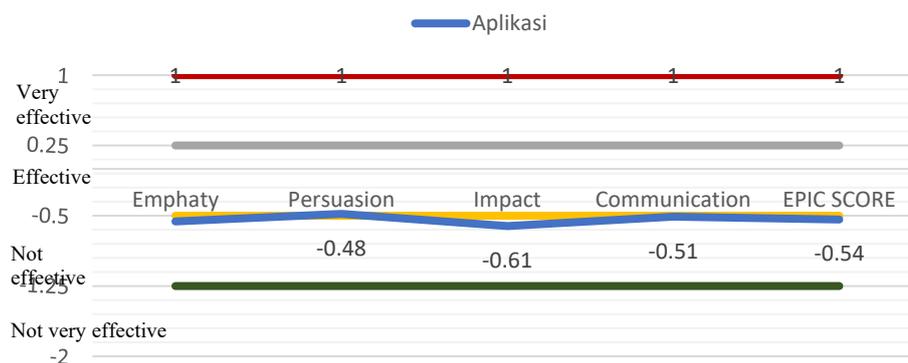


Figure 5: Application EPIC Visualization

The table and visualization above show that persuasion and impact have the highest and lowest values of -0.48 and -0.61. The Medan Tourism application is in the ineffective category with an EPIC Score of -0.54.

YouTube

The effectiveness assessment results of the Dinas Pariwisata Kota Medan’s YouTube media management are shown in the following table:

Table 12: YouTube Effectiveness Assessment

Aspect	Result	Interpretation
Empathy	0.37	Very effective
Persuasion	0.24	Effective
Impact	0.15	Effective
Communication	0.20	Effective
EPIC Score	0.24	Effective

Digital Media Effectiveness

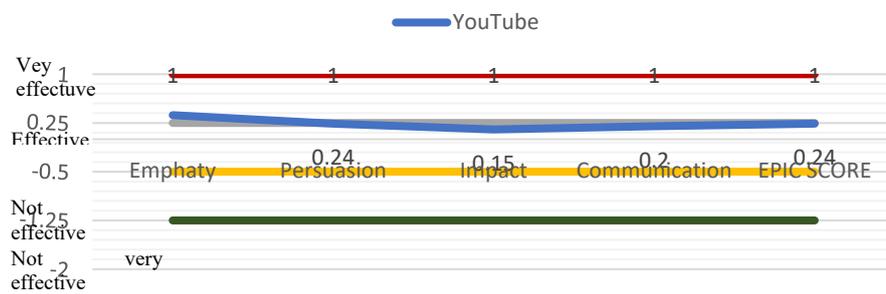


Figure 6: YouTube EPIC Visualization

Based on the table and visualization, empathy, and impact have the highest and lowest values of 0.37 and 0.15. The Dinas Pariwisata Medan's YouTube account is appreciated as one of the effective digital media, with an EPIC Score of 0.24.

Website

The effectiveness assessment for the digital media website is based on medantourism.pemkomedan.go.id because the other web account (pariwisata.pemkomedan.go.id) is no longer active.

Table 13: Website Effectiveness Assessment

Aspect	Result	Interpretation
Empathy	0.08	Effective
Persuasion	-0.04	Effective
Impact	-0.00	Effective
Communication	0.17	Effective
EPIC Score	0.05	Effective

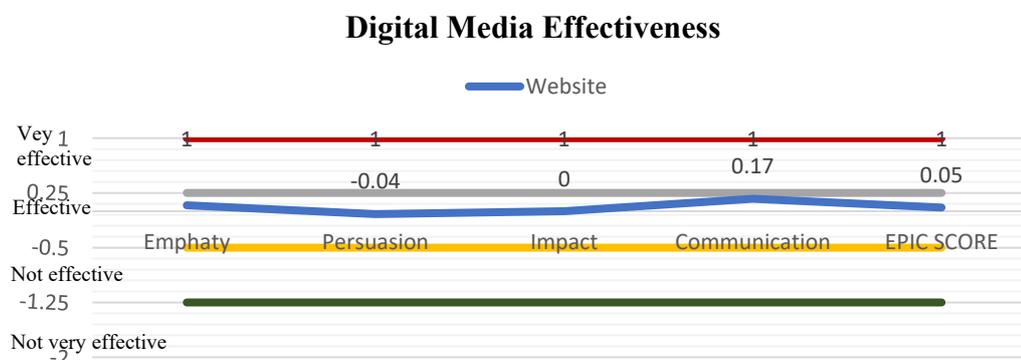


Figure 7: Website EPIC Visualization

The table and visualization above shows that the communication and persuasion aspect on the website digital media of medantourism.pemkomedan.go.id have the highest and lowest values of 0.17 and -0.04. In general, this website digital media has an EPIC Score of 0.05 in the practical category.

DISCUSSION

The effectiveness assessment of all digital tourism marketing media in Medan City can be summarized in the following table:

Table 14: Overall Effectiveness Assessment

Aspect	Result	Interpretation
Empathy	0.13	Effective
Persuasion	0.01	Effective
Impact	-0.07	Effective
Communication	0.04	Effective
EPIC Score	0.03	Effective

Based on the table above, tourism marketing digital media in Medan City are categorized as effective with an EPIC Score of 0.03. The highest and lowest effectiveness values are obtained by the empathy and impact of 0.13 and -0.07. This empathy aspect shows that users like digital tourism marketing media in Medan City. Even though the impact value is negative, it is still in the practical category. This indicates that with the presence of tourism marketing digital media, users become aware and motivated to visit the activities offered.

The results did not show the same pattern in determining the dominance of each aspect. A study on advertising promotion media, specifically for Instagram in Kediri, showed the highest effectiveness level is in communication

compared to other aspects (Suryaningsih & Widi Nugraha, 2019). Another study in Langsa City also showed that the highest effectiveness value is in the communication aspect (Indah & Maulida, 2017). This shows the flexibility of assessing the effectiveness of digital media. Therefore, a score of 0.03 does not necessarily appreciate the effectiveness of all tourism marketing, and it requires an exposure aspect of each digital media as follows:

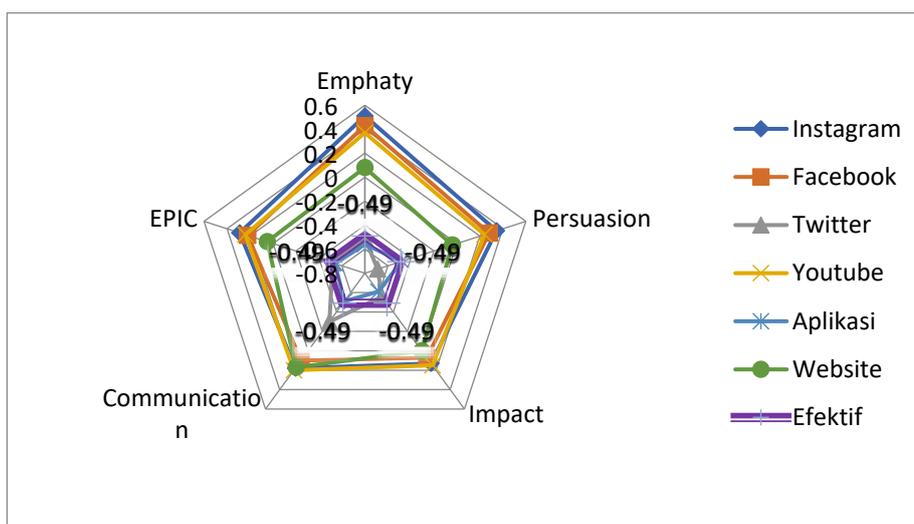


Figure 8: EPIC Diagram of all Digital Media

The table and diagram above show that Instagram (EPIC: 0.29) is in a very effective category, followed by YouTube (EPIC: 0.24), Facebook (EPIC: 0.22), and Website (EPIC: 0.05) in the effective category. Meanwhile, the ineffective category consists of Application (EPIC: -0.54) and Twitter (EPIC: -0.52).

The Instagram media tested is the account of @pariwisatakotamedan, which has content of more than 3,000 posts. The empathy aspect of 0.51 indicates that the user likes this media. The quality of the photos/videos displayed is also maximized with appropriate and informative captions. The post has a tourism theme in Medan City, especially with information on events designed by the Tourism Office, such as the Creative Homepage. However, the impact value on Instagram is only 0.13, which is the lowest of the other aspects. This shows that the post has been effective in distributing information, hence users are aware of the event promotion offered by Instagram. This information is not best for encouraging consumers to make additional contributions to the event offer. The primary consideration is interaction on Instagram, where the number of likes on 1 post is only about 1% of the total existing followers.

The 'also publish to' feature allows similar content to be posted on Facebook and Instagram. Therefore, the EPIC Score assessment for Facebook shows the same result for Instagram.

For YouTube media, the highest level of empathy or liking is 0.37 in the very effective category. The pattern is the same as on Instagram, where the impact of posts is the lowest with a score of 0.15 in the practical category. This YouTube account, created on July 4, 2017, has garnered 1 million views, and 7,000 of them have become subscribers. The high impact value is due to the activeness in distributing its content, such as live streaming and coverage. In live streaming, the content displayed is an ongoing event. The list of videos, teaser videos, or promotional content that invites users to attend upcoming events is still limited. For example, the video teaser for the Creative Economy Agency's weekly City Hall page event on May 28, 2022, will be posted on May 25, 2022. Subsequently, there will be no video teaser for activities in the following week. This may be due to the repeated concept of the event and the absence of a particular theme.

One particular note in managing this YouTube is that caption writing on videos needs to be considered and adjusted to the General Guidelines for Indonesian Spelling (PUEBI). The limitations of video teasers, event themes, and the rules for writing captions are why the impact value on digital media is still not optimal.

In website media, the highest value is on the communication aspect at 0.17. This is because the most updated menu is news, where the content update period is carried out almost every working day. Persuasion on the website has the lowest value of -0.04, and in this aspect, digital media is expected to increase the trust and understanding of its users. This is because the content related to tourism in Medan City is still limited.

In the Medan Tourism application media, the content created is the same as the news on the website. This media has a negative value because there is no perceived benefit to using the application. However, the contents can be found on other websites/media, and there is a download process that takes time and consumes phone memory.

On Twitter, ineffectiveness is evaluated since the account has been dormant for an extended period. This can be seen from the last post in May 2021 as a report or the use of the 'also post to' feature from Instagram. The use of this media is still ineffective because it does not optimize the opportunities as a narrative platform that is still in demand by some internet users.

Facebook, YouTube, Twitter, and Instagram are common platforms widely used in digital marketing (Fondevila-Gascón et al., 2020). However, this study showed that Twitter is still not effectively utilized by the Medan City government for tourism marketing in Medan City. Other platforms are currently

being developed, such as TikTok, that need to be taken advantage of (Haenlein et al., 2020; Mou, 2020).

CONCLUSION

Digital media for tourism marketing in Medan City is categorized as effective. However, there is a significant gap in measuring effectiveness between platforms, where Instagram is in a very effective category, followed by YouTube, Facebook and Website in the effective category. The ineffective category consists of Application and Twitter. For future analysis, the management of every digital marketing media should be carried out more seriously, especially by placing human resources that fulfill the criteria needed by each HR. Finally, there is awareness of the research's limitations, mainly because the focus is the Medan City government, hence the generalization of the result needs to be considered.

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STUDY OF SPATIAL CHANGE IN ASTANA VILLAGE HERITAGE AREA, CIREBON, INDONESIA

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Abstract

Astana Village which located in Gunungjati District, Cirebon Regency, West Java Province, In-donesia, belongs to a rural area. However, there lies the grave complex of the kings of the Cirebon Sultanate. This 14th-century funerary complex is a structure with a long history. This graveyard is designated as a historical site. The tomb complex was constructed in the shape of a palace, with different ceramic embellishments adorning the walls. It has become a popular tour-ist site for pilgrims. It is open 24 hours a day, seven days a week, to encourage local economic activity. As a result, this area grows seldom and shows signs of grave complicated injury. The purpose of this study is to characterize the spatial changes in Astana Village, which was desig-nated as heritage area from 2006-2020. The method used is by using GIS. The results of the study are used as material for digital documentation of the changes in space that have occurred. The study findings serve as a guide for area conservation.

Keywords: Astana village, Heritage area, Spatial change

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INTRODUCTION

Land use change is induced by human activities. Land use in a center shows the main concentration on residential, educational, trade, services and recreational activities (Pozoukidou et al., 2017). Land use systems define the location and arrangement of socioeconomic activity within the bounds of spatial entities (Collazo, 2020). The modification of natural ecosystems is responsible for the majority of land cover changes (Li et al., 2019). Spatial abnormalities can be seen everywhere around us, and as a result of human action, they will grow increasingly unpredictable.

Uncontrolled land use changes in heritage areas put ancient artifacts at risk of being damaged. The Cirebon Sultanate's kings' burial complex is a heritage site in Astana Village, Gunungjati District, Cirebon Regency, Indonesia. Local regulations define the heritage area. Documenting the ancient artifact space is an endeavor to introduce cultural heritage (Dalkılıç & Nabikoğlu, 2020). The awareness of particular values in humans that must be protected is stimulated by tangible and intangible heritage (Vecco, 2010). Human and environmental processes endanger the preservation of cultural relics (Mubaideen & Al Kurdi, 2017). It was only in the 20th century that care for protection, rehabilitation and proper use of cultural heritage has expanded significantly especially the understanding of its relationship to the environment (Petrić et al., 2020).

The research on Astana Village has primarily focused on pilgrimage tourist places that are well-known in other countries (Hindersah et al., 2021). Because of the tradition and space, studies on heritage values have been conducted in this location. The tomb of the youthful pharaoh Tutankhamun is the most famous of all royal tombs in the Valley of the Kings (VOK) in Luxo, and studies on historical graves as tourist sites are carried out using technology (Sambuelli et al., 2019). However, no research on the spatial changes that threaten the area's destruction have yet been conducted. Despite the fact that the research location is located in the Mount Sembung highlands, occasional land cover changes may pose a threat to the tomb construction, which is a heritage site. As a result, the goal of this research is to characterize the spatial changes in the heritage area of Astana Village in the Gunungjati District of Cirebon Regency. This research can be used as proof of area conservation efforts, particularly in terms of managing the usage of space in the area.

GIS is used to see changes of the way space is used. Maps can be displayed using GIS. Maps are essentially subjective, interpretative, and fictitious construction of facts that have the potential to affect cultural decisions, actions, and values (Hossain & Barata, 2019). GIS can be used to track the expansion of new areas and study effect trends. The analysis of cultural heritage around places experiencing growth can benefit from the use of GIS analysis of accessible data (Kristy, 2018).

Digital technologies can now be used to present cultural assets. Cultural heritage can be represented using a variety of digital tools. These tools not only illustrate cultural heritage, but also allow people to submit cultural heritage data of their own (Jaillot et al., 2020). GIS is a type of digital map technology. Understanding, interpreting, and sharing cultural heritage data will be made easier with GIS modeling. Digital technologies used to evaluate extremely diverse data, such as GIS, have shed new light on aspects, variables, and questions throughout the previous two decades. We can present four GIS applications in the subject of cultural heritage in particular: First is the use of geographic information systems (GIS) to aid in the preparation of heritage inventories. The second goal is to have a clearer understanding of inheritance. These assets must be viewed as part of a constantly changing physical and social context rather than as standalone items. Third, the use of geographic information systems (GIS) in the formulation of controls and projections for the conservation of known heritage, as well as the identification of potential site locations. The fourth GIS is to develop a strategic plan for natural and/or cultural heritage management. GIS can be used to examine existing data that is placed on the historical asset layer, and to detect, compute, and assess protection limits and levels (Ferreira-Lopes & Pinto-Puerto, 2018).

LITERATURE REVIEW

Heritage Village

Heritage village always intersects with sustainable development. Preservation of heritage village itself is able to develop benefits for the people who are in it in the physical, social, economic and cultural aspects (Sukmana & Yuliasuti, 2020). The heritage village must maintain its cultural preservation. Some things that need to be done to preserve culture include providing space for the people in the heritage village to express and develop their culture, so that the heritage value they have will always be there (Ye et al., 2020).

Spatial Change

Spatial planning in heritage areas has characteristics that are adapted to the existing landscape. Spatial change cannot be done freely and must adapt to the heritage landscape (Wang & Gu, 2020). Architectural elements have an important role in the heritage landscape. Architecturally, the value of dwellings in heritage areas has a relationship with both natural and cultural factors. Several architectural elements include building materials and architectural forms. Spatially, apart from architectural elements, heritage areas can be seen and assessed through geographical elements such as climate and landforms. Heritage areas are often found using elements of geography as a basis for constructing buildings (Fu et al., 2021). So far the preservation of heritage villages is still

constrained by funding, although several countries have allocated funding for preservation through their governments (Mu & Aimar, 2022).

RESEARCH METHODOLOGY

Astana Village is located in Gunung Jati District, Cirebon Regency. Cirebon Regency is located in the eastern part of West Java Province. With a geographical location of 108°33 East Longitude and 6°41 South Latitude (see Figure 1). The research location is located in the heritage area according to the regional regulations of Cirebon Regency. Sunan Gunungjati, a member of a walisanga (Islamic preacher) and the King of the Cirebon Sultanate, uses the research area as a pilgrimage tourist attraction (Agustina et al., 2016). The condition of the artifacts in the tomb complex area will be related to changes in space in the area. The tomb complex has become a magnet for regional economic growth.



Figure 1: The Position and Location of Research Area

Location data is obtained from Google Earth in 2006, 2013 and 2020. The information for that year is fairly complete. Field observations are used for the rest of the data. This strategy is used to keep track of regional weather and navigation. From October 3, 2021 to October 9, 2021, field observations were conducted for one week. Observations were carried out by a research team of 5 people in turn. 3 October -5 October 2021 conducted by 2 researchers. On October 6-8 conducted by 2 researchers and on October 9 conducted by one researcher. The research time was carried out for 2 hours every day to record the conditions of the surrounding environment. Recording is done by using a camera and checking with GPS (Global Positioning System). The date is determined by the fact that the study site is a popular tourist destination. Tourists come from all over the world, and there are a lot of them, despite the fact that CoVid-19 is still

a serious disease hazard for researchers. As a result, the date for data collection has been selected.

In the context of spatial analysis, GIS generates a variety of particular maps (Audisio et al., 2017). Documentation is utilized to collect data from a variety of scales using a set of GIS (Geographic Information System) program methodologies, and the results are then merged (Lesvignes et al., 2019). Similarly, in this study, geographical changes are analysed using GIS (Geographic Information System) software, specifically System ArcGIS 10.8. From the same Google Earth map, this software was used to map and evaluate the 2006 Astana Village maps, 2013, and 2020. The stages of analysis carried out are:

- Digitizing the 2006 2013 and 2020 Google Earth maps,
- Comparing the digitized maps for 2006,2013 and 2020,
- Marking the spatial changes that occurred in 2006, 2013 and 2020.
- Checking the results of GPS navigation
- Determine the spatial changes that occurred from 2006,2013 and 2020

ANALYSIS AND DISCUSSION

The graveyard complex has become a draw for local business, which has consequences for the deterioration of ancient artifact quality. The Hisan ceramics that embellish the cemetery's architectural structure are said to be ruined. The cemetery building (Mohammed Abdullah Eben Saleh*) portrays a distinct image of culture, as evidenced by the direct relationship in the form of architecture. Aside from heritage structures, the cemetery complex serves as a pilgrimage tourism site, with facilities available 24 hours a day. Tourism itself is proven can improve community economy (Aji, 2020). Tourists arrive from all around the country and even from other countries. When it coincides with religious seasons, such as the month of Mulud in the Javanese calendar, the number of tourists would increase. Figure 2 shows the quality of the artifacts that are beginning to show symptoms of damage. Ancient pottery is a sign of the Kacirebonan Sultanate's glory, and they depict the message of ancient manuscripts or manuscripts written in Arabic script.



Figure 2: Ancient ceramics become a unique decoration in the grave complex of Sunan Gunungjati which is indicated to be damaged

The outcomes of the study demonstrate that the cover space in Astana Village's heritage area changed from 2006 to 2020. The results of the mapping show changes (see Figure 3). Since ancient times, mapping has been extremely beneficial for administrative, navigational, cultural, and other purposes (Hossain & Barata, 2019). Built-up land cover and the expansion of road networks are shown to cause changes in the mapping. The morphological circumstances of earlier use, whether agricultural land or the way it was used, often shape settlements (Dovey et al., 2020) should be able to communicate with one other. The road network development map enables access in the expanded land cover region, virtually completely surrounding the graveyard complex. Every seven years, there are huge changes in space.

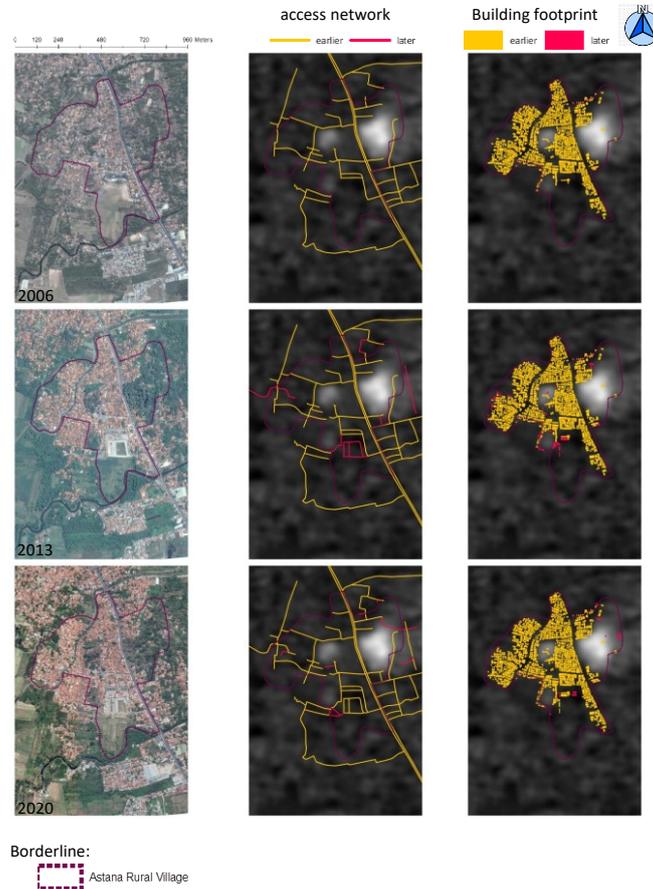


Figure 3: Ancient ceramics become a unique decoration in the grave complex of Sunan Gunungjati which is indicated to be damaged

The Astana Sunan Gunungjati cemetery is threatened by changes in land cover in Astana Village. Many businesses have opened a store in front of the cemetery complex. The building on top of the hill has cracks in the floor. Color and image began to fade from ancient ceramics. For cultural heritage preservation, the construction of the Astana Sunan Gunungjati cemetery must be a primary concern.

The term "Cultural Heritage" refers to all "movable and immovable property of great importance to the cultural heritage of every person...", hence it can be understood as an invaluable resource for the advancement of knowledge. According to the International Council on Monuments and Sites (ICOMOS), heritage is a broad concept and includes the natural and cultural environment. Landscapes, historic locations, sites, and the built environment are all part of it,

and so are biodiversity, collections, ancient and modern cultural practices, knowledge, and life experiences. It is a dynamic reference point as well as a positive instrument for growth and transformation. Each community's unique past and collective memory are irreplaceable and serve as a crucial foundation for development today and in the future (Bleibleh & Awad, 2020).

The Astana Sunan Gunungjati burial complex is rich in history and architecture. Cultural heritage encapsulates and expresses a wide range of values (Yildirim & Turan, 2012). The conservation of monuments is based on an assessment of heritage values. The preservation of historical authenticity and local identity is inextricably linked to architecture. The preservation of all places' cultural heritage, which necessitates universal compliance, is essential for a secure future (Borissova, 2018).

In order to provide future guidance, history highlights challenges and developments concerning historical patterns and protected zones (Yildirim & Turan, 2012). The Astana Sunan Gunungjati tomb complex exemplifies the magnetic appeal of a holy man who disseminated Islam in West Java reaches. There is also evidence of a king who is also a guardian with extensive Islamic knowledge. Tolerance is portrayed in ceramic artifacts from numerous countries, including China, Europe, and Arabia, as well as diverse religions (Vecco, 2010). Cultural diversity is a source of richness for humanity as a whole.

In the field of burial site study, new technological approaches are being developed (Sambuelli et al., 2019). Similarly, the Astana Sunan Gunungjati Cemetery Complex must begin digitizing its records. The creation of a formal computational approach to analyze the risks exposed to such important material assets is required by digital documenting of cultural heritage (Nebbia et al., 2021). Various technology-based planning documentation efforts are used to conserve and maintain Architectural Heritage (AH) and spatial artifacts (Apollonio et al., 2017).

In the perspective of the government, archeological sites have tourism potential, hence a management system for tourism sites must be devised (Mubaideen & Al Kurdi, 2017). Local stakeholders, heritage specialists, and local governments are involved in management, with useful tools to construct a conservation plan (Nebbia et al., 2021). Furthermore, the scientific community must show strong support for conservation activities (Parga Dans & Alonso González, 2018).

International organizations such as UNESCO are offered alternative conservation options. Through an international organization, solutions for the protection and maintenance of the Tomb of the Ancestors have been developed (Alshweiky & Ünal, 2016). As an alternative, the architectural heritage conservation movement can be utilised, due to worldwide recognition and the presence of non-governmental organizations. In emerging countries, when new construction threatens historic regions, conflicts between heritage conservation

developments are more common (Bleibleh & Awad, 2020). Because the area's rapid development caused lasting damage, maintaining a sense of balance was critical (Deghati Najd et al., 2015).

CONCLUSION

Based on the results of research using map digitization, it shows that Astana Village in Gunungjati District, Cirebon Regency, Indonesia has experienced a spatial change. Astana Village in Gunungjati District, Cirebon Regency, Indonesia has witnessed a spatial transformation, according to the results of research employing map digitalization. From 2006 to 2020, significant space changes occur every seven years. The rise in land cover due to sporadic building growth indicates changes in space. It also led to an increase in accessibility. The expansion of the road network, which includes land cover gaps, is an indicator.

The change in space has implications for the pressure on the heritage area of the Astana Sunan Gunungjati tomb complex. Indications of the obstruction of the facade of the tomb building can be seen from the coverage of the building growing along the new road network. This change in space is caused by the attractiveness of Astana Village which is the object of a pilgrimage tourist destination.

Efforts to conserve the environment must be carefully considered. International parties are offered conservation efforts involving a variety of interests and endeavors. Conservation is done to preserve cultural heritage with historical importance as well as the quality of objects that can be used as a source of information in the present and future.

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EROSION RATE ESTIMATION IN KUALA TERENGGANU COASTLINE FOR SUSTAINABLE COASTAL COMMUNITY

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Abstract

Kuala Terengganu is located on the east coast of Peninsular Malaysia and its coastline has been attracting various economic activities such as tourism, agriculture, and food industries. However, studies regarding erosion management for the populated sustainable community in Terengganu remain lacking. The purpose of this study was to quantify coastal erosion using geospatial and statistical approaches. It involved the utilisation of high-resolution SPOT-5 satellite imagery and unmanned aerial vehicles (UAVs) to monitor the coastline changes along Kampung Batu Rakit to Pantai Tok Jembal in Kuala Terengganu. This study proves that the geospatial technique based on high-resolution UAV and SPOT-5 images is suitable for the determination and analysis of coastline erosion.

Keywords: Erosion, Geographic Information System, satellite image, SPOT-5

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INTRODUCTION

Coast is defined as a stretch of land along the sea while coastline describes the boundary between water and land (Li & Damen, 2010). However, it is difficult to identify water level due to its dynamic nature. Coastline also can be defined as the product of natural processes, such as sea level change, waves, tides, and human activities, that happened within a large timescale (Stanchev et al., 2018). The coastal area produces various advantages and has become more important to human activities. As a result, the conversion of coastline areas for economic use becomes a common sight where numerous areas situated nearby the coast have been developed to accommodate tourism infrastructure and activities, such as airports, hotels, and resorts. While such development assists towards a boost in the economy, it also promotes land use conflicts and shoreline erosion. Apart from natural causes like water and wind, past studies suggest that the severity of shoreline erosion is dependent on several factors, including geomorphological properties and land use (Adnan et al., 2021; Muslim, Foody, & Atkinson, 2007).

The National Coastal Erosion Study (NCES) identified that 29% of Malaysia's coastline was in various stages of evacuation due to erosion (Abdul Maulud et al., 2022; Ghazali, 2006). In this regard, the main cause of coastal slope changes comes from the dynamic physical process within the area due to the change in sea level and human activities. The erosion rate is influenced by many factors, such as geomorphological characteristics, monsoon season, anthropogenic activity, and the coastal profile. Coastline is also a dynamic environment element with its important component changes being the sea level rise, shore protection, tidal inundation, land subsidence, and erosion sediment process (Muslim et al., 2011).

In response to the issue, researchers have highlighted the use of remote sensing and Geographic Information System (GIS) technology for mapping the pattern of coastal erosion (Saravanan et al., 2014; Abdul Maulud et al., 2022; Abdul Rahim et al., 2022). Nowadays, geospatial technique can be used to ease the production and preparation of coastal erosion and accretion along the coastline as well as reducing the time needed for such process. Remote sensing provides high-resolution data image systems like Worldview Data with 0.4 m resolution and SPOT with 1.5 m resolution. The advantage of using the geospatial technique lies on its ability to evaluate changes and the relationship between coastal slope and rate of coastline erosion. This highlights the prominence of utilizing the geospatial technique to classify and analyse coastal slopes, rates of erosion, and patterns within a research study area, particularly following its ability to conduct efficient surveys and digital mapping.

RESEARCH BACKGROUND

Coastline refers to the intersection between the land and water surface at a selected tidal elevation level (Adnan et al., 2021; Mohd et al., 2021). However,

the process of selecting water surface is difficult due to its dynamic environment and important component, such as sea level rise, erosion process, tidal, and land. The mean high and low water levels are also useful to specify the sea level rise based on the mean sea level. This study area is important for many economic activities, including the tourism, agriculture, food, and fisheries industries. It also offers a huge contribution to the industrial economy at the state and country levels.

According to Ariffin et al. (2018), at least 60% of sand beach across the world is classified as coastal erosion areas. The global coastal erosion is mainly triggered by natural phenomena, such as wind and wave, that commonly occurred during monsoon season. Ultimately, coastal erosion can cause severe damage to nearby infrastructure like buildings, hotels, chalets, and roads. In the context of Malaysia, the local erosion problem mainly owes to the dynamic process, changes in sea level, and human activity (Chalabi et al., 2006). The NCES reported that 30% of Malaysian coastal areas are threatened by erosion (Ghazali, 2006). Furthermore, the National Coastal Vulnerability Index (NCVI) classifies coastline erosion into three categories: (1) shorelines that are currently in the state of erosion where shore-based facilities are in immediate danger of being damaged; (2) shorelines that are eroding at an alarming rate whereby public properties or valuable agricultural lands are threatened in the last 5 to 10 years; and (3) undeveloped coastlines that are subject to erosion but with only minor or no economic losses if left unchecked. Additionally, researchers indicated that Kampung Mengabang Telipot is one of the areas extremely affected by coastal erosion with approximately 65 residential are situated less than 5 meters from the danger zone (Husain, 2017; Razak, 2015).

Furthermore, the coastal erosion at Kuala Terengganu has been aggravating every year; however, studies regarding the erosion management system at Terengganu are still lacking (Ariffin et al., 2018). Hence, the application of unmanned aerial vehicles (UAVs), Geographic Information System (GIS), and remote sensing can assist in measuring and analysing this phenomenon to better understand the erosion problem. The geospatial technique has been widely used to monitor coastal erosion and accretion area. Such technique also reduces the time needed to obtain relevant data while having the capability of providing reliable quantitative output.

METHODOLOGY

This study involved the administration of 4-phases research that looked on the relationship assessment of erosion rate at Kuala Terengganu coastline using the geospatial technique. The research objective was achieved using data obtained from the ground, UAV image, and high-resolution SPOT-5 satellite imagery data. Figure 1 shows the flowchart of the methodology employed in this study. It began with Phase 1, which was the selection of the study area that was related to the

coastline changes in Kuala Terengganu. Phase 2 involved the acquisition of SPOT-5 satellite imagery data for the year 2014 from the Malaysian Space Agency (MYSA) as well as UAV image for the year 2018. This study quantified the erosion rate of coastline using the geospatial technique from these two images.

Phase 3 involved the calculation of erosion rate based on the NCES techniques (Adnan, Abdul Rahim, Mohd and Maulud, 2021; Adnan et al., 2021) for the quantification of physical and economic factors. Equation 1 was used to derive the erosion rate and categories (as shown in Table 1).

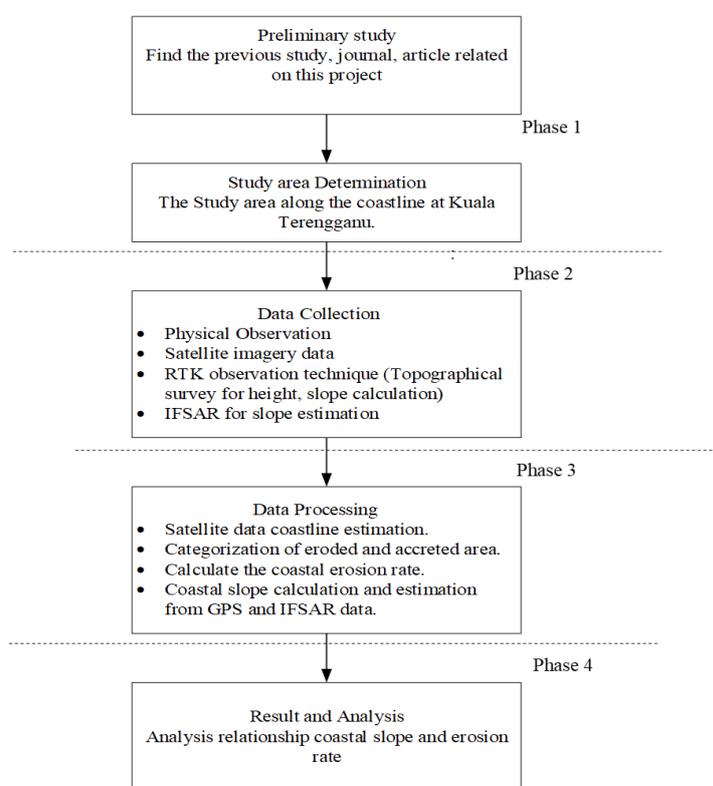


Figure 1: The flowchart of research methodology

The calculation of erosion rate is based on the NCES techniques (Adnan, Abdul Rahim, Mohd and Maulud, 2021; Adnan et al., 2021) which involves the quantification of physical and economic factors as in Phase 3. The Equation 1 below involved in order to derive erosion rate and categories. Meanwhile the erosion categories as shown in Table 1.

Total Score = Physical Parameter Score

$$\times \left(\begin{array}{c} 0.1 \times \textit{Land Use Rating} \\ + \\ 0.4 \times \textit{Buildings and Establishments Rating} \\ + \\ 0.3 \times \textit{Public Utilities and Infrastructure Rating} \\ + \\ 0.2 \times \textit{Public Facilities and Amenities Rating} \end{array} \right) \quad (\text{Eq.1})$$

Table 1: Erosion rate category according to NCES (2015)

Erosion Category	Description
K1 (Critical)	The rate of more than 4 m/year with generally fairly dense human settlement, with some commercial/industrial activities
K2 (Significant)	The rate of between more than 1 m/year but less than 4 m/year with generally sparsely-populated area
K3 (Acceptable)	The rate less than 1 m/year with generally no human settlement and minimal agricultural activities

RESULT AND DISCUSSIONS

The results of this study were generated based on on-site physical observation that was done between 4 and 5 February at Kuala Terengganu coast. The purpose of the observation was to identify the geomorphology characteristics that began from the coastal of Kampung Batu Rakit to Pantai Tok Jembal, with a distance of approximately 8.5 km. There were about 25 chainages collected along the coastline. Each control station was collected through five (5) series of observation lines with 5-meter intervals (Figure 2). The geomorphology of this coastal area was classified as sandy coast. The east coast facing the South China Sea, specifically Terengganu, experienced high wave energy during the Northeast Monsoon (Daud et al., 2016).

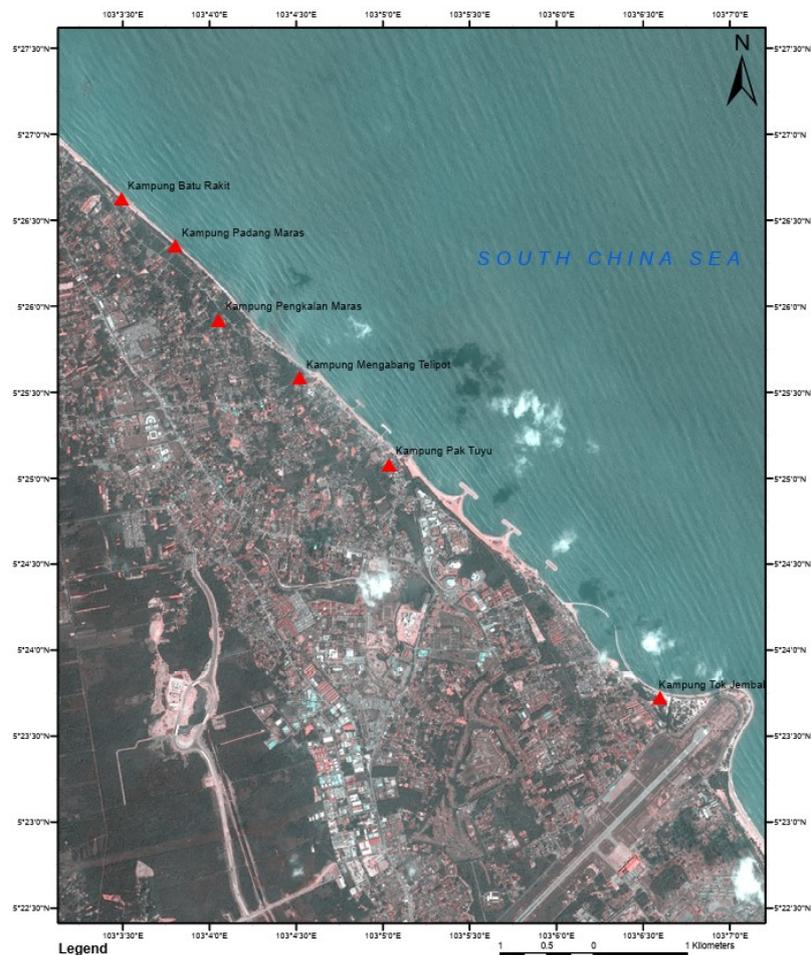


Figure 2: Location site observation from SPOT-5 (2014)

A study by Jones (2005) stated that the erosion rate caused by sea-level rise is increasing approximately 2.5 times higher for the next 100 years. For example, investigation on the sea-level rise at the shoreline of Klang, Selangor indicated that almost all existing village settlements at Pulau Ketam will be affected by a 0.53 m increase of maximum water level rise in 2100 (Mohamad et al., 2018).

However, it is important to note that coastal structures may have a localized impact on accretion or erosion changes, depending on shoreline trends (Romine et al., 2013; Ling et al., 2019). Table 2 shows the critical areas that were derived by coastal erosion, namely Pantai Tok Jembal, Kampung Pak Tuyu, Kampung Mengabang Telipot, Kampung Pengkalan Maras, Kampung Padang Maras, and Kampung Batu Rakit (Figure 2). The results revealed that Pantai Tok

Jembal has the largest erosion area that spans across 11.746 hectares with a length of 3387.397 m. Whereas, the smallest erosion area is located at Kampung Pak Tuyu with 0.118 hectares.

Table 2: Area derived from SPOT-5 2014 and UAV image 2018 based on the erosion table

No	Location	Coastline Length (m)	Area eroded (Hectare)
1	Pantai Tok Jembal	3387.397	11.746
2	Kampung Pak Tuyu	161.983	0.118
3	Kampung Mengabang Telipot	1453.857	3.4798
4	Kampung Pengkalan Maras	1161.521	0.5361
5	Kampung Padang Maras	798.387	0.2905
6	Kampung Batu Rakit	1231.819	0.6489

Table 3 summarises the area of erosion in Kuala Terengganu. The most critical area was K1, which contained 12 zones from a total of 33 erosion areas. This was categorised based on the total score of the NCES (2015) report, which consisted of three categories: critical, significant, and acceptable. The first category (critical) refers to erosion areas that will cause significant loss of property and land. In this study, the critical area comprised a total of 15.0829 hectares along the 4627.665 m coastline from Pantai Tok Jembal to Kampung Pengkalan Maras. An increase of 0.72 m is projected by the end of the century; hence, salinity contour will intrude further up to 9 km into the river as the deltas are low-lying areas (Pereira et al., 2019).

Our results also demonstrated the significance of K2, which comprised 9 areas, with a total score of more than 5 and less than 12. The K3 area, which consisted of 12 areas, was considered as an acceptable area with a total score of less than 5. However, the destruction of mangrove forests was observed along with the report of low awareness amongst the coastline community (Aisyah et al., 2015). Additionally, K3 recorded a total of 825.717 m² eroded area with a length of 258.419 m (Table 3).

Table 3: Summary for area of erosion in Kuala Terengganu

Classify	No	Coastline Length	Area (Sq. meter)	Condition Level
K1	(12)	4627.665	150829.886	Critical
K2	(9)	340.690	1214.996	Significant
K3	(12)	258.419	825.717	Acceptable

Figures 3 and 4 present the analysis of erosion length category as well as the erosion area (m²) for the Terengganu coastal, respectively. As shown in Figure 3, K1 (critical category) had the highest number of categories with a length of 4627.665 m along the coast of Kuala Terengganu. The second highest category was recorded by K2 (significant category) with a length of 340.69 m, followed by K3 (acceptable category) with a length of 258.419 m. Tan et al. (2007) observed that breakwaters create a calmer water surface at the shoreward side. This proves that Terengganu is one of the states experiencing serious erosion on the East Coast of Malaysia. Therefore, it is crucial for stakeholders to take necessary mitigation and prevention actions against the problem. However, as the coast of Terengganu is a tourist attraction area, beach nourishment was conducted recently, which requires maintenance every three to five years. This technique is considered a “hold the line” strategy to maintain the recreational beach (Beaven et al., 2020).

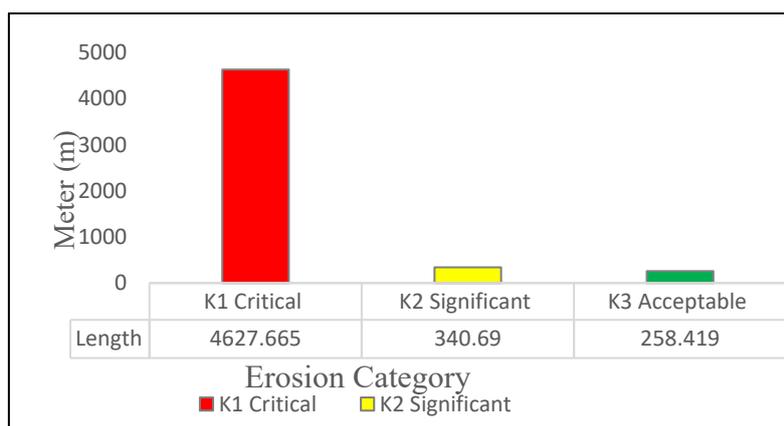


Figure 3: Erosion length of coastal Terengganu.

On the other hand, Figure 4 indicates that the K1 category contributed about 88.5% of the total erosion area 150829.89 m². The K2 category of erosion was approximately 1214.99 m², followed by the K3 category with a total area of 825.72 m².

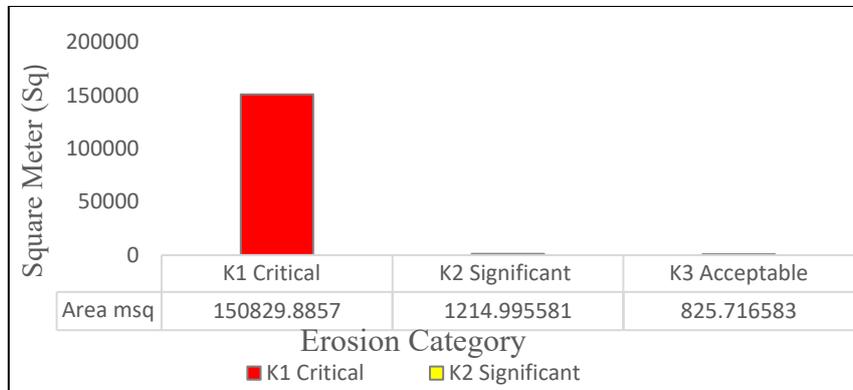


Figure 4: Erosion area (sq.) for Terengganu coastal

Figure 5 portrays that both Pantai Tok Jembal and Kampung Mengabang Teliput had a high value of erosion with rates ranging from -5.147 to -7.107 m/year. Most of the coastal areas were represented by sandy coast. Furthermore, the rate of erosion was highest due to anthropogenic activities, such as land reclamation and a new airport extension. Hence, the coastline changes in shape and size from year to year in response to the wave, current, tide, and monsoon season.

The second-highest erosion rate was recorded at Kampung Mengabang Teliput with -5.147 m/year. It showed that erosion or accretion occurred on the backshore and the sand ridges, which was caused by the higher level of waves during the Northeast Monsoon. Lee et al. (2012) discussed about the installation of geotextile-synthetic tubes for shoreline management at Teluk Kalong and Pantai Batu Buruk, Terengganu. Such mitigation measure was conducted along the coastline by constructing the water break. Meanwhile, Kampung Pengkalan Maras, Kampung Padang Maras, and Kampung Batu Rakit recorded an erosion rate of 1.063 to 1.384 m/year. This highlights mangroves as the most suitable vegetation species to minimise the effect of mighty tidal waves (Kathiresan et al., 2005). However, these areas are far from anthropogenic activities and mitigation measures must be conducted to maintain the coastline. Additionally, local participation is considered as an important key determinant for adaptation (Betzold et al., 2015).

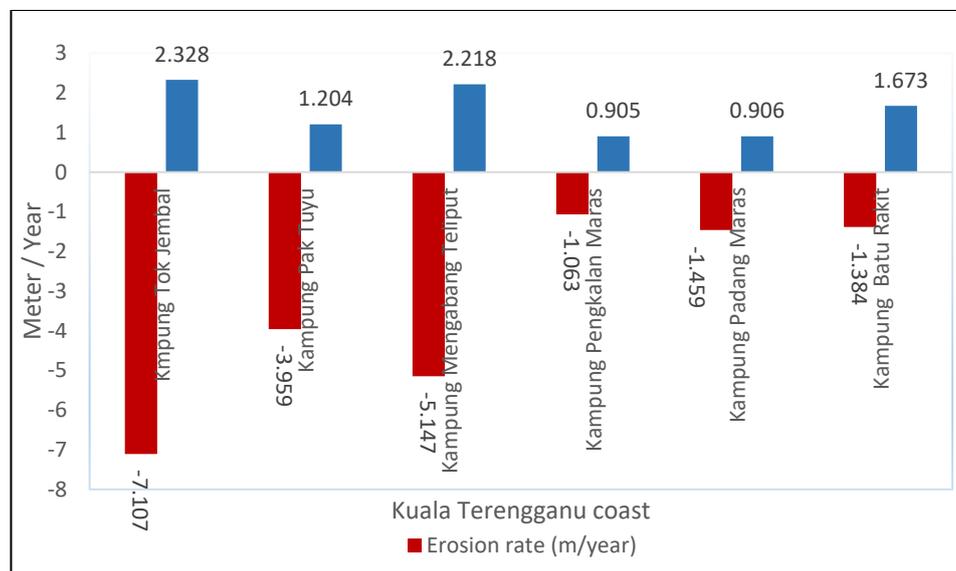


Figure 5: The area for the erosion and accretion (m/year) rate along identified Kuala Terengganu areas.

Moreover, the highest accretion rate was recorded at Pantai Tok Jembal with 2.328 m/year, followed by Kampung Mengabang Telipot with a slightly lower rate of 2.218 m/year. These areas have development activities occurring at its surrounding area. Accumulated sediment successfully stabilized the shoreline and provided a suitable condition for natural mangrove growth (Das et al., 2020). The on-site observation further revealed that local stakeholders have been taking their own actions and initiatives to mitigate erosion. It included a new mangrove rehabilitation using an ecoengineering coastal protection technique to restore the endangered mangroves. Lastly, Kampung Pengkalan Maras and Kampung Padang Maras showed the lowest accretion rate with less than 1 m/year. However, adverse physical and environmental impacts are expected at the adjacent shoreline and downdrift areas.

CONCLUSION

Anthropogenic factors or human activities such as land development and reclamation along the coast may have an impact towards the erosion rate and vertical coastal slope changes. Our results showed that the most critical area (K1) of erosion category in Kuala Terengganu consisted of 12 areas from the total number of 33 known areas. The highest critical erosion area was represented by Pantai Tok Jembal. Overall, this study revealed 15.0829 hectares of critical erosion areas that stretched along the 4627.665 m coastline from Pantai Tok Jembal to Kampung Pengkalan Maras. The energy from the waves is believed to

have directly washed the surface area of the beach and swept away the white medium sand, causing Kampung Batu Rakit to be the area with the lowest erosion. Shorter width and flat slope of the beach also make the erosion to become more aggressive with the weak waves hitting the shore. This study also proved the suitability of using satellite imagery data to estimate coastal erosion changes. Appropriate measures for the mitigation and prevention of coastal environment should be taken by the related authorities to maintain the livelihood and living sustainability of the coastal surrounding communities.

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IMPACT OF LAND USE ACTIVITIES ON THE HYDROLOGICAL REGIME IN THE JUNJUNG RIVER BASIN, PENANG ISLAND, MALAYSIA

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Abstract

Land use activities in the river basin have a very significant negative impact on the hydrological regime, especially surface runoff. The study of the impact of land use activities on the hydrological regime in the Junjung river basin aims to analyse changes in the rate of surface runoff due to current land use changes and land use planning in 2030. To achieve the goal of this study, curve number analysis was used as a determinant of hydrological parameters in the development of HEC HMS modelling in the study basin area. The results of the study found that the current land use in 2020 recorded an average curve number value of 85.77 and then increased to 86.36 in 2030 due to land use changes in 2030. The change in the value of the curve number has had an impact on the hydrological regime that is surface runoff because there is an increase in the percentage of impervious areas from 22.84 percent in 2020 to 31.14 percent by 2030. The rate of change in runoff is shown through the simulation of the peak flow rate that occurs according to the frequency of the event, which is between 0.7 to 4.9 percent. The results obtained from this study can be used as fundamental data for advanced studies of flood control and management for better sustainable flood risk management.

Keywords: Land use, Runoff, hydrological regime, Curve Number, HEC-HMS

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INTRODUCTION

Land use activities are anthropogenic factors that directly impact changes in the hydraulic regime of rivers, especially surface runoff. To date, changes in land use activities continue to occur to meet human needs and demands. Land use change is a continuous process, which includes all types of development on land such as agriculture, commercial, industrial, residential, urban and others. Changes in land use activities occur as a result of the changing needs of residents to carry out specific activities driven by physical, economic and social factors. Uncontrolled and excessive land use activities will have serious impacts on global warming, sea level rise, carbon cycle and changes in the hydrological regime. Land use activities create open or exposed surface areas without any canopy cover that can contribute to the increase in surface runoff entering the drainage system (Ismail, 2013; Felix Tongkul, 2000; Mustaffa et al., 2023). The increase in surface runoff is seen as significant with changes in land use activities that occur in a river basin area. For example, an increase in the area of impermeable surfaces can result in an increase in surface runoff capable of carrying various pollutants into the river system, as well as causing changes in the river's capacity to handle floodwaters, which can have an impact on the balance of the river system, especially during rainfall (Azid et al., 2015; Toriman et al., 2015; Saad et al. 2023). The imbalance of the river system can lead to various negative implications such as pollution, property damage, sedimentation, and flooding. Therefore, this study was conducted to identify the impact of land use activities on changes in the hydrological regime, i.e., surface runoff in the Junjung River Basin, and to propose mitigation measures that need to be taken to ensure that the increased surface runoff does not harm the residents around the Junjung River Basin area.

LITERATURE REVIEW

Land Use

Land use is often associated with human actions directly or indirectly in determining the landscape pattern on the land (Meyer et al., 1994). The spatial aspect of land use refers to changes in land size or area, whether it undergoes any changes or not. Meanwhile, from a temporal aspect, land use is viewed through a period of time (Wolman and Fournier, 1987). Land use activities refer to human determination, management and transformation of land based on human needs including basic needs, socio-economic development and so on (Bajocco et al., 2012; Pijanowski & Robinson, 2011; Pourebrahim et al., 2015; Zhao et al., 2017). Determining land use activities is a complex and dynamic process, but it can be controlled through certain management practices (Pei & Pan, 2010). Optimal land use, multiple objectives and maximum output are the basis for land use activities in an area (Putman, 1975). Land use change is a result of human influence on the landscape that occurs due to significant modifications in the ecosystem (La Mela Veca et al., 2016). In general, the developmental zones in the Junjung River area

in Penang mainly concern the existing built-up areas that have amenities such as transportation, infrastructure, and utilities, as well as urban sectors with a population growth rate of 2%.

Runoff

Generally, stormwater runoff is defined as surface water flow resulting from storm events, and can contribute to large volumes of water that can lead to disasters for both life and water resources if not managed properly (Amatya et al., 2022; Ismail, 2013). The process of stormwater runoff is essentially the same as the water cycle in hydrology. However, the term "stormwater runoff" is used when surface water runoff, which should be absorbed by plants and infiltrate into the ground or return to the atmosphere, is diverted through impermeable surfaces, causing an increase in river discharge. Surface runoff is defined as water that runs off in areas that lack vegetation, have thin soil cover for infiltration processes, and semi-arid areas with high rainfall (Jones, 1997; Ranjan & Singh, 2022; Jaafar et al., 2010). Furthermore, the rate of urbanization has altered the hydrograph entity in terms of peak flow frequency (Hashim & Ahmad, 2007).

RESEARCH METHODOLOGY

Research Location

The state of Penang is located in the northern part of Peninsular Malaysia. It is divided into two areas, the island and the mainland, and has five main zones. For the island area, there are two main zones, namely the Southwest Zone and the Northeast Zone. As for the mainland area, Seberang Perai is divided into three main zones, namely the North Seberang Perai Zone, Central Seberang Perai Zone, and South Seberang Perai Zone. Generally, the study was conducted in the Junjung Basin in the Central Seberang Perai Zone, Penang Island. Junjung River is a sub-catchment of Jawi River, which flows through the southern part of Seberang Perai through the town of Simpang Ampat. Junjung River is also used for irrigation canals for rice cultivation. The main river of Junjung River is in Kampung Jawi, near the border of Kedah State. The area of the basin is approximately 154.8 km² and it consists of the main river and several sub-channels such as Cempedak, Junjung Mati, Batu Tiga, Perangin, and Tok Subuh. Over the past 20 years, the Junjung River Basin has undergone rapid development, converting agricultural land into industrial and residential estates. Junjung River is the main river of Jawi River, which originates from Bukit Batu Belah in the eastern part of Penang Island. The length of the main flow of Junjung River is 18.2 km. Figure 1 shows the extent of the basin and the main branch rivers. The average annual rainfall depth in the study area is approximately 2400 mm, ranging from 1800 to 3000 mm.

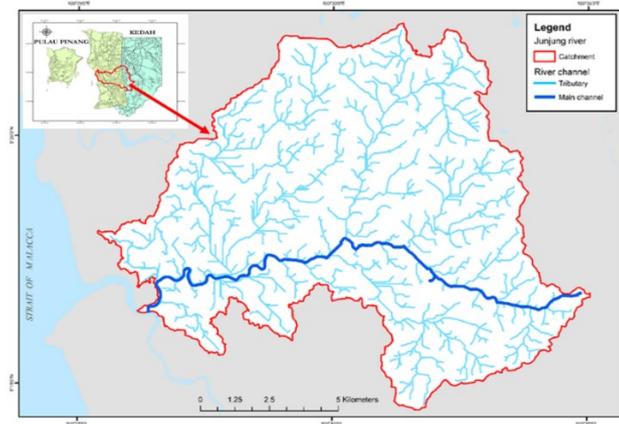


Figure 1: Main River Junjung, Malaysia

Land Use Analysis

The analysis of land use change data involves various GIS technical applications used to assess the trend of land use change in the Sungai Junjung Basins. A map overlay approach is used to analyse changes that occur throughout the years, including relative percentage changes from 2010 to 2020, and from 2020 to 2030. ArcGIS software simplify the analysis process to determine changes according to various land use categories. The land use map for the year 2020 in JPEG format was first recorded in the Rectified Skew Orthomorphic (RSO) projection format, and then digitized according to the land use category of the studied area. The 2030 land use map from the Penang RSN report in PDF format which was then converted to file format using ArcGIS software to facilitate the map overlay technique. Figure 2 shows the overlay process performed using functions provided by ArcGIS software.

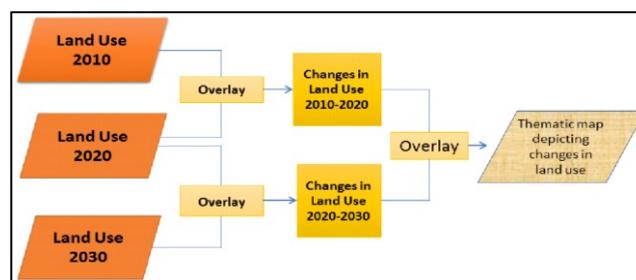


Figure 2: Process of Land Use Map Overlay for 2010 – 2030

Hydrological Data Analysis

Development of Thiessen Polygon

Rainfall data is the fundamental data used in this study to determine changes in hydrological regime, especially changes in discharge rates that occur in the Junjung River Basin. However, in this study, there is only one rainfall station located within the basin area, namely the Simpang Ampat River station. Therefore, to continue this study, seven rainfall stations closest to the basin area were used to determine the annual rainfall amount in the Junjung River Basin. Table 1 show the selected rainfall station locations to represent the Junjung River Basin. Furthermore, the Thiessen polygon method and the availability of data were used to estimate the amount of rainfall that influences the Junjung River Basin area according to the selected rainfall stations. The Thiessen polygon method is a better method than the arithmetic computation of rainfall in an area based on rainfall stations (Chow et al., 1988; Abdul Maulud et al., 2021). This method uses the GIS-Thiessen polygon command found in the CWRW Vector Extension. The polygons formed are based on lines that have the same distance between the climate observation stations. The total rainfall for the entire Junjung River Basin area is calculated using equation [1]:

$$P = [Ps1 * A1 + Ps2 * A2 + \dots + Ps8 * A8] / At [1]$$

where:

P = Total rainfall of the area (areal precipitation), At = Area, Ps1, Ps2...Ps8 = Rainfall for each station, A1, A2...A8 = Area of each Thiessen Polygon.

Table 1: List of Rainfall Stations and Data in Junjung River Basin

No.	Station Name	Longitude	Latitude	Data Availability
1	Sungai Simpang Ampat	100°28'50.00"E	5°17'38.00"N	1989-2019
2	Ladang Batu Kawan	100°25'50.00"E	5°15'25.00"N	2000-2019
3	Sungai Bakap	100°29'48.00"E	5°12'57.00"N	2000-2019
4	Terap at Kedah	100°37'45.00"E	5°16'55.00"N	2011-2019
5	Komplek Prai	100°23'30.00"E	5°22'55.00"N	2000-2019
6	Kolam Air Cheruk To' Kun	100°28'27.00"E	5°20'59.00"N	2000-2019
7	Kampung Dusun at Kedah	100°33'35.00"E	5°23'5.00"N	2009-2019
8	Kolam Air Bukit Berapit	100°28'32.00"E	5°22'32.00"N	2000-2019

Development of Intensity-Duration-Frequency Curve (IDF)

The development of IDF frequency curve is a graph that shows the variable intensity of rainfall against the probability of possible events. The IDF curve is constructed with the aim of estimating rainfall conditions in the past to make projections for the future (Mukhtar et al. 2020; Suhaimi et al., 2020). The IDF curve was developed using the annual maximum rainfall collected (Ariff, Jemain & Abu, 2015). The IDF curve considered a generalized extreme value (GEV)-

Max (kappa specified, L-Moments) distribution using Hydrognomon software (Houessou-Dossou et al., 2019). The development of the frequency curve (IDF) for rainfall was carried out for the return period of ARI 2-, 5-, 10-, 20-, 50-, 100- and 1000- years. Furthermore, the intensity of rainfall in the Junjung River Basin is calculated using the Thiessen weight method (Thiessen, 1911) using equation [2].

$$I_{basin} = \frac{\sum_{i=1}^n I_i W_i}{\sum_{i=1}^n W_i} \quad [2]$$

Where I_{Basin} = Intensity, I_i = Interval value and W_i = Area

Development of the HEC-HMS Model

The HEC-HMS model was used in the Junjung River Basin to simulate rainfall design for various frequencies and durations. The basin consists of five main sub-basins: Machang Bubok, Junjung hulu, Chempedak, Junjung Mati, and Junjung Downstream. The HEC-HMS modelling was used to generate synthetic hydrographs for the ARI 2-, 5-, 10-, 20-, 50-, 100-, and 1000-year recurrence intervals for the effects of land use changes in 2020 and projected changes in 2030. The Hydrologic Modelling System (HEC-HMS) is designed to simulate hydrological processes in dendritic river modelling systems. This software considers various hydrological elements such as infiltration, unit hydrograph, and hydrologic routing and is developed for various geographical conditions to solve hydrology problems. In this study, the SCS-CN method was used to simulate rainfall losses due to its simplicity, applicability, and wide usage for various basin conditions. The SCS-CN method is represented by CN, which consists of a combination of hydrological soil group, land use types, and type of land cover. Soil structure is an important spatial data in determining Curve Number (CN), and each soil type has a different infiltration rate. The cumulative CN value with the weightage area factor equation [3] and CN value for land use soil and land use type refer to United States Department of Agriculture (USDA, 1986).

$$CN_{aw} = \frac{\sum_{i=1}^n (CN_i \times A_i)}{\sum_{i=1}^n A_i} \quad [3]$$

where;

CN_{aw} = Cumulative Curve Number, CN_i = Curve Number for Area A_i and $\sum A_i$ = Basin Area

Conversion of rainfall into runoff is using Unit Hydrograph SCS-CN. It needs to have main parameters; time of concentration (T_c), storage constant (R) and baseflow. Formulae for each parameter are shown as in Table 2. Many

methods can be used to determine the time of concentration, T_c based on basin condition such as forest, rural and urbanized. Initial estimation of concentration time is based on HP27. Storage constant calculated based on hydrograph where the inflection points of falling limb hydrograph divided with derivative of discharge, Q of the time. Baseflow estimation that needs to calculate the whole hydrograph design using Hydrological Procedure No. 27 (2010) by DID, Malaysia.

Table 2: Equation Used for Hydrology Model

Equation	Formulae	Description
(1) Time of concentration, T_c	$T_c = 2.32A^{-0.1188}L^{0.9573}S^{-0.5074}$	A = basin area (km ²); L = length of flowpath (km);
(2) Storage constant, R	$R = 2.976A^{-0.1943}L^{0.9995}S^{-0.4588}$	S = basin slope (m/km); R = storage constant;
(3) Basin baseflow, Q_b	$Q_b = 0.11A^{0.85889}$	A = basin area (km ²); L = longest flow path in river basin (km); S = basin slope (m/km); Q_b = basin baseflow;

RESULT AND DISCUSSION

Analysis of Land Use Changes

The land use analysis in this study covers changes in land use classification from 2010 to 2030 for two river basins, and considers the classifications adopted by various government departments such as the Department of Agriculture Malaysian, PLANMalaysia@Penang, Penang Town, and Rural Planning Department. Thirteen land use categories were identified, including aquaculture, water bodies, orchards, rubber, forest, swamp forest, built areas, oil palm, other crops, transportation, animal husbandry, mining, and vacant land. More detailed classification results for land use category and the percentage of area they cover are presented in Figure 3. The Figure 3 illustrates the land use trends in the Junjung River Basin area from 2010 to 2030. The study identifies 13 land use categories, namely aquaculture, water bodies, orchards, rubber, forests, swamp forests, built areas, oil palm, other crops, transportation, animal husbandry, mining, and vacant land. In 2010, rubber was the largest land use category occupying 44.39 km² (28.67%) of the area, followed by built areas covering 34.67 km² or 22.4% of the studied area. Forests, swamp forests, and other crops came next with 15.13 km² (9.77%), 13.17 km² (8.51%), and 10.21 km² (6.6%), respectively. The remaining categories were oil palm, transportation, orchards, mining, and water bodies. The land use in the region started to change in 2020 as construction activities expanded, and built-up areas began to dominate, occupying 45.33 km² or 29.28% of the land area. The area under rubber decreased by 11.71%, from 44.39 km² in 2010 to 26.26 km² in 2020. Other crops rose in

importance, taking up 15.51 km² (16.6%) by 2020. Land use for transportation and oil palm cultivation also increased, accounting for 13.1 km² (8.46%) and 10.82 km² (6.99%), respectively, in 2020. The area under forests and swamp forests declined to 13.86 km² (8.95%) and 10.63 km² (6.87%), respectively. Water bodies, orchards, and mining also decreased in 2020, occupying 5.82 km² (3.76%), 3.87 km² (2.5%), and 3.29 km² (2.13%), respectively. On the other hand, aquaculture, animal husbandry, and vacant land categories increased in land use, occupying 1.06 km² (0.68%), 2.85 km² (1.84%), and 1.41 km² (0.91%), respectively.

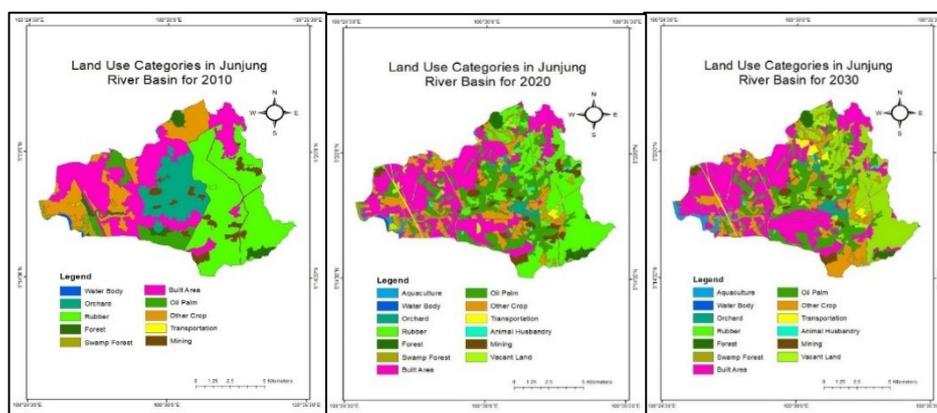


Figure 3: Classification for Land Use Category at Junjung River Basin

In line with the vision of Penang for development into the future, the pattern of land use will be expected to change further towards the year 2030. From the results of this analysis, the area under agriculture can be expected to decrease. In particular, the area under rubber cultivation is expected to decline to 11.14 km², accounting for only 7.2% of the land area in 2030. Nonetheless, some other aspects of agriculture will likely experience expansion. The area planted with oil palm could reach 12.3 km² (7.94%) in 2030, while aquaculture would take up 2.17 km² (1.4%) of the total land area, animal husbandry 3.59 km² (2.32%) and miscellaneous crops 17.81 km² (11.51%). According to the trend, land use for various other categories would decline by 2030. The area under forests would be reduced to 10.56 km² (6.82%), that of swamp forest to 7.08 km² (4.57%), water bodies to 4.81 km² (3.11%), orchards to 1.64 km² (1.06%), vacant land to 1.27 km² (0.82%) and mining areas to 1.05 km² (0.68%). The built-up area would continue to expand from 2020 to 2030 as the entire area develops as a whole, taking up 63.81 km², representing 41.22% of the land area in 2030. In tandem with this development, infrastructure for transportation would increase, accounting for 17.57 km² or 11.35% of the land area in 2030.

Rainfall Analysis

Determining the annual rainfall amount in an area using the Thiessen polygon method requires information on the area's extent and rainfall data representing each formed polygon. This study used eight rainfall stations located within and around the Junjung River Basin area to obtain the annual rainfall amount in the basin area. Table 3 show the results of the rainfall influence area for each selected rainfall station, as well as the thematic map of Thiessen polygons for the Junjung River Basin.

Table 3: Thiessen Weightage Factor at Junjung River Basin

No	Station	Area (km ²)	Thiessen Weightage Factor, w
1	Sungai Simpang Ampat	71.1	0.535
2	Ladang Batu Kawan	9.0	0.068
3	Kolam Air Bukit Berapit	0.6	0.005
4	Sungai Bakap	7.7	0.058
5	Terap at Kedah	8.4	0.063
6	Komplek Prai	0.9	0.007
7	Kolam Air Cheruk To' Kun	10.1	0.076
8	Kampung Dusun at Kedah	25.1	0.189

Next, the Intensity-Duration-Frequency (IDF) curve is the basis for designing any structure, especially those involving drainage systems. The IDF curve is plotted based on the recurrence interval of events of 2, 5, 10, 20, 50, 100, and 1000 years. The IDF curve is then plotted with rainfall duration (minutes) on the horizontal axis and rainfall intensity (mm/hour) on the vertical axis. Figure 4 IDF curve in the Junjung River Basin according to the recurrence interval of events that have been determined using the Thiessen polygon method.

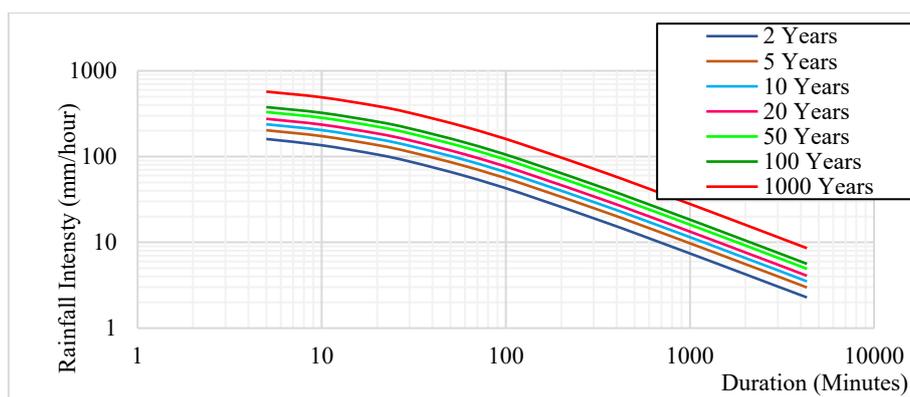


Figure 4: IDF Curve with Thiessen Polygon in Junjung River Basin, Malaysia

Soil Hydrology Groups

Hydrological soil group has been identified through spatial land use data from the Department of Agriculture Malaysia. There are three groups of soil hydrology dominated at both of the basin which is B, C and D. Based on the information, the Junjung River Basin is dominated by soil hydrology class D (75,361 km²) which is a type of sand, clay-clay and concentrated in the upstream area of the basin. This type of soil has a low infiltration rate and has the potential to produce high runoff especially the maximum level of soil saturation especially during the rainy season. While the soil hydrology class C (40,949 km²) with its distribution is concentrated in the downstream area of the basin. This type of soil has the characteristics of clay-clay with usually high with a percentage of clay. It also has a moderately low infiltration rate. For hilly areas at the headwaters of the basin, the hydrology class of soil B (15,358 km²) is clearly visible where this type of soil has shallow-loess, sandy and easily eroded properties.

Curve Number Analysis

The Curve Number analysis is based on Technical Release 55 (Soulis & Valiantzas, 2012). The CN value is produced after combining the land use data set in the river basin area. The curve number values in the river basin vary, and the estimated flow is usually identified through the curve number that can represent the entire basin area. Figures 5a and 5b show the gridded curve numbers for the Junjung River Basin in year 2020 and 2030. Figure 5a shows the cumulative curve number in 2020 is 87.15, while in 2030, due to land use changes (Figure 5b), the curve number increases to 87.71. This indicates the possibility of an increase in the magnitude of flow, especially for peak flow at each rainfall design for the next 10 years. Curve number analysis is essential to understand the future changes in land use. The increase in the impermeable area can be seen with the increase in the curve number value. The curve number is then used in the HEC-HMS model to represent the land use changes scenario. The rainfall design to be applied should cover the entire time of concentration (T_c) calculated for the whole basin area. Therefore, designated rainfall events can be greater than the basin's time of concentration; some suggest using 3 to 4 times the time of concentration (County, 1990), while most of the design peak flows used 24 hours or the same as the time of concentration (Levy & McCuen, 2001). The results of the hydrological parameters for the model developed for the current land use scenario in 2020 and the land use scenario in 2030 are shown in Table 4.

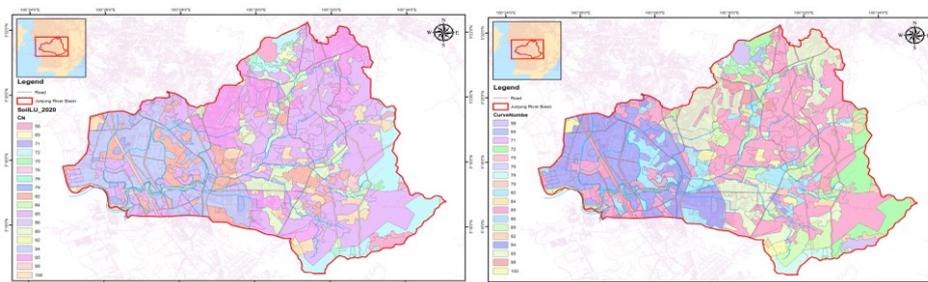


Figure 5a and 5b: Curve Number for Year 2030 Junjung River Basin

Table 4: Hydrology Parameters at Junjung River Basin

Sub-basin	Losses				Transform		Baseflow
	Curve Number (CN)		Impermeable Area (%)		Conc. time (hr)	Storage constant (hr)	Initial discharge (m ³ /s)
	2020	2030	2020	2030			
<i>Machang Bubok</i>	86.07	86.51	19.05	25.93	8.86	10.19	2.0
<i>Junjung Upstream</i>	81.97	82.71	7.52	15.14	6.94	7.76	2.16
<i>Chempedak</i>	82.20	83.84	10.53	22.25	4.66	5.65	1.29
<i>Junjung Mati</i>	89.27	89.34	39.79	47.42	10.22	11.40	2.99
<i>Junjung Downstream</i>	89.34	89.38	37.29	44.96	23.14	26.06	0.97

Model Calibration and Validation

According to received dataset, it was identified that there was no river discharge data available in Junjung River Basin. Hence, to validate the developed model, comparative analysis of peak flow conducted with the Hydrological Procedure No. 27 (DID, 2010).

Table 5: Validated Peak Flow for Junjung River Basin

Sub-basin	Method	Validation date		
		22.11.2015	3.9.2017	14.4.2018
Muara Sungai	HP27	102.8	169.9	81.5
Junjung	HEC HMS	81.8	120.5	43.1
Junjung U/S	HP27	30.5	51.1	25
	HEC HMS	22	31.2	9.6
Junjung Mati	HP27	32.3	53	25.7
	HEC HMS	29.6	45	19.1
Junjung D/S	HP27	7.3	10	4.9
	HEC HMS	5.4	7.4	2.8
Chempedak	HP27	21.9	35.1	17.6
	HEC HMS	16.6	22.5	7.2

Sub-basin	Method	Validation date		
		22.11.2015	3.9.2017	14.4.2018
Machang Bubok	HP27	23	38.1	18.5
	HEC HMS	17.6	26.7	9.2

Assessment of peak flow showed as in Table 5. It was found that most of the data close to line of equality 1:1 and linear regression with intercept at 0 which indicates the consistency of equality in determine the peak flow. The value of linear correlation coefficient (R^2) obtained from the comparison analysis was 0.9649.

Simulation Impact of land use changes on peak flow

Two main scenarios were simulated to assess the effects of increased surface runoff in the Junjung River Basin, namely the current scenario and the land use impact scenario in 2030. The current scenario involves an analysis of land use changes over a ten-year period from 2010 to 2020. The second scenario refers to the land use planning impact in 2030 according to rainfall frequencies of 2, 5, 10, 20, 50, 100, and 1000-years ARI. The simulation was carried out for time periods of 3, 6, 12, and 24 hours. The analysis of peak flow in the Junjung River Basin shows a significant increase. This is demonstrated through simulations of rainfall events over periods of 3, 6, 12, and 24 hours, and with a return period of 2, 5, 10, 20, 50, 100, and 1000 years, which indicate that peak flow values are increasing due to land use changes in the Junjung River Basin. For a rainfall event lasting 3 hours, the land use changes that occur in 2030 result in an increase in peak flow rates of 1.5 to 4.9 percent for each return period. For a rainfall event lasting 6 hours, peak flow increases between 1.3 to 4.5 percent. For rainfall events lasting 12 to 24 hours, peak flow rates increase by 1.1 to 3.9 percent and 0.7 to 2.3 percent, respectively, for each return period. Surface runoff occurs when the land surface fails to absorb water into the ground during rainfall events.

The findings of the study on land use change from 2010 to 2030 show a moderate and not too drastic increase. However, it is expected that in the coming years after 2030, the land use in Junjung River, Penang, will face development pressure due to the increasing population and high demand for land use for housing and other purposes. Changes in land use activities in the Junjung River Basin, Penang, starting from 2010 and 2020, and development plans in 2030, found that the agricultural land use category has changed to the category of densely built-up land use. Densely built-up land use refers to developed areas that have impervious surfaces that prevent water from infiltrating into the soil through percolation to recharge groundwater storage (Ferguson, 1998).

CONCLUSION

In conclusion, the study found that land use is an important factor that affects the quantity and quality of water in a river basin. Significant changes in land use can alter the rate of discharge and surface water flow in a river basin. Integrated river basin management should be implemented in the Junjung River Basin area so that the increase in surface runoff due to increased urbanization can be managed more sustainably. From such management, it will increase the potential for other sector to grow and contribute to the local economy. This is deemed as potential positive spillovers to the local community (see Azwar et al., 2022) and organic growth of other sectors such as tourism for instance in the sense that it is managed sustainably (see Azinuddin et al., 2022).

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DISCLOSURE STATEMENT

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

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CHANGING EXTREME SEA LEVELS ALONG THE COAST OF MALAYSIA

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Abstract

This study examined extreme sea level (ESL) variations along the Malaysian coast using hourly sea level data from 17 tide gauge stations. The maximum observed ESLs varied from 1.26 m at Bintulu to 2.92 m at Port Klang, with tides playing a significant role in ESLs, especially along the west coast of Peninsular Malaysia. The spatial variation of seasonal ESLs showed a higher maximum of non-tidal residuals (0.8-1.1 m) along the east coast of Peninsular Malaysia during the northeast monsoon. This can be mainly attributed to the influence of the monsoon wind. Moreover, significant increases in ESLs were observed at 14 stations, largely due to rises in mean sea level. The interannual variability of ESL could be associated with the El Niño-Southern Oscillation at most sites except the northeast coast of Peninsular Malaysia. Interestingly, the interannual variability of the non-tidal residuals could be linked to the monsoon at sites located on the west coast of Peninsular Malaysia and East Malaysia. These findings provide valuable insights to relevant authorities for coastal planning, especially regarding flood risk management and the formulation of effective mitigation strategies.

Keywords: South China Sea, Malacca Strait, Extreme Sea-Level, Sea-Level Rise, Tides.

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INTRODUCTION

Extreme sea level (ESL) is the occurrence of an unusually high or low local sea surface driven by short-term events, including tides, storm surges, waves, and seiches (Gregory et al. 2019). Based on the tide gauge observations, the changes in extreme still water level (combination between relative mean sea level, tide, and surge) at most locations globally are primarily driven by relative mean sea level (MSL) rise (Oppenheimer et al., 2019). ESL is affected by relative sea-level changes in two ways: directly by moving average water levels and indirectly by modifying the depth at which tides, waves, and surges propagate (Pickering et al., 2012).

The planning of coastal protection at local and regional levels requires a detailed understanding of the spatial and temporal characteristics of ESL and their possible mechanisms (Wahl et al., 2017). In evaluating overall risk, coastal planners need to know the likelihood of flooding in addition to the value of assets and communities that may be affected. For instance, by analyzing extreme sea level distributions, planners can determine how often specific levels may be surpassed in any given year, representing the Return Period (or Average Recurrence Interval) for a particular level at a specific location (Woodworth 2022). As global sea level is expected to continuously rise beyond the end of this century (Fox-Kemper et al., 2021), this will lead to an increase of frequency and severity of ESL and coastal flooding, particularly in tropical regions (Oppenheimer et al., 2019).

Located in tropical Southeast Asia, Malaysia is surrounded by the South China Sea (SCS), the Sulu Sea, the Celebes Sea, and the Malacca Strait. In 2020, about 5.9 million people (excluding Sabah and Sarawak) mostly lived in 16 major cities located in the Malaysian coastal zone (PLANMalaysia, 2022). Economically, about 40 per cent of Malaysia's gross domestic product (GDP) is attributed to the maritime industry (MIDA, 2021). In particular, Port Klang and Port of Tanjung Pelepas, located on the west and south coasts of Peninsular Malaysia respectively, were included in the top 15 global container ports for the year 2019-2020 (UNCTAD, 2021). Therefore, the increase in ESL and the associated coastal flooding will severely threaten the high coastal population and economic importance of this region.

In investigating the ESL characteristics over the whole SCS, Pham et al. (2019) showed that the maximum ESLs vary spatially between 0.9 m and 4 m. They suggested that the spatial variability of ESLs in southern China is largely due to the summer tropical cyclones, which is in agreement with the findings by Feng and Tsimplis (2014) and Zhang and Sheng (2015). In the southern SCS, Pham et al. (2019) suggested that ESLs are primarily driven by different forcings associated with the winter monsoonal wind. They also found a significant link between ESL in the SCS and the two climate modes of the Pacific Decadal

Oscillation and the El Niño-Southern Oscillation (ENSO). Nevertheless, to date, understanding the long-term characteristics and seasonal variations of ESL, especially along the Malaysian coast, is still far from complete. The temporal variability of ESLs and their link to the climate modes of ENSO, the Indian Ocean Dipole (IOD), and the monsoon are still unresolved.

The general aim of this study was to assess the changes in ESLs along the Malaysian coast using tide gauge records and explore their link to climate modes. The first specific objective was to evaluate the spatial distributions of the maximum ESL, their seasonal variations, and sea level return periods. Then, the temporal variability of ESL was examined, including its link to regional climate indices.

RESEARCH METHODOLOGY

Data

Hourly sea level data from 17 tide gauges were primarily obtained from the University of Hawaii Sea Level Center (UHSLC) (Caldwell et al., 2015) except for one site at Labuan (sites 16), which was obtained from Department of Survey and Mapping Malaysia (Figure 1). The sea level data consist of more than 22 years long and spanning over different periods between 1983 and 2019. Quality control was carried out by visually inspecting each time series. The time series was carefully processed to eliminate any erroneous data points caused by phase offset, datum shift, or data spikes. Additionally, the tide gauge records at Pulau Langkawi, Pulau Pinang, and Lumut stations in the northern Malacca Strait showed non-climatic signals resulting from the 2004 Sumatra-Andaman earthquake-driven tsunami, which were also appropriately removed from the analysis.

Three climate indices, namely the Oceanic Niño Index (ONI), the Dipole Mode Index (DMI), and the Western North Pacific Monsoon Index (WNPMI), were used to examine the influence of climate modes on the temporal variability of ESL at interannual scale. The ONI was represented by the 3-month average temperature anomaly in the surface waters of the east-central tropical Pacific (Barnston et al., 1997). The differences in sea surface temperature anomalies between the western and eastern regions of the equatorial Indian Ocean formed the basis of the DMI (Saji et al., 1999). The WNPMI was inferred from the differences in the 850-hPA zonal wind between a southern region (5°-15°N, 100°-130°E) and a northern region (20°-30°N, 110-140E) (Wang & Fan, 1999).

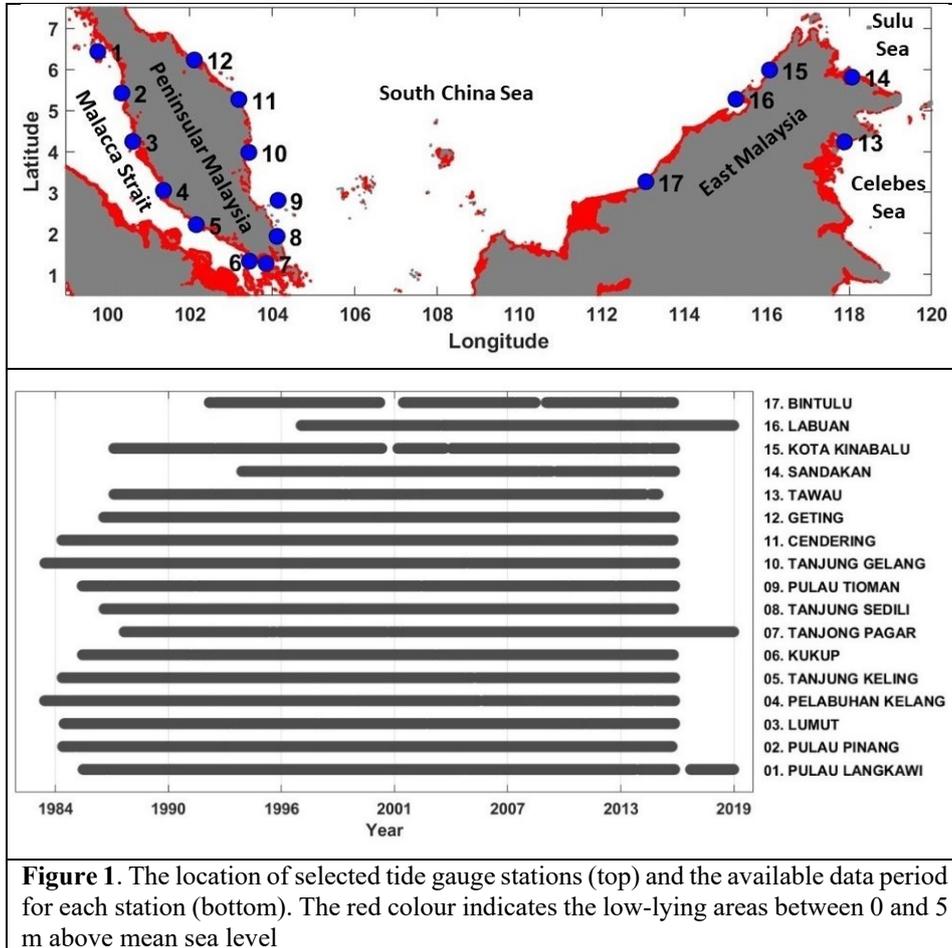


Figure 1. The location of selected tide gauge stations (top) and the available data period for each station (bottom). The red colour indicates the low-lying areas between 0 and 5 m above mean sea level

METHODOLOGY

To account for potential variations in station datum (benchmark or reference level) between different countries, the observed records at each site were adjusted by referencing them to their respective average sea level records across the entire available period. Subsequently, the observed sea level records were further decomposed into three primary components: mean sea level (MSL), tidal variations, and the non-tidal residual (NTR).

Based on the harmonic analysis, the tidal components were computed using the T_TIDE software package (Pawlowicz et al., 2002). For each calendar year with a minimum of 75% of valid data, the tidal signal has been calculated taking into account 65 tidal constituents. As the annual and semi-annual are

mainly driven by meteorological factors, these components were omitted from the computation of tides.

After calculating the tidal components, they were subtracted from the observed sea level at each tide gauge station, resulting in the derivation of the NTR. Additionally, the mean spring tidal range was computed based on the average differences between the monthly maximum and minimum levels of spring tides. To assess the spatial distribution of seasonal variations in ESL, the observed ESL and the NTR were divided into two seasons: the Northeast Monsoon (Oct-Mac) and the Southwest Monsoon (Apr-Sep).

The direct peak over threshold (POT) method was employed to estimate the probabilities of ESL. Compared to other direct methods such as r-largest events and block maxima, the POT method is considered more effective as the chosen extreme values are based on a reasonable upper threshold rather than being constrained by a fixed number of extreme values per year (Arns et al., 2013). Hence, the risk of losing actual extreme events in the chosen criteria can be reduced.

In addition, the probability of extreme sea level (ESL) events was also estimated using the Generalized Pareto Distribution (GPD). Following Coles (2001), the extreme values that surpassed a specified threshold based on the POT method were then fitted to the GPD, which followed the cumulative distribution function:

$$GPD(y) = 1 - \left(1 + \frac{\xi y}{\theta}\right)^{-1/\xi}, \text{ with } \theta = \sigma + \xi(u - \mu) \text{ Eq. 1}$$

Where σ is a scale parameter, ξ is a shape parameter, μ is a location parameter, u is the threshold, and y is the number of independent extreme values that exceed the threshold. As recommended by Coles (2001), the maximum likelihood approach was employed to estimate the shape and scale parameters.

To eliminate the influence of long-term mean sea level (MSL) changes on extreme event probabilities, a linear trend was calculated based on the annual MSL data and then subtracted from the observed sea level records at each station. This was done before calculating the daily maxima.

The selection of an appropriate threshold is crucial to accurately assessing the tail distribution of sea level and capturing an adequate number of real extreme events. To investigate the sensitivity of threshold selection, various percentiles were considered, including the 99th, 99.3rd, 99.5th, and 99.7th percentiles.

After analysing the stability of the Generalized Pareto Distribution (GPD) parameters, notably the shape parameter (ξ), the threshold was set at the 99.3th percentile of the available sea level records at each station. To ensure independence between extreme events, a time period of 96 hours was chosen between successive events.

The return period refers to an estimation of the average time, in years, between occurrences of extreme events of a specific level being exceeded at a particular location. The N-year return level (R) of an extreme event was defined as:

$$R = u + \frac{\sigma}{\xi} (N^\xi - 1) \text{ Eq. 2}$$

Based on the delta method recommended by Coles (2001), the uncertainty related to the estimated return levels was determined at a 95% confidence interval.

To investigate the inter-annual and long-term variability and trends in ESL, a percentiles analysis was employed. Annual percentiles were calculated using both the observed sea level and the NTR data available during the study period. This involved sorting the sea level and NTR data in increasing order and finding the values corresponding to specific percentiles. The 99th and 99.9th percentiles were chosen to assess changes in ESL. Additionally, the 50th percentile, representing the annual MSL, was computed to provide insights into the average sea level behaviour over the study period. Trends in percentiles were calculated using linear regression. The inter-annual variability of ESL percentiles was correlated with three climate indices (ONI, DMI, and WNPMI). The statistical significance of the linear trends and the correlation analysis were assessed at the 95% confidence interval.

ANALYSIS AND DISCUSSION

The Spatial Distribution of Extreme Sea Level

Over the whole available record, the maximum observed ESL at each site, varied between 1.26 m at Bintulu (Site 17) and 2.92 m at Pelabuhan Kelang (Site 4) (Figure 1a). The largest range of maximum ESL values was observed on the west coast of Peninsular Malaysia and was between 1.56 m and 2.92 m, whereas the smaller range was located in the southeastern SCS between 1.26 m and 1.5 m. The maximum observed ESL values consisted of the combined contributions from MSL, tidal variations, and the NTR components. Together, these factors determined the highest sea level experienced at a given location during extreme events.

To examine the role of tides in ESLs, the mean spring tidal range was estimated at each site. The mean spring tidal range showed high spatial variation (Figure 1b), varying between 1.12 m at Geting (Site 12) and 5 m at Pelabuhan Kelang (Site 4). The mean spring tidal range at Pelabuhan Kelang was notably larger when compared to the neighbouring sites on the west coast of Peninsular Malaysia (2.22-3.38 m). This could be associated with the narrowing shapes from

the northern Malacca Strait to the middle part of the Malacca Strait and Pelabuhan Kelang, which can create a funnelling effect and thus amplify the tidal range.

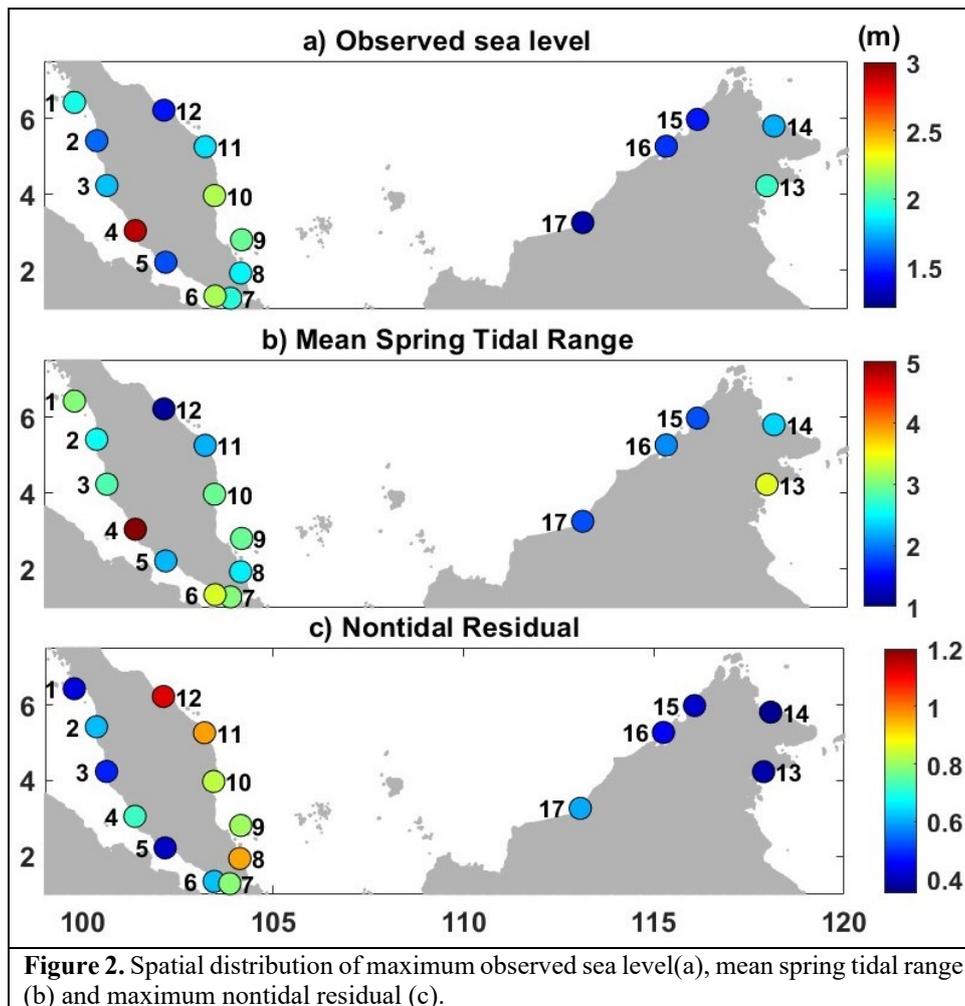


Figure 2. Spatial distribution of maximum observed sea level(a), mean spring tidal range (b) and maximum nontidal residual (c).

The NTR component was estimated by subtracting the tidal component from the observed ESL. The maximum NTR varied between 0.37 m at Sandakan (Site 14) and 1.13 m at Geting (Site 12). On the west coast of Peninsular Malaysia, it is interesting to observe that ESL values exhibited considerable variation, with differences reaching up to 1.4 meters. However, in contrast, the maximum NTR values demonstrated close agreement, ranging from 0.4 to 0.7 meters. This finding suggests a substantial contribution of tides to the overall extreme sea level in this region.

The maximum ESLs and NTRs were divided into two seasons, namely: the Northeast Monsoon (Oct-Mac) and the Southwest Monsoon (Apr-Sep), to assess the seasonal variations in ESLs. Most sites showed that the maximum seasonal ESLs were observed during the Northeast Monsoon (Figure 3). In particular, the differences between these two monsoons for the maximum observed ESL (Figure 3a) and NTR (Figure 3b) were higher, ranging between 0.36 m and 0.8 m on the west coast of Peninsular Malaysia. This could be linked to the forcing of monsoon winds in the southwestern SCS (Amiruddin et al., 2015). The smaller differences between these two monsoons for the maximum observed ESL and NTR were observed on the west coast of Peninsular Malaysia, which were less than 0.16 m.

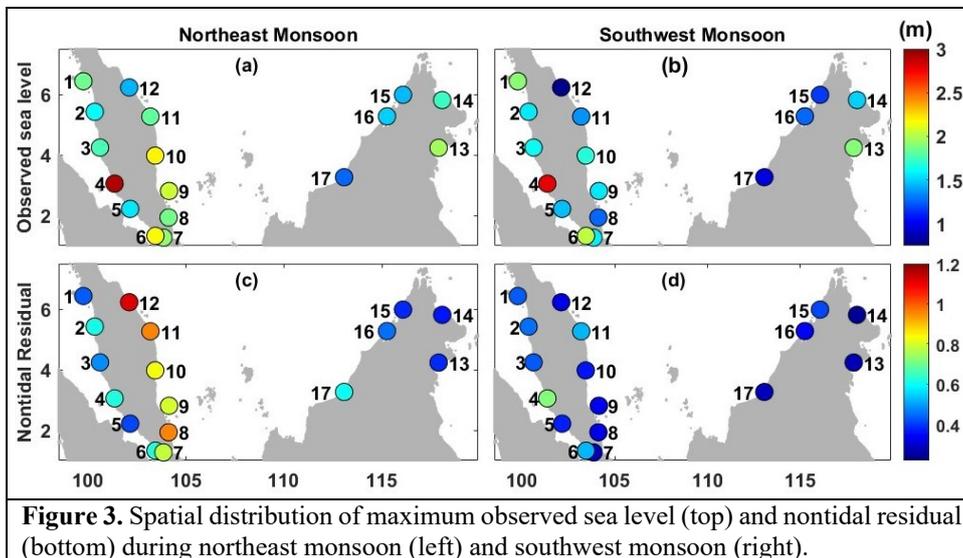


Figure 3. Spatial distribution of maximum observed sea level (top) and nontidal residual (bottom) during northeast monsoon (left) and southwest monsoon (right).

Return periods indicate the average time between a particular sea level return level being exceeded at a specific location, enabling coastal planners, engineers, and policymakers to assess the probability and severity of extreme events like flooding (Wahl et al., 2017). Using the 99.3th percentile threshold, the 50- and 100-year return levels for ESLs and the NTR were estimated and listed in Table 1. The 50-year ESL return levels varied between 1.3 m at Bintulu (Site 17) and 2.92 m at Pelabuhan Kelang (Site 4). The 100-year ESL return levels ranged between 1.38 m and 2.95 m at the same sites. For the NTR, the 50-year return levels varied between 0.36 m at Sandakan (Site 14) and 1.16 m at Geting (Site 25). The 100-year NTR return levels ranged between 0.37 m and 1.29 m at the same sites. Note that the large uncertainty (>1 m) at Bintulu for the

NTR return level might be related to the deficiency of the assumed probability distribution and lead to low confidence in the model projection.

Table 1. The 50-year and 100-year return levels for the observed ESL and the NTR.

Station Name	Observed ESL		NTR	
	50 year (m)	100 year (m)	50 year (m)	100 year (m)
1 Pulau Langkawi	1.91 (0.09)	1.94 (0.12)	0.43 (0.03)	0.44 (0.03)
2 Pulau Pinang	1.56 (0.08)	1.60 (0.11)	0.56 (0.09)	0.59 (0.12)
3 Lumut	1.74 (0.09)	1.77 (0.11)	0.45 (0.05)	0.47 (0.07)
4 Pelabuhan Kelang	2.92 (0.10)	2.95 (0.13)	0.72 (0.16)	0.77 (0.22)
5 Tanjung Keling	1.56 (0.09)	1.59 (0.11)	0.42 (0.03)	0.43 (0.04)
6 Kukup	2.15 (0.06)	2.17 (0.07)	0.58 (0.07)	0.61 (0.09)
7 Tanjong Pagar	1.93 (0.31)	2.07 (0.50)	0.76 (0.15)	0.81 (0.20)
8 Tanjung Sedili	1.87 (0.30)	1.98 (0.44)	1.04 (0.30)	1.15 (0.43)
9 Pulau Tioman	2.04 (0.15)	2.09 (0.20)	0.78 (0.11)	0.82 (0.15)
10 Tanjung Gelang	2.12 (0.12)	2.17 (0.15)	0.84 (0.16)	0.90 (0.22)
11 Cendering	1.85 (0.17)	1.91 (0.23)	0.90 (0.16)	0.96 (0.21)
12 Geting	1.48 (0.26)	1.59 (0.39)	1.16 (0.33)	1.29 (0.49)
13 Tawau	1.97 (0.04)	1.98 (0.04)	0.42 (0.13)	0.47 (0.20)
14 Sandakan	1.71 (0.19)	1.78 (0.28)	0.36 (0.03)	0.37 (0.03)
15 Kota Kinabalu	1.44 (0.22)	1.52 (0.33)	0.41 (0.03)	0.42 (0.04)
16 Labuan	1.62 (0.43)	1.76 (0.69)	0.44 (0.04)	0.45 (0.05)
17 Bintulu	1.30 (0.24)	1.38 (0.34)	0.82 (0.72)	1.04 (1.25)

*The standard error (95% confidence interval are stated in bracket

Temporal Variability of Extreme Sea Level

To determine the temporal changes of ESLs and the link with climate modes, the 50th, 99th, and 99.9th percentiles were estimated for all sites. Using linear regression, trends in each of the 50th, 99th, and 99.9th percentiles, were computed and listed in Table 2. Positive significant trends in the 99th and 99.9th ESL percentiles were found at 10 and 9 sites, respectively. The largest trend in the 99th percentile was 4.5 ± 1.7 mm/yr at Pelabuhan Kelang (Site 4). For the 99.9th percentile, the largest trend was 5.8 ± 5.4 mm/yr at Sandakan (Site 17). It is important to understand that the substantial differences in trends observed for each site could be attributed, in part, to the variation in the periods of the available records at each location. The varying available records for each site contributed to the diverse trends observed, making it essential to consider the record length when interpreting and comparing the results from different tide gauge stations.

The available records for the stations on the west coast and the east coast of Peninsular Malaysia spanned over the common period of 1983-2015, allowing direct comparison of trends among sites. On the west coast of Peninsular Malaysia, the trends of the 99th percentile were significant at all sites. The

significant positive trends varied between 1.7 ± 1.6 mm/yr at T. Keling (Site 5) and 4.5 ± 1.7 mm/yr at P. Kelang (Site 4). On the east coast of Peninsular Malaysia, a significant trend in the 99th percentile was only observed at Geting (Site 12) and T. Pagar (Site 7), both about 3.4 mm/yr. Insignificant trends were observed at most sites (not shown) after subtracting the 50th percentile from the 99th and 99.9th percentiles. This suggests that trends observed in ESLs at most stations were due to the rise observed in MSL, in agreement with studies in the South China Sea from Feng and Tsimplis (2014) and Pham et al. (2019).

Table 2. Linear trends of sea level percentiles over available records

Station Name	Observed sea level trends (mm/yr)		
	50th	99th	99.9th
1 Pulau Langkawi	3.5 ± 1.5	3.0 ± 1.3	3.0 ± 1.9
2 Pulau Pinang	3.3 ± 1.5	2.4 ± 1.3	1.5 ± 2.1
3 Lumut	2.8 ± 1.4	2.4 ± 1.3	2.0 ± 2.2
4 Pelabuhan Kelang	2.6 ± 1.5	4.5 ± 1.7	5.0 ± 4.1
5 Tanjung Keling	1.9 ± 1.6	1.7 ± 1.6	2.1 ± 2.3
6 Kukup	3.0 ± 1.7	4.1 ± 1.3	5.8 ± 1.8
7 Tanjong Pagar	3.3 ± 1.7	3.4 ± 1.7	3.1 ± 2.4
8 Tanjung Sedili	0.9 ± 2.0	0.0 ± 2.4	2.2 ± 3.8
9 Pulau Tioman	2.2 ± 1.4	1.2 ± 2.5	2.9 ± 3.4
10 Tanjung Gelang	1.6 ± 1.9	1.2 ± 2.6	3.7 ± 2.9
11 Cendering	1.6 ± 1.8	1.3 ± 2.7	1.5 ± 3.8
12 Geting	2.2 ± 1.7	3.4 ± 2.0	4.7 ± 4.0
13 Tawau	4.3 ± 2.2	3.8 ± 1.9	4.1 ± 2.2
14 Sandakan	2.5 ± 2.4	3.3 ± 4.6	5.8 ± 5.4
15 Kota Kinabalu	3.7 ± 1.5	2.7 ± 2.8	4.4 ± 4.0
16 Labuan	3.1 ± 2.2	2.3 ± 4.3	2.7 ± 6.2
17 Bintulu	2.5 ± 1.8	3.1 ± 4.0	3.9 ± 5.4

*The statistically significant trends are shown in bold

To examine the connection between inter-annual variability in ESLs and climate modes, the 99th ESL percentile time-series at each site were correlated with three climate indices, namely: the ONI, the DMI, and the WNPPI. The 99th percentiles of observed ESL were significantly anti-correlated with the ONI at most sites, except at three sites (Tg. Gelang, Cendering and Geting), all located on the northeast coast of Peninsular Malaysia (Table 3). The 99th percentiles of the observed ESL were also significantly anti-correlated with the DMI, but only at the four sites (Pulau Langkawi, Pulau Pinang, Lumut, and Kelang) located on the northwest coast of Peninsular Malaysia. For the WNPPI, the distinct significant correlations were found with the 99th ESL NTR percentiles at five sites on the west coast of Peninsular Malaysia (except Pulau Langkawi) and five sites located in East Malaysia. The results indicate the link between La Nina, the

negative modes of Indian Ocean Dipole and Monsoon in modulating the positive ESL in certain areas of the region.

Table 3. Correlation coefficient between 99th percentiles of observed extremes with ONI and DMI, and 99th percentile of NTR with WNPMI

	Station Name	ONI	DMI	WNPMI
1	Pulau Langkawi	-0.35	-0.40	
2	Pulau Pinang	-0.59	-0.47	-0.41
3	Lumut	-0.73	-0.49	-0.47
4	Pelabuhan Kelang	-0.55	-0.35	-0.45
5	Tanjung Keling	-0.56		-0.74
6	Kukup	-0.50		-0.71
7	Tanjong Pagar	-0.63		
8	Tanjung Sedili	-0.42		
9	Pulau Tioman	-0.43		
13	Tawau	-0.73		-0.43
14	Sandakan	-0.49		-0.86
15	Kota Kinabalu	-0.37		-0.71
16	Labuan	-0.67		-0.81
17	Bintulu	-0.67		-0.46

*Only statistically significant correlations are shown

SUMMARY AND CONCLUSION

The changes of ESLs and the NTR were examined using 17 tide gauge stations along the Malaysia coast. Maximum ESLs varied between 11.26 m at Bintulu and 2.92 m at Pelabuhan Kelang. The maximum NTR varied between 0.37 m at Sandakan and 1.13 m at Geting, indicating substantial influence of tides to the ESL, especially on the west coast of Peninsular Malaysia. Changes of tides have been observed worldwide (Talke and Jay, 2020; Haigh et al., 2020). The rise and fall of tides reaching higher levels due to elevated MSL will result in an escalated risk of coastal flooding. Changes in the characteristics of tides in Malaysia needs to be explored in the future studies.

The maximum values of ESLs were observed along Malaysia coast, primarily during the Northeast Monsoon. During this period, the risk of coastal flooding is notably larger for potentially vulnerable sites, especially when considering the combination of factors such as the maximum mean seasonal sea level cycle, high spring tide, storm surge, and heavy rainfall. Understanding the interplay of these factors is crucial for effective coastal management and preparedness to mitigate the impacts of extreme events and compound flooding in coastal regions.

The positive significant trends in ESL percentiles were observed to be primarily attributed to variations in MSL. The inter-annual ESL variability was found to be linked to ENSO at most sites except the northeast coast of Peninsular

Malaysia. Interestingly, this study found that the inter-annual variability of the NTR on the west coast of Peninsular Malaysia, and sites in East Malaysia can be connected with the monsoon. Understanding mechanisms of the climate modes in influencing the changes of extremes in these regions should be explored in the future studies.

In conclusion, this study has provided an output of spatial and temporal variation of ESL along the coast of Malaysia. As the frequency of coastal flooding is expected to rise exponentially due to mean sea level rise (Taherkhani et al., 2020), this information is highly beneficial in recognising vulnerable coastal areas that face an increased probability of experiencing ESLs. In particular, the estimated return periods computed at each site offer valuable parameters for coastal planning and the design of flood defence measures along the coast. Moreover, the study's findings, especially concerning temporal variability, provide crucial insights for modelling future changes in ESLs along the Malaysian coast. This information proves indispensable for relevant authorities in implementing effective mitigation strategies, as well as disaster risk reduction and management measures (e.g. Amin & Hashim, 2014; Chong & Kamarudin, 2018) against coastal flooding, including sustainable coastal planning and development.

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DATA AVAILABILITY

Hourly tide gauge records are available from University of Hawaii Sea Level Center (UHSLC) (<http://www.uhslc.soest.hawaii.edu>). Climate indices of ONI is available from National Oceanic and Atmospheric Administration (NOAA) (<https://www.cpc.ncep.noaa.gov/data/indices/oni.ascii.txt>), DMI is available from Japan Agency for Marine-Earth Science and Technology JAMSTEC (https://www.jamstec.go.jp/aplinfo/sintexf/iod/dipole_mode_index.html) and WNPMI is available from Asia Pacific Data Research Center (APDRC) (<http://apdrc.soest.hawaii.edu/projects/monsoon/seasonal-monidx.html>).

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PLANNING SEAWEED FARMING BASED ECOTOURISM: A TOURISM SPECTRUM APPROACH IN BANTAENG REGENCY, INDONESIA

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Abstract

Ecotourism allows tourism policymakers and the community to manage nature-based tourism. However, although ecotourism is a promising idea or concept, this opportunity is only partially a reality. It requires a particular study relative to the current conditions of the destination and other aspects that can support the implementation of ecotourism. The objectives of this study are to 1) examine the opportunities for implementing ecotourism in a coastal area, Bantaeng regency of Indonesia; 2) analyse the environmental impacts resulting from seaweed-farming activities and their relation to tourism. This research, conducted in June 2020, applies a qualitative method. Data-collection methods included interviews with seaweed farmers, field notes (observation) and a review of published information online. This study utilises the *tourism opportunity spectrum* (TOS) in analysing the current conditions in the research location. The results showed that floods caused crop failure, prompting the need for alternative income for the community to survive. Ecotourism can represent an opportunity for seaweed-farming communities if on-site management factors and goals are applied with the principle of sustainability. This study found that TOS helps understand the impact resulting from the activities of the seaweed-farming community in Bantaeng regency—the use of massive numbers of plastic bottles as floats conflicts with the principle of ecotourism. The TOS approach views ecotourism planners, including the government and the tourism industry, as being able to open educational opportunities for the community and visitors.

Keywords: Bantaeng Regency, Ecotourism, Tourism Opportunity Spectrum, Seaweed-Farming

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INTRODUCTION

Ecotourism and nature-based tourism are types of tourism that continue to develop along with the increasing human awareness of conserving natural resources. Various academics in the world, especially in Indonesia, study various aspects of ecotourism, including its recent identification with the use of natural resources for tourism (Azinuddin et al., 2022a; 2022b; Fifiyanti & Damanik, 2021; Kasmiasi & Dharmawan, 2016; Phelan et al., 2020; Prasetyo et al., 2020). Often associated with nature conservation, the management of natural resources still pays attention to the sustainability of nature. Ecotourism is the choice of most policymakers at the regional level when tourism is an option for regional development.

The implementation of ecotourism can represent an opportunity for the community, especially the local government, if an area or destination notices and applies ecotourism principles. The various advantages of ecotourism can be a driving force for realising these ecotourism goals (Masud et al., 2017; Orams, 2002; Tsaur et al., 2006; Wu & Chen, 2018), including nature preservation, economic benefits for local communities and the quality of tourist visits through educational tours. Therefore, ecotourism is an opportunity to attract foreign and domestic tourists to visit a destination.

However, although ecotourism is a promising idea or concept, this opportunity is not fully a reality. Those thinking about tourism's potential and opportunities have not fully considered its natural potential and implications for the life of its people. Therefore, even though ecotourism is the right concept to adopt to develop Indonesian tourism, it requires a particular study relative to the current conditions of the destination and other aspects that can support the implementation of ecotourism. Dimitriou (2017) argues that there is still a gap between the theory and practice of ecotourism, and thus, effective strategies are required to achieve ecotourism's goals. This research examines from a tourism perspective the opportunities for planning and implementing ecotourism in Cabodo village, Bantaeng regency, South Sulawesi province, where the community works as seaweed breeders.

Bantaeng regency, South Sulawesi province, and especially Makassar city have become preferred destinations for most domestic tourists in Indonesia. The travel distance of about 3 (three) hours from Makassar city qualifies Bantaeng regency as the primary choice for those seeking a different atmosphere for tourism activities. Various locations have become attractions for domestic tourists visiting Bantaeng regency, including Seruni beach and Marina beach, as well as the beautiful Bantaeng city area. The activity of seaweed-farming farmers on the coast can also be an ecotourism opportunity in Bantaeng regency. However, the existence of seaweed breeders is only a livelihood commodity.

Travel businesses or the larger community have yet to make seaweed-farming activities an opportunity for attracting tourists.

This study aims to 1) examine the opportunities for planning and implementing ecotourism in the coastal area; 2) analyse the environmental impacts resulting from seaweed-farming activities and their relation to tourism. This study utilises the tourism opportunity spectrum theory to analyse the current conditions in Cabodo Village, Bantaeng regency. The tourism opportunity spectrum is a comprehensive planning approach for understanding the supporting aspects of implementing ecotourism in a destination. This research contributes to the analysis and understanding of ecotourism in a destination by using the concept of the tourism opportunity spectrum.

LITERATURE REVIEW

Defining Ecotourism

Ecotourism is a popular term that practitioners and academics use in proposing the importance of preserving natural resources for tourism potential. Ecotourism and nature-based tourism are often used interchangeably since ecotourism uses more of nature for tourism purposes. Three characteristics of the application of ecotourism in a destination are 1) making a beneficial impact on local communities without massively exploiting the economic and social systems; 2) protecting and conserving natural, cultural and environmental resources; 3) requiring ethical behaviour from tourists or visitors and supporting the role of the tourism industry in carrying out tourism activities (Butcher, 2007; Cater, 2004; Dawson, 2008; Handriana & Ambara, 2016).

The idea of ecotourism was born from a combination of tourists, the environment and the culture of the people in a destination. Fennell (2015) argues that the concept of ecotourism first emerged from the work of Hetzer (1965), which explains the inseparable relationship between tourists, environment and culture, where the interaction between the community and the tourists elevates the importance of building positive interactions. Ecotourism as “low impact nature tourism which contributes to the maintenance of species and habitats either directly through a contribution to conservation and/or indirectly by providing revenue to the local community is sufficient for local people to value, and therefore protect, their wildlife heritage area as a source of income” (Goodwin, 1996:288). This definition emphasises the use of nature, with various species of living things and their habitats, for tourism purposes. Humans take advantage of nature through tourism activities, which, in turn, provide economic benefits for humans (Azinuddin et al., 2022c). These benefits give rise to hope and desire to protect and conserve nature with its various species, so that they may become a sustainable source of income.

The opportunity for ecotourism management is inseparable from the destination's community and policymakers (e.g. local government). This is why there is an emphasis on collaboration between the community and destination stakeholders (Azwar et al., 2023). Ecotourism is a type of tourism that emphasises the sustainability of nature and its people (Blamey, 2001; Dehoorne & Tatar, 2013; Hein et al., 2018; Hussin et al., 2022; Rukmana, 2015). Motivation and interest in learning about nature drive ecotourism tourists. Thus, ecotourism qualifies as a type of special-interest tourism (Blamey, 2001; Fennell, 2015; Phelan et al., 2020; Winson, 2006). As the principle of ecotourism, environmental education offers tourists a learning experience about the environment and its various species. Therefore, as part of a tourism product, a tour provides an experience in understanding environmental conservation. Nature as a tourist destination is the focus of a tourist's trip. Ecotourism uses nature (including its cultural aspects), offering information and experiences to tourists, which, in turn, will encourage motivation and interest in preserving these natural and cultural resources.

The Concept of Tourism Opportunity Spectrum

The term *tourism opportunity spectrum* (TOS) has been widely used to benefit frameworks and procedures for assessing tourism issues (Boyd & Butler, 1996; Huang & Confer, 2009). The utilisation of TOS comprises several components, namely, management objectives, accessibility factor, visual characteristics factor, environmental impact factor for visitors, location management factor, social interaction factor and visitor management factor (Dawson, 2008). The term TOS is also often associated with ROS, or *recreation opportunity spectrum*. Since the 1970s, the Bureau of Land Management in the United States has used the concept of ROS (Clark & Stankey, 1979; Dawson, 2008; Wellton et al., 2018).

Tourism destinations can attract tourists based on nature and ecotourism potential. At the same time, tourism planners also have the opportunity to develop other types of tourism according to the potential tourism products of a destination. Tourism planners can use the TOS approach to connect the various types of tourism owned and promoted by destination managers. Ecotourism tourists are not solely looking for ecotourism experiences but need other tourism activities to improve the quality of the travel experience. Increased demand for travel to ecotourism destinations can be a driving force to increase further efforts to conserve natural resources. TOS enables the development of tourism destinations by linking and integrating nature conservation and educational processes for tourists.

Planning and tourism destinations are related, allowing policymakers to manage destinations sustainably. Ecotourism area has characteristics that may attract tourists to gain relevant experience. TOS or ROS is essential to analyse an

area's characteristics and implement sustainable ecotourism strategies (Suksmawati et al., 2021). Tourists will utilise facilities to support their ecotourism activities. TOS approach enables ecotourism policy makers and managers to plan and implement strategies for such tourists' activities (Carroll & Hession, 2015).

Dhami & Deng (2018) use the term ROS to examine the relationship between tourist attractions and tourist spending in tourism destinations. According to Dhami and Deng (2017), ROS can be used in planning and managing tourist attractions in various regions (Lu, 2023). ROS or TOS includes an analysis of a tourism area and can also examine ecotourism areas. TOS is essential for assessing an environment's sustainability as a tourist location or area. Tourists or residents who want to carry out recreational activities can choose an open area as a tourist location. An environmental impact assessment in an ecotourism area can utilize the TOS principle. Thus, destination managers can plan and implement strategies to minimize the impact on environmental damage.

RESEARCH METHODOLOGY

This study employs a qualitative approach to understanding community activities in the coastal area through tourism opportunity spectrum theory. Qualitative research is relevant for understanding the social conditions of a tourism destination (Decrop, 2004). The information that informants provide is the main data for understanding community expectations. The information aligns with the research objectives regarding the possibility of the ecotourism concept becoming an option other than just the daily activities of a seaweed farmer in the area. The research was conducted in June 2020 by visiting Cabodo village and the surrounding area in Bantaeng regency (see Figure 1). The research area can represent the management of seaweed farming in Sulawesi, Indonesia.

This study used data from interviews with seaweed farmers along the coastal area of Bantaeng regency. Fifteen people participated as research informants. The authors informed the research objectives to informants before the interview process. In addition, the authors received research instructions and permission from the institution (Letter of Research Assignment No. KP. 105/115/14/Poltekpar/2020) as a legal basis for collecting research data in the Bantaeng regency village of seaweed farmers.

Field notes recorded direct observation of the actual conditions of the coastal area and local community activities also constitute the primary data of this study. The authors used these observations to take pictures at the research location, additional data for analysing social phenomena that occurred. The authors also used secondary data from Internet sources to support the argument from primary data. All qualitative data were analysed using the principles of qualitative data analysis, including data reduction, presentation and conclusion.

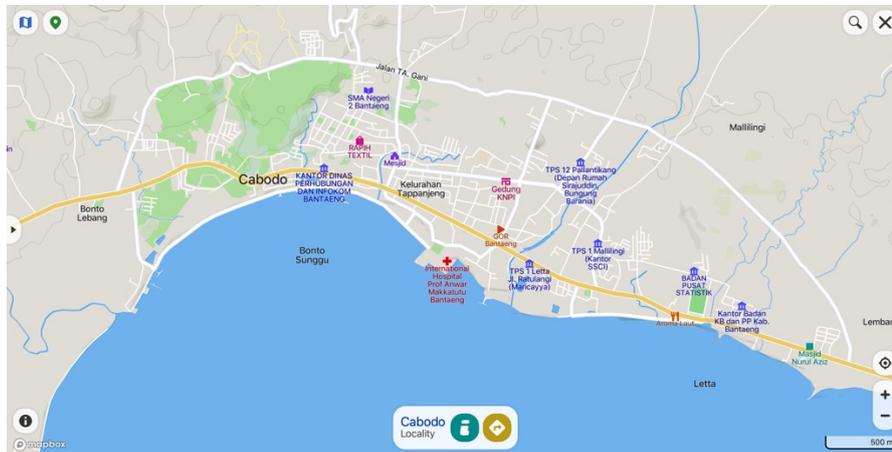


Figure 1: Cabodo Village map in Bantaeng Regency
Source: Mapcarta (2023)

ANALYSIS AND DISCUSSION

Flood Disaster and its Impact on Seaweed Farmers in Bantaeng Regency

On Friday, 12 June 2020, a flash flood hit Bantaeng Regency and several surrounding districts. The rain flushed Bantaeng City from 17.00 until late at night. The flash-flood disaster occurred at night when the community did not have time to prepare to save assets from the flood. Rain throughout the night caused Bantaeng regency to experience flash floods in several areas. Flash floods have also hit people living in coastal areas. The areas that flash floods affected include Pallantikang village, Tappanjeng village, Malround village, Bonto Rita village, Bonto Sunggu village, Bonto Atu village, Bonto Lebang Village, Bonto village and Bonto Majannang village. The flash-flood disaster in Bantaeng regency killed one community member.

The most significant impact of this flash flood was on the people living in the coastal area in Cabodo village, Bissappu district. The people living in Cabodo village are seaweed farmers. Various media conveyed the impact of the flood disaster on people's lives. *Tribun Timur* in Bantaeng reported the plight of community members in Cabodo village. A community member stated that 'two tons of seaweed has been damaged due to exposure to fresh water. It costs around 10 million to cover cultivating two tons of seaweed; her husband has to borrow IDR 1,500,000 due to the loss; her husband did not know how to pay off his debt' (*tribun timur.com*). Most community members who suffered losses, including the equipment used to farm seaweed, had damage. As a result, this society could not earn income for their living. A community member stated, "Everything can't be used, the seeds per kilogram are IDR 4000; everything failed, sir. I told the

fisheries how this seaweed is because we really need help and seeds because time is so short” (interview, June 2020).

The community in Bantaeng described the flood as an extraordinary event. The flood damaged the livelihoods of people who make the sea and coastal areas their economic activity. For seaweed farmers, flooding has damaged the community's economy. Community members expressed 'big waves and blackouts, and we do not know which one we have (seaweed). For the repairs, we need about IDR 3 million. The activity is now clearing the landscape; if seeds are being worked on, if not, then I go to Makassar to find work as a construction worker. If I go down again, I will go down to Makassar again' (interview, male aged 30s, 20 June 2020). The flood eliminated people's livelihoods. When the research was conducted, the community received no assistance and stated, 'If in the regional head election, the crop failure will be replaced. When officials convey their vision and mission if the seaweed harvest fails, the money will be replaced, and they will be assisted. However, no financial assistance exists (interview, June 2020).

The risk of flooding and other disasters can occur in every area of a destination. This community statement is why the community must acquire an understanding of finding alternative livelihoods apart from seaweed farming. The community tends to depend on one type of business, seaweed farming. Meanwhile, other business opportunities still need to be addressed. This study recommends the tourism business as an opportunity for people in coastal areas could choose to manage a business.

Seaweed Farmers' Activities and their Impact on Environmental Sustainability

People who live around coastal areas generally manage seaweed-farming in the Cabodo coastal area, the area that the flooding most affected. Seruni beach, the tourism icon of Bantaeng regency, borders the Cabodo area. Tourists arriving in Bantaeng regency will generally visit Seruni beach, which offers the experience of enjoying a café, relaxing activities, enjoying the sunset and exercising. The Seruni beach area is the centre of casual activities of the Bantaeng community and its tourists. The coastal area beyond Seruni beach also contains seaweed management for people living there. Compared to Cabodo, this area does not appear to have been affected by the flash-flood disaster (*Banjir Bandang*) and this area has successfully harvested seaweed products, unaffected by the flash-flood disaster.

Seaweed management by coastal communities can be seen directly from the road along the coastal area. The stretch of farmers' hooks at sea level is visible from the highway. The seaweed hooks stretch along the sea surface, covering the sea level, so the sea area around the coast's edge appears to be an

extensive stretch of hook. The stretch of the hook can be seen in May, June, July and even throughout the year, depending on the community's seaweed-farming activities. According to farmers, the season for harvest is these three months.

The hook is made of mesh that is attached using plastic bottles. The bottles floating above sea level result from the seaweed farmers' activities, and plastic bottles are used so that the hook where the seaweed grows can float. The authors asked about the reason for using plastic bottles. The informant said, 'these bottles are the binder, sir. I have used other tools, but it is useless; the result is that the hook sinks, cannot stand it. So finally, I used the bottle as an anchor to keep the hook from sinking' (Informant aged 40s, interview, June 2020).



Figure 2: Plastic bottles used for seaweed farming in Bantaeng regency
Source: Authors, 2020

The farmers argued that the bottles were not thrown overboard but burned. Some of these plastic bottles are also sold, so the farmers get a profit from the sale. However, the authors' observations indicate that plastic bottles tend to become garbage, scattered around the coast. The amount of plastic-bottle waste that has accumulated is a result of the use of plastic in the seaweed-farming process. All seaweed farmers in Bantaeng regency use plastic bottles as a tool for seaweed-farming activities. As a result, plastic bottles fill the sea area around the coast in Bantaeng regency. Figure 2 shows the plastic bottles in massive numbers that become rubbish.

The use of plastic bottles by seaweed farmers may damage marine life in the waters of Bantaeng regency. Plastic bottles in large quantities can also

become waste and difficult to control. Although the residents' arguments justify their actions, the authors argue that plastic bottles can damage the environment. Seaweed-farmer activity can attract tourists but threatens environmental conservation. Travellers who pass on the road of Bantaeng regency may stop to see the seaweed farmers' traditional activities. Arguably, seaweed farming attracts travellers and can become a tourist attraction. Figure 3 shows seaweed-farming activities by local people.



Figure 3: Harvesting of seaweed by seaweed farmers
Source: Authors, 2020

Figure 3 indicates the successful harvesting of seaweed by the local people. The authors noted that the local people did not suffer from the flood, unlike Cabodo village. The local people also use plastic bottles to run their seaweed farming. Most seaweed farmers use plastic bottles; visitors who pass the coastal area or stop to see the local people's traditional activities can see the sea's surface around the coastal area.

The Opportunity for Implementing Ecotourism in the Coastal Area of Bantaeng Regency

Tourism activities, especially ecotourism, have yet to be fully considered as an alternative strategy to increase people's income. Tourism development is more focused on existing tourist attractions, with promotional efforts carried out by the local governments and tourism business managers. For example, Seruni beach is a leading, iconic tourist attraction in the Bantaeng regency because it offers various activities for tourists. In addition, other tourist attractions—for example, Eremerasa waterfall and Marina beach—are also promoted as tourist attractions. However, the lives of people living on the coast, who cultivate seaweed, have not

been fully touched in terms of its utilisation as a tourist and promotional attraction.

The community said that there had been tourist visits to their area. However, the purpose of their arrival is only interpreted as the activity of outsiders who see the lives of fishermen and seaweed farming. The value of the benefits of tourist arrivals has not been felt significantly because the understanding of tourism still needs to be improved. Nevertheless, tourist visits provide opportunities that the community might take as a form of participation in tourism activities. In other words, outsiders who visit the Bantaeng regency and pass the road there get to other regencies can support the local people's ability to manage seaweed-based ecotourism.

Ecotourism is a type of tourism the community can manage (Bello et al., 2017). Indeed, implementing ecotourism management requires conditions where the community, local government and various parties will work together to encourage tourism activities. From the tourism opportunity spectrum analysis perspective, the following describes those conditions.

1. Goal of ecotourism management

Regarding management goals, the community must understand the aims and objectives of implementing ecotourism. The preservation of marine resources as the location for seaweed cultivation must ensure that farmers' activities do not damage the marine environment. The use of plastic bottles is currently one of the main activities of the local population that opposes conservation goals. The local government has tried to encourage people to replace plastic bottles with other buoys that are more environmentally friendly. The local government has provided training, such as the following statement: 'Now there is a solution for farmers, namely, replacing floats from plastic bottles with a kind of environmentally friendly buoy. If plastic floats are used, at least one or two harvests are replaced and that adds to the waste. If you use a long-term environmentally friendly buoy, you can manage the long practice of seaweed management (Upeks.co.id., 2019).

The use of plastic bottles should be stopped and replaced by other means. Ecotourism tourists come to see the seaweed-cultivation process. Community activities must be carried out by implementing the principle of environmental preservation. Seaweed cultivation and environmental conservation activities are the selling points of ecotourism in Bantaeng regency. Therefore, the first step in implementing ecotourism must be to determine the goal of preserving nature while continuing to cultivate seaweed. The local government should provide mechanisms and regulations for the management of seaweed farming, emphasising providing alternative ways to run seaweed farming and avoiding the use of plastic bottles.

2. Accessibility factor

In terms of accessibility, Cabodo Village has an advantage over other tourist attractions in Bantaeng regency. The location is very close to Seruni beach, the location that most tourists visit for recreational purposes. To reach the Cabodo village area, tourists can very easily visit because it is just adjacent to Seruni beach. However, in the absence of a tour package and not yet having implemented ecotourism, a visit to this location cannot be developed. Stewart et al. (2016) conducted a research in West Indies and found that ecotour package is essential to provide alternative livelihood for the local fisher through ecotourism. Accessibility, in terms of distance and mode of transportation, could support the implementation of ecotourism based on seaweed cultivation.

3. Visual Characteristic Factor

Seen from the perspective of visual characteristic description, tourists can directly see the coastal location with seaweed-cultivation activities by farmers. The landscape of seaweed cultivation is a recurring reality. However, this stretch also shows activities that do not preserve the environment, due to the use of plastic bottles. Therefore, ecotourism can be realised if the community switches to environmentally friendly activities, the main one being seaweed farming.

4. Environmental impact factors of tourists' visit

From the point of view of the environmental impact of tourist visits, that impact is still very small. However, a potentially negative impact is very likely without regulations for visitors. Ecotourism planners and managers must prepare signs or codes of ethics for visitors who will carry out ecotourism activities. "Travel with primary interest in the natural history of a destination. It is a form of nature-based tourism that places about nature first-hand emphasis on learning, sustainability (conservation and local participation/benefits), and ethical planning, development and management (Fennell, 2015: 17). Such definition indicates that ecotourism is about how to develop and manage natural resources sustainably through tourism. Utilise natural resources for tourism should ensure the conservation of nature. In other words, there should efforts to avoid negative impacts to the environment.

5. Infrastructure Factor

Infrastructure is a major factor in managing nature as an ecotourism-based tourist attraction. The infrastructure needed to manage ecotourism in Cabodo village is good roads, good transportation with a priority on safety and comfort for tourists and a tourism information centre. Soft infrastructure, in terms of human resource development, should become the priority of policymakers for the ecotourism program to succeed.

6. Social Interaction Factor

The hospitality of the people in Cabodo village provides an opportunity to apply it to ecotourism. Local residents must maintain the principle of hospitality when tourists visit. Most tourists require good hospitality from the host people; they will experience ecotourism through the services that the local people provide.

7. Visitor Management

From the perspective of visitor management, the opportunity for tourists to take advantage of various types of transportation enables the realisation of ecotourism activities. The existence of a *bendi* (a local means of transportation using horses) is an additional attraction that tourists can use. One aspect of visitor management is the use of local transportation. Traditional boats can be a support in carrying out maritime-based ecotourism activities and cultivating seaweed. The application of ecotourism will be realised if visitor management is implemented by utilising the community and traditional transportation systems to support ecotourism activities.

CONCLUSION

This study utilises a tourism opportunity spectrum approach to answering research problems related to ecotourism. Community life among seaweed farmers in Bantaeng regency offers opportunities for the management and development of natural ecotourism. Seven factors become the setting characteristics of the tourism opportunity spectrum, the theoretical framework in this study. On-site management and management goals are two factors to which the government and local communities should pay attention if the ecotourism concept is an option in tourism management. In addition, opportunities for ecotourism management can run if the preservation and protection of marine and coastal areas include applying sustainability principles.

Community activities that use plastic bottles as buoys can become an obstacle to implementing ecotourism in the coastal area of Bantaeng regency. The use of plastic bottles in large quantities can cause a decrease in environmental quality. Environmental impact, in the form of pollution due to plastic bottles, is contrary to ecotourism principles. Therefore, this study recommends implementing the characteristics of the tourism opportunity spectrum to achieve the goals of ecotourism. The involvement of community members in implementing the principles of ecotourism will be greatly supported by the readiness of the government and community organisations to avoid the negative impact of using plastic bottles in seaweed cultivation.

Analysis of the tourism opportunity spectrum (TOS) can be an analytical tool for understanding the conditions in the coastal area. The TOS approach views ecotourism planners, namely the government and the tourism

industry, as able to open educational opportunities for the community and visitors. Furthermore, the ecotourism manager, the community, can carry out its functions and roles if the people understand the position and objectives of seaweed-based ecotourism management that the community manages. This study found that TOS helps understand the impact resulting from the activities of the seaweed-farming community in Bantaeng regency. Ecotourism can be an opportunity for such seaweed-farming communities, especially those that experience crop failure due to flooding. This paper provides insight into the local people who live in the coastal area and potentially suffer from disaster. Hence, the local people having an alternative source of income to sustain their livelihood is essential.

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A COMPARATIVE ANALYSIS OF THE LEGAL FRAMEWORKS FOR SIA AND EIA IN MALAYSIA

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Abstract

Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) are the primary assessment tools used to generate information on the likely impacts of a project on all aspects of the environment and society, aiding the decision-making process to achieve sustainable development. While EIA is mainly concerned with assessing the potential environmental consequences of a proposed development, SIA evaluates the potential social consequences. These two mechanisms play a crucial role in promoting resilient and sustainable development in Malaysia. The legal framework for EIA has been enforced since 1988 and evolved through several legislations, including the Environmental Quality (Amendment) Act 2012 (Act A1441), very much earlier compared to the SIA legal framework, which was introduced in 2017 by virtue of the Town and Country Planning (Amendment) Act 2017 (Act A1522). Thus, this paper aims to analyse the legal framework of both assessment mechanisms, employing the qualitative method of library research, content and comparative analysis. The result shows that the EIA framework is more comprehensive and practical and is an effective model for the improvement of the SIA framework in Malaysia.

Keywords: SIA, EIA, Legal Framework, Malaysia

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INTRODUCTION

The growing global awareness of environmental and social protection and preservation has resulted in an increase in efforts to promote local environmental consciousness (Maisarah et al., 2014). A regulation or law that mandates certain categories of development projects to go through specified evaluations serves as the catalyst for environmental protection in land development projects both, globally and specifically, in Malaysia. The pattern can be observed through the implementation of various assessments designed and aimed at establishing and sustaining resilient development, including Social Impact Assessment (SIA) and Environmental Impact Assessment (EIA). It is to be noted that not all types of development projects are subject to SIA and/ or EIA as the law and policy in Malaysia clearly set down the categories of development projects that are required to undergo these assessments. For instance, in regards to SIA, the Government of Malaysia initiates its implementation by requiring the preparing of reports for massive-scale projects and those having national interest. SIA is currently made mandatory for the aforementioned types of development projects for the reason that SIA is crucial to achieving sustainable development by balancing economic, social, and environmental considerations. SIA is primarily formulated to focus on assessing and evaluating the social consequences and implications of a proposed development project. The assessment procedures are comprehensive in nature as they take into consideration multiple aspects of human life, namely the potential impacts on local communities, individuals, social structures, cultural heritage, and quality of life and all these aspects are technically and thoroughly examined during the decision-making processes (Coakes, 2021; Vanclay, 2003).

On the other hand, EIA is engineered to focus on evaluating the potential environmental ramifications, and effects of the intended project. It assesses variables such as air and water quality, biodiversity, ecosystems, and natural resources (Yusoff, 1996). The predictions that have been made via the evaluation will lead to the implementation of mitigation measures to address the potential adverse environmental impacts of the intended development. As a result, EIA encourages ecologically sustainable development that can strike a balance between human progress and the preservation of the natural environment.

Both, the SIA and the EIA, significantly impact the general public and numerous project stakeholders, including contractors, architects, engineers, planners, consultants, and others. It is imperative that these parties take these assessments seriously and carefully consider the fundamental requirements outlined in the legal framework. Nevertheless, in the course of implementing the existing framework, especially in the case of SIA, it has been found that the legal provisions are inadequate, which necessitates further improvement in its

implementation (Suaree et al.,2022). Thus, this paper aims to dissect and analyse from the comparative perspective, the fundamental background of SIA and EIA, as well as the existing legislation that governs both assessments in Malaysia, such as Act 127, Act A1441, Act 172 and Act A1522, employing qualitative methods such as library research and content analysis. The ultimate aim of this paper is to identify and confirm the status of the earlier findings, including whether or not the problems and difficulties are still present or have largely been solved. Additionally, by employing the comparative method, the researchers believe that recommendations can be formulated in response to the current challenges.

DISCUSSION

SIA Legal Framework

The Town and Country Planning Act 1976 (Act 172) is the principal legislation regulating the planning and development control of land use in Peninsular Malaysia (Act 172, 1976). The Act emphasises the need for comprehensive planning and sustainable development, taking into consideration multiple factors, including social considerations. SIA is an assessment used in the planning process to manage social change resulting from proposed developments in community areas (IISD, 2016). SIA is recognised as a comprehensive framework that encompasses a wide range of impacts ascertainable on humans, such as aesthetic, archaeological, community, cultural, demographic, development, economic, fiscal, gender, health, indigenous rights, infrastructure, institutional, political, poverty, psychological, resource, tourism, and other societal impacts (Syafawaty, 2009).

In 2017, the requirement to conduct SIA for development under SIA Category 1 was inserted vide section 20B (2) of the Town and Country Planning (Amendment) Act 2016 (Act A1522), marking the fifth amendment to Act 172. Tan Sri Noh Omar, the then Minister of Urban Well-being, Housing, and Local Government (2017), stated that the submission of an SIA application is compulsory and is a pre-condition for the approval of certain development projects (The Borneo, 2017). Tan Sri Noh also said that not all development requires the preparation of SIA, but it is subject to the scale of development (Parliament Hansard, 2016). When preparing development plans or considering development proposals, the local planning authority may discretionally take into account the potential social impacts of projects, including effects on communities, socio-economic conditions, cultural heritage, and quality of life. This can be accomplished by integrating SIA principles and methodologies into the planning and decision-making processes. However, Act 172 itself does not explicitly mention the requirement of SIA for SIA Categories 2 and 3 (Section 20B, Act A1522). The Act is also silent on the important features of SIA implementation, such as the criteria for qualified persons to prepare SIA reports,

enforcement, and monitoring in implementing the SIA process. Table 1 shows the Categories of SIA under Act 172, Act A1522 and the SIA Manual.

Table 1: Categories of SIA

Category	Development	Source
One	Coastal reclamation, major infrastructure	Section 20B (2), Act A1522
Two	Township, major infrastructure, hillslopes	Section 22(2A), Act 172
Three	Prescribed in Table 2.3 and determined by State Authority	SIA Manual

Source: Act 172, Act A1522 & Manual SIA

The Town and Country Planning Department at the federal level (PLANMalaysia Federal) has formulated and produced three manuals for project proponents, consultants, and others as a primary reference for SIA implementation. It is essential to refer to these specific guidelines related to SIA for a comprehensive and in-depth understanding of the relationship between SIA and the management of development projects. These manuals act only as a guideline and are not legally binding. The State Authority has the power to implement or not to implement the manual through the State Gazette, and if so, it becomes part of the town and country planning policies for that state. Consequently, the legislation and the court will consider the manual as an authoritative reference in preparing SIA at state level. However, the status of the SIA report will not be automatically void if there is any non-compliance with these manuals. The manual is merely considered a soft law with no sanctions provided for non-compliance.

The first manual is titled '*Pengenalan Ringkas SIA Penilaian Impak Sosial*' (2012), and the second manual is the 'Manual for Social Impact Assessment for Project Development' (Second Edition) (2018). The latest manual, "Panduan Pelaksanaan Penilaian Impak Sosial," which PLANMalaysia released in April 2023, takes into account changes in SIA implementation, including the categorization of development projects, qualifications for qualified individuals, the monitoring and auditing aspect of post-SIA, and others. (PLANMalaysia, 2023). A qualified person is important as that person is reliable and has the responsibility to carry out the report. Prior to this, stakeholders had brought up these concerns regarding the ineffectiveness of the SIA implementation. Although the new manual has been produced, its implementation is still under evaluation since it is still in its infancy and has not been fully implemented across all states.

SIA is essential to assess the potential impact of development projects and help the community realise its right to a high standard of living. The right to access the SIA report is very well illustrated in the case of *Yusof Bin A Bakar and Anor v. Datuk Bandar Kuala Lumpur* (2019); the Court of Appeal in this case allowed the appeal, stating that the public has the right to obtain technical reports such as the development proposal report, traffic impact assessment report, SIA report, and other relevant reports. The respondent had applied for planning permission for development around Taman Tiara Titiwangsa. However, the local community was not given access to the technical reports regarding the planning of that area. The court held in favour of the Appellants, stating that the community has the right to public participation in the process of the development. Public involvement is one of the compulsory processes in preparing the SIA report (Manual, 2018). It is also an established element since Malaysia consented to the Rio Declaration (Loh et. al, 2023). This component promotes SIA as a public report that is transparent and accountable. It helps determine the consequences of the proposed development. Therefore, public accessibility to the SIA report is significant to uphold their right to protect the standard of living within that area.

Additionally, the requirement of SIA has been stipulated under two related guidelines: the Guideline of Application for Development Proposal under Act 172 for development projects under section 20B (PPA 14, 2017) and the Guideline of Application for Development Proposal under Act 172 for development projects under section 22(2A) (PPA 13, 2017). These guidelines provide guidance and assistance for relevant stakeholders to obtain advice from the Council on the proposed developments based on the respective categories. However, the content of the manual is more detailed compared to the guidelines (PPA 13 and PPA 14) as the manual outlines the background of SIA, the SIA categories, persons qualified to prepare the SIA report and others. Figure 1 below illustrates the legal framework involved in SIA implementation in Malaysia.

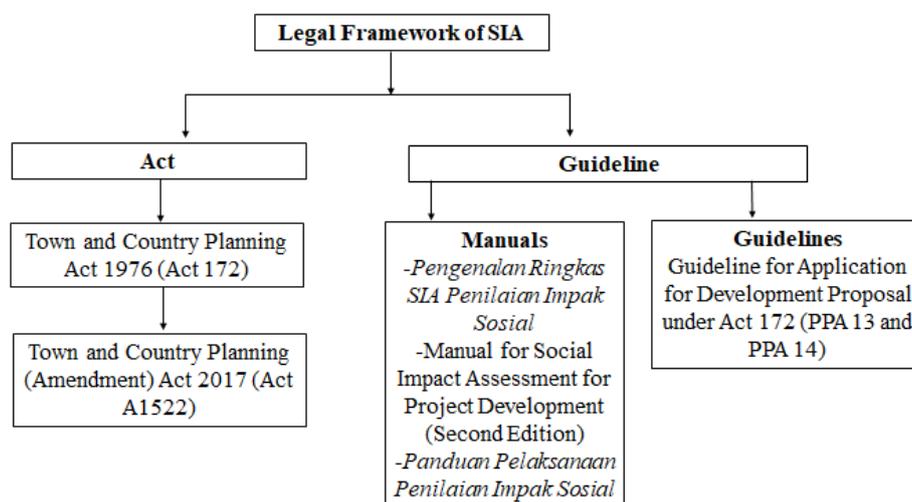


Figure 1: SIA Legal Framework in Malaysia

EIA Legal Framework

The legal framework for Environmental Impact Assessment (EIA) in Malaysia is primarily regulated by the Environmental Quality Act 1974 (Act 127). Section 3 of Act 127 empowers the Department of Environment (DOE) to regulate and enforce environmental quality standards, including the requirements for EIA. This Act is supported by various regulations, rules, orders, guidelines, manuals, and others. In total, twenty-five (25) regulations are enforced to protect the environment (DOE Portal, 2023). For instance, the Environmental Quality (Industrial Effluent) Regulations 2009 provide prescribed limits for pollutants discharged from industrial effluents and require industries to comply with these limits as part of their EIA compliance.

Over time, several orders have been developed in relation to EIA. One such order was the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987, which outlines a list of prescribed activities that require an EIA before they can be carried out. This order prescribed the types of projects or developments that fall under the EIA requirement. However, the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987 has been revoked and replaced by the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) (Amendment) Order 2015. This amendment expands the scope of prescribed activities that necessitate an EIA, ensuring that a wider range of projects are subject to environmental assessment. Recently, a new proposed amendment has been introduced through the Environmental Quality (Prescribed

Activities) (Environmental Impact Assessment) (Amendment) Order. This proposal further refines the list of prescribed activities and updates the requirements for EIA submissions and assessments (DOE Portal, 2023).

Section 34A (2) of the Environmental Quality (Amendment) Act 2012 (Act A1441) highlights the necessity for individuals undertaking the prescribed activities to appoint a qualified person to conduct an EIA study and submit a corresponding report to the Director General. The DOE is dedicated to enhancing professional knowledge and skills related to EIA through a guideline, namely the Guidance Document on EIA Consultant Registration Scheme. This document provides guidance to help applicants assess their eligibility for successful registration and fulfil the required registration criteria (2019). Section 34A(2B) of Act A1441 states the duties of a qualified person, who should be responsible for preparing the EIA report, recommending a report that does not contain misleading or false statements and being liable for professional indemnity insurance during the EIA process. As a result, it is possible to produce a quality and thorough report to maintain a resilient environment because the requirements outlined in (Act A1441) are sufficiently clear for potential applicants to refer to and follow.

Besides that, the DOE has also issued the Environmental Impact Assessment Guideline in Malaysia, which provides detailed information and procedures for conducting an EIA. Section 34A (2) of Act 127 explicitly states that the EIA report must be in accordance with the guidelines prescribed by the Director General. This guideline serves as a reference for project proponents, consultants, and regulators involved in the EIA process. Figure 2 below illustrates the legal framework for EIA implementation in Malaysia.

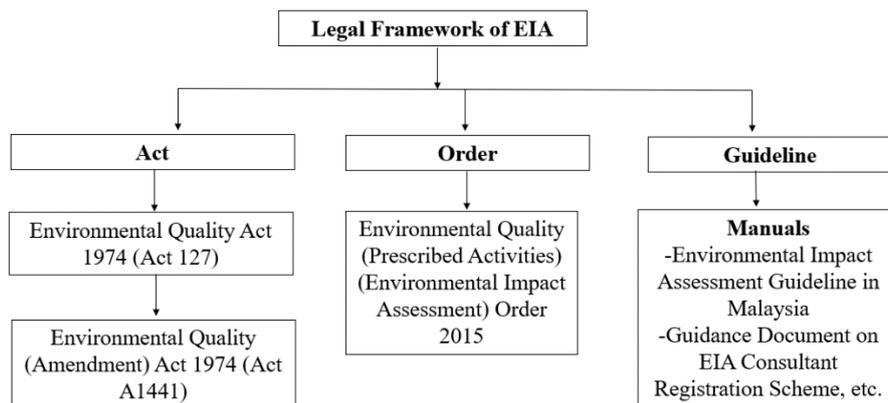


Figure 2: EIA Legal Framework in Malaysia

METHODOLOGY

This research employed a qualitative method, utilising library research, content and comparative analysis. According to George (2008), library research involves collecting, reviewing, and interpreting data from primary sources. Additionally, Zhang and M. Wildemuth (2009) state that content analysis is a research approach used to analyse and interpret textual data, including written documents, interview transcripts, and various forms of communication. The present paper analyses the content of books, articles, related laws, manuals, and reports relevant to the study.

The research also employed comparative analysis in analysing the basic background of SIA and EIA as well as the respective legal framework in conducting the assessments. Norat Roig-Tierno, Tomas F. Gonzalez-Cruz, Jordi Llopis-Martinez (2017) state that this methodology is crucial to establish causal relationships through systematic comparisons. It particularly prescribed the methods of agreement and difference between the two models. The data is presented through a matrix table, providing detailed information on the background of the assessments. This presentation enables a comparison of the similarities and differences between the SIA and EIA legal frameworks.

ANALYSIS AND CONCLUSION

The findings indicate that there are distinctions between SIA and EIA, particularly in regard to their respective scopes and principles. The scope of SIA is to examine the social aspects and impacts associated with a project, including socioeconomic factors, community well-being, cultural heritage, human rights, and stakeholder engagement. It considers, evaluates, and anticipates the project's effects on various social dimensions and aims to identify potential risks and benefits to affected communities and individuals to enable the developer to devise a viable mitigating plan to be put into motion.

On the other hand, although in principle, EIA shares the same spirit as SIA, EIA specializes in the examination of the environmental aspects and impacts associated with a project. It is an assessment tool to evaluate factors such as pollution, habitat destruction, resource depletion, and ecological disruptions. The goal is to identify and mitigate potential adverse environmental effects and promote sustainable development practices. Both assessments are often conducted in conjunction to comprehensively evaluate the potential effects of a proposed development or policy on both social and environmental aspects.

Generally, SIA can be integrated within the EIA framework and process or conducted as a standalone assessment, depending on the legal and policy requirements of a particular jurisdiction in which the proposed development is to be undertaken. Compared to EIA, it often incorporates social considerations to some extent but may not comprehensively address all aspects of social impacts.

Thus, the integration of SIA principles within the EIA mechanism can arguably further enhance the effectiveness of the assessment of social impacts.

In some countries, SIA may have its specific legal framework, while in others, it may be integrated within broader and general environmental or social policies and regulations. In Malaysia, both SIA and EIA are statutorily formulated under their own respective legal framework, as discussed in detail above, thus, the position of both assessments are statutorily recognised and shall be complied with accordingly by the relevant parties. To provide a comparative analysis, Table 2 presents the legal frameworks of SIA and EIA. The table includes the Acts, manuals, and guidelines that have been analysed in this research and contribute to the development of both assessments.

Table 2: Legal framework under SIA and EIA

Legislation	SIA	EIA
Act	Act 172, Act A1522	Act 127, Act A1441
Regulation	NA	Environmental Quality (Industrial Effluent) Regulations 2009
Order	NA	Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) (Amendment) Order 2015, Proposal Amendment of Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) (Amendment) Order
Manual & Guidelines	Manual Preparation SIA for Development Project 2012, 2018, 2023	Environmental Impact Assessment Guideline in Malaysia, Guidance Document on EIA Consultant Registration Scheme

Source: Policies and Frameworks in Malaysia

The law is vital as it serves as a norm of conduct for society and acts as a guide for acceptable behaviour. Many believe that a society without laws would descend into chaos (ENL, 2019). This principle also applies to the legal framework of these assessments. Table 2 shows that the number of legislations pertaining to EIA is greater compared to SIA because EIA implementation was introduced in 1988 as a mandatory requirement through the Environmental Impact Assessment Order (DOE, 1987) for prescribed activities. The implementation of EIA was based on the United States' National Environmental Policy Act (NEPA) of 1969 (2012). On the other hand, the requirement for SIA was only introduced in 2017 under Act 172. The significant gap in the duration

between the introduction of these assessments reflects the difference in the maturity of their implementation. Given the fact that the main intention for the development itself is intended for human beings the introduction of SIA can be viewed as a recognition of the human factor that plays a pivotal role from the development perspective hence, necessitating an evaluation of the impacts of the proposed development on the society.

Table 3 presents a summary of comparison pertaining to the differences of the implementation between these SIA and EIA based on their respective Act (Act 127 and Act 172).

Table 3: Distinctive features of SIA and EIA according to the respective legislations

Element	SIA	EIA	Significance
Requirement of report	Yes, for SIA Category 1 only (Section 20B)	Yes (Section 34A (2))	Ensure the accountability of the project proponent & consultant in preparing the report
Qualified Person	NA	Yes (Section 34A (2))	To ensure quality, only qualified individuals should prepare the report.
Report Approval	NA	Yes (Section 34A (4))	Approval of report by the Director-General/ relevant authority
Public Participation/ Display	NA	Yes (Environmental Quality (Prescribed Activities) (EIA) Order 2015)	Public interest

Source: Policies and Frameworks in Malaysia

Several fundamental aspects of the implementation, such as the requirement for report preparation, the criteria for a qualified person to prepare the report, the significance of approval of the report, the obligation of the applicant to follow prescribed guidelines and others, are required to be considered as stipulated under the Act. The requirement of a report under the Act ensures the accountability of project proponent in preparing the report for a development project. A report that has quality and is transparent will be produced if it is prepared by a qualified person, and such report needs to be approved by the authority to guarantee compliance with the intended environmental goals. Furthermore, during the stage of data collection, it is essential to involve the

surrounding community and potential stakeholders in the preparation of reports, as they are the very group of people that will be directly impacted by the proposed development. EIA has generally addressed these aspects under Act 127 and Act A1441, which assist and facilitate the implementation of EIA among stakeholders.

It has been found that stakeholders face issues with SIA implementation, such as a lack of specific operational provisions under Act 172 and explicit guidelines to further explain the implementation (PLANMalaysia, 2022). The inadequacy of provisions under the Act and guidelines leads to difficulties for them in preparing, monitoring, and auditing the report. Table 3 illustrates that Act 172 does not expressly provide for the fundamental aspects of SIA implementation, for instance, on the aspect of the criteria of qualified persons, report approval mechanism, and mandatory public participation. The table shows that no provision is provided under Act 172 regarding the requirement of SIA for development projects under SIA Categories 2 and 3. The same situation applies to the requirements and criteria of a qualified person, report approval, and public participation. These limitations restrict their ability to contribute effectively to a resilient development environment or in the worst-case scenario, this loophole can be manipulated by any *mala fide* developer maneuvering around technicalities to avoid any liabilities. Furthermore, these limitations can lead to higher costs, especially for consultants and project proponents, who may have doubts about the procedures for preparing SIA reports without a clear basis that they can refer to.

The rapid pace of development has compelled regulators to implement a comprehensive legal framework to strike a balance between social development and the utilization of natural resources. In response to this concern, the government is called upon to make legislative amendments and introduce improvements to the governance of these assessments, with priority to the SIA. Notably, this approach also aligns with the Sustainable Development Goals (SDGs) and will truly promote sustainable development as well as environmental protection in Malaysia.

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DEVELOPING SUSTAINABLE URBAN REGENERATION (SUR) EVALUATION METHOD FOR THE MALAYSIAN CONTEXT

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Abstract

Sustainable urban regeneration (SUR) represents an advanced and comprehensive approach to urban regeneration, aiming to integrate the three key pillars of sustainable development. While various global frameworks exist for measuring sustainable urban regeneration performance, a dedicated method tailored to the specificities of the Malaysian context remains absent. This study addresses this gap by developing a SUR evaluation method for Malaysia, utilising indicators as a means to gauge sustainability performance. A self-administered questionnaire was employed to solicit assessments from key experts regarding potential SUR criteria and indicators. The resulting data were analysed using the Analytic Hierarchy Process (AHP) to establish weightage based on priority scales. Results from the study identified ten (10) fundamental criteria and thirty-three (33) indicators, each assigned respective weightage, pivotal in achieving sustainable urban regeneration. This study contributes to the improvement of sustainability performance of urban regeneration initiatives in Malaysia by introducing a novel evaluation method. As a way forward, it is recommended that the practicality and capability of the proposed evaluation method be assessed through real-life case study in Malaysia.

Keywords: urban regeneration; sustainable urban regeneration (SUR); sustainability performance; indicators; evaluation method; Analytic Hierarchy Process (AHP)

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INTRODUCTION

The sustainable urban regeneration (SUR) approach is regarded as a vital solution for addressing the multi-faceted challenges of aging cities and reinvigorating their historical significance, characterised by intrinsic values such as heritage structures and unique local cultural attributes, all within a sustainable framework. Emerging in the late 1990s, SUR represents an evolved iteration of urban regeneration approach, which transitioned from a focus on mere demolition and reconstruction in the post-World War II era (Couch, Sykes & Börstinghaus, 2011; Rosly & Rashid, 2013) to a more comprehensive approach that integrates sustainability in urban regeneration practices (Korkmaz & Balaban, 2020; Shutkin, 2000; Berke, 2002; Chan & Lee, 2006).

Numerous studies have highlighted the necessity of sustainable development within urban regeneration efforts (Huang, Zheng, Hong, Liu & Liu, 2020; Lee & Lim, 2018; Zheng, Shen & Wang, 2014; Turcu, 2012; Yung & Chan, 2012; Burrage, 2011; Winston, 2009; Chan & Lee, 2008; Evans & Jones, 2008; Hunt, Lombardi, Rogers et al., 2008). According to these studies, positive results are anticipated after the completion of urban regeneration projects; attributing them to the incorporation of sustainability principles, such as fostering economic growth, enhancing the quality of both natural and built environments, as well as enhancing social well-being. Thus, it is crucial to evaluate and monitor the sustainability performance of these initiatives in order to ensure that the initiatives are implemented in a sustainable manner, aligning with the emphases of prior studies (Zheng, Shen, Song, Sun & Hong, 2017; Brandon, 2005; Hemphill, McGreal & Berry, 2002; Innes & Booher, 2000).

While the need to implement sustainable urban regeneration which aligns with the global '2030 Agenda for Sustainable Development', Malaysia's involvement in such initiatives is relatively new as compared to longstanding efforts in developed countries such as the United Kingdom, Germany and France, which embarked on urban regeneration as early as the late 1940s. Given the fledgling nature of urban regeneration experiences in Malaysia (Rosly & Rashid, 2013); a tailored SUR evaluation method applicable to the local context has yet to be established. Therefore, this study aims to develop a practical and quantifiable evaluation method tailored to the unique characteristics of the Malaysian context. This study involves an examination of existing evaluation framework from various global studies, which will be adapted to the specificities of the Malaysian context; (i) through collaboration with local experts; and (ii) by leveraging on locally relevant data sources. Subsequent sections of this paper present a comprehensive literature review, detailed methodology, presentation of the results and discussion on the findings, and a conclusive summary. The outcome of this paper is the proposed evaluation method as part of a monitoring mechanism poised to improve the sustainability performance of urban regeneration initiatives in Malaysia.

LITERATURE REVIEW

From a policy perspective, constant evaluation of regeneration initiatives throughout their life cycle holds paramount importance in formulating effective and practical strategies in order to achieve the most sustainable outcomes (Cahantimur, Öztürk, & Öztürk, 2010). Evaluation does not only provide insights into future trends (Zheng et al., 2014), but also enables the refinement or termination of existing programmes, if deemed unsuccessful (Hemphill, Berry & McGreal, 2004a). Despite various sustainability assessment tools and frameworks being studied and proposed (Korkmaz & Balaban, 2020), comprehensive studies focusing on urban regeneration achievements in economic, social, physical, and environmental sustainability remain limited, as the prevailing focus predominantly on social and economic evaluations (Zheng et al., 2014).

The evaluation framework garnering the most attention is the indicator-based approach (Huang et al., 2020; Zheng et al., 2014; Hemphill, Berry & McGreal, 2014; Wong, 2000; Audit Commission, 2002; Hemphill, McGreal & Berry, 2004b; Peng, Lai, Li & Zhang, 2015). This approach relies on key performance indicators that provide diverse metrics for evaluating achievement (Audit Commission, 2002), encompassing both qualitative and quantitative assessments. It has garnered the interests of both scholars and policymakers alike, as it serves to encapsulate the essence of sustainability (Turcu, 2012). Nonetheless, the classification of ‘sustainability’ into discrete indicators and the subsequent measurement of urban regeneration performance based on these indicators present inherent challenges (Turcu, 2012). While it is plausible to establish indicators to assess certain urban regeneration outcomes, such as job creation and leveraged private sector investment, the task becomes considerably more complicated when attempting to set indicators for multi-dimensional sustainability criteria, such as quality of life (Hemphill, Berry & McGreal, 2014).

Several indicator frameworks have been developed (Korkmaz & Balaban, 2020; Turcu, 2012; Chan & Lee, 2008; Zheng, Shen, Song, Sun & Hong, 2017; Hemphill et al., 2004a; Chan & Yung, 2004; Lee & Chan, 2008). However, there is a lack of consensus within the literature regarding the most appropriate framework for assessing regeneration initiatives (Balaban, 2013), particularly concerning the design and selection of indicators. Scholars such as Tanguay et al. (2010); Hemphill et al. (2004a); Shen et al. (2011); Langstraat (2006) contend that a universally applicable set of sustainability indicators, adaptable for use in any city or urban context, remains elusive. Nonetheless, it is generally accepted that urban regeneration initiatives must be attuned to local circumstances and tailored to their specific local contexts (Kleinhans, 2012), including the design or selection of sustainability evaluation methods (Korkmaz & Balaban, 2020).

An emerging consensus underscores the necessity for sustainability evaluation methods to be tied to the specificities of individual cities (Langstraat 2006), reflecting the nuances of local conditions and aligning with the values of the target audience (Dahl, 2012). Context is thus suggested to be “the most influential element of the assessment” (Conte & Monno, 2012).

RESEARCH METHODOLOGY

This study adopts a mixed-method approach, beginning with the identification of potential SUR indicators. Subsequently, local experts assess these indicators to determine their relative importance, followed by the development of a points scoring system for each measurement items. The Analytical Hierarchy Process (AHP), in conjunction with a questionnaire survey, are utilised for the purpose of assigning weights to each sustainability criterion.

Step 1: Identification of Sustainable Urban Regeneration (SUR) Indicators

The identification and selection of SUR indicators are conducted judiciously, considering their value and practical applicability of each potential indicator in terms of data availability, geographical condition, potential for time-series analysis, feasibility of implementation, and interpretability (Hemphill et al., 2004a). The initial step of this process is a comprehensive review of the extensive range of SUR indicators found in the literature. Employing content analysis, indicators related to sustainable urban regeneration are categorised and grouped based on shared and relevant characteristics. Only indicators that meet various criteria, including scientific rigour, technical robustness, clarity, sensitivity to change, measurability and able to be regularly updated (DETR, 1998) are selected for the next phase.

Step 2: Allocation of Weightage based on Expert Evaluation

Identified through a comprehensive literature review, the potential SUR indicators are further evaluated by local experts to establish their relative weightage. These experts, selected using purposive sampling, comprise a diverse group encompassing government authorities, professionals (including planners and urban regeneration consultants), and academicians. The selection criteria for experts include a robust publication profile in urban regeneration, sustainability, planning, and development, alongside substantial experience or reputation in their respective fields. Specifically, the chosen experts possess the following characteristics:

- Over 15 years of experience in the built environment, town planning, or property development.
- Hold at least an executive level position within their organisations.
- Have prior experience or are currently involved in projects or programmes related to urban regeneration.

A Delphi survey questionnaire was employed to obtain the experts' evaluation of each SUR criteria and indicator in a pairwise comparison scale to express the importance of one criterion over another. The Delphi survey questionnaire offers a more practical alternative to conventional brainstorming techniques that rely on open dialogue to solicit opinions (Lee & Lim, 2018). The questionnaire prompts experts to evaluate each SUR criterion and indicator through pairwise comparisons, allowing them to express the relative importance of one criterion over another, as shown in **Table 1** below.

Table 1: Example of Pair Wise Comparison Scale Asked in the Questionnaire

OPTION A	SCORE													OPTION B				
	Extreme	Very Strong		Strong		Moderate		Equal	Moderate		Strong	Very Strong			Extreme			
	9	8	7	6	5	4	3	2	1	2	3	4	5		6	7	8	9
Job Availability													✓					Business Activity

Descriptive analysis is conducted using SPSS software to synthesise the assessments of each expert into a unified judgement through mean scores. These aggregated scores are then input into the Super Decision software to determine the respective weightage. This process involves the application of Multiple Criteria Decision Making (MCDM) using the Analytic Hierarchy Process (AHP) technique. AHP is chosen for its relevance in the Malaysian context (Hashim, 2021) as well as its capacity to improve consistency in judgements (Saaty, 2008). This methodology is a theory of measurement through pairwise comparisons, relying on expert assessments to establish weight and priority scales, where comparisons are made using a scale of absolute judgements that indicate the extent to which one element supersedes another in relation to a given attribute.

Step 3: Establishment of Measuring Item and Points Scoring

The evaluation of each indicator is through the use of several measuring items within an aggregated point scoring system. This approach is crucial, as the application of indicators lacks meaningful interpretation without an established scoring system that enables performance evaluation and quantification (Hemphill et al., 2004a). A range of scaling methods can be applied to assign points ranging

from direct methods based on a singular characteristic (such as frequency, weight, or value), or indirect methods grounded in multidimensional concepts (such as health or welfare) relying on a scale of acceptability or satisfaction (Horn, 1993).

ANALYSIS AND DISCUSSION

Sustainable Urban Regeneration (SUR) Criteria and Indicator

The literature review exploration has identified a comprehensive list of potential SUR indicators. Following rigorous screening of the identical indicators (indicators that share the same meaning but use different terminology), a set of potential SUR indicators is selected and subsequently categorised into ten (10) groups (criteria) according to three (3) dimensions of sustainability, which are economic, social, and environment.

Allocation of Weightage based on Expert Evaluation

Figure 1 illustrates the AHP Analysis Model, depicting the pairwise comparisons among sustainability dimensions (Level 1), criteria (Level 2) and indicators (Level 3). The first level encompasses the Sustainability Dimension, representing the three pillars of sustainability. Following this, the second level encompasses SUR Criteria, which group indicators based on shared characteristics. The third level comprises SUR Indicators, reflecting the level of achievement or sustainability performance, evaluated through a combination of quantitative and qualitative data. All evaluations by experts yielded Inconsistency Ratio (IR) values below 0.1 (<0.1), indicating good consistency and affirming the acceptability of the results.

i. Sustainability Dimension (Level 1)

Results from the pairwise comparison matrix of Sustainability Dimension (Level 1) indicate that Social and Environment sustainability are emphasised more as compared to Economic sustainability (**Table 3**).

Table 3: Weightage and Rank of Sustainability Dimension (Level 1)

Rank	Sustainability Dimension	Economic	Environment	Social	Normalised
3	Economic	1.00	0.33	0.20	0.11
2	Environment	3.00	1.00	0.50	0.31
1	Social	5.00	2.00	1.00	0.58
Idealised		0.19	0.53	1.00	

The Sustainability Dimension Inconsistency Ratio is 0.00

Source: Author (2023)

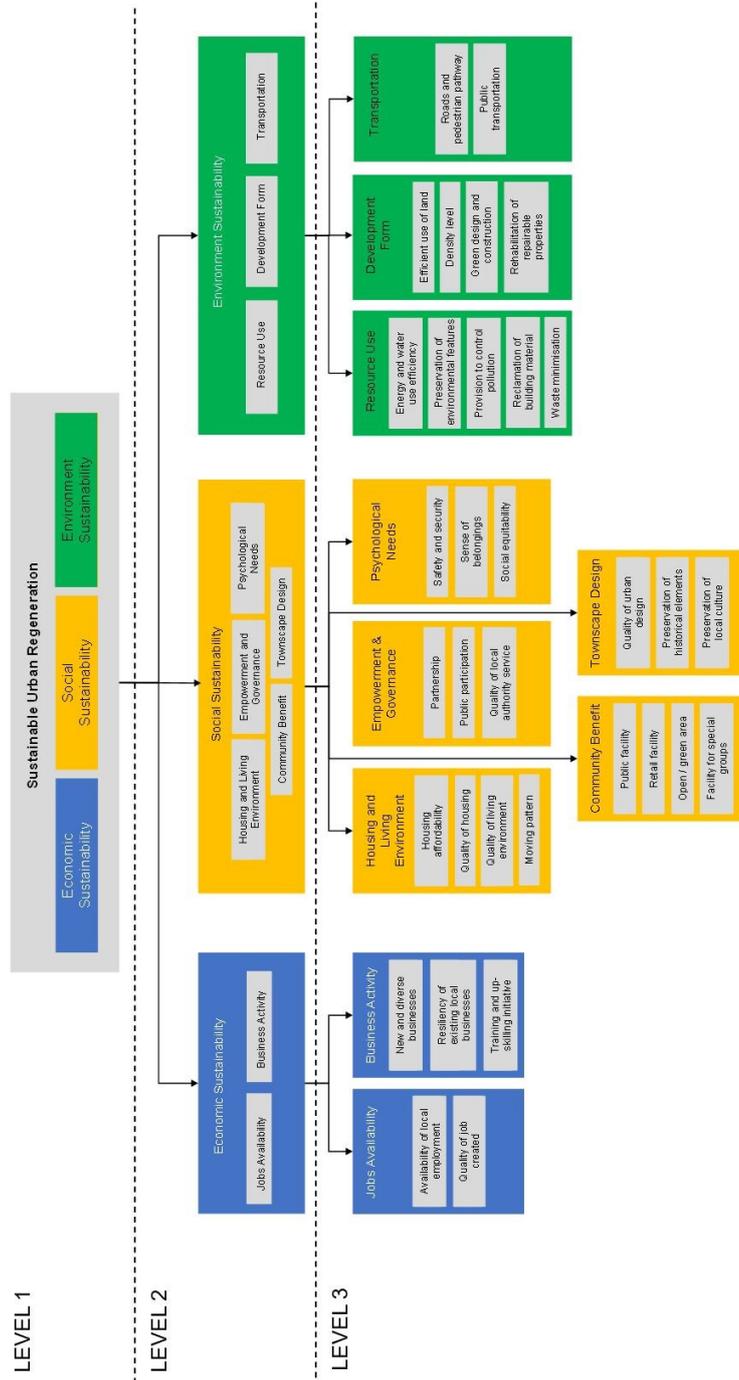


Figure 1 : AHP Model for Sustainable Urban Regeneration (SUR)

Source: Author (2023)

ii. Sustainable Urban Regeneration (SUR) Criteria (Level 2)

Within the Economic Sustainability dimension, two criteria (groups of indicators) were identified, in which the pairwise comparison matrix revealed that the Jobs Availability criterion carries significantly higher weight (0.86) compared to Business Activity (0.14). This indicates the imperative of prioritising employment generation within urban regeneration initiatives, a crucial aspect for achieving sustainable urban regeneration (**Table 4**). Urban regeneration efforts should aim to produce substantial job opportunities within the community and its surrounding areas (Chan & Lee, 2008), fostering a balanced distribution of both higher and lower-value employment opportunities (Hemphill et al., 2004a).

Table 4: Weightage of SUR Criteria (Economic Sustainability)

Description	Business Activity	Job Availability	Normalised
Business Activity	1.00	0.50	0.33
Job Availability	2.00	1.00	0.67
Idealised	0.50	1.00	

The Economic Sustainability Criteria Inconsistency Ratio is 0.00

Source: Author (2023)

Within the Social Sustainability dimension, comprising five (5) distinct criteria, the Empowerment and Governance criteria were accorded the highest weight (0.34), followed by Housing and Living Environment (0.30), and Townscape Design (0.16), as shown in **Table 5**.

Table 5: Weightage of SUR Criteria (Social Sustainability)

Description	CB	EG	HL	PN	TD	Normalised
CB	1.00	0.33	0.33	2.00	0.50	0.11
EG	3.00	1.00	1.00	3.00	3.00	0.34
HL	3.00	1.00	1.00	3.00	2.00	0.30
PN	0.50	0.33	0.33	1.00	0.50	0.09
TD	2.00	0.33	0.50	2.00	1.00	0.16
Idealised	0.34	1.00	0.91	0.25	0.48	

The Social Sustainability Criteria Inconsistency Ratio is 0.02

Source: Author (2023)

*Note:

CB - Community Benefit	PN - Psychological Need
EG - Empowerment and Governance	TD - Townscape Design
HL - Housing and Living Environment	

This underscores the integral role of multiple stakeholders in shaping a sustainable future, a sentiment emphasised by Zawawi and Abdullah (2011). Establishing local partnerships and facilitating ‘delegated power’ among key stakeholders in urban regeneration initiatives not only can sustain but also increase community activity, both of which are critical aspects for ensuring the sustainability of the regenerated area (Turcu, 2012). In terms of Environment Sustainability, Transportation emerged with the highest weight (0.65), followed by Resource Use (0.23), and Development Form (0.12) as shown in **Table 6**. Given the pivotal role of transportation in driving developmental growth, its impact on environment sustainability is significant (Teh et al., 2019). A clear cause-and-effect example lies in the construction of roads to accommodate development, often at the expense of depleting existing natural resources. This underscores the need to prioritise the implementation of sustainable transportation concepts, such as Transit Oriented Development (TOD), within urban regeneration initiatives. As emphasised by Ramlan, Osman, Rabe et.al (2021), TOD is a highly acclaimed concept that advocates for sustainable development by integrating land use and public transport stations as integral components of urban strategies.

Table 6 : Weightage of SUR Criteria (Environment Sustainability)

Description	Development Form	Resource Use	Transportation	Normalised
Development Form	1.00	0.50	0.20	0.12
Resource Use	2.00	1.00	0.33	0.23
Transportation	5.00	3.00	1.00	0.65
Idealised	0.19	0.35	1.00	

The Environment Sustainability Criteria Inconsistency Ratio is 0.00

Source: Author (2023)

The results for pairwise comparison matrix among all SUR criteria (**Table 7**) indicate that the Jobs Availability (0.67) criterion holds the highest rank, followed closely by Transportation (0.65), Empowerment and Governance (0.34), Business Activity (0.33) and Housing and Living Environment (0.30). Employment plays a pivotal role in enhancing social well-being by not only generating incomes but also providing a platform for social interaction and contact (Omann & Spangenberg, 2002). Moreover, increased employment rate serves to alleviate issues such as poverty, social exclusion, welfare dependence, family problem, and social disorder (Stiglitz, 2001).

Table 7: Weightage and Rank of SUR Criteria (Level 2)

Rank	Weightage (Normalised)	Sustainability Criteria	Sustainability Dimension
1	0.67	Job Availability	Economic
2	0.65	Transportation	Environment
3	0.34	Empowerment and Governance	Social
4	0.33	Business Activity	Economic
5	0.30	Housing and Living Environment	Social
6	0.23	Resource Use	Environment
7	0.16	Townscape Design	Social
8	0.12	Development Form	Environment
9	0.11	Community Benefit	Social
10	0.09	Psychological Need	Social

Source: Author (2023)

The rankings derived indicate that while many SUR indicators demonstrate similarity and consistency, the significance of each criterion in contributing to sustainable urban regeneration varies based on the local context. For example, the ranking for the community benefits criterion in this study is relatively lower in comparison to the findings reported by Hemphill et al. (2004a).

iii. Sustainable Urban Regeneration (SUR) Indicator (Level 3)

The weightage results for the thirty-three (33) SUR indicators (Level 3) is summarised into rankings as illustrated in **Figure 2**. The top five (5) SUR indicators are *Public Transportation* (0.83), followed by *Availability of Local Employment* (0.67), *Safety and Security* (0.61), *Resiliency of Existing Local Business* (0.50) and *Provision of Access to Open / Green Area* (0.50).

Development of Measuring Item and Points Scoring Method (Level 4)

The performance of each individual indicator is evaluated through several measuring items, encompassing both quantitative and qualitative data, capable of allocating a maximum of 10 points for each item. While some indicators may be evaluated by using either quantitative or qualitative data, others require a combination of both, such as in the case of townscape design. Striking a good balance between quantitative and qualitative indicators is a pivotal characteristic of sustainability evaluation methods (Majid, Lim, Zaman & Ruslik, 2021) for urban regeneration (Korkmaz & Balaban, 2020), transcending beyond mere quantitative metrics (Hemphill et al., 2004a; Boyle, Michell, Viruly, 2018). In this study, a total of seventy-eight (78) measuring items are proposed to evaluate the identified thirty-three (33 SUR) indicators.

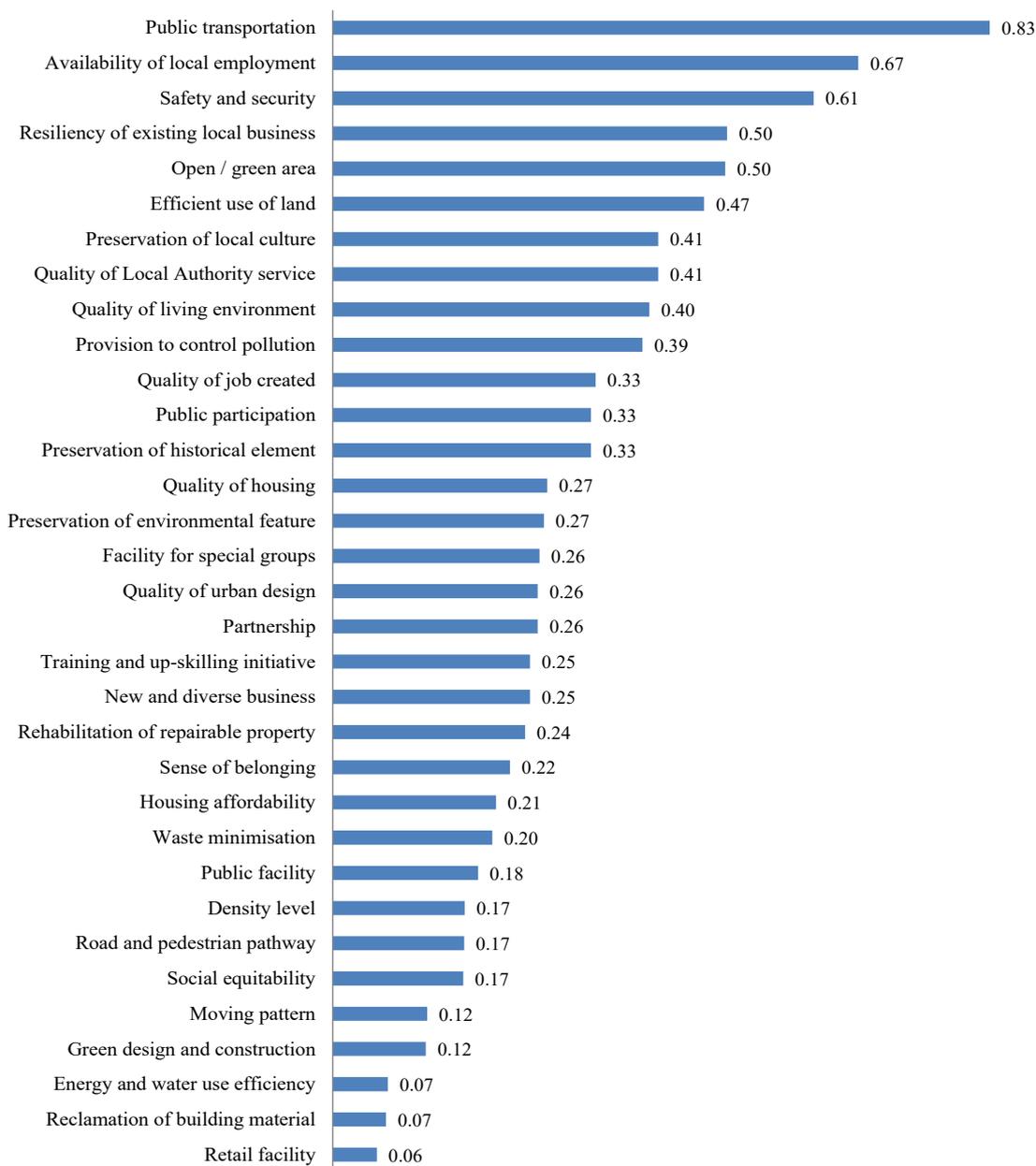


Figure 2: Ranking of SUR Indicator (Level 3) based on the Weightage
 Source: Author (2023)

Sustainability Level Calculation

In order to measure the sustainability performance of an urban regeneration initiative, the total points obtained from the measuring items are subsequently multiplied by the weightage assigned to each criterion (**Table 8**).

Table 8 : Total Possible Points from SUR Scoring Method

Criteria	Criteria Weightage (%)	Number of Measuring Item	Max Points	Max points × Weightage
Job Availability	22.3	4	40	892
Transportation	21.7	7	70	1,519
Empowerment and Governance	11.3	6	60	678
Resource Use	11.0	5	50	550
Housing and Living Environment	10.0	8	80	800
Development Form	7.7	8	80	616
Townscape Design	5.3	10	100	530
Business Activity	4.0	7	70	280
Community Benefit	3.7	13	130	481
Psychological Need	3.0	8	80	240
Total	100.0	76	760	6,586

*Note: Technique adapted from Hemphill et al. (2004a)

Source: Author (2023)

A sliding scale technique is adopted, involving the computation of the total weighted points attainable, which is further distributed as a range of percentages along a sliding scale from ‘poor’ to ‘excellent’ (**Table 9**). This scaling approach is calibrated to represent realistic goals for achieving sustainable urban regeneration (Hemphill et al., 2004a).

Table 9: Sustainability Level Based on Sliding Scale Technique

Sustainability Level (Scale)	Percentage Range
Very Poor	< 41
Poor	41 – 55.9
Average	56 – 70
Good	71 – 85
Excellent	86 – 100

*Note: Technique adapted from Hemphill et al. (2004a)

Source: Author (2023)

The developed scoring and weighting system serves as a valuable tool, providing a comprehensive indication of performance while indicating areas that require improvement (Hemphill et al., 2004a).

CONCLUSION

The evaluation and monitoring of sustainability performance in regeneration initiatives are recognised as essential components in delivering a holistic and coherent strategy rooted in sustainability principles. Consequently, various evaluation methods have been proposed on a global scale, with the indicator-based approach emerging as one of the most widely adopted methods. This study has initiated the development of a tailored evaluation method in Malaysia, namely the SUR indicator and points scoring method. This method is designed to align with the local context, employing expert-led approaches wherein local experts provided their assessments on each sustainability dimension, criteria, and indicator. The selection of measuring items for each indicator also considers the availability and source of data that accurately reflects the local context. Notable findings of this study include the identification of ten (10) fundamental criteria and thirty-three (33) indicators, each with explicit weightage, signifying their relative importance in contributing to sustainable urban regeneration efforts. Moreover, the evaluation method is engineered to be adaptable, allowing local authorities to apply it in the selection of the most sustainable design proposals for urban regeneration initiatives, with the flexibility to modify the measuring items as needed.

This evaluation method has the potential for further refinement, transitioning from manual calculation, as shown in this study, to a computerised system. Users (local authorities) could easily derive results by inputting their evaluations for each measuring item. This tool offers the capacity to identify specific criteria that significantly affect the performance of urban regeneration, thereby enabling the implementation of necessary corrective actions. The contribution of this study lies in its practical guidance for the evaluation and monitoring of urban regeneration initiatives in Malaysia. The developed SUR Indicator and Points Scoring Method represents a novel approach within the Malaysian context, addressing a current gap in the availability of measuring tools for evaluating the sustainability of urban regeneration initiatives in Malaysia at the neighbourhood or site specific level. Nonetheless, it is recommended that the practicality and capability of the evaluation method be assessed through real-life case studies, demonstrating both the robustness of the selected indicators and the adaptability of the point scoring method in evaluating the sustainability performance of regeneration initiatives.

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DEVELOPMENT OF HYDROLOGICAL MODELLING USING HEC-HMS AND HEC-RAS FOR FLOOD HAZARD MAPPING AT JUNJUNG RIVER CATCHMENT

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Abstract

Climate change has resulted in severe disasters such as floods, droughts, hurricanes, etc. As the climate warms, precipitation events become more frequent and intense, resulting in severe rains that may overflow rivers, streams, and drainage systems. The Junjung watershed, like many other areas, is vulnerable to floods, which may significantly damage the environment, infrastructure, and the local populace. As a result, precise knowledge of the catchment's rainfall intensity and hydrological features is required, as is the development of effective flood danger mapping. This research aims to determine the rainfall intensity for the catchment area. The study also intends to create a flood danger map for the Junjung watershed using HEC-HMS. The rainfall intensity for 50- and 100-years ARI was computed using HEC-HMS. HEC-RAS was used to produce flood hazard models, which revealed that rainfall intensity rose from the 50-years to the 100-years ARI. This indicates that the catchment is more likely to flood during extreme weather events, possibly more catastrophic flooding during uncommon, high-intensity rainfall. The Junjung watershed, according to the flood hazard mapping data, is in danger of flooding after high rains, which may result in the river overflowing and flooding the adjacent regions. As a result, reliable flood hazard maps are critical for mitigating the effect of flood occurrences in the study region.

Keywords: Climate Change, Disaster Reduction, Flood Mapping, HEC-HMS and HEC-RAS

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INTRODUCTION

Flooding is a significant natural disaster that can damage people's homes and structures, make it hard for people to make a living, and even kill people. Climate change is likely to make floods happen more often and be worse when they do. Because of this, it is crucial to make accurate and valuable flood danger maps so that areas at risk can be found and steps can be taken to avoid or lessen potential flood tragedies (IPCC, 2014; Toriman et al., 2015; Saad et al. 2023). Penang, Malaysia, where the Junjung River flows into the sea, is at risk of floods. The catchment area is about 89 square kilometres and has more than 70,000 people. Because of where it is, the stream is at risk of flooding when it rains a lot. This is because the river can overflow and flood the area around it. Hydrological modelling was used to make accurate flood risk maps for the Junjung River basin. Hydrological modelling is a process that models how water moves in an area, including rain and flow, in order to predict how a river will act and whether or not it will flood.

The study aimed to learn as much as possible about the hydrological processes and amount of rain in the Junjung River basin and to use HEC-HMS to create a computer model. The study used different kinds of data, such as weather data, topographic maps, maps of how land is used, and data from stream gauges, to make the hydrology model. Observed stream flow data were used to test and confirm the model. The results were used to map flood danger based on different return times (50 and 100 years). Heavy rainfall events create a danger of flooding in the Junjung River watershed, according to the research, which might cause severe damage to infrastructure and force the relocation of communities. Results from the modelling were used to create flood hazard maps, pinpoint vulnerable locations and suggest solutions for dealing with floods, such as better drainage and installing early warning systems (Jaafar et al., 2010; Azid et al., 2015; Mustafa et al., 2023). For this purpose, it is crucial to create hydrological models utilizing HEC-HMS and HEC-RAS to forecast how rivers would act during times of significant rainfall and to pinpoint locations likely to be flooded. To lessen the severity of future flood natural disasters in the Junjung River basin and other regions in danger of flooding, the findings of this research may be used to create efficient flood risk management methods and mitigation measures.

LITERATURE REVIEW

Flood Disaster

Damage to infrastructure, houses, and assets, as well as disruption of livelihoods and loss of life, are all regular results of floods, impacting many nations across the globe. Globally, climate change has been linked to more frequent and severe floods (Dilley et al., 2005; Kundzewicz et al., 2007). Flooding will become more severe due to global warming, according to the Intergovernmental Panel on

Climate Change (IPCC) (IPCC, 2012). As a result of this danger, several nations have created flood hazard maps to help pinpoint vulnerable locations and execute flood risk management plans (Meyer et al., 2009; Abdul Maulud, 2021).

These floods have destroyed homes and businesses, displaced thousands, and claimed lives. Because of its tropical environment, the state often experiences flooding, particularly during the monsoons (Chow, 2016). Baharom et al. (2015) found that in recent years, Penang flood occurrences have become more frequent due to climate change and land use changes. The research concluded that rainfall intensity and duration are the most important factors in determining flood risk in the Penang region. The fast urbanization and significant population growth in Penang have also increased the likelihood of flooding (Baharom et al., 2015). The terrible storm that hit Penang in November 2017 was just one of numerous significant flooding catastrophes the city has had to deal with in recent years. Since then, the state government has made steps to resolve the problem, such as funding flood mitigation projects and creating flood hazard maps to pinpoint vulnerable locations.

Flood hazard mapping is vital in flood risk management and catastrophe preparation. Authorities may take preventative actions against flood damage by pinpointing vulnerable sites. Thanks to flood hazard mapping in Penang, effective flood management strategies and sites for flood mitigation projects have been developed. However, like with any modelling technique, flood hazard mapping has its own caveats and uncertainties that must be considered when planning for flood management.

Flood Hazard Mapping

Mapping flood hazards is an important part of flood risk management. It entails locating potentially flooded regions and drawing maps to illustrate the full scope of the problem. Flood maps have various uses in flood protection and catastrophe management, including risk assessment, community development, and disaster preparedness. Flood maps are only as reliable as the information that goes into making them. Digital Elevation Models (DEMs) are crucial to creating reliable flood maps, and recent advancements in remote sensing technology, like Light Detection and Ranging (LiDAR), have made their generation feasible. More data sources, such as precipitation, stream flow, and land use information, can now be integrated and analyzed using Geographic Information Systems (GIS), creating more accurate and detailed flood danger maps.

Chen et al. (2021) produced a flood danger map for the Lower Mekong River Basin using hydrological modelling, LiDAR data, and GIS. The research concluded that by including LiDAR data in the flood hazard map, the accuracy of the map was much enhanced, making it an effective tool for pinpointing vulnerable locations and setting priorities for flood risk management. Using

hydrological modelling, rainfall data, and GIS, Lam et al. (2019) created a flood danger map for Hong Kong. According to the results, the flood hazard map helps pinpoint vulnerable locations and guide land-use planning choices in high-risk flood zones.

Local groups have also helped with flood risk assessments. The People's Disaster Risk Reduction Network (PDRRN) mapped urban flood hazards in the Philippines to better inform local disaster risk reduction programs (Abiera et al., 2021). Disaster preparation and mitigation initiatives in India have benefited from flood risk mapping conducted by the Gorakhpur Environmental Action Group (GEAG) (Kumar et al., 2017). There currently needs to be defined terminology or agreed-upon techniques for flood mapping in Europe (Pardoe et al., 2020), even though such mapping is an essential component of flood risk management.

More precise information on flood danger zones and probable flood damage is provided by 2D flood hazard mapping, which is another benefit. Flood insurance, land use planning, and disaster preparation are just a few of the areas where community members may benefit greatly from having access to this data. Flood danger is better communicated to the public via 2D flood hazard maps, according to research by Chen et al. (2018). In addition, 2D flood hazard mapping might reveal vulnerable locations that have been missed or underrated. For instance, Smith et al. (2015) demonstrated that two-dimensional flood hazard maps were superior to one-dimensional ones in pinpointing potential flash flood zones. Effective flood control strategies and emergency response plans may be created using this data.

In conclusion, flood hazard mapping is crucial for controlling flood hazards. HEC-RAS and GIS advancements have made it simpler to create precise flood maps, which have various uses in flood defence and disaster management. Because of the significance of community involvement in controlling flood hazards, community-based groups have also participated in flood hazard mapping.

RESEARCH METHODOLOGY

Methods

The Junjung River Basin flood hazard map was created using HEC-HMS and HEC-RAS. Figure 1 depicts a flood danger map development. Hydrological data analysis and rainfall design for certain return periods employed the basin's topography and land use data. HEC-HMS computed basin runoff proportional temporal patterns. The research calibrated input data in HEC-HMS to create a synthetic unit hydrograph.

This hydrograph was created for a 50- and 100-year Average Recurrence Interval (ARI) for two basin development and land use scenarios.

HEC-RAS will flood calibration verify this data. The research will next compare simulated data accuracy to Junjung River Basin water level data. This method verifies flood calibration. The research must adjust parameters before creating the flood hazard map if simulation data is erroneous.

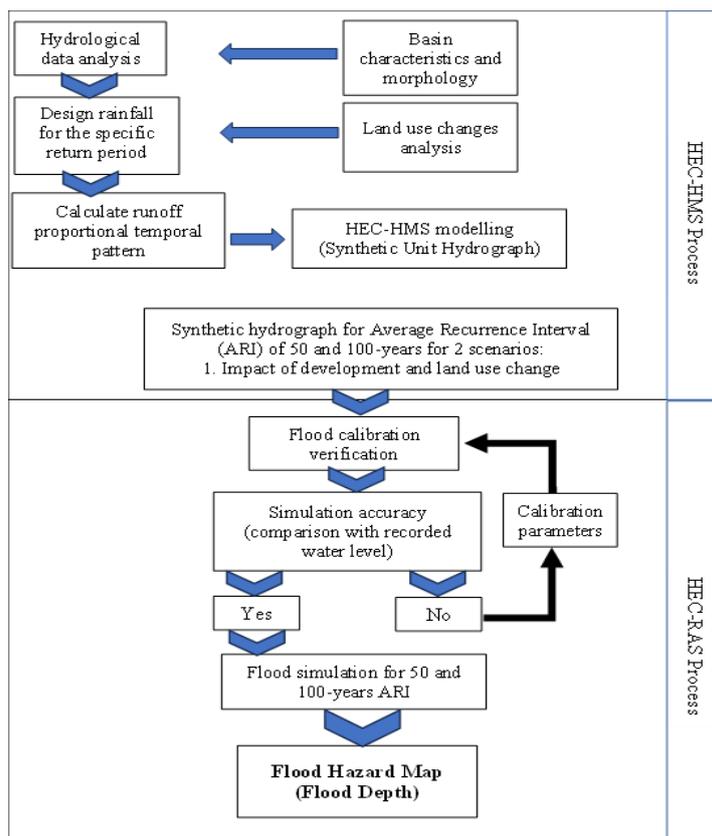


Figure 1: Flood Hazard Mapping Development Flow

Research Location

Penang is situated in Northern Peninsular Malaysia. The island and the mainland are only two of the five primary zone sections that make up this place. The island proper is divided into two major regions: the Southwest and Northeast Zone. In contrast, that happened in Seberang Perai, on the mainland. The three distinct areas are North Seberang Perai, Central Seberang Perai, and South Seberang Perai.

Penang's central Seberang Perai is located on the Junjung River. Its basin is around 154.8 km² in size. Numerous smaller tributaries, including the Cempedak River, Junjung Mati River, Perangin River, and Tok Subuh River, feed

into it. The agricultural land usage in the Junjung Mati River Basin has expanded rapidly in the past 20 years to include industrial and residential developments. The eastern section of Penang is located in Bukit Batu Belah, the source of the Junjung River. The main channel of the Junjung River is 18.2 km long.

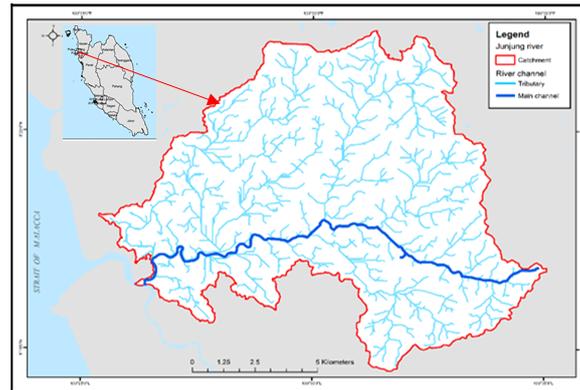


Figure 2: Junjung River Basin

RESULT AND DISCUSSION

Calculate Rainfall Intensity by using Thiessen Method

This study had done a development of Intensity-Duration-Frequency (IDF) to get the rainfall temporal design for each average recurrence interval with time specific and ratio of rainfall excess in the form of temporal pattern (Table 2). IDF curve developed using the annual maximum rainfall collected (Ariff, Jemain & Abu, 2015). In this study, IDF curve developed according to IDF curve with Thiessen method. Table 1 show the Thiessen weightage at Junjung river basin.

Table 1: Thiessen Weightage Factor at Junjung River Basin

Station	Area (km ²)	Thiessen Weightage Factor, w
5204048 - Sungai Simpang Ampat	71.088	0.535
5204049 - Ladang Batu Kawan	9.018	0.068
5304045 - Kolam Air Bukit Berapit	0.622	0.005
5205050 - Sungai Bakap	7.738	0.058
5206102 - Terap at Kedah	8.430	0.063
5303053 - Kompleks Prai	0.875	0.007
5304047- Kolam Air Cheruk To' Kun	10.079	0.076
5305001 - Kampung Dusun at Kedah	25.083	0.189

Rainfall intensity in the river basin area with Thiessen weightage (Thiessen, 1911) calculated using the equation as below:

$$I_{basin} = \frac{\sum_{i=1}^n I_i W_i}{\sum_{i=1}^n W_i} \quad \dots [1]$$

where, I_{basin} is an average weightage, I_i is a weightage and W_i is an area.

Table 2: Rainfall Intensity in Junjung River Basin

Rainfall Intensity (mm/hr)	Average Recurrence Interval (Years)	
Duration (min)	50	100
5	377.881	572.397
10	323.724	490.998
20	255.569	388.164
30	213.311	324.222
60	146.018	222.159
120	92.889	141.407
360	41.238	62.792
480	32.963	50.191
720	23.928	36.431
1080	17.303	26.341
1440	13.725	20.892
2160	9.885	15.045
2880	7.826	11.909
4320	5.625	8.559

HEC-RAS Modelling

HEC-RAS is designed to simulate hydrological process in dendritic river modelling system. This software can run various analysis and considered hydrological elements such as infiltration, unit hydrograph and hydrologic routing. It was developed for various geographical condition to solve hydrology problems.

Typical method to simulate rainfall losses used in the modelling are initial and constant rate. In this study, conversion of rainfall into runoff is using Unit Hydrograph SCS-CN. It needs to have main parameters; time of concentration (T_c), storage constant (R) and baseflow. Formulae for each parameter are shown as in equation [2] and [3].

$$T_c = 2.3A^{-0.1188}L^{0.9573}S^{-0.5074} \quad \dots [2]$$

where;

A = basin area (km^2)

L = length of flowpath (km)

S = basin slope (m/km)

$$R = 2.976A^{-0.1943}L^{0.9995}S^{-0.4588} \dots [3]$$

where;

R = storage constant

A = basin area (km²)

L = longest flow path in river basin (km)

S = basin slope (m/km)

Baseflow estimation that needs to calculate the whole hydrograph design using Hydrological Procedure No.27 (2010) by Department of Irrigation and Drainage Malaysia (DID) as shown in equation below:

$$Q_B = 0.11A^{0.85889} \dots [4]$$

where;

Q_B = basin baseflow

A = basin area

HEC-HMS model at Junjung River Basin generated for rainfall design simulation for various frequency and time. Flood simulation carry out with calibrate and validate hydrological model using the spatial land use. Scenarios were designed for modelling listed in Table 3.

Table 3: Scenario Framework for Hydrology

Scenario	Modelling Framework	Input	
		Meteorology	Land Use
Scenario 1 Existing scenario	1. Schematic geometry 2. Input hyetograph of flood event	Latest rainfall data	Land use year 2015 - 2020
Scenario 2 Scenario impact of development and land use change	1. Validated model 2. Input: Synthetic hydrograph various ARI in future	50-years 100-years	Land use 2030

The selection of rainfall design to be applied shall covered the whole time of concentration (T_c) calculated for the whole basin area. Hence, designated rainfall event can be greater than the time of concentration of basin; some suggest for 3 to 4 times of time concentration (County, 1990), most of the design peak flow used 24 hours or same with the time of concentration (Levy and McCuen,

2001). However, this study used 12 hours of concentration to calibrate the rainfall and concentration (Table 4.).

Table 4: Summary of Peak Flow of Junjung River Basin of Scenario 1 and 2

ARI (years)	Time	Sub-basin (m ³ /s)				
		Machang Bubok	Junjung Upstream	Chempedak	Junjung Mati	Junjung Downstream
50	12 Hours	82.8	101.6	68.2	130.1	16.9
100	12 Hours	96.0	118.8	79.6	149.6	19.5

In this study, the use of HEC-RAS model is to identify the locations that are easily flooded as a result of land use changes in the basin. This integration of flood modelling to assess the impact of land use and rainfall is crucial in determining the hazard area towards management plan development. The level of security, managing flood quantity and magnitude need to identify through the modelling exercise. Flood model was developed using HEC-RAS to identify area at risk of flooding as a result of land use changes. Study found that the flooding event in Junjung River Basin is category as High and Extreme. This can be proven as the data shown in the Table 5. below.

Table 5: Flood Classification of Scenario 1 and 2

Average Recurrence Interval (ARI)	Scenario 1			Scenario 2			
	Maximum Flood Depth (m)	Flooded Area (km ²)	Classification	Average Recurrence Interval (ARI)	Maximum Flood Depth (m)	Flooded Area (km ²)	Classification
50	4.75	20.86	High	50	4.86	22.12	High
100	5.12	22.52	Extreme	100	5.24	23.16	Extreme

Figure 3a shows the current flood occurrence, which primarily affected areas near the river outlet or in low-lying areas. The flood depth reached approximately 4.76 meters, and the total flooded area was 20.86 km². However, Figure 3b shows that the 100-year ARI flood resulted in a larger affected area compared to the current flood. The flood depth reached approximately 5.12 meters, and the total flooded area was 22.52 km².

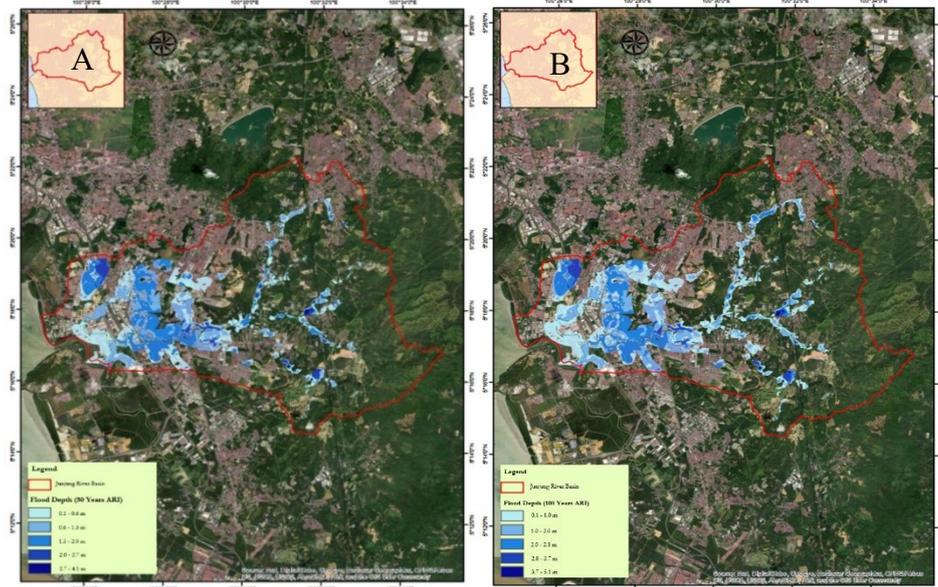


Figure 3 (a) and (b): Flood Depth for Scenrio 1 (50 and 100-years ARI & 12hours Critical Rain Period)

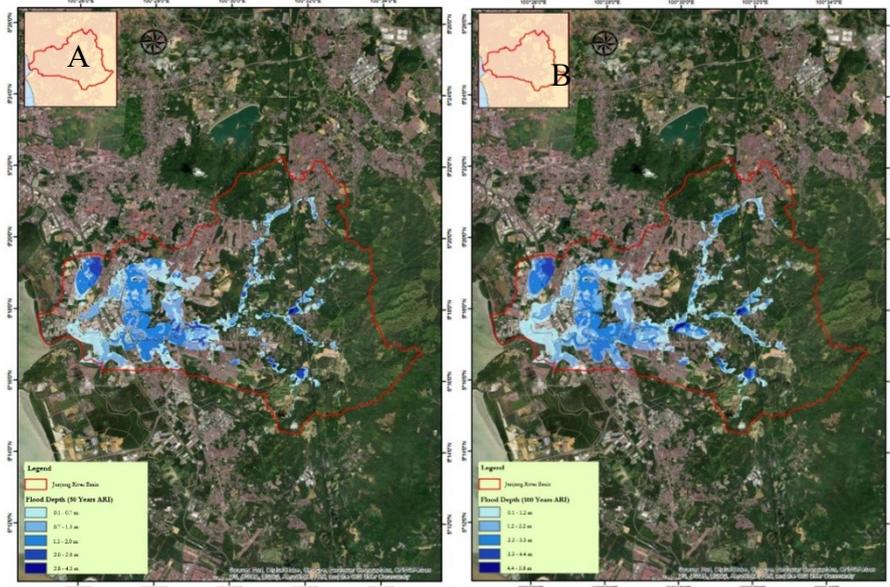


Figure 4 (a) and (b): Flood Depth for Scenrio 2 (50 and 100-years ARI & 12hours Critical Rain Period)

This study was conducted on the second scenario of 50-year and 100-year ARI floods to predict the potential impact of land use changes on previous flood situations in the research area. The 50-year ARI map shows that the total area that may be flooded would increase to a depth of 4.86 meters, with a total flooded area of 22.12 km² (Figure 4a). Figure 4b shows that the predicted flood occurrence in the Junjung River Basin has also increased due to changes in land use. Future land use changes are expected to further exacerbate the frequency and intensity of flooding, which could have a significant impact on local communities residing in these flood-prone areas. In the case of the 100-year ARI flood (as shown in Figure 4b), the estimated flood depth is 5.24 meters, and the total affected area is 23.16 km².

Millions of people are impacted by floods every year, making it one of the most destructive natural catastrophes. It's a regular occurrence in Malaysia, particularly during the rainy season, and it's responsible for a lot of destruction and tragedy. Predicting and reducing the effects of floods requires flood hazard mapping. Flood risk mapping using hydrological modelling is a common practise. In this study, we explore the evolution of hydrological modelling in the Junjung River watershed via the use of HEC-HMS and HEC-RAS for the purpose of flood hazard mapping. HEC-HMS and HEC-RAS are two extensively used hydrological modelling tools created by the Hydrologic Engineering Center (HEC) of the US Army Corps of Engineers. The watershed's hydrology may be modelled with the use of HEC-HMS, which then provides the input data for HEC-RAS. In order to calculate the river's hydraulics and predict how much water will flow and how deep it will rise during a flood, engineers turn to HEC-RAS. These two programmes work in tandem to provide a detailed depiction of flood risk in a specific region.

HEC-HMS was used to create the hydrological model for the Junjung River catchment. The model uses precipitation information collected from three stations within the catchment area. Precipitation information was gathered for the present period, and ARI forecasts for the next fifty-and-one hundred years. Discharge measurements were taken at the Junjung River gauge station to set the model's parameters. The hydrological model was able to mimic the runoff from the catchment region after a rainfall event with diverse land use changes. The hydraulic model took the artificial runoff as its starting point.

HEC-RAS was used to create the river's hydraulic model along the Junjung River. The gauge station readings from the Junjung River were used to properly adjust the model's parameters. The hydraulic model accurately reproduced the rate and height of flooding. The catchment area flood danger maps were then generated using the simulated water depth. The hydraulic model's simulated water depth was used to create the flood danger maps. Maps depicting the risk of flooding have been made for three distinct return periods: 50 years,

100 years, and two future projection scenarios. Areas most likely to be flooded within a specified return period have been pinpointed using flood hazard maps. The lowest region of the catchment area, close to the river mouth, was shown to be the most susceptible to flooding throughout all return periods in the flood hazard maps. Areas near the junction of the Junjung River and its tributaries are particularly at risk of flooding, as shown by the flood danger maps. HEC-RAS was used to create the river's hydraulic model along the Junjung River. The gauge station readings from the Junjung River were used to properly adjust the model's parameters.

The hydraulic model accurately reproduced the rate and height of flooding. The catchment area flood danger maps were then generated using the simulated water depth. The hydraulic model's simulated water depth was used to create the flood danger maps. Maps depicting the risk of flooding have been made for three distinct return periods: 50 years, 100 years, and two future projection scenarios. Areas most likely to be flooded within a specified return period have been pinpointed using flood hazard maps. The lowest region of the catchment area, close to the river mouth, was shown to be the most susceptible to flooding throughout all return periods in the flood hazard maps. Areas near the junction of the Junjung River and its tributaries are particularly at risk of flooding, as shown by the flood danger maps.

CONCLUSION

Developing hydrological models utilizing HEC-HMS and HEC-RAS for flood hazard mapping at the Junjung River basin has offered useful information for flood risk management in the region. The catchment area's runoff during a rainstorm event was successfully simulated by the hydrological model, and water flow was successfully simulated by the hydraulic model.

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DISCLOSURE STATEMENT

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

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ASSESSING THE SOCIAL VALUES OF HISTORICAL WATERFRONT: A CASE STUDY OF SUNGAI PETANI, KEDAH, MALAYSIA

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Abstract

Waterfronts are vibrant areas that are heavily utilised by people with activities in pre-industrial cities. Riverfronts and towns have a tight association during this time frame. As a result, industrial plants were shut down and modes of transportation were altered. In the face of rapid urbanisation and industrialisation in Sungai Petani, Kedah, there is a growing concern that the economic and environmental changes may negatively affect the social values among the community. Overall, this research aims to identify several key areas for the historical waterfront regeneration of Sungai Petani. A social impact assessment was conducted to analyse the social values of the existing waterfront to expand the aspects of social and culture to the planning of urban waterfront regeneration in Sungai Petani. Results of the questionnaire revealed that respondents showed their satisfaction and opinion upon the waterfront element. There are 61.6% proportion of the respondents who consider that the community cohesiveness is the greatest strength of the Sungai Petani's waterfront. This is followed by cultural vibrancy (47.2%), beautiful streets (40.8%), streets in harmony with nature (28.8%), and beautiful river (12%). At the end of the study, solutions were suggested for the regeneration of historical waterfront and correcting mistakes in existing spaces in light of these determinations.

Keywords: Historical Waterfront, Social Values, Urban Waterfront Rehabilitation, Culture Context

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INTRODUCTION

Urban natural water resources are crucial to the establishment of the harmony between nature and social life necessary for the sustainable growth of cities. The comfort of humans, both physically and psychologically, makes water the most crucial planning component. In addition, it helps to bring the surroundings a range of attributes in terms of aesthetic and functional (Önen, 2007). According to a study by Mohd Shafiq Mohd Sazili et al. (2020), there is a growing trend towards revitalising urban waterfronts as part of broader urban regeneration efforts in Malaysia. However, the majority of the research in this area has focused on large cities. The authors suggest that there is a need for more research into the regeneration of waterfronts in smaller towns, particularly those with historical significance.

Meanwhile, Sungai Petani is a town located in Kuala Muda District, Kedah, Malaysia, that is also not exempted from the impacts of pre-industrial activities. It is currently the largest and most populated town in the state of Kedah, at about 120 years old. The town derives its name from the river along which it is located. Long before 1900, the territory that is now Sungai Petani town was primarily covered in dense jungle, swamps, and a few rice farms, and it was part of Kuala Muda's wealthy hinterland. It was sparsely occupied by inhabitants of previous settlements. Rice cultivation, fishing, hunting, and gathering forest products provided food for the inhabitants and the river serves as a link between these communities (Nadaraja, 2016).

In the face of rapid urbanisation and industrialisation in Sungai Petani, the relationship between the human and natural urban elements may receive negative impacts, which results in: i) weak natural surveillance; ii) corrupted waterfront biodiversity; and iii) a missing sense of place at the waterfront. Waterfront redevelopment in small cities can be an excellent catalyst for small community revitalisation (Breen, 1994). The opportunity to utilise waterfront redevelopment as a tool for enhancing downtowns has never been better. Waterfronts, if properly pursued, can serve to bring communities together, enhance sociability, increase activity, and improve community image and pride. However, urbanisation has displaced place-based communities and their fragile cultural ecologies. Neighbourhoods are constantly being erased and replaced with generic built landscapes. The production of homes, food, domestic items, and leisure activities has been transformed into a goods and services industry for urban consumption. This loss of connectivity to source materials and the collective practice of placemaking has dehumanised the urban environment (Pillai, 2020). The aim is to identify several key areas for the historical waterfront regeneration of Sungai Petani. A social impact assessment was conducted to analyse the social values of the existing waterfront to expand the aspects of social and culture to the planning of urban waterfront regeneration in Sungai Petani.

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Assessing The Social Values of Historical Waterfront: A Case Study of Sungai Petani, Kedah, Malaysia

Figure 1 and Figure 2 show the maps portraying the location of Sungai Petani town.

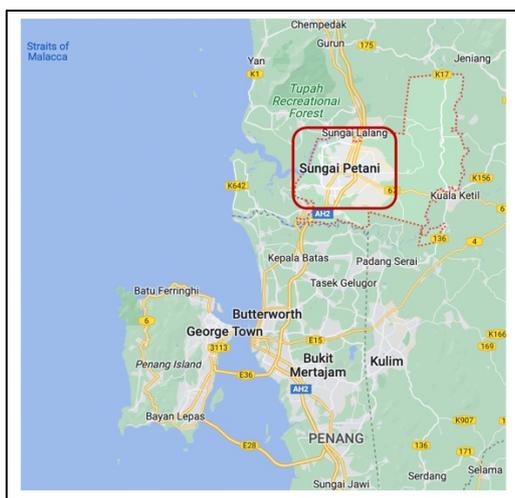


Figure 1: The key plan of Sungai Petani town.
Source: www.google.com/maps (2023).

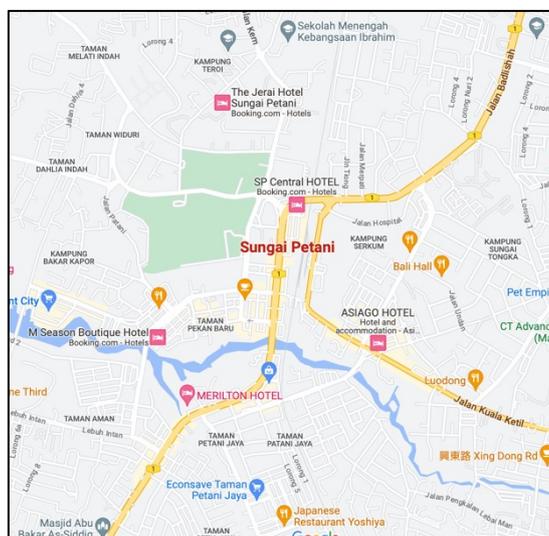


Figure 2: The location plan of Sungai Petani town.
Source: www.google.com/maps (2023).

RESEARCH METHODOLOGY

An online structured questionnaire survey was constructed to gather information from the general public, such as residents and visitors in Sungai Petani's old town. The data collection was performed online using Google Forms and face-to-face interviews. The survey questions were designed in four (4) sections: a) Basic Information of the respondents; b) Past- Personal History on Sungai Petani River; c) Present - Level of Satisfaction of Existing Conditions at Sungai Petani Waterfront; and d) Future - Respondents' Opinions. A total of 128 numbers of questionnaire results were obtained. After filtration, 120 were selected based on the location and qualification of the respondents in order to achieve a valid and reliable result.

The findings from the data set derived from the data collection process were then analysed, summarised, and presented. The results collected presented in the form of image, table, and Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis followed thereafter.

RESULT

Basic Information of the Respondents

The study collected data from 125 residents in the Sungai Petani waterfront area, encompassing various age groups ranging from 12 to 80 years old. The largest proportion of the respondents belonged to the age group of 18–24 (48%), followed by those aged 60 and above (24%). The majority of the respondents lived within a distance of 1–5km from the site (39.2%), indicating good accessibility. Most visitors frequented the site 1–3 times per week (32%) and primarily visited in the afternoon (37.6%). The main reasons for visiting the site were local food (88%), followed by local businesses (31.2%) and the market (30.4%). Fishing was a less common activity due to river pollution. Overall, the study aimed to gather perspectives from various age groups to develop a comprehensive guideline for future urban waterfront regeneration.

Past - Personal History of the respondents with the Sungai Petani River

According to the respondents, there was a close relationship between the river and daily life in the past, as stated by 34.4% of them, particularly the older generations who have witnessed the original waterfront. However, the majority (53.6%) felt that there was no such relationship. In terms of the purposes of the river in the past, visiting for local food was the most common reason (52.8%), followed by local business (44%), the market (39.2%), pier and jetty (37.6%), fishing (36.8%), walking by the river (32.8%), religious activities (32%), and playing with water (18.4%). The respondents' perception of the Sungai Petani River in the past varied, with many considering it dangerous (87 respondents) and dirty (107 respondents). Additionally, a majority felt the river had an unpleasant smell (111 respondents) and presented an urban scene (57 respondents), although

some respondents viewed it positively in terms of safety, cleanliness, and providing a country scene. Overall, the study highlighted the diverse perceptions and experiences related to the river in the past.

Present - Level of Satisfaction of Existing Conditions at Sungai Petani
Satisfaction Level in Environmental Aspect

The satisfaction level of the respondents regarding various environmental aspects of the waterfront was measured. These aspects include maintenance, urban furniture, greenery, accessibility, pedestrian and cycling facilities, traffic conditions, and parking. The respondents assigned scores to each aspect based on their observed performance. Among these aspects, accessibility received the highest score of 4.603 out of 5.000, indicating a high level of satisfaction. Greenery was the next highest-rated aspect with a score of 3.890, followed by traffic and parking (3.650), pedestrian and cycling facilities (3.500), urban furniture (3.334), and maintenance (3.264). These findings highlight the need for improvements in the maintenance of the waterfront to enhance overall satisfaction. Additionally, attention should be given to the other components to further increase satisfaction levels.

Aspect	Maintenance	Urban Furniture	Greenery	Accessibility	Pedestrian, Cycling	Traffic, Parking
Score (Full=5.000)	3.264	3.334	3.890	4.603	3.500	3.650

1—poor, 2—fair, 3—average, 4—good, 5—excellent

Figure 3: Satisfaction Level in Environment Aspect
Source: Author's

Satisfaction Level in Social Aspect

The satisfaction level of the respondents regarding the social aspects of the waterfront was assessed. These aspects include the attractiveness of the waterfront, its suitability in providing services to individuals of different education levels, age groups, ethnicities, and income levels, and the presence of a sense of pride towards the waterfront. The data indicate that the respondents perceived the waterfront as a friendly area that provides services to users from diverse backgrounds and with different needs, receiving a rating of 3.665. However, the majority of the respondents consider the waterfront to be unattractive and in need of upgrades to improve satisfaction levels, with a rating of 3.130. Notably, the highest score was given to the sense of pride, indicating that despite the waterfront's current condition, most respondents feel a strong sense of pride towards it, scoring it at 4.239. This pride may stem from the preservation of heritage values at the waterfront, evoking a sense of nostalgia among the respondents.

Aspect	Attractiveness	User Friendly	Sense of Pride
Score (Full=5.000)	3.130	3.665	4.239

1—poor, 2—fair, 3—average, 4—good, 5—excellent

Figure 4: Satisfaction Level in Social Aspect

Source: Author's

Satisfaction Level in Economic Aspect

The respondents' satisfaction levels regarding the economic aspect of the waterfront were assessed. This includes the variety of services provided and the provision of water-based activities. The majority of the respondents believe that a wide range of services is available to all user groups, scoring it at 4.005. However, the provision of water-based activities received a lower score of 3.452. Given that the river is a valuable resource, it is important for planning regulations to leverage its potential. The regeneration of the waterfront area could be driven by prioritising water-based activities. Reintroducing activities from the past, such as riverside markets, waterfront dining, water transportation, and cultural events along the water promenade, can help reconnect all the values and contribute to a more sustainable waterfront.

Aspect	Variety of Services	Provision of Water-based Activities
Score (Full=5.000)	4.005	3.452

1—poor, 2—fair, 3—average, 4—good, 5—excellent

Figure 5: Satisfaction Level in Economic Aspect

Source: Author's

Satisfaction Level in Cultural Aspect

The respondents' satisfaction level to the economic aspect were assessed. These such as the respectful attitudes to the historical evidence and cultural-oriented placemaking. Most of the respondents were of the view that the placemaking process is in average which it accounted for 3.756 score. While the respectful attitudes to the historical evidence could not be seen by the respondents which it only accounted for 3.204 score. It is important to upgrade the later for better satisfaction level.

Aspect	Respectful to Historical Evidence	Cultural-Oriented
Score (Full=5.000)	3.204	3.756

1—poor, 2—fair, 3—average, 4—good, 5—excellent

Figure 6: Satisfaction Level in Cultural Aspect

Source: Author's

Future - Respondents' Opinion

Strength of Sungai Petani River and the Old Town

A proportion of 61.6% of the respondents consider that the community cohesiveness is the greatest strength of Sungai Petani waterfront. This is followed by the cultural vibrancy (47.2%), beautiful streets (40.8%), streets in harmony with nature (28.8%), and beautiful river (12%). Meanwhile, a proportion of 20% of the respondents believe that there is nothing in particular about the waterfront that is attractive to them.

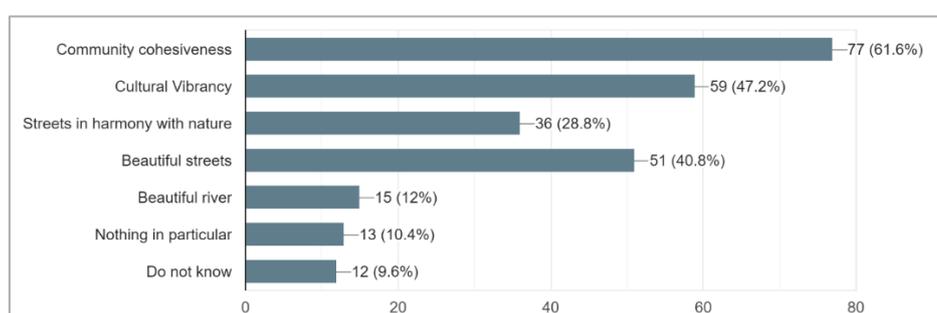


Figure 7: Strength of Sungai Petani River and the Old Town

Awareness of Local Planning of the River

This question intends to clarify the awareness of the respondents to the local planning of the waterfront. Based on the survey, only 0.8% of the respondents are aware of the local planning while 77.6% of the respondents got no idea to the local planning while 21.6% respondents are somehow aware of the news but do not understand the details about it. This shows a low awareness of the respondents to their own environment. To ensure the success of urban waterfront regeneration, the effort and participation of the local community is vital.

Knows well	0.8%
Knows somehow	21.6%
Do not know	77.6%

Figure 8: Awareness of Local Planning River

Ideal Image of Waterfront Development Compared to Existing One

This question is asked to test the difference of the respondents' ideal image of the waterfront compared to the existing one. It is found that majority of the respondents deem that there is a little different comparing the ideal and the existing one, accounting for 38.4% of overall. This is followed by 30.4% of the respondents who views that it is greatly different, whereas 10.4% of the respondents believe it is somehow similar, and 1.6% is of the opinion that it is mostly similar. There are 19.2% of the respondents who voted for 'do not know,'

which shows that they have no idea on the waterfront regeneration and no awareness in improving their own natural assets and resources.

Mostly similar	1.6%	Greatly Different	30.4%
Somehow similar	10.4%	Do not know	38.4%
A little different	38.4%		

Figure 9: Ideal Image of Waterfront Development Compared to Existing One

Desire for Involvement in Future Planning

This question intends to clarify the desire of the respondents to involve in the future waterfront regeneration project. 32% of the respondents are fine to answer a questionnaire in assisting the respective authority or researchers to fine line the planning process. 25.6% of the respondents think that a flier or brochure is sufficient for them which they are not interested in actively involved in the process of development. This is follows by a proportion of 17.6% of the respondents who have no intention to be involved in any form of engagement, while 14.4% of the respondents would like to participate and expressed their opinions in the explanatory meetings of the development. Lastly, 10.4% of the respondents would like to be actively involved in any workshops to contribute their ideas and efforts to creating a more socially driven regeneration of the waterfront.

Active Involvement in workshops	10.4%
Participating and expressing opinions in exploratory meetings	14.4%
A flier or brochure is sufficient	25.6%
Answering a questionnaire	32.0%
No intention of involvement	17.6%

Figure 10: Desire of Involvement in the Future Waterfront Regeneration Project

DISCUSSIONS

The waterfront area under study has been recognised as a site of significant historical and cultural importance, characterised by a rich tapestry of heritage buildings, social interactions, and economic activities. To comprehensively understand the social impact and potential of this waterfront, a thorough assessment was conducted using a social impact assessment approach and field observations (Petrtylová, 2022). This assessment aimed to examine the social values embedded within the waterfront and identify the strengths, weaknesses, opportunities, and threats present in the environment, urban development, social dynamics, and economic dimensions. The findings of this assessment were then analysed through a SWOT analysis, allowing for a deeper understanding of the site’s potential and the challenges it faces. This paper presents the results of the

SWOT analysis, focusing on the environmental, urban, social, and economic dimensions, along with corresponding recommendations to guide future planning and decision-making processes. By considering these findings, stakeholders can develop strategies that can help to preserve the historical and cultural significance, enhance accessibility and connectivity, revitalise the community, and leverage the economic potential of the waterfront, ensuring its sustainable development and continued vibrancy (Xu, 2021).

Regarding the environmental dimension, the waterfront showcases a diverse range of historically significant buildings. However, a significant number of these buildings, both private and public, are in a state of disrepair due to economic constraints or neglect by absentee owners. To address this issue, it is recommended that planning authorities or the local government explore options for providing financial support, such as small grants or loans, to incentivise restoration and refurbishment efforts. Additionally, site planning should take into account the presence of mobile vendors, who form part of the informal retail/market sector and contribute to the unique character of the site (Byun & Kim, 2022).

In the urban dimension analysis, accessibility emerges as a critical factor in the regeneration of the waterfront. Enhancing accessibility ensures that the community, including individuals with disabilities, can readily access and enjoy the waterfront, fostering inclusivity and a sense of community (Pedrycz, 2021). Improved accessibility also has the potential to attract a wider range of visitors, revitalise the area, and create new economic opportunities. Furthermore, connectivity plays a crucial role in linking the waterfront with the surrounding community and city, facilitating easier access for individuals with limited mobility or transportation options. By promoting connectivity, foot traffic to the waterfront can increase, enhancing its vibrancy and livability. Lastly, incorporating green spaces is emphasised as an important aspect of waterfront regeneration, as it offers multiple benefits, such as air quality improvement, biodiversity promotion, and a healthier and more pleasant environment for residents and visitors (Nikezić & Milovanović, 2021).

The analysis of the social dimension highlights the significance of the long-standing trading community and their expertise in revitalising the economy and fostering community identity and pride in the waterfront. Deepening research, documentation, and cultural interpretation are recommended to fully leverage the cultural capital of the site (Andersen Cirera, 2022). It is also crucial to involve younger entrepreneurs to ensure the long-term sustainability of the area, considering the ageing population of the current community. Strengthening and revitalising the trader's association, as well as enhancing social meeting places like sidewalks, eating stalls, and restaurants, are suggested to create more attractive and engaging spaces (Abed, 2022).

In terms of the economic dimension, the waterfront area presents economic potential through the sale of local products in shophouses, encompassing a wide range of fresh produce and dry goods. To maximise the appeal of these products to both local and foreign visitors, repackaging, and promotion within the context of local trades are recommended. It is essential for authorities to have better control over changes in building use to prevent insensitive alterations by new investors that disregard the site’s character (Zhihao, 2021). Restricting building use to trades or economic activities that align with the existing ones, such as restaurants, cafes, or traditional sundry stores, is advised. Furthermore, encouraging afternoon and evening operations of businesses can maintain a bustling and lively waterfront throughout the day (Setiadi & Kusliansjah, 2021)

The findings from the SWOT analysis of the environmental, urban, social, and economic dimensions provide valuable insights into the strengths, weaknesses, opportunities, and threats associated with the waterfront site. These analyses offer guidance for future planning and decision-making processes, emphasising the preservation of historical and cultural elements, improvement of accessibility and connectivity, revitalisation of the community, and optimisation of the economic potential of the waterfront.

Table 1: Summary of Social Values Assessment Using SWOT Analysis

Source: Author’s

SWOT Analysis - Environmental Dimension				
Environmental Elements	Strengths	Weaknesses	Opportunities	Threats
Site - Natural Environment	Site has a natural asset, which is the waterfront city.	Low awareness of historical and cultural values of site.	Promotion of site for cultural tourism.	Lack of attraction for newer residents or tourists.
Building, Monuments and Artefacts	Good range of building typologies and styles reflective of settlement history.	Poor condition and poor maintenance and insensitive upgrading of buildings.	Guided interpretation for tourists.	Buy-up and insensitive restoration by new businesses.
Space Use	Temporary street stalls and active shophouses enjoy a complementary and interdependent relationship.	Low occupancy of shophouses and timber houses results in decline in vitality.	Introduce new, complementary use, particularly food or cultural-related.	Illegal and temporary structures overshadow heritage buildings.
SWOT Analysis - Urban Dimension				
Urban Elements	Strengths	Weaknesses	Opportunities	Threats
Accessibility	Convenient and accessible location.	Poor traffic and waste management.	Introduction of new management systems.	
Connectivity	Convenient transportation	Poor maintenance, non-human	Human-oriented connectivity enhancement,	Hardscapes overshadow the natural townscape.

	infrastructure and facilities.	oriented connectivity.	such as a 30-foot setback.	
Greenery	Rich in greenfield near waterfront area.	Landscape left abandoned without proper planning.	Regenerating the waterfront and bring back the natural ecology with proper plan of landscaping.	Weak natural surveillance.
SWOT Analysis - Social Dimension				
Social Elements	Strengths	Weaknesses	Opportunities	Threats
Community	Source of intangible knowledge and skills.	Ageing population.	Build community by strengthening commercial opportunities and mapping shared history.	New players with only economic interests.
Values and Belief System/Organisational Structure	Hungry Ghost, Nine Emperor festival activities, marketing and eating.	Absence of social facilities.	Provide incentives to boost local leisure and social activities.	New elements introduced into festival unrelated to tradition.
Skill and Knowledge	Good range of cultural skills and knowledge.	Traders reluctant to interact with visitors due to language limitations.	Living knowledge available to be transmitted to younger generation.	No documentation.
SWOT Analysis - Economic Dimension				
Economic Elements	Strengths	Weaknesses	Opportunities	Threats
Cultural Product and Artefact	Contribute to the sustainability of the local food industry and local household needs.	Chinese predominated products.	Local partnership to enhance display and packaging of cultural products.	Lack of preparation can lead to industrial style packaging with no local identity.
Livelihood, Industrial and Commercial Use	Trades and services are closely related to local culture.	New population demanding ready-made goods.	Introduce evening trade.	Competition from new retails, which have greater variety of products.

CONCLUSION

In conclusion, this research paper has explored the strategies for future urban riverfront development in Sungai Petani, Kedah, with a focus on the old town area. The study aimed to rediscover and analyse the social values of the waterfront area in order to enhance the social and cultural aspects of urban waterfront regeneration in Sungai Petani. The findings from the field observation and questionnaire survey provided valuable insights into the past and present conditions of Sungai Petani waterfront, as well as the perceptions and satisfaction levels of the local community and visitors. The study highlighted the transformation of the waterfront from a natural river settlement to a modern concrete town, resulting in weak natural surveillance, degraded waterfront biodiversity, and a loss of sense of place. However, it was evident that the Sungai

Petani waterfront has held a strong historical significance and was once a vibrant hub for trade and transportation.

The research identified several key areas for improvement in the urban waterfront regeneration process. These included enhancing the maintenance of the waterfront area, improving urban furniture and greenery, addressing accessibility issues, and providing better pedestrian and cycling facilities. Furthermore, attention should be given to the social aspect of the waterfront, making it more attractive and inclusive for individuals of different backgrounds and needs. Despite the current challenges, the study revealed a sense of pride and attachment among the respondents towards the waterfront, indicating its potential as a catalyst for community revitalisation. Overall, this research contributes to the broader understanding of waterfront regeneration in smaller towns with historical significance. It emphasises the importance of considering the social values and cultural aspects in the planning and implementation of urban waterfront redevelopment projects. By integrating these elements, the future development of Sungai Petani waterfront can not only enhance the physical environment but also promote social interaction, cultural preservation, and economic growth. It is hoped that the findings of this study will serve as a valuable reference for urban planners, policymakers, and stakeholders involved in the regeneration of Sungai Petani waterfront and similar contexts.

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DEVELOPING TALENT AND PERFORMANCE OF GOVERNMENT EMPLOYEES, CAPACITATE MALAYSIA'S DEVELOPMENT PLAN

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Abstract

The Twelfth Malaysia Plan (12MP) aimed at revitalizing the economy to restore the financial well-being of the people and comprehensively rejuvenate and strengthen the overall national economic growth. In line with the prominent national agenda, this paper aims to investigate talent management and its relationships with the performance of state government employees in Malaysia. When employees are motivated, skilled, and engaged, they are better able to work towards the company's objectives, improving job performance. Hence, talent management was identified to model its impact on state government employee performance in Malaysia. To gather data, survey questions from earlier studies are incorporated and modified. The 385 state government samples and SPSS version 22 are used for the data analysis. The study results show that talent management, recruitment, and retention significantly affect company performance. This helps those in charge of human resource management to appreciate the situation and decide how best to promote employee advancement.

Keywords: Employee performance, state government, talent management, talent acquisition, talent development, talent retention

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INTRODUCTION

Human capital serves as the primary catalyst for economic advancement, with the development of competent talents forming the foundation for a resilient and dynamic economy. Aligned with the 12th Malaysia Plan (2021 - 2025) objectives, the focus is on talent management for inclusive and sustainable growth. It is crucial to reinforce talent development strategies and initiatives to increase the performance of state government employees in Malaysia.

To thrive in various industries, talents must possess relevant skill sets and high adaptability. There exists a positive correlation between the norms of reciprocity and trust and the skills and commitments of young individuals (Nor, Alias & Musa, 2018). A productivity-driven economy necessitates highly skilled young individuals and the contribution of quality human capital to enhance product performance. The commitment of all individuals plays a crucial role in determining the successful execution and accomplishment of the objectives and goals outlined in the 12th Malaysia Plan.

The presentation of the 12th Malaysia Plan on 27 September 2021 comes at the right time as the country recovers from the COVID-19 crisis (PwC, 2021), including decentralisation becoming an important agenda during the crisis (Seo, 2022). The 12MP establishes a strategic course for Malaysia's growth from 2021 to 2025. It revolves around three main focal points: firstly, revitalizing the economy; secondly, enhancing security, well-being, and inclusiveness; and thirdly, promoting sustainability. Therefore, while they assist the government in achieving the country's ambitions for sustainable growth, state government organisations are at a crucial turning point.

By measuring value added per hour worked, Malaysia's labour productivity in the third quarter of 2021 declined by 0.6% (2Q 2021: -12.9%). While working hours decreased by 3.9% (2Q 2021: 33.3%), the Malaysian economy shrank by 4.5% from 16.1% the previous quarter (DOSM, 2021). Having a decrease in productivity, Malaysia demands a talented workforce. A talented workforce will help diversity and growth in our country's economy. Therefore, workers that possess the skills and knowledge are required. A high-quality workforce can help our nation's labour productivity and employment, as well as for long-term success.

Furthermore, in his statement, the Director General of the Malaysian Productivity Corporation (MPC) revealed that Malaysia's productivity declined in 2020, the worst in ten years (MPC, 2021). To satisfy the populace's expectations, Malaysia must implement certain basic reforms to build a more effective and efficient public sector. According to the 12MP report, the government also prioritised hiring and maintaining top talent, putting important leaders in the civil service, instilling admirable values and ethics, and advancing skill development when training future leaders. Despite growing interest in

academic disciplines worldwide, talent management concerns in the public sector, especially in Malaysian state government agencies, have gotten less attention (McDonnell et al., 2017). Talent retention is a problem in Malaysia (Alias, Noor, & Hassan, 2014). Therefore, this article explores how talent management affects employee performance in Malaysian state government.

LITERATURE REVIEW

Employee Performance

According to Karoso et al. (2022), employee performance is a measure of an individual's achievement over a period of time in relation to various factors, including work standards, objectives, goals and criteria. The favourable impacts of coaching on employee performance can be reaped by all employees (regardless of their career stage) (Pousa et al., 2017). Talent management affects employee performance; the better a company's talent management practises are, the better its employees perform (Krishnan et al., 2020; Wadhwa & Tripathi, 2018). According to several studies, there is a strong correlation between talent management and employee performance (Sopiah et al., 2020; Damarasri & Ahman, 2020; Kaleem, 2019).

Talent Management

Perceived as a collection of standard practises, duties, and specialisations found in human resource departments, including recruitment, hiring, training, and career and succession planning (Mercer, 2005). Noe and Kodwani (2018) noted that talent management is growing due to changes in job and occupation demand, skills shortages, the impending retirement of the baby boomer generation, and the need to train the next generation of business leaders. According to Sanjeev and Singh (2017), talent management entails hiring new employees, developing and keeping current employees, as well as luring talented and experienced individuals to work for the company. Talent management aims to build enduring, high-performing organisations that achieve operational and strategic goals and objectives (Massie, 2015).

Talent Acquisition

As a collection of highly skilled, independent, exportable, and movable individuals, intellectual capital is presently in greater demand than it is available (Ewing et al., 2002; Ployhart, 2006). Highly trained workers benefit from the competitive labour market since few employment opportunities are available (Srivastava & Bhatnagar, 2008), especially in professional, informational, technical, and service companies (Ewing et al., 2002). Additionally, potential employees pick the correct company and the suitable position priority (Rynes & Cable, 2003). Thus, companies are more actively assessing and improving their

appeal to potential hires (Highhouse et al., 1999). The biggest talent acquisition problem for recruitment agencies is finding the right blend of skills, competences, and cultural fit (Rynes, 1991). Hence, it can be assumed that:

H₁: There is a positive relationship between talent acquisition and employee performance.

Talent Development

To guarantee that the company has both present and future talent, talent development must plan, select, and implement strategies for the talent pool (Garavan et al., 2012). This can help achieve strategic goals that call for coordination between the organization's personnel management procedure and development efforts. According to Hedayati Mehdiabadi and Li (2016), it is crucial to understand that having the necessary specialised skills for one's profession and being aware of how critical it is to be in an unstable situation presently are two related concepts. Flexible workers that can pick up new knowledge and skills are needed. Consequently, it is assumed that:

H₂: There is a positive relationship between talent development and employee performance.

Talent Retention

Even if it is asserted that this activity is one of the talent management approaches that will affect employee performance (Iles et al., 2010; Lynn, 2003), retention management or talent retention should be a top priority. Bhattacharyya (2015) asserts that talent retention will prevent the loss of brilliant individuals and is considered the most likely cause of employee happiness and well-being, both of which are demands made by all workers (Qureshi, 2019). Retention prospects are also enhanced when firms preserve a positive brand or reputation in the labour market. This plan will prevent the organisation from overspending due to talent loss and assist it in surviving and expanding. Such a talent retention strategy has long-term beneficial effects on business performance (Qureshi et al., 2019). To develop and keep hold of critical talent, organisations must offer a diversity of practises (Collings & Mellahi, 2009). According to the findings, this study presupposes that:

H₃: There is a positive relationship between talent retention and employee performance.

Talent Management and Employee Performance

Talent management, a fresh approach to organisational effectiveness, is a thorough and all-encompassing strategy for business and human resource planning (Ashton & Morton, 2005). The positive impacts of talent management practises on employee performance and job satisfaction were demonstrated by

Dixit & Amit-Arrowatia (2018). Similar findings were found by Luna-Arocas and Lara (2020) who have emphasized that (soft) talent development strategies will influence the performance provided by (hard) professionals. Furthermore, earlier researchers (Bibi, 2019) came to the same conclusion: talent management increases employee performance while assisting organisations in overcoming obstacles, expanding into new markets and advancing the competitive landscape. Thus, the conclusion that follows is as follows:

H₄: There is a positive relationship between talent management and employee performance.

METHODOLOGY

A quantitative approach is used to create a cross-sectional survey. This study adopted (with some modifications) questionnaires from Kaleem (2019) and made them into an online survey tool. Kaleem (2019) examined the impact of talent management techniques on employee performance in a few UAE public sector organizations. The method that was previously verified in the UAE is now more flexible and has more variety as a result of Malaysia adopting the self-assessment survey method. The survey questionnaire was created using <https://www.google.com/forms>. It comprised 15 questions to evaluate employees' awareness of state government talent management and 4 to measure self-assessment performance. The components of talent management and their relations with staff performance are selected from a literature review, which is later used to prepare questions covering areas of talent acquisition, talent development, talent retention (4 items), talent management, and employee performance. The reliability of an assessment instrument was tested to find out whether it produces the same results each time it is used in the scales. Cronbach's alpha, or coefficient alpha, measures a questionnaire's reliability, especially its internal consistency dependability or item interrelatedness (Cronbach, 1951). Acceptable Cronbach's alpha values are 0.70 or greater (Alias et al., 2023; Nunnally, 1978). All variables in this study exhibit Cronbach's alpha coefficients (employee performance=0.849, talent acquisition=0.810, talent development=0.901, talent retention=0.830, talent management=0.866) greater than 0.70, indicating acceptable reliability.

The research model was examined, and the hypothesis was evaluated, using multiple regression analysis. Subsequently, a one-way Analysis of Variance (ANOVA) was used to calculate a generalizability coefficient that quantifies how much measurement error can be attributed to each data set. ANOVA examines the overall dependability of the results (Brennan, 1992). ANOVA can be used when researchers need to make multiple comparisons in a study (Connelly, 2021). After receiving responses from the state government personnel, it was decided to ask the questions in Malay. Each answer was graded

on a scale of 1 to 7, with 1 meaning "strongly disagree" and 7 denoting "strongly agree." When compared to a 10-point scale, a 7-point scale produces mean values that are somewhat higher with the highest possible score (Dawes, 2008). Further, an executive officer from Kelantan State Economic Planning Unit (UPEN) states that the total number of Kelantan state government employees is approximately 4,120 (Wan Zulfadhli Syahman, WhatsApp, Sept 28, 2021). As research samples for this study, 385 employees were chosen, more than the minimum 274 sample sizes recommended by Krejcie and Morgan (1970). A sample size of 30 to 500 is adequate for conducting research (Sekaran & Bougie, 2019; Roscoe, 1975).

Most current Internet research studies employ non-probability convenience sampling techniques that are generally accessible, affordable, and cheap (Lehdonvirta et al., 2021). This study uses a convenience sample approach, which entails merely sending the questionnaire link to Kelantan state government employees over WhatsApp. The main problem with convenience sampling is that sample bias makes it impossible to generalise study results. As a result, according to Ibrahim et al. (2023) and Emerson (2021), convenience sampling studies are in between single-subject approaches and approaches using randomised control groups. However, this study used a large sample size instead of a single-subject design. It, therefore, allows for a bit greater generality. Convenience sampling used in the study severely restricts generalizability. The researchers of this study obtained complete responses from 385 Kelantan state government employees, yielding a response rate of 69%. According to Mugenda & Mugenda (2003), this response rate is appropriate for analysis and publishing. A response rate of 50% is considered adequate for analysis and publishing, a response rate of 60% is considered good, and a response rate of 70% or more is considered very good, according to academics.

Descriptive and Inferential Analysis

41% of the population were women, and 59% were men. Female high-potential employees are more dedicated to developing their leadership abilities than their male colleagues, according to research by Khoreva, Vaiman, and Van Zalk published in 2017. Tatli et al. (2013) contend that women are less inclined than men to fight for higher status because they detest competition. Looking at this study's trivial gender differences in percentage (i.e., 8%), the present finding denotes that Kelantan state government agencies should make the best use of the talents available to them by communicating the value of talent management practises to both male and female employees and encouraging them to participate in developmental initiatives. Employers must support, inspire, and develop high-potential workers of all genders to achieve this (Khoreva, Vaiman & Van Zalk, 2017). In addition, 61% of the respondents belong to the age category of 20-40, 33.2% are 41-50 years old and 5.8% are 51 to 60 years old. In this study, future

competence maintenance depends on young employees remaining in the labour market for longer. Considering this, detailed knowledge of the talent management used by human resource personnel and how older workers' talent is positioned when technology is involved is essential. Due to worries about human capital, employers may choose young people since they have a longer future revenue stream and better development potential than older workers (Urwin, 2006). Wilson, Parker, and Kan (2007) advised businesses to concentrate their hiring efforts on the necessary abilities and underlined that age was not a factor. Furthermore, for the education level, 86.5% of the employees have diplomas and above. There are many of them, with a sizable fraction having a tertiary degree, indicating a high talent level. This implies that most state government employees possess the skills needed for the managerial post. Employees' work performance is positively and significantly impacted by their work experience (Fajriah et al., 2021). More than half of the state government employees have working experience above 3 years (72.2%). 36.6% have been working for above 9 years. The employees' work performance is outstanding, with 41% good, 20.5% perfect, and 16.9% excellent. These figures show that most employees possess work experience, which would allow them to develop work-related competencies and acquire skills. They would later turn up as talented workers.

RESULTS AND DISCUSSION

The correlation coefficient was used to determine how significantly the dependent and independent variables were related.

Table 1: Correlations among the Variables

Hypotheses	Coefficient
H1: There is a positive relationship between talent acquisition and employee performance.	.560**
H2: There is a positive relationship between talent development and employee performance.	.621**
H3: There is a positive relationship between talent retention and employee performance.	.716**
H4: There is a positive relationship between talent management and employee performance.	.574**

A more significant correlation between the two variables is indicated by values closer to +1.00 or -1.00, whilst a lesser correlation is indicated by values closer to 0.00 (Pallant, 2013). Table 1 shows correlation results among the variables.

The findings showed that every variable was significant and positive, and all correlation values were classified as large (Cohen, 1988). The two variables most strongly correlated were talent development and retention

($r=0.810$, $p0.01$) and talent acquisition and talent development ($r=0.783$, $p0.01$). The largest associations between talent retention and employee performance were found in the correlation study between independent variables and dependent variables ($r=0.716$, $p0.01$). The weakest link was between talent acquisition and employee performance ($r=0.560$, $p0.01$). Further, a one-way ANOVA, also known as an F test, was exercised to determine whether there was a difference between the variables (for example, different dosages of an intervention or different timeframes) (Connelly, 2021). Accordingly, the result exhibits a significant difference in mean [$F(4, 378) = 119.86$, $p=0.00$] between the variables. Then, the association between talent management elements and worker performance was examined using multiple regression analysis. The outcomes in Table 2 uncover talent acquisition ($\beta = 0.330$, $t = 5.770$), talent retention ($\beta = 0.712$, $t = 11.700$), and talent management ($\beta = -0.163$, $t = -2.900$) significantly influenced employee performance. Both t-values are equivalent to p-values that are less than 0.05, making them statistically significant. As a result, talent acquisition and retention are beneficial in predicting employee performance. Whereas talent development ($\beta = -0.089$, $t = -1.103$) does not since its p-value is 0.271, i.e., >0.05 .

Table 2: Multiple Regression Results for Business Performance

Model	Standardized Coefficients Beta	t	Sig.
1	(Constant)	11.285	.000
	Talent Acquisition	.330	5.770
	Talent Development	-.089	-1.103
	Talent Retention	.712	11.700
	Talent Management	-.163	-2.900

a. Dependent Variable: Employee Performance

This study's result resembles that of Mensah (2015), who indicates that implementing a talent management system improves employee performance. Additionally, Sariwulan et al. (2021) assert that talent management affects employee work performance. Dalal & Akdere (2021) also discovered a strong and advantageous association between talent management and employee job-related results. However, due to the insignificant finding, it can be said that talent development is not individually reliable for predicting Kelantan state government employees' performance. Hence, state government's human resource management (HRM) personnel must pay more attention to developing employee talents. These measures for talent development are crucial for fostering learning, employee engagement, talent management, and staff development, which in turn improves organisational performance, productivity, and results (Galagan, Hirt &

Vital, 2020). For example, a supportive learning environment is usually prioritized by employees so that their learning process is not disrupted by global health crises such as COVID-19 (Nik Md Salleh et al., 2022). In addition, to be more successful in promoting innovation in the firm, it is necessary, according to Datta et al. (2021), to broaden the scope of HRM practice and supervisory support.

IMPLICATIONS

While previous studies have investigated organizational talent management issues, their findings are not generalised to state government employees. This study's contribution can be viewed as filling a gap in research studies, attempting to identify talent management and its relationships with the performance of Malaysian state government employees. Few researchers have previously investigated talent management practises in the Malaysian state government in terms of theoretical implications. The empirical evidence on the impact of talent management on the performance of Kelantan state government employees serves as a model for other state government employees in evaluating their performance in each element of talent management. As a result, state governments can assess how much they capitalise their assets in the above parameters to achieve high organisational productivity and performance.

When considering the practical ramifications, employees of the State Secretary HRM division should be aware that talent management outcomes depend not only on an organization's overall philosophy but also on the personal ideologies of those who are in charge of putting talent management practises into practise, primarily senior officers in state government departments and agencies. To ensure that talent management is used as intended, senior officers must explain to junior officers the talent philosophy of their organisations. Senior and junior officers must share the same talent mindset to communicate unambiguous instructions to their staff, whose perceptions are crucial factors in talent-management outcomes. However, the authors present a theoretical model of talent management and employee performance with three factors, which is a limitation of this study. Other variables may need to be added to the study to improve it.

CONCLUSION

The 12th plan demonstrates the government's dedication to proactively anticipating and strategizing for any potential circumstances. One of the most challenging tasks organisations confront in today's talent competition is finding, evaluating, training, and keeping talented employees. The only thing that distinguishes one organisation from another is its human resources. It helps the organisation create long-term growth while giving it a competitive advantage. An

international talent deficit is affecting businesses everywhere. The lack of skilled candidates with the required skill sets affects many jobs. Consequently, this study significantly explores state government talent management that affects employee performance. Specifically, this study contends that for HR professionals to manage talents effectively and efficiently, it is vital for them to be defined, understood as a whole, and connected to the organization's plan.

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PRESERVATION OF CRAFT HERITAGE AND ITS POTENTIAL IN YOUTH ECONOMIC EMPOWERMENT

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Abstract

The community's involvement in preserving cultural heritage is very important and greatly impacts it. One of the ways to involve the community in the preservation of cultural heritage, especially in fine arts and crafts, is to combine those efforts with economic benefits for the target group. The strategy will attract the community's interest, especially those looking for a job or wanting to increase their economic resources. Financial problems, job loss, and unemployment are big issues among today's youth. The study focuses on forming a step that can act as a double-edged sword that aims at two objectives; preserve cultural heritage and create new economic resources, especially for the youth. Therefore, this study aims to identify the potential of intangible cultural heritage (fine arts and crafts) in creating new economic resources for youth facing unemployment. This study was carried out using a mixed-methodology approach which is a combination of quantitative and qualitative implemented in Malaysia covering all zones, namely North Zone (Penang), West/Central Zone (Selangor), East Zone (Terengganu) and East Malaysia Zone (Sabah). The questionnaire involved 155 youth groups involved in the traditional craft sector. In-depth interview method with respondents consisting of government bodies such as the National Heritage Department, the Malaysian Handicrafts Development Corporation, and NGOs from other relevant agencies. The results of the study found that intangible cultural heritage (fine arts and crafts) can be preserved by making it a new economic resource among the youth. With the support of the government, help from the aspect of training, and the interest of the youth itself, the craft heritage has the potential to generate income while guaranteeing the sustainability of this cultural heritage. This study is expected to be a backup for the government in designing any cultural heritage preservation program that greatly impacts the community, especially the youth. It becomes a new economic source for them.

Keywords: preservation of heritage, cultural heritage, handicraft, youth

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INTRODUCTION

Despite the dimension of societal change towards the era of progress and modernity, the cultural heritage left behind by our ancestors should not be allowed to disappear with the tide of time. At the international level, the emphasis on cultural heritage is clearly expressed in the 17 Sustainable Development Goals (SDG) goals. The 11th SDG goal regarding the sustainability of cities and communities (sustainable cities and communities) has placed the preservation of cultural heritage as one of its targets (SDG 11.4). Awareness of the importance of preserving intangible cultural heritage has driven foreign countries to preserve the intangible cultural heritage in their countries equally, and Malaysia is no exception in this regard. The direct involvement in UNESCO by the Malaysian government proves that the country takes the preservation of intangible cultural heritage seriously (Sharafina Zaky & Ida Madieha, 2018). In Malaysia, the government has taken various measures, including law enforcement, the establishment of responsible bodies, support agencies and various other follow-up programs to preserve the intangible cultural heritage among Malaysians with diverse cultural backgrounds.

Fine arts and crafts are part of the legacy of previous generations that must be continued to ensure the skills and knowledge of fine arts and crafts continue from generation to generation. The knowledge and skills to produce crafts are highly valued by UNESCO when listed in one of the five intangible cultural heritage categories that must be protected (UNESCO, 2003). The preservation of cultural heritage, including fine arts and crafts, is a responsibility that cannot solely rest on the shoulders of government bodies. Nevertheless, it can have a substantial impact when there is active community involvement. However, it is essential to invest effort in capturing the attention and cooperation of the community to participate in the preservation of cultural heritage. The role of the community in the matter of heritage preservation constitutes one of the effective steps, complementing the initiatives undertaken by policymakers, academic institutions, and the government (Pimid et al., 2020; W. Ariffin, 2023). In light of the need for increased collaboration between the community and tourism stakeholders, it becomes evident that fostering this partnership is crucial (Azwar et al., 2023).

The preservation of the cultural heritage of fine arts and crafts needs to be combined with economic benefits to attract more young people to venture into the fine arts and crafts industry and further empower Malaysian handicrafts to a higher level as marketed internationally. At the same time, it becomes a new source of the economy that can be ventured by the youth facing unemployment and financial problems. In Malaysia, youth between 15 and 24 years of age account for 2.8 million of the labor force, which is 18 percent but already represents 58.2 percent of the total unemployed (Berita Harian, 2020). According to current statistics, the unemployment rate in Malaysia is now quite significant

and worrying. Job loss increased by 42 percent year-on-year in the first quarter of 2020 and is expected to continue to increase for each subsequent quarter in 2020 (Rahman, A.A, 2020). The unemployment rate, as recorded by the Department of Statistics Malaysia (DOSM) in February 2023, is 3.5% of the population, or 591,900 people unemployed (Department of Statistics Malaysia, 2023). Youth unemployment in Malaysia is higher than other age groups. It is understood that the factors causing the problem are Malaysia's lack of education, low-quality jobs, and skill mismatches (Aun, 2020). Therefore, the youth's involvement in preserving the heritage of fine arts and crafts is in line with Act 222 - Malaysian Handicrafts Development Corporation Act of 1979 and Act A562 - Malaysian Handicrafts Development Corporation Act (Amendment) 1983. Among the objectives is to expand the size of the product market crafts and provide trained personnel according to the needs of the craft industry. Through this policy, it is necessary to prepare the youth who have the potential to make the heritage of fine arts and crafts their main economic resource. Handicraft is one of the cultural products that can be found in Malaysia. As one of the cultural assets, it can become a cultural product that can be a tourist attraction (Mohd Yunus et al., 2021). Its potential as a tourism product cannot be denied because the latest report by the Malaysian Handicraft Development Corporation (Kraftangan Malaysia) recorded high sales of various Malaysian handicraft products even during the COVID-19 pandemic. A report from Malaysian Crafts in 2016 states that developing the country's craft industry opens up job opportunities for residents in the local area. In 2016, there were 10,404 workers involved in this craft industry, where 54% were in the field of textile craft, followed by 20% in forest products and the rest in the field of land products, metal products and various crafts. In conclusion, fine arts and crafts are hand-made skills and the height of knowledge that can be applied in various forms of goods, which are also cultural heritage that should be preserved. Community involvement in heritage preservation will positively impact and increase economic resources.

However, the focus must be on ensuring that the youth are ready to engage with this industry. The potential of the community and the opportunity from the responsible party is the emphasis given in this study in designing a preservation model for intangible cultural heritage, namely the heritage of fine arts and crafts. It shows that handicraft is not only a cultural and tourism product which can greatly contribute to the country's economy (see Azinuddin et al., 2022a; 2022b; 2022c), it also has a strong potential as a source of income, especially for the youth.

RESEARCH BACKGROUND

UNESCO sees intangible cultural heritage as a tradition or expression of life inherited from previous generations. The Convention for the Safeguarding of the

Intangible Cultural Heritage held in 2003 by UNESCO presents five domains expressed by intangible culture. Among them are 1) Oral traditions, 2) Performing arts, 3) Community practices, rituals, and festival events, 4) Knowledge and practices about the environment and nature, 5) Knowledge and skills to produce crafts (Zaffwan Idris 2016; Solihah Mustafa & Yazid Saleh, 2017). As part of tangible cultural heritage, fine arts and crafts manifest the community's culture and identity, which is also a valuable national heritage. According to the National Heritage Department (2016), fine art involves the process of building, creating, or producing objects or goods through the creation of hand skills. Malaysia, as a country with a multi-racial society, gives advantages and uniqueness when various types of carvings or crafts belong to the culture of each ethnic group, such as the architecture of houses and mosques, daily clothing made of pottery or ceramics, batik, wood carving, woven mats, woven Songket, clothing manufacturing, silver and gold embroidery, batik, and woven cloth, beads, copper production, gourds, jewellery and others (Solihah Mustafa & Yazid Saleh, 2017).

To preserve the heritage of traditional handicrafts, one of the causes of the extinction of traditional handicrafts is the need for more involvement of the new generation in the handicraft manufacturing industry. This new generation tends to avoid venturing into traditional handicrafts due to a lack of interest, no economic value found and difficulties in making the craft. As is the case among the Che Wong Aboriginal people, where crafts such as traditional hats and wood-made clothes face extinction (Jamilah Bebe et al., 2016). The same goes for Mengkuang mat handicrafts which are increasingly difficult to find and face the threat of extinction due to the lack of people skilled at weaving these mats (Som, 2020). Youth involvement in traditional handicrafts will not only preserve cultural heritage but also preserve local wisdom. A study from Nocca (2017) found that cultural heritage positively impacts economic productivity as a new form of economy. Cultural heritage can be a new economic source of social capital that can generate income. It becomes a significant indicator of community involvement in the strategy of heritage preservation. Social indicators can contribute to conservation projects that can improve living conditions in an economic context. At the same time, it can help overcome the problem of unemployment among the youth. Unemployment, which refers to individuals who do not have a job and are actively trying to find a suitable job, is an issue that is often discussed. The current economic situation, which is very challenging, sometimes forces employers not to hire new employees after some have retired because of financial problems, which greatly impacts people just starting to look for a job (Ong, 2018). Many factors cause the problem of unemployment that occurs and is not limited to academic qualification factors only. According to Nurhadhinah and Dayangku Aslinah (2020), in a study identifying the causes of youth unemployment, especially in rural Sarawak, they stated that unemployment

factors include insufficient job opportunities in certain areas, education levels that do not meet vocational matching requirements, lack of communication skills, lack of confidence employers towards graduates, the family influence that emphasizes working in the government sector only, being the backbone of the family and having to take care of sick family members.

RESEARCH METHODOLOGY

This research uses a mixed methodology technique combining qualitative and quantitative methods to obtain data. The data collection done in this research uses primary and secondary sources. For primary data collection, various techniques were used, including semi-structured interviews, unstructured interviews and questionnaires. As for the interview process, interviews were conducted to obtain as much information as possible from key informants such as traditional craft operators, officials from government departments, and youth involved in the craft industry, either as artisans or business owners. Interviews are an important technique for collecting qualitative data (Yusuff, 2004). This interview allows the researcher to obtain information from the informant by asking questions according to a predetermined theme. The researcher obtains research information directly from the informant through the interview process. Qualitative data obtained through interviews were then transcribed and analyzed using Nvivo software. While for quantitative data, a set of questionnaires consisting of several items identified based on the study's objectives was distributed to 155 respondents who were selected using the purposive sampling method. The research sampling area and framework cover four zones in Malaysia: The North Zone, East Coast Zone, West/Central and East Malaysia Zone (Sabah), as shown in Table 1. Regarding the distribution of the number of respondents in each zone, 30 respondents are from the North Zone, 21.9 respondents in the Central Zone, 37 respondents in the East Coast Zone, and 54 respondents in the East Malaysia Zone. The study population consists of youth aged 15 to 45 who are involved in the craft industry. Questionnaires in this study are divided into several parts, namely Part A: Socio-Demographic and Part B: Intangible Cultural Heritage Craft Preservation Indicators, which include several items such as government efforts, innovation, education, tourism and attitudes. A 5-point Likert scale was used for this study. The 5-point scale was chosen for this study because it is often used and has the best characteristics, in addition to its ability to measure attitudes consistently (Joshi, 2015; Jamieson, S. 2004). The mean value is seen in three levels; low level, average level, and high level (Zeynep Copur, 2015; Alan Agresti & Barbara Finlay, 2009 and Zainudin Abu Bakar et. al., 2007). The potential level is low if the mean value is 0-1.67. While the mean value between 1.68 - 3.33 shows that the level of potential is at an average level. The mean value of 3.34-5.0 shows that the level of potential is at a high level. The quantitative

data obtained from the questionnaire was then analyzed using SPSS software to support the qualitative data in this study.

RESEARCH FINDINGS

Qualitative data were obtained from this study through interviews with several respondents regarding the potential of traditional handicrafts as an income generator among youth. A total of 15 respondents were interviewed, and they believe that craft heritage has the potential to be used as an economic resource, especially for the youth. The average respondent sees potential in several indicators, namely the marketing of craft products, government support, the role of craft activists, perceptions of craft heritage, and technology and innovation. As a summary, the findings obtained through the interview method are illustrated in Table 3.

Table 3: Research Findings through Interview Methods

Issues	Respondents
<i>The market of craft products</i>	R15, R1, R4,
<i>High demand by users</i>	R6, R8, R9,
<i>Tourist's attraction</i>	R11, R10
<i>Government support</i>	R2, R3, R12, R4,
<i>Youth support program such as training, capital, market opportunities</i>	R7, R5, R13
<i>The role of Craftsmen</i>	R14, R3, R4,
<i>High-demand opportunities for traditional craft products</i>	R9, R11, R5
<i>Perception of craft heritage, Appreciation for cultural heritage</i>	R1, R14, R4,
<i>Digitization, technology and innovation in marketing</i>	R7, R8, R3

Findings obtained through interviews found that the craft market in Malaysia received high response and demand. Most of the found craft entrepreneurs stated that the community still appreciates the artistic value of craft heritage. Their interest in and appreciation for the subtleties of traditional craft art is the main reason that motivates them to buy craft products. The work of art usually requires the time and skill of the craftsman. Some respondents admit they sometimes need help to fulfill buyers' requests due to time and human resources constraints. They admit that when there is a lack of craft makers, the high demand by consumers causes some to be rejected or have to wait a long time to meet the buyer's demand. In terms of the role of the government, there are now various efforts to empower the heritage of handicrafts, including handicraft exhibitions, design competitions, training courses, financial assistance, and marketing

support. This shows that youth have had many opportunities and forms of support to venture into traditional craft enterprises.

"According to our research data, craft sales are increasing. For instance, in our big events like in KL or in Johor Craft Festival at (Plaza) Angsana, craft sellers can earn up to million (Ringgit)".

(R1, II)

By organizing the National Craft Day and other craft festivals organized by the state, handicrafts can be marketed more widely. It can also attract tourists to visit Malaysia and improve the socioeconomics of the local community while preserving Malaysian-made handicrafts. It can be used as a tourism product for foreign visitors who come to Malaysia for vacation. Apart from that, respondents also agreed that handicrafts are products that better reflect local cultural values compared to other souvenirs. Respondents also stated that handicrafts can bring profit to the entrepreneur. The high demand for handicrafts will not only guarantee the sustainability of the handicraft manufacturing industry but also create more job opportunities and expand business opportunities. The high response to this craft shows that the potential to make handicrafts a source of income for youth is high. The aspect of government support is also seen as one of the important elements in empowering traditional crafts among the youth. Among the programs offered by the government through the Malaysian Handicrafts Institute is the incubator program, where qualified handicraft entrepreneurs will be given free business space assistance, and entrepreneurs will only have to bear the cost of utility bills and production costs without having to think about monthly shop rent.

"We provide help for young entrepreneurs, they have no capital (yet), so we'll provide an incubator. Where they can use our space for up to six months, free of charge, they only have to pay for the utilities and materials (that will be used in the production of craft)".

(R10, II)

Malaysian handicrafts have designed and implemented various initiatives to help handicraft entrepreneurs and encourage those who want to venture into this field. Apart from the incubator, Malaysian Handicrafts also provides a Craft Apprenticeship Program where those interested in joining the handicraft industry will be placed under the care of experienced handicraft entrepreneurs for six months. They will be given a training allowance throughout

the program by Malaysian Crafts. This program targets youth who are interested in handicrafts.

"Another program that we have is 'Craft Attachment', where we attach anyone who is interested in joining Craft (industry) with craft entrepreneurs, and they will train (those involved). So, in six months, we (Kraftangan Malaysia) will pay an allowance. We encourage the youth to participate in this program".

(R5, I1)

In addition to assistance in the form of skills training, Malaysian Crafts also provides workshop and machine repair assistance on a 'one-off' basis to entrepreneurs in need. Help like this is important for handicraft entrepreneurs. The craft-making workshop must be comfortable to guarantee safety while working. Handicraft entrepreneurs need machines that can work well in producing high-quality products. Malaysian handicrafts also assist in the form of marketing networks for handicraft entrepreneurs. Among them is through marketing on digital platforms. MyCraftShopee is an online shopping site operated by Malaysian Craft. Along with that, Malaysian Crafts also provides a Craft on The Go smartphone application where users can find the craft items they need along with a complete directory of the products, such as prices, store locations, and pictures.

"And then we help with platforms like MyCraftShopee, e-Craft Bazaar, and Craft on The Go. It helps tourists who want to buy crafts, they can just go there. It is complete with location (of the craft shop)".

(R1, I1)

A modern and digital platform like this is certainly closer to the youth. This form of online marketing is expected to attract youth not only to buy handicraft products but also to become an attraction for them to work on handicrafts. This form of digitization can counter the view that handicrafts can only be traditionally marketed at the market or worn by older people.

To serve the purpose of this study, the study's results through a questionnaire found that handicrafts have the potential to become an economic resource for youth based on several indicators. Briefly, the quantitative data findings are displayed in Table 4 below.

Table 4: Potential indicator of craft heritage as a youth economic resource.

Potential	Mean Value
Craft Demand	3.9168
<i>Tourist's attraction</i>	3.8194
<i>Innovated Crafts</i>	3.7652
<i>Local Demand</i>	3.7484
<i>Participation of Youth</i>	3.9026
<i>Craft as Business and better local product</i>	4.1484
<i>Reflects Local Value</i>	4.0129
<i>Profitable</i>	3.9935
Government Aids	4.9086
<i>Play important roles in helping craft makers</i>	4.8800
<i>Had play it roles in marketing and preserving crafts</i>	4.9323
<i>Special aids should be given to craft makers</i>	4.8830
Youth Interest	4.8415
<i>Attending programmes related to craft</i>	3.9717
<i>Have interest in craft</i>	4.8697
<i>Have skills in craft making</i>	4.7644
<i>Willing to learn more about craft making</i>	4.8719
<i>Attending marketing program held by the government</i>	4.7046

In order to fulfil the purpose of this study and support the findings obtained through interviews, questionnaires regarding some potential indicators have been identified and distributed to respondents. The indicators used are the handicraft market, government agency support and youth tendencies. The indicator with the highest mean value is government agency support, with a score of 4.91; youth tendencies, with a score of 4.84; and the handicraft market, with a score of 3.92. From the mean value shown, government support is the indicator with the highest mean value of 4.91, showing that support from government agencies is the leading indicator in ensuring that the traditional handicraft industry finds a place among the youth and is an economical source. Respondents in this study showed a positive attitude towards handicrafts. Most of them have attended courses related to handicrafts. The mean value also shows that most respondents have interests and skills in handicraft making and tend to venture into the field more seriously.

DISCUSSION

Traditional handicraft has significant potential in generating income and being an economic resource for the youth. Support from government agencies through

support programs, financial assistance, training, exhibitions, and access to the market implemented makes traditional handicrafts a potential economic resource for the community, especially for the youth. This support helps handicraft entrepreneurs increase their chances of generating sustainable income and expanding their businesses. The government has carried out its responsibilities well in marketing and preserving handicrafts in Malaysia, in addition to increasing assistance and initiatives to handicraft entrepreneurs for the sake of the sustainability of the country's handicraft industry. In addition, technological developments have enabled handicraft entrepreneurs to access the global market more easily through e-commerce platforms and social media. Handicraft entrepreneurs can market and sell their products globally through websites, online markets, or platforms such as MyCraftShopee, e-Craft Bazaar and Craft on The Go. This platform provides an opportunity to increase market reach and revenue. The potential is also seen in the tourism sector, which opens up ample market space for traditional craft products. Tourists often look for handicraft products as souvenirs or souvenirs related to the places they visit. Tourist attractions such as cultural and heritage destinations are often good places to sell handicraft products to tourists. Therefore, vast marketing opportunities can guarantee the future of the traditional handicraft industry.

The potential of crafts to be used as an economic resource for youth is also influenced by the willingness and acceptance of the youth themselves. In venturing into the field of entrepreneurship, especially involving traditional craft products, attitude plays a role in making an agenda successful, even more so when it involves business or enterprise. Nor Hanim et al. (2021) state that the attitude required to succeed in a handicraft business is the attitude of seizing opportunities in business, entrepreneurial spirit, and customer service. In short, attitude affects the success of a handicraft business. Handicraft products that connect with cultural heritage, traditional arts, or specific special skills are sure to be of interest to anyone looking for different products with cultural value. Handicraft entrepreneurs who can produce unique and high-quality handicraft products can attract customers willing to pay a higher price. For this reason, traditional handicraft entrepreneurs do not see profit solely because, for them, the satisfaction of making artwork is more important for preserving local art and culture.

CONCLUSION

Traditional craft products are the result of art and hand skills that highlight the value of cultural heritage and the uniqueness of the local community. The intellectuality of the local community and culture manifested in every craft product must be preserved through various means. One is through entrepreneurship by involving the youth as the next generation to continue this cultural art. From the results of this study, handicrafts have great potential to

generate income and significantly impact the local economy. However, despite the potential, the success of making handicrafts in generating income still depends on other factors such as product quality, innovation in design, business management, effective marketing, and patience and perseverance in this craft industry.

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APPLICATION OF A HYBRID CELLULAR AUTOMATON-MARKOV MODEL IN LAND USE CHANGE DETECTION AND PREDICTION IN FLOOD-PRONE AREA, JOHOR, MALAYSIA

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Abstract

Changes in land use can significantly impact natural resource sustainability, socioeconomic activities, and flood risks. Cellular Automata-Markov model (CA-Markov) is utilized in this study to predict land use changes by modeling the spatial dynamics and transitions of land use categories over time in one of the flood-prone area in Segamat district, Johor. Satellite images obtained from Landsat 5 Thematic Mapper and Satellite Pour l'Observation de la Terre (SPOT) 5, 6, and 7 for years 2006, 2011, and 2016 were utilized to assess the magnitude of the land use change via unsupervised and supervised classification. Additionally, ancillary data such as residential, road, water bodies, and slopes were used as input to forecast future land use. The findings revealed that between 2006 to 2026, there was an increase in built-up areas and mixed agriculture up to 26%. The expansion of built-up areas and mixed agricultures involves the removal of forests, further exacerbating flood risks. This fundamental research can provide valuable insights for effective land management and urban planning.

Keywords: Markov chain model; Change simulation; Urban Development; Image classification; Environmental Planning

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INTRODUCTION

Assessing spatial-temporal land use has become a prime concern in determining how human activities interact with the environment. Land use changes are triggered by a variety of factors, such as urbanisation, industrialization, deforestation, land modification, agricultural intensification, and the introduction of artificial forests (Islam et al., 2018; Zhao et al., 2018). All of these result in forest fragmentation, habitat degradation, biodiversity loss, diminished ecosystem service function, altered soil quality and loss of soil resources, as well as global and regional climate change, which ultimately influence natural resource sustainability and socioeconomic activities (Islam et al., 2018; Zhao et al., 2018; Hu & Zhang, 2020). Aside from that, changes in land use also have a serious impact on floods and become one of the main drivers of flooding in urban areas (Muhammed Noordin et al., 2007; Rogger et al., 2017). Abdulkareem et al. (2018) posit that changes in land use can impose a negative impact on infiltration, surface runoff, flood peaks, rate of evaporation, rate of sediment transport, soil moisture, streamflow, and groundwater flow. Additionally, land use changes such as the removal of natural buffer zones like forests and wetlands have severely harmed watershed areas' ability to mitigate floodwaters (Ponting et al., 2021).

Malaysia has not been exempted from land use changes caused by population and economic growth. For instance, the country has experienced deforestation and the conversion of land to oil palm plantations following its status as the largest exporter of oil palm (Omran & Schwarz-Herion, 2020). Additionally, Malaysia is expected to have a population of 33.8 million in 2040, signifying an increase in built-up areas as 85% of the population will live in urban areas (Samat et al., 2020). In particular, the Segamat district in Johor was recognized as a flood-prone area. The district is a rural area which is not exempted from land use changes, particularly deforestation and conversion to oil palm and rubber plantations that are planted on estates as well as the FELCRA and FELDA land programmes (Johor Land and Mines Office, 2022). Although the local development seemed slow between 2007 to 2017 (Segamat District Council, 2022), it is still worrisome because both small and large scale floods have been an annual occurrence in Segamat, with the flooding events that happened in 2006, 2011, and 2017 having the most devastating hit towards the district (Reza et al., 2017; Sach et al., 2018). Floods pose a threat not only to society and infrastructure but also to the agricultural sector that may result in monetary losses, damage to existing drainage systems, and equipment and machinery disruption (Muhadi et al., 2017; Muhammad et al., 2018).

A spatial-temporal analysis is required to understand the characteristics of past and future landscape changes, and dynamic change information is necessary for experts to estimate the potential environmental impact of changes (Wan Ibrahim & Muhamad Ludin, 2016). As a result, scientists from various

disciplines are interested in using modelling to study the environmental impacts of land changes (Abba Umar et al., 2021; Azari et al., 2022). Cellular Automata-Markov (CA-Markov) is a robust model that has outperformed other techniques and is capable to simulate long-term predictions of any intricate pattern's spatial variations (Mathanraj et al., 2021; Wang et al., 2021). The aims of the study are to employ remote sensing and GIS technology to assess the spatial-temporal of land use change from 2006 to 2016 and predict future changes using a hybrid CA-Markov model in Segamat district, Malaysia.

MATERIALS AND METHODS

Study area

Segamat is a district in Johor, Malaysia, located in the northern part of the state, bordering the Pahang state in the northeastern and Negeri Sembilan in the west (Figure 1). The Segamat district occupied approximately an area of 2866.56 square kilometres (km²) with 11 sub-districts (Gemas, Sermin, Buloh Kasap, Jabi, Sungai Segamat, Pogoh, Gemereh, Jementah, Labis, Chaah, and Bekok). Geographically, this district is a flat area with slightly undulating slopes and hills in the Segamat river basin (Reza et al., 2017). The economy of Segamat is driven by agricultural activities like oil palm and rubber, followed by the industrial and tourism industries. The population of this district was estimated at 210,000 persons in 2016 (Department of Statistics Malaysia, 2017).

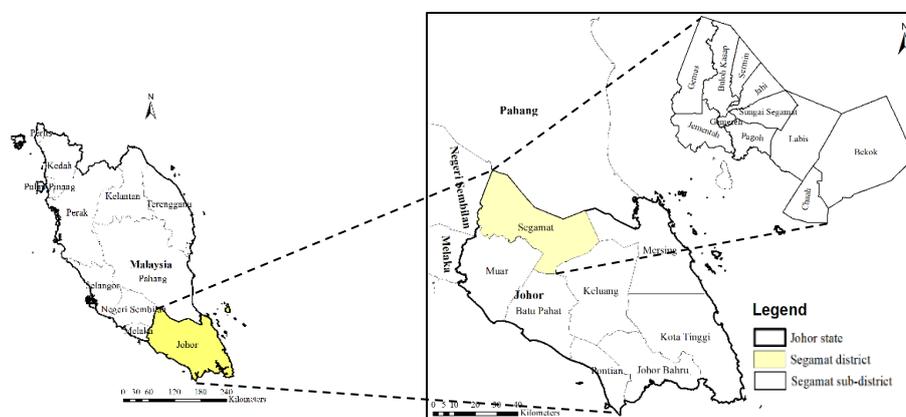


Figure 1: Geographical location of the Segamat district in Malaysia

Data and classification method

This study used Landsat and Satellite Pour l'Observation de la Terre (SPOT) satellite imagery as well as other geospatial data from the Department of Surveying and Mapping Malaysia (JUPEM) (Table 1). The Landsat imageries were downloaded from the United States Geological Survey (USGS)

(<https://earthexplorer.usgs.gov/>) and the SPOT imageries were obtained from the Agency of Remote Sensing Malaysia (ARSM). Owing to the unavailability of SPOT imagery for 2006, different satellite imagery was used as in a previous study by Hassan et al. (2016). Thus, a comparison between Landsat and SPOT imageries for 2011 was performed to ensure that the results produced were acceptable. The selection of imageries was screened as clear and of good quality.

Table 1: List of datasets of the study

Data	Criteria	Year	source	Data format
Satellite imagery	Landsat 5 TM (30m resolution)	2006	USGS	Raster
	Landsat 5 TM (30m resolution)	2011	USGS	Raster
	SPOT 5 (10m resolution)	2011	ARSM	Raster
	SPOT 6 & 7 (6m resolution)	2016	ARSM	Raster
DEM	Slope	2014	USGS	Raster
Topographic map	Distance from residential areas, road networks and water bodies	2015	JUPEM	Vector

Pre-processing of satellite imagery should be performed before classification to reduce or minimize distortions due to the sensor, atmospheric and topographic effects during acquisitions, and to improve image quality and interpretability (Dangulla et al., 2020). Therefore, the imageries were subjected to geometric correction, mosaic, and image sub-setting using the ArcGIS 10.4 software. The imageries were co-registered to Malaysia’s common local geographical coordinate system - Rectified Skew Othomorphic (RSO) projection. Four classes were identified in this paper: (1) built-up areas, comprising residential, commercial and services, and industrial and road; (2) mixed agriculture, comprising oil palm, rubber, orchards, and mixed vegetation; (3) forest, comprising all types of forest (evergreen); and (4) water bodies, comprising lakes, ponds, rivers, and reservoirs. These classes were identified based on the visual interpretation of satellite imageries and verified by field observation. After pre-processing, both unsupervised (Iterative Self-Organizing Data Analysis or ISODATA) and supervised (Maximum likelihood classification or MLC) classification techniques were performed via the ENVI 5.1 software. The MLC technique is one of the most frequently used since it is deemed reliable and accurate (Khan et al., 2016).

Accuracy assessment

The accuracy of land use classification maps is crucial, and Dangulla et al. (2020) suggested the maps must have an accuracy of at least 85%. Assessing the accuracy of land use map can be done using indicators such as producer's accuracy (PA), user's accuracy (UA), overall accuracy (OA), and Kappa coefficient (KC), as shown in Eqs. 1–4 (Ren et al., 2018). The 100 points were

selected randomly and reference data, such as a land-use map from the Department of Agriculture Malaysia as well as Google Earth Pro, were used to assess the accuracy of land use maps extracted from satellite images.

$$OA = \frac{\sum_{i=1}^r n_{ii}}{N} \quad (1)$$

$$PA_i = \frac{n_{ii}}{n_{+i}} \quad (2)$$

$$UA_i = \frac{n_{ii}}{n_{i+}} \quad (3)$$

$$KC = \frac{N \sum_{i=1}^r n_{ii} - \sum_{i=1}^r (n_{i+} n_{+i})}{N^2 - \sum_{i=1}^r (n_{i+} n_{+i})} \quad (4)$$

Where, N is the total number of pixels, n_{ii} is the number of pixels that are correctly classified, n_{i+} is the number of pixels in land use map, n_{+i} is the number of pixels in a reference data, r is the number of the classes, and i is the i^{th} class.

CA-Markov model

In many land use change studies, the Markov Chain (MC) model has been successful in simulating land use change status (Khwarahm et al., 2020). Nevertheless, one of the disadvantages of the MC model is its inability to provide the occurrences of spatial distribution in each land use class, instead providing only an estimate of land use change magnitude, as well as the lack of a spatial dimension (Khwarahm et al., 2020; Matlhodi et al., 2021). Since the MC model provides no information about any land use class's spatial distribution, integration with the Cellular Automata (CA) model is necessary because the CA model is closely linked to the spatial variables (Azizi et al., 2016; Liping et al., 2018). The integration of CA and MC models (CA-Markov) is deemed to be advantageous for forecasting land use changes due to its ability to accurately simulate spatial forecasts (Hua, 2017; Liping et al., 2018). The MC (Eqs. 5-7) and CA (Eq. 8) models are expressed as follows (Liping et al., 2018):

$$P_{ij} = \begin{bmatrix} P_{11} & \dots & P_{1n} \\ \vdots & \vdots & \vdots \\ P_{n1} & \dots & P_{nn} \end{bmatrix} \quad (5)$$

$$0 \leq P_{ij} < 1 \text{ and } \sum_{j=1}^n P_{ij} = 1, i, j = 1, 2, \dots, n \quad (6)$$

$$S_{t+1} = P_{ij} \times S_t \quad (7)$$

Where, S is the status of land use, n is the number of land use types, P_{ij} is the probability matrix of state transitions, and t; t+1 is the time point.

$$S_{t+1} = f(S_t, N) \tag{8}$$

The set of states of the finite cells is denoted by S. t and t + 1 are different moments; N is the cell neighbourhood; and *f* is the local space transformation rule.

To derive the transition probability matrix for each land use class, calibration data between 2006-2011 and 2006-2016P were calculated to simulate and predict land use in 2016 and 2026. As per Table 2, the trend to remain in the same land use class is higher for all periods. In order to develop the criteria for MCE, factors such as slope and distance from residential areas, roads, and water bodies were used (Table 3) following previous studies by Keshtkar and Voigt (2016) and Camara et al. (2020).

Table 2: Markov transition probabilities matrix of 2006-2011 and 2006- 2016P

Periods	Land use	Mixed agriculture	Forest	Built-up areas	Water bodies
2006-2011	Mixed agriculture	0.9601	0.0229	0.0107	0.0062
	Forest	0.0756	0.9203	0.0000	0.0040
	Built-up areas	0.2124	0.0000	0.7826	0.0049
	Water bodies	0.5159	0.0411	0.0212	0.4218
2006-2016P	Mixed agriculture	0.9624	0.0160	0.0151	0.0065
	Forest	0.0888	0.9064	0.0000	0.0048
	Built-up areas	0.1564	0.0000	0.8404	0.0033
	Water bodies	0.5030	0.0358	0.0282	0.4329

Table 3: Extracted weights based on AHP and Fuzzy model standardization for built-up areas

Factors	Fuzzy membership functions type	Control point	Weight
Distance from residential areas	Linear	0–100m highest suitability	0.38
		100-5000m decreasing suitability	
		>5000m no suitability	
Distance from road	J-Shaped	0–50m highest suitability	0.28
		50-1500m decreasing suitability	
		>1500m no suitability	
Distance from water bodies	Linear	0–100m no suitability	0.15
		100-7500m increasing suitability	
		>7500m highest suitability	
Slope	Sigmoidal	0% highest suitability	0.19
		0-15% decreasing suitability	
		>15% no suitability	

The VALIDATE module was used in this study to compare the predicted and observed land use in 2016. The results revealed kappa statistics above 0.8, such as Kstandard (0.9640), Kno (0.9735), and Klocation (0.9681), subsequently indicating that the model performed well and was credible in modelling future land use patterns. Models with accuracies greater than 80% indicate a degree of confidence in the simulation (Keshtkar & Voigt, 2016). The simulation was conducted using ArcGIS 10.4 and IDRISI Selva 17.0.

RESULTS AND DISCUSSION

Spatial-temporal of land use changes

In the study area, bare land and mixed agriculture were classified as one class since bare land was seen as agricultural land without crops at the time, notably in oil palm plantations. The overall accuracy of all four land use classification maps was 86% and above, with kappa statistics considerably over 0.80. The land use classification was deemed satisfactory as per the accuracy assessment result because it exceeded the recommended level (85%). Considering most of the classes have user and producer accuracy of 70% or above (Table 4), it can be inferred that the classified image and the ground reality it represents are in acceptable agreement (Yesuph & Dagnew, 2019). Meanwhile, the overall accuracy and kappa coefficient of the SPOT imagery were 91% and 0.87, respectively, compared to the of the Landsat imagery, which was 89% and 0.85, respectively. A similar result by Mosime and Tesfamichael (2017) revealed that SPOT imagery outperformed Landsat imagery with an overall accuracy of 71% and 53% using unsupervised classification (ISODATA). This is owing to SPOT performing better due to its higher spatial resolution—10 m as instead of 30 m for Landsat. The accuracy, cost, and effectiveness of data analysis are all influenced by the spatial resolution of satellite imagery; as a result, the use of high spatial resolution data typically results in more precise estimates because it allowed for the capture and detect of detailed landscape characteristics as well as specific small land use changes that have possibly been missed with coarse satellite, notably Landsat (Fisher et al., 2018).

Figures 2a-2d summarise the changes in land use between 2006 and 2016. The continuing expansion of built-up areas accounted for around 2.44% of the total land area in 2016, up from 1.76% in 2006. Meanwhile, forest and water bodies have continued to decrease, with forests covering 31.63% of the total land area in 2006 and 30.10% in 2016, and water bodies covering 0.74% of the total land area in 2006 and 0.45% in 2016. For mixed agriculture, Landsat imageries (2006 and 2011) and SPOT imagery (2016) showed continued expansion, accounting for around 65.87% of the total land area in 2006, up to 66.76% in 2011 and 67.01% in 2016. Conversely, an "increase-decrease" was seen in mixed agriculture for Landsat imagery (2006) and SPOT imageries (2011 and 2016),

which accounted for around 65.87% of total land area in 2006, up to 67.48% in 2011 and decreased to 67.01% in 2016.

Table 4: Classification accuracy assessments of Segamat district from 2006 to 2016 using error matrix

Land use Class	Landsat				Spot			
	2006		2011		2011		2016	
	UA	PA	UA	PA	UA	PA	UA	PA
Built-up areas	90.00	90.00	85.00	94.44	85.00	100	70.00	100
Forest	100	76.92	100	90.91	100	82.33	100	86.96
Mixed agriculture	87.50	85.37	92.50	82.22	82.50	88.10	97.50	78.00
Water bodies	65.00	100	75.00	100	85.00	100	65.00	100
OA	86 %		89 %		91 %		86 %	
KC	0.81		0.85		0.87		0.80	

Note: the abbreviations UA, PA, OA, and KC represent user's accuracy, producer's accuracy, overall accuracy, and Kappa coefficient, respectively

A comparison of observed and predicted land use for 2016 was conducted to determine the similarity of land use classes (Figures 2d-2e). The results indicated that all classifications revealed contrasting areas. In the predicted map, built-up areas and forest showed a slightly lower percentage of 2.24% and 29.78%, respectively, as opposed to 2.44% and 30.10% in the observed map. Meanwhile, mixed agricultural and water bodies accounted for 67.23% and 0.75% of the total area, respectively, in the projected map, as opposed to 67.01% and 0.45% in the observed map. Figure 2f reveals the predicted land use using the CA-Markov model for 2026. The results showed that the built-up area, forest, mixed agriculture, and water bodies accounted for approximately 2.92%, 28.21%, 68.15%, and 0.72% of the total land area, respectively. Furthermore, land use changes across the study period of 2006-2016 and 2006-2026 revealed that built-up areas and mixed agriculture continued to expand while forest and water bodies continued to decrease. The expansion of built-up areas was spurred by the concentration of settlements, particularly around Segamat town (Figure 3), which serves as the district's municipal and administrative centre (Liew et al., 2021).

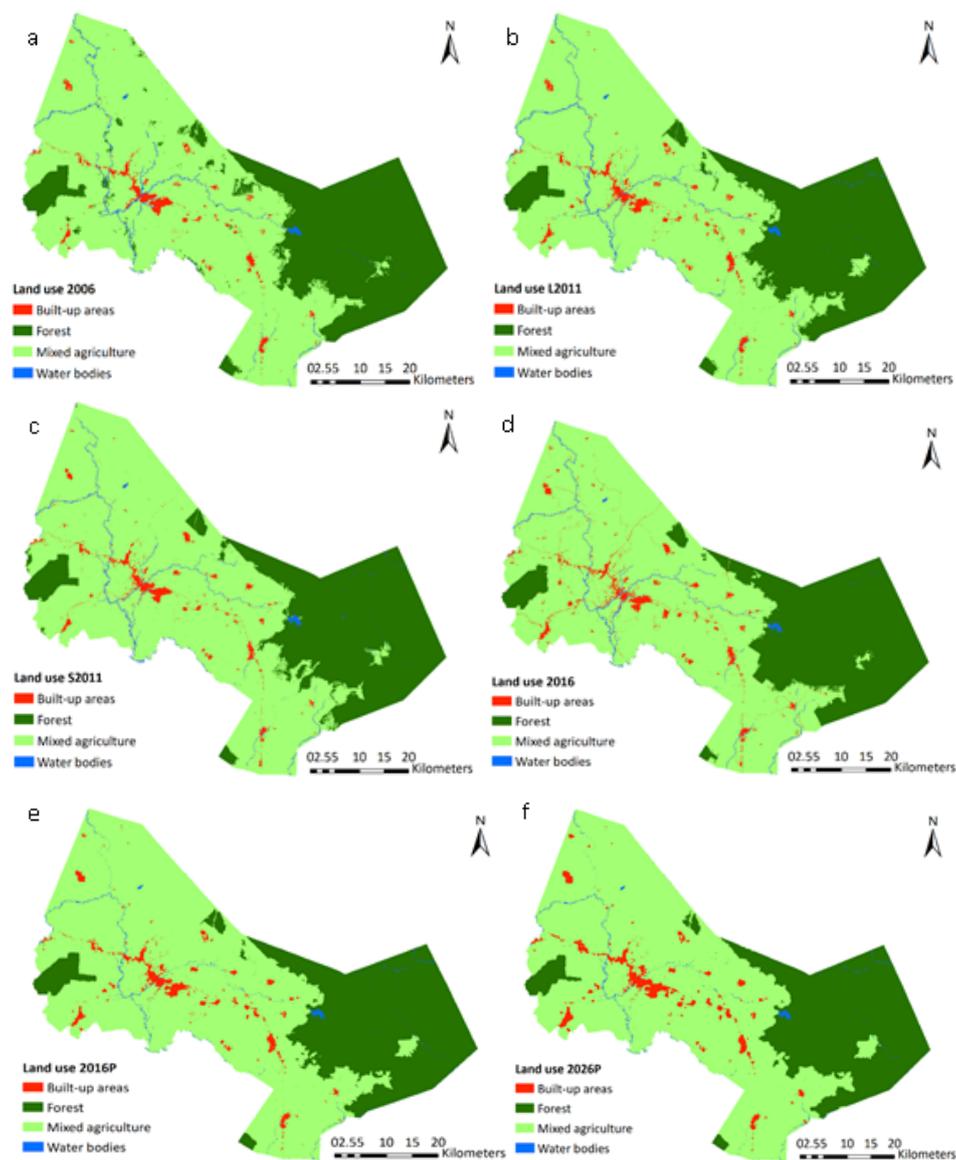


Figure 2: Spatial patterns of land use in Segamat district from 2006 to 2016, land use for the year 2006 (Landsat imagery) (a), 2011 (Landsat imagery) (b), 2011 (SPOT imagery) (c), 2016 (SPOT imagery) (d), 2016 (Predicted) (e), and 2026 (Predicted) (f)

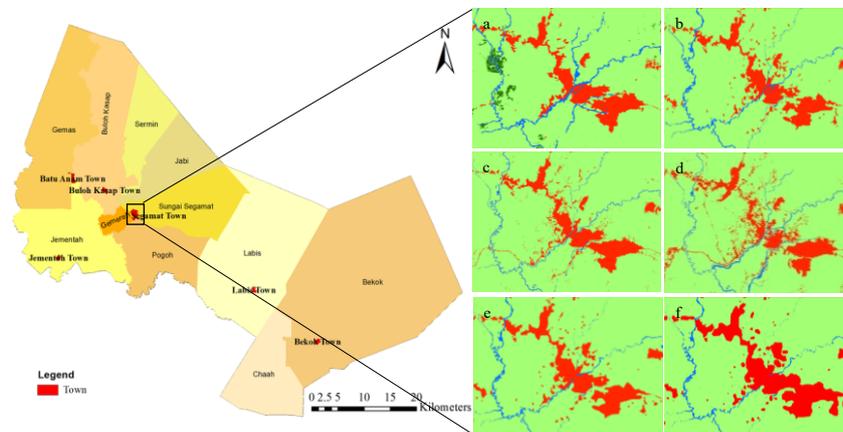


Figure 3: Spatial patterns of land use in Segamat town from 2006 to 2016; land use for the year 2006 (Landsat imagery) (a), 2011 (Landsat imagery) (b), 2011 (SPOT imagery) (c), 2016 (SPOT imagery) (d), 2016 (Predicted) (e), and 2026 (Predicted) (f)

Conversion of Land Use Types

Figure 4 and Table 5 summarise the land use type conversion from 2006 to 2026. Approximately 80 km² of the forest was cleared between 2006 and 2016, with 95% of the land converted to mixed agricultural and 5% of the total area converted to built-up areas and water bodies. Approximately 50 km² of mixed agriculture has been converted into built-up areas and forest, accounting for 40% and 43% of the total loss, respectively. Within 20 years (2006-2026), around 110 km² of the forest will be cleared with roughly 97% being converted to mixed agriculture. Meanwhile, roughly 50 km² of mixed agriculture has been converted into built-up areas, forests, and water bodies, with 65%, 20%, and 14%, respectively.

Through land use spatial transfer characteristics over the decade, the gains in mixed agriculture and built-up areas were related to population growth and economic factor. The Segamat district was expected to have a population of 218,213 people in 2020 compared to 188,968 people in 2000, where the GDP per capita was projected to be RM 22,511 in 2020 compared to RM13,187 in 2000 (Johor State Town and Country Planning Department, 2014). As a result, the built-up areas took over mixed agricultural land especially surrounding Segamat town, as illustrated in Figure 3. Additionally, this district is located within a watershed; Camara et al. (2020) posit that watersheds are lowland areas that are highly attractive for urban development. Meanwhile, mixed agriculture has displaced forest land for oil palm plantations since Malaysia became one of the world's leading exporters of palm oil, driving forest fragmentation in the state of Johor (Omran & Schwarz-Herion, 2020; Camara et al., 2020). Despite the fact

that the forest is declining, it seems quite dominant after mixed agriculture because the government gazetted the Endau-Rompin National Park as a Permanent Forest Reserve in order to protect forest resources (Johor State Forestry Department, 2006).

Table 5: Transfer matrix of land use types in Segamat district from 2006 to 2026 (km²)

Periods	Land use	Built-up areas	Forest	Mixed agriculture	Water bodies
2006 - 2016P	Built-up areas	42.72	0.00	7.28	0.15
	Forest	0.03	828.71	71.88	3.56
	Mixed agriculture	20.78	22.36	1833.53	8.61
	Water bodies	0.57	0.67	10.36	9.01
2006 - 2026P	Built-up areas	45.41	0.00	4.69	0.04
	Forest	0.12	794.72	105.80	3.54
	Mixed agriculture	37.04	11.50	1828.56	8.13
	Water bodies	0.96	0.63	10.16	8.86

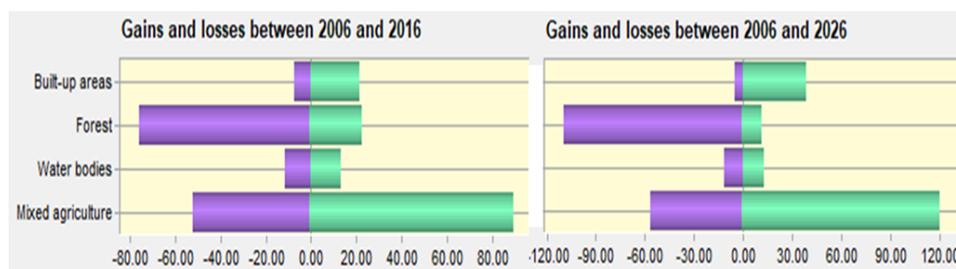


Figure 4: Gains and losses in each land-use category from 2006 to 2026 (km²)

CONCLUSION

Assessing and understanding the spatial-temporal of land use change is necessary for protecting and managing land resources, as well as raising awareness of environmental problems. In this study, RS data and GIS technology were used to undertake a spatial-temporal research from 2006 to 2016, whereas CA-Markov was used to predict future changes. The findings showed that mixed agriculture seems to dominate the total area. This owes to the conversion of forest areas for oil palm and rubber plantations, which is the district's main economy, as well as Malaysia's economy as a major exporter of oil palm. Meanwhile, water bodies seem less dominant, accounting for less than 1% of the study area. In addition, the study found that the conversion to mixed agriculture resulted in a forest loss of roughly 95% between 2006 and 2016, and about 97% within 20 years (2006-2026). The findings also revealed that approximately 40% of mixed agricultural

was lost owing to conversion to built-up areas between 2006 and 2016, and approximately 65% within 20 years (2006-2026) owing to increased population growth, causing the small town to expand by buildings and infrastructure. Generally, land use changes in the Segamat district seem to be slow; nonetheless, the study of spatial-temporal land use change is vital because this area is flooded on a small or large scale almost every year. Therefore, the expansion of built-up areas and mixed agriculture can pose significant threats to the environment that require urgent attention. Additionally, the results of this study can be potentially linked with hydrological and climatic studies to identify climate change and flood disasters. This fundamental research may help in the decision-making and policymaking of a holistic environmental management and planning strategy.

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PLANNING FOR COMMUNITY DEVELOPMENT: EFFECT OF KNOWLEDGE MANAGEMENT, SOCIAL CAPITAL AND COMMUNITY LEADERSHIP

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Abstract

The main focus of the study is to evaluate the perspective of strengthening social capital resources of rural communities for rural development in Terengganu. Utilizing a convenient sampling procedure, participants for this study were taken from one hundred and seventy leaders in rural Terengganu. This study employed a self-administered online survey to gather primary data. The data were analysed using the Partial Least Square Structural Equation Modelling (PLS-SEM). The research findings unveiled that social capital and community leadership are germane and indispensable traits in rural development. Ubiquitously, this is true regardless of the stages of development any country is going through at the time. It is therefore the responsibility of the community and its leaders to create their social capital and make efficient use of it to advance rural development in Terengganu and refine the state's local policy.

Keywords: knowledge management, leadership, rural development, social capital, sustainable development

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INTRODUCTION

The process of rural development is not without difficulty, even on the global scale, and its philosophy has changed throughout time in unison with broader rural development ideology. Currently, it is to promote sustainable livelihoods as a means of reducing poverty and enhancing employment opportunities. Initially, rural areas are defined differently in different countries, and are frequently imprecise, particularly in many developing countries (Li et al, 2019; Asmawi Ibrahim et al, 2023). In the words of Ajayi and Otuya (2006), rural development as a social process is very pertinent to the progress of humans in that it enables people to conform and cope with changing environment and exert some leverage over local conditions. Rural areas are undergoing significant and sweeping changes which have created a sense of insecurity. However, there are a variety of concerns, ranging from decline to rapid growth (Beaulieu, 2019). Thus, effective rural community leadership is necessary for the organizing of community activities, promoting social well-being, and enhancing community sustainability, especially through government rural development programs.

Undoubtedly, Malaysia has implemented multiple initiatives and programs to improve rural leaders' critical thinking, integrity, power of authority, and many more. Over the past decade, the government has implemented various programs under the Malaysia plan. Among the programs and development plans specific to rural areas are the New Rural Economic Model (NREM), Rural Transformation Program (RTP), Rural Development Master Plan (RDMP), National Blue Ocean Strategy (NBOS), and Government Transformation Program (GTP, GTP 2.0). These programs and plans prioritize social and economic development, infrastructure development, and human well-being initiatives that have no doubt the potential towards improving and fixing the condition and standard of living of rural communities (Rami, et al 2021).

However, the absence of an effective implementation mechanism for programs designated for rural leaders has resulted in inefficient resource utilization. The question, therefore, lies in what strategies should be implemented by local leaders to strengthen their leadership with the presence of knowledge management and social capital components in their respective areas? Determining the answer to this question will help identify and provide an outlook from the perspective of more dynamic rural development reached through the strengthening of social capital resources among rural communities in Malaysia.

LITERATURE REVIEW

Theoretical Background and Hypotheses Development

Leadership is an art which encompasses convincing and controlling people's obedience, spirit, morale, and loyal cooperation to actualize a community of interest and a common goal (Gandolfi & Stone, 2016). Reports have shown that

the leadership pattern and styles often played significant roles in acclaimed successful societies which then accord them the opportunity to attain their desired goals (Xu et al., 2017; Zikhali & Smit, 2019). According to Seoketsa (2014), KM fundamentally concerns the organization of community understanding and intellectual resources which can improve a number of structural and community performance characteristics and generate value by enabling the creative process to operate with greater knowledge. To adopt this notion, we would like to explore the benefits of KM towards leadership in rural areas and expand it by applying social capital bridging and linking as moderators. To do so, we developed several hypotheses to inform our research.

Knowledge Management (KM)

People's lives are dependent on their ability to manage their knowledge. The success of an organisation is more likely to occur when excellent knowledge management practices are implemented (Shujahat et al., 2019). The ultimate objective for development of rural areas is to uplift the well-being of rural communities by transforming their leaders into knowledge-creating and knowledge-management individuals who use leadership styles that rural communities had in the past (Rianto et al., 2021). In this study, the strength of knowledge management may be found in its capacity to harness knowledge for the benefit of leaders and the community.

H₁. Knowledge management positively affects leadership.

Social Capital Bridging and Linking

Social capital is assumed as the "contextual complement" to human capital". Putnam (2000) referred to social capital as the relationship between individuals to form social networks, norms of reciprocity, and trustworthiness in helping one another. Social capital is described as a strong relationship and interaction among participants in a group (bonding), outside the group (bridging), or with authorities such as government, non-governmental organizations (NGOs), or institutions (linking) that catalyze community development programs. Bordering on this study, social capital bridging exemplifies strong relationships between community leaders who help each other improve their leadership style(s) through sharing information and exchanging ideas between them. Accordingly, the following hypotheses were proposed:

H₂. Bridging positively affects Leadership.

H₃. Linking positively affects Leadership.

Rural communities with a high level of social capital have the abilities to mobilise internal and external resources to carry out locally initiated activities and adjustments in response to external developments (Li, et al 2019; Wan Nor et al

2023). Thus, while leadership development systems that are solely focused on human capital may produce the most knowledgeable and talented leaders, if they do not include the necessary social capital (bridging & linking), there is a risk that these resources and capabilities will stay stalled and unable to be utilised. Moreover, in the context of the study, an incidental relationship that may subsist between knowledge management and leadership was analysed. Thus, within the purview of the literature, the under-listed hypotheses were formulated:

H4. Bridging positively moderates the relationship between Knowledge Management and Leadership.

H5. Linking positively moderates the relationship between Knowledge Management and Leadership.

The underneath conceptual framework was construed based on the literature and the formulated hypotheses of the study.

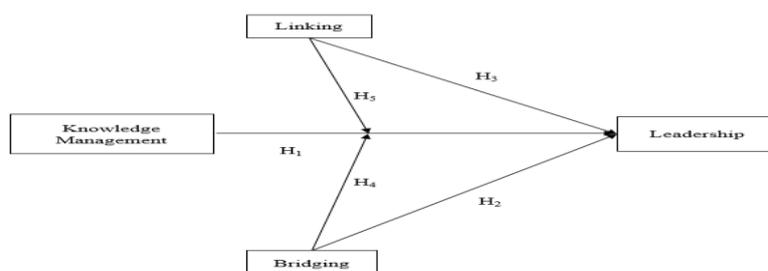


Figure 1: Conceptual framework

MATERIAL AND METHODS

Design and Procedures

This study employed quantitative research design by conducting a cross-sectional survey using a set of self-administered questionnaires. The unit of analysis was rural leaders in Terengganu. The study population numbered at about 412 rural leaders in Terengganu from eight (8) districts. The list of rural leaders was provided by the Institute for Rural Advancement (INFRA) and Terengganu State Government (2021). Using a convenient sampling technique, the researchers collect data from almost 170 respondents. An online self-administered survey was utilized for data collection spanning between November and December 2021 amid the COVID-19 pandemic lockdown period. Cohen power analysis and G.Power 3.1.9 instruments were used to determine the alpha which then shows that the sample size is substantial and adequate to achieve a level of significance at less than or equal to 0.05 and power greater than or equal to 80%.

Study area

The investigation was carried out in Terengganu, a fast-growing social-economic state in Malaysia. The study area is located in the northeast of Peninsular Malaysia, with a population analysis of about 1.0 million people of which 49% reside in the rural areas (Siwar et al., 2014).

Data Analysis

The research proposed hypotheses were analysed using Partial least squares structural equation modelling (PLS-SEM). The statistical package objective is to estimate the covariance matrix in a sample dataset and to simplify variance in endogenous variables when investigating a proposed theoretical model (Hair et al., 2013). As a result, this approach was chosen for the present research.

RESULTS

Measurement Model

In the current study, the measurement model assessment included composite reliability (CR) and average variance extracted (AVE). The Cronbach Alpha (CA) and composite reliability were used to measure reliability. Table 1 shows the results of the CA and CR index for Knowledge Management to be 0.912, 0.923, Leadership as 0.961, 0.962, LK equal 0.890, 0.889, and BG to be 0.839, 0.845 correspondingly. Adopting the CA and CR threshold value higher than or equal to 0.70 as suggested by Hair et al. (2011), make the above values to be suitable for analysis for the study. To measure discriminant validity, we utilized the Heterotrait-Monotrait (HTMT) and Fornell-Larcker ratio. The results of the discriminant validity of Fornell-Larcker presented in Table 2 show the values of the variables to be greater than the correlations index. Likewise, the results of the HTMT ratio are below the 0.090 thresholds. We further examined the convergent validity by computing the AVE values, and all values (KM= 0.501; LDRSHP= 0.562; LK= 0.539; BG= 0.526) were beyond the 0.50 threshold as recommended by Henseler et al. (2015) (look up to Table 2). Additionally, in this study, the variance inflation factor (VIF) was assessed. The values gotten are less than 10 (the suggested range) exhibiting that the data is devoid of multicollinearity issues (see Table 3).

Table 1: Measurement model

Construct	Loading	α	Rho A	CR	AVE
KNOWLEDGE MANAGEMENT (KM)		0.908	0.912	0.923	0.501
1. When I share my knowledge, I bond with my community members.	0.798				
2. When I help my community members, they help me, and vice versa.	0.623				
3. I feel content when I share my knowledge with community members.	0.697				
4. When I know something is useful for my community members, I inform them.	0.706				
5. I participate in seminars because I like knowledge, even if I would not receive credit or a certificate of participation.	0.625				
6. Knowledge acquisition gives me power.	0.642				
7. Knowledge is shared during group meetings.	0.791				
8. Knowledge is shared using electronic means (websites, WhatsApp, forums).	0.622				
9. I share knowledge with leaders of other communities.	0.683				
10. Most community members share their knowledge freely.	0.690				
11. Knowledge is created during group meetings.	0.812				
12. Knowledge is created during group seminars.	0.758				
LEADERSHIP (LDRSHP)		0.958	0.961	0.962	0.562
1. I tell community members what to do if they want to be rewarded for their work.	0.774				
2. I provide recognition/rewards when community members reach their goals.	0.555				
3. I call attention to what community members can get for what they accomplish.	0.751				
4. I am satisfied when community members meet agreed-upon standards.	0.740				
6. I keep track of all mistakes.	0.691				
7. I make community members feel good to be around me.	0.600				
8. Community members have complete faith in me.	0.772				

Construct	Loading	α	Rho_A	CR	AVE
9. Community members are proud to be associated with me.	0.816				
10. I enable community members to think about old problems in new ways.	0.863				
11. I provide community members with new ways of looking at puzzling things.	0.710				
12. I get community members to rethink ideas that they had never questioned before.	0.811				
13. I help community members develop themselves.	0.797				
14. I let community members know how I think they are doing.	0.696				
15. I give personal attention to community members who seem rejected.	0.686				
16. I give all my attention to dealing with mistakes/ complaints/failure.	0.776				
17. I tell community members the standards they have to know to carry out their work.	0.782				
18. I seek a different perspective in problem solving.	0.773				
19. I spend time on training and coaching.	0.844				
20. I display a sense of power and confidence.	0.718				
21. I express confidence in goal achievement.	0.758				
BRIDGING (BG)		0.778	0.839	0.845	0.526
1. In the past 12 months, I have been involved in community/ volunteer activities outside of this community.	0.662				
2. I liaise with other community leaders for funding/donations.	0.611				
3. I liaise with other community leaders on technical issues.	0.681				
4. I visit outside communities for my community development efforts.	0.790				
5. I share my interests and responsibilities as a community leader with other community leaders.	0.854				
LINKING (LK)		0.857	0.890	0.889	0.539
1. I have attended a course provided by the government.	0.558				

Construct	Loading	α	Rho_A	CR	AVE
2. I have been involved in community programs organized by a State Legislative Assembly Member (ADUN).	0.587				
3. I work with the government/NGOs/stakeholders to address community problems (drugs/theft/poverty etc.).	0.758				
4. I work with the government/NGOs/stakeholders in developing my community's infrastructure.	0.814				
5. The government/ NGOs/ stakeholders guide me if I am not skilled/competent in something.	0.779				
6. I get information directly from the government and channel it to the local community.	0.785				
7. I have good relationships with government agencies, private agencies and NGOs.	0.811				

Table 2: Fornell-Larcker criterion

Construct	Fornell-Larcker Criterion						Heterotrait-Monotrait Ratio (HTMT)					
	1	2	3	4	5	6	1	2	3	4	5	6
BG	0.725											
KM	0.551	0.707					0.630					
KMxBG	-0.163	-0.387	1.000				0.171	0.405				
KMxLK	-0.283	-0.410	0.610	1.000			0.327	0.429	0.610			
LDRSHP	0.645	0.783	-0.363	-0.434	1.000		0.697	0.830	0.370	0.438		
LK	0.548	0.536	-0.301	-0.336	0.594	1.0	0.603	0.572	0.333	0.344	0.615	

NB: BG = Bridging; KM = Knowledge Management; LDRSHP = Leadership; LK = Linking

Table 3: Variance inflation factors (VIF) for all constructs

Variance Inflation Factor (VIF)	
KM	1.805
BG	1.687
LK	1.655

Structural Model

To determine the significance (path coefficient) of relationships between the variables, we used the Smart PLS software which made use of the 5000-bootstrapping technique. As shown in Table 4, KM significantly affects LDRSHP ($\beta = 0.526, t = 9.089, p = 0.000$). Hence, H1 is supported. The results also revealed that LDRSHP is impacted by LK ($\beta = 0.138, t = 2.337, p = 0.020$) and BG ($\beta = 0.251, t = 4.421, p = 0.000$) significantly, supporting H2 and H3. However, the findings exhibit a non-significant effect of LK and BG as moderators, where $KM \times LK$ ($\beta = -0.083, t = 1.369, p = 0.171$) and $KM \times BG$ ($\beta = -0.027, t = 0.362, p = 0.717$), implying that the results fail to support H4 and H5. According to Chin (1998), the values of coefficient (R^2) should be >0.1 . This study found that 70.2% of the variance that occurs in LDRSHP can be explained by KM, LK and BG. Moreover, the value of Q^2 should be higher than zero. Hence, this study's results are shown to be within significance level, and the study model's predictive relevance was achieved (see Table 5). According to Cohen (2013), the guidelines for assessing f^2 are the values of 0.02, 0.15, and 0.35 representing the small, medium, and large effects of the exogenous latent variable, respectively. Hence, this study revealed that KM has a large effect on LDRSHP with f^2 recorded at 0.515. Meanwhile, LK and BG have an effect size of 0.038 and 0.126 on LDRSHP respectively, which values fall in the small effect size (see Table 4). The Q^2 also confirms the endogenous constructs' predictive validity. A Q^2 value greater than 0 indicates that the model is predictively relevant. The findings demonstrate that there is significance in the prediction of the constructs (see Table 4).

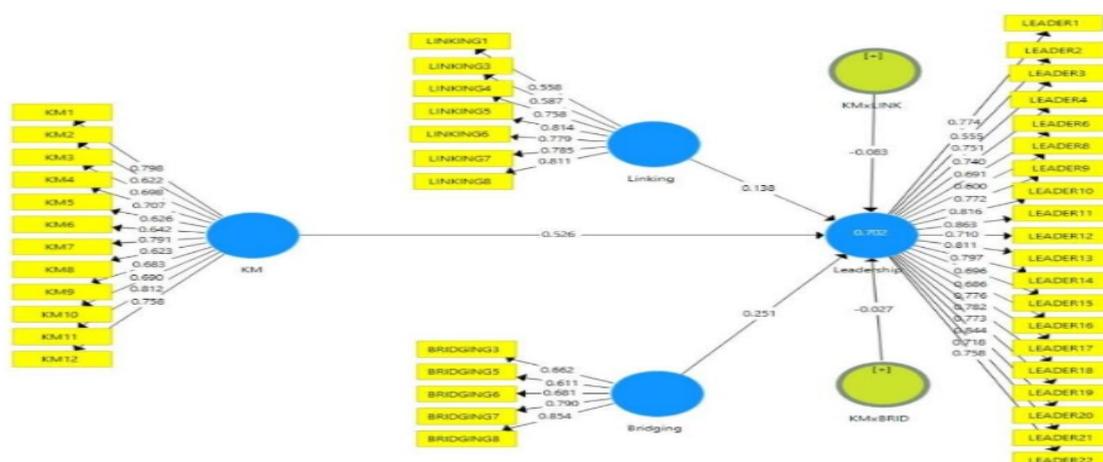


Figure 2: Structural Model Results

Table 4: Hypotheses testing results

Hypothesis	Relationship	B	p	t	Result	R ²	Adj. R ²	F ²	Q ²
H1	KM LDRSHP ->	0.526	0.000	9.089	Supported	0.702	0.693	0.515	0.381
H2	BG LDRSHP ->	0.251	0.000	4.421	Supported			0.038	
H3	LK LDRSHP ->	0.138	0.020	2.337	Supported			0.126	
H4	KMxBG LDRSHP ->	-0.027	0.717	0.362	Not Supported			0.014	
H5	KMxLK LDRSHP ->	-0.083	0.171	1.369	Not Supported			0.001	

Note: KM = Knowledge Management; LDRSHP = Leadership; BG = Bridging; LK = Linking

Figure 2 indicates the results of the structural model with the interaction terms of bridging and linking social capital in the relationship between knowledge management and leadership. As shown in Figure 2 below, it is clearly indicated that bridging and linking social capital does not signify the relationship between knowledge management and leadership.

DISCUSSION

The purpose of this research is to explore the direct and indirect effects of predictors of leadership. Very few studies have identified the links between Knowledge Management and Leadership in Malaysian rural areas. The first observation made from this research is the relationship between knowledge management and leadership of Terengganu's rural leaders which implies that knowledge-oriented leaders in rural areas are able to contribute to the development of rural communities' infrastructure by influencing the culture. This finding is equivalent with past study by Naqshbandi & Jasimuddin (2018) which mentioned that the dimensions of knowledge management practices were found to be significantly associated with leadership. Therefore, this study managed to address the deficiencies in addressing the issue of knowledge-oriented leaders among rural communities.

The second observation is the aforementioned chain of variables showing the effect of social capital bridging on leadership among rural leaders in Terengganu. Undoubtedly, bridging social capital has been shown to have a positive effect on bringing together disparate elements (Engbers, et al, 2017), as it was claimed that providing people with a sense of belonging to a community and the opportunity to engage with others who come from a variety of socioeconomic backgrounds.

Subsequently, this study also discovered that Terengganu's rural leaders' leadership is significantly influenced by linking social capital. A possible explanation for this relationship has been mentioned in a previous study by Reiche et al (2020) which highlighted that leaders have the responsibility to be

mindful of the social capital that exists not only within their own units and institutions, but also beyond those boundaries in a variety of other contexts.

Nevertheless, if they do not include the necessary social capital linking, there is a risk that these resources and capabilities will stay stalled and unable to be utilised. The fourth and fifth hypotheses were rejected as insignificant relationships between the interactions of bridging and linking social capital with knowledge management towards leadership among rural leaders in Terengganu were found. The results revealed that bridging and linking social capital are still not sturdy enough to become moderators for the relationship between knowledge management and leadership among the leaders. Hence, modification of character to adjust to current needs has to be enforced among leaders in rural Terengganu to enable them to execute their roles as agents for rural transformation and development.

CONCLUSION

The current research indicates that social capital and leadership in the community are fundamental characteristics that are universal in nature; this is true regardless of the development stages of a state or a country. Furthermore, effective leadership is essential for rural communities to achieve sustainable development through the expansion and intensification of the social capital role in leadership. It is crucial to possess proper and adequate leadership skills as transformational leadership motivates followers to act (Hoch et al., 2018).

Measures should be done to develop policies and promote stakeholder participation in order to improve social cohesion and unity governance. Thus, leaders must put aside their differences and foster mutual understanding in order to build a strong, united, and wealthy society. This current research demonstrates that social capital and leadership in the community are fundamental characteristics that are universal in nature; this is true regardless of the stages of development that a country is going through at the time. Recognize, maintain or conserve, and invest are the three behaviours that Uphoff (2003) outlined as necessary for social capital. With these actions, communities will intervene in "mutually advantageous collective actions" and "shared thinking". Additional research in this area will shed light on the growing significance of social capital in today's world and will assist us in better appreciating its role. It is up to the community and its leaders to build their social capital and make efficient use of it in order to further promote rural development in the state of Terengganu and refine its local policy.

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THE NEXUS BETWEEN CHILD ABUSE AND ECONOMIC CONDITIONS: EMPIRICAL EVIDENCE FROM MALAYSIA

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Abstract

This research attempts to examine the impact of economic conditions on number of child abuse cases in Malaysia. Yearly time series data has been included in data collection from year 1988 until 2019. To achieve the objective of the study, an estimation method of Autoregressive Distributed Lagged (ARDL) has been employed. The ARDL methodology consists of two steps analysis; first, ARDL Bound test which to determine the existence of cointegration relationship between child abuse and economics condition and second, ARDL Level Relation test with purpose to identify the cointegration relationship does significant in the long run. The findings have found cointegration relationship among the variables. However, only inflation (INF), unemployment (UEM), and minimum wage (MIN) appear significant to affect number of child abuse cases in Malaysia in the long run. The results suggest except poverty (POV), the number of child abuse cases in Malaysia are fully adjusted by the movement in INF, UEM and MIN. Overall, output from this study provide recommendation for policy-makers in readjusting the existing policies so that they able to curb the rising number of child abuse as well as to promotes economic growth and peaceful environment in Malaysia.

Keywords: Child abuse, Poverty, Income, Unemployment, Minimum wage

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INTRODUCTION

According to United Nations Children's Fund, UNICEF (2019), child abuse refers to the maltreatment of children, which appear in the forms of physical abuse, emotional abuse, sexual abuse, and neglect. In medical literature, the first child abuse case was reported in 1860. In 2017, World Health Organization (WHO) estimated that up to one billion children aged 2-17 years have experienced physical, sexual and neglect. More surprisingly, about 120 million children were reported that abuse was committed by people who were close to them, such as parents, relatives, and teachers (UNICEF, 2018). Child abuse has severe and long-term consequences for children's physical, emotional, and psychological well-being. It can lead to physical injuries, impaired brain development, emotional trauma and a higher risk of engaging in risky behaviors later in life.

Generally, child abuse is defined as misconduct action towards the children due to social rules (Bakır, 2018). A notable rise in child abuse cases has the potential to exert substantial and immediate impacts on both community and economy in the country. This situation has alarm us on the possibility when they grow up, they are more likely to commit crimes. The consequences of maltreatment can be devastating, ranging from minor injuries to severe brain damage and even death. Meanwhile, psychological consequences range from chronic low self-esteem that prone to be passive and alone. In any civilized society, child abuse is deemed unacceptable thus public health systems must be mobilised to prevent it.

It has been demonstrated in numerous studies that socio-economic factors, including poverty has a great contribution to child abuse (Nazirulla *et al.*, 2023). Zakaria (2015) and Karim *et al.*, (2020) suggests that children from marginalized communities or disadvantaged backgrounds may be more vulnerable to abuse due to various social and economic stressors. A study by McLeigh *et al.* (2018) found the evidence of the poverty have a direct relationship on rates of abuse and neglect in South Carolina. Meanwhile, Zakaria (2015) describe in his findings that the uncertain economic condition of families gives encouragement of child abuse. Pasian *et al.* (2013) suggested that the chances for children in poor families to be neglected are stronger than in middle level income families. In consistent with a study from Lacharité (2014), he infers lack of financial assistant and social support promotes the likelihood of child neglect. Thus, it can be suggested the parents that experience economic hardship is at a greater risk of mistreatment the children.

Another factor that received limited attention to influence the number of child abuse is minimum wage of the parents. Typical minimum wage earner is a breadwinner and provider which responsible for raising a child, running a household and paying bills (Perez, 2014). Higher minimum wage literally has decreased the pressure among the parents thus contribute to the lower risk of the child is being abuse. Berger *et al.* (2013) elaborates increase in household income

has led to decrease in child maltreatment. In line with the study by Raissian and Bullinger (2017) that suggested increase in the minimum wage implies a significant decrease in children maltreatment. Nonetheless, following to the Sabia and Nielsen (2013) there is no significant effect of minimum wage on poverty rates hence not significant to contribute number of child abuse cases as well.

In Malaysia, the number of reported cases of child abuse have been on the rise since 2019. According to the Department of Social Welfare, more than 2,000 child abuse cases are reported every year and for the first half of 2022, Malaysia recorded a total of 1,055 child abuse cases, with physical abuse being the most common type of abuse, followed by sexual and emotional abuse. The majority of the abuse was directed towards girls, with 706 cases, while 349 cases involved boys. These alarming developments in child abuse are heartbreaking and tragic, and it is crucial to create a safe environment free from violence and harm for all children. In light of these statistics, continued efforts are needed to prevent and address child abuse in Malaysia.

Majority of the previous studies has been found does not include the economic determinants such as poverty and minimum wage to affect child abuse especially from the context of Malaysia. For instant, Shaari et al. (2015) only include unemployment and inflation as determinants to influence child abuse cases in Malaysia. Practically, a higher minimum wage could improve income level of the family thus reduce poverty as overall. With a stable income, parents are able to fulfil basic needs of the children and continuously provide satisfactory physical, mental, spiritual, and moral development. Since poverty and minimum wages has widely received an attention to influence the income level hence reduce the risk of child abuse, this study proposes to investigate the long-run cointegration between child abuse cases and economic conditions in Malaysia as the first objective. Next, to examine the one-to-one relationship between child abuse and economic conditions in Malaysia as second objective.

LITERATURE REVIEW

There has been a vigorous debate about child abuse among non-economists. Most of them provide a discussion that limited from the view of medical consequences which include physical injury and mental health development. However, the findings among the economists deliver mass evidence when they found child abuse has severe and lasting consequences for injuring physical and mental health and affecting interpersonal relationships, victims, labor force outcomes, educational achievement, and criminal behavior (Currie & Tekin, 2012). The study from Peterson et al. (2018) suggest child abuse has significant economic consequences for society, including productivity losses, increased burdens on criminal justice systems, special education programs and substantial costs for child welfare services and health care. The economic burden of child maltreatment is difficult to calculate, but estimates suggest that the total lifetime

costs associated with one year of confirmed cases of child maltreatment in the United States is approximately \$428 billion. Furthermore, Nguyen (2013) infers when parents are stressed in the aftermath of divorce, they may not give their children full attention, which can lead to feelings of neglect. Additionally, children can be stressed due to the fact that their parents are battling for custody, which can affect their happiness.

Numerous economic factors in child abuse have been explained by previous literature, such as higher cost of living, domestic problems, unemployment and poverty. Given these factors possibly can cause stress thus triggered child abuse. Bullinger et al. (2020) found economic conditions such as income, macroeconomic conditions and parental employment have been identified as predictors of child abuse and neglect. Sidebotham and Heron (2006) specified that child abuse is impacted from poverty. Consistent with Olive (2007), he proposes that poverty is one of the determinants in child abuse and proves that physical abuse by the parents is due to the pressure from poverty. Gallo et al., (2006) conclude parents who live in prosperity are reluctant to abuse their children as compared to the parents live in poverty. According to Eisenbruch (2019), most of the children in Cambodia suffer abuse due to poverty, culture, and sexual desire. Meanwhile Zakaria (2015) ascertained that the high volatile economy of the families can increase child abuse cases. In line with the study from Shaari et al., (2022), in short run, inflation has been found to boost the number of a child abuse in developing countries including Malaysia. In the study, they discover the high cost of living due to inflation triggered the most pressure from the parents which led them to abuse their children. Therefore, higher cost of living possibly produce repercussion on the families.

Majority scholars identify that unemployment is one of the main contributions to child abuse. The stress of unemployment can drive individuals to resort to substance abuse as a coping mechanism, potentially leading to an escalation in physical abuse or neglect. Unemployment can also contribute to higher divorce rates, which may expose children to new adults who could potentially perpetrate abuse. Furthermore, single-parent households, often a result of divorce or unemployment, may struggle with limited resources to fulfil a child's basic needs. Lastly, an upsurge in poverty resulting from increased unemployment will affect failure to adequately meet a child's fundamental physical and psychological requirements. Following to Rosemary et al. (2019), the study stated that child sexual abuse is associated both unemployment and poverty. In the same vein with Doidge et al. (2017), unemployed parents tend to abuse their children due to the pressure of having no salary to support for their families. Besides, Morris et al. (2019) highlights that families living in poverty and being unemployed put the children at high risk of being abused.

Furthermore, previous literature has consistently provided the evidence among the children with low-income families, specifically those in poverty, are

at a higher risk of child maltreatment. Unfortunately, causal evidence for this relationship is inconclusive. Other than that, an increase in minimum wage has been associated with less number report of child abuse, but the evidence is mixed (Bernstein & Shierholz, 2014). In a study conducted by Raissian and Bullinger (2017), higher minimum salary laws also appear to be significant with lower reports of neglect for children ages 0 to 12 years.

In the literature, limited study has been found to investigate a group of economic determinants to influence number of child abuse cases especially in Malaysia. Most of them did not explore the determinants of child abuse using a time series data analysis. However, a limited number of previous studies, for instant Shaari et al. (2015), investigate the effects of unemployment, inflation, and child abuse in Malaysia. The study did not include minimum wage as a potential determinant. Therefore, the present study proposes a minimum wage as recent significant variable to be consider under economic determinants of child abuse case in Malaysia.

METHODOLOGY

Data Collection

Data in this study consists of yearly time series data covering period of 32 years from 1988 until 2019. For dependent variables, child abuse (CAB) was gauge by the yearly number of reported child abuse cases, meanwhile inflation (INF), total unemployment (UEM), poverty (POV) and minimum wage (MIN) have been chosen as a proxy for economic conditions that act as an independent variable. The data on economic variables (INF, UEM, POV and MIN) were collected from the Department of Statistics Malaysia while the number of child abuse (CAB) cases were collected from the Department of Social Welfare Malaysia. The present study proposes that the CAB will act as dependent variable and believe the variation of CAB could be explained by the set of explanatory variables which include economic determinants such as INF, UEM, POV and MIN.

Autoregressive Distributed Lag (ARDL) Cointegration Approach

The present study proposes the ARDL cointegration approach in order to assess the relationship between number of child abuse and set of economic determinants in the first stage analysis. Pesaran and Shin (1999) initiate the ARDL bounds cointegration approach and later being extended by Pesaran et al. (2001). The ARDL approach is most recent cointegration technique after the Johansen Juselius (Johansen & Juselius, 1990) and Eagle Granger (Engle & Granger, 1987) approaches. Main benefit of ARDL approach is it allows separate order of integration and does not restrict the same order of integration among the variables. This condition is certainly appropriate for those variables that might own fractional order of integration (Pesaran & Shin, 1999). Likewise, this method is more suitable for two or more variables in a small sample size to identify the

long-run relationship as compared to Engle and Granger's (1987) and Johansen and Juselius (1990) approaches. Other than that, Pesaran and Shin (1999) mention the ARDL framework produce super-consistent long-run coefficients estimators. In fact, many studies have been proven to validate the factors of child abuse by employing ARDL methodology (Shaari et al., 2022).

It is essential to check the stationarity for all variables to determine the integration order before continuing with the ARDL bounds test. In previous, there is a large argument on the literature that claim ARDL approach is not necessary for pre-testing the stationarity to identify the order of integration. However, according to Alimi and Ofonyelu (2013) the prior test is important for model under the ARDL framework as to ensure no variables are integrated of order $I(2)$. Following to Ouattara (2004), any variable with the presence of $I(2)$ leads to the invalid computed F-statistics as the critical values under bounds test proposed by Pesaran et al. (2001) is cover on the hypothesis that have variables range from $I(0)$ or $I(1)$. Therefore, the prior checking of unit root tests in conducting the ARDL approach is needed to confirm no variable is integrated of order 2 or above.

Next step is to proceed with ARDL bounds test methodology as propose by Pesaran et al. (2001) to examine the existing of cointegration among the child abuse and economic conditions. Below depict the ARDL (p, q) model used to estimate the long run relationship between the variables:

$$\Delta i_t = c + \sum_{j=1}^{p-1} \beta_j i_{t-j} + \sum_{i=1}^{q-1} \beta_{2i} x_{t-i} + \sum_{i=1}^{q-1} \phi_i \Delta i_{t-i} + \sum_{i=1}^{q-1} \psi_i \Delta x_{t-i} + \phi \Delta x_t + \varepsilon_t \dots \dots \dots (1)$$

Where, Δ denotes the first difference operator, i_t = child abuse (CAB_t); x_t = inflation rate (INF_t), Unemployment (UEM_t), Poverty (POV_t), minimum wage (MIN_t) and (ε_t) represents white noise error term. On the other hand, p and q are the autoregressive lag orders of the independent and dependent variables.

To estimate cointegration in equation (1) can be assessed by using ordinary least squares and *F-statistics*. A Schwarz Bayesian Criterion (SBC) has been employed for the selection of optimal lag length. According to Pesaran et al. (2001), the critical values of this test valid under two conditions, *i.e.* when all variable are stationary at $I(0)$ and $I(1)$. The critical value consists of two sets of upper and lower bounds. Alternate hypothesis is supported if the computed F-statistics fall above the upper bound, thus infers the cointegration among the child abuse and the economic determinants. Meanwhile, if the computed F-statistic fall below the lower bound, the null hypothesis is valid, and this imply no cointegration between child abuse and the economic determinants. Moreover, if the computed F-statistics fall in these bounds, the result remains inconclusive.

In addition to this, the study from Bahmani and Gelan (2006) suggest is the alternative option to detect long-run cointegration relationship in model estimation is by providing a significance lagged of Error Correction Model (ECM_{t-1}). They propose a negative and significant value of ECM_{t-1} indicates the existence of long run cointegration thus support the variation of child abuse cases is explain by the economic variables. The coefficient on ECM_{t-1} also indicates the pace among child abuse and economic variables to achieve their long-run equilibrium.

RESULTS AND ANALYSIS

Stationarity Test – Phillips-Perron and Augmented Dickey-Fuller Unit Root Tests

First step prior to the ARDL bounds test, it is necessary to identify the order of integration for all the variables. For this purpose, the present study employs Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) unit root tests to determine the integration order of the variables (Dickey & Fuller, 1979; Phillips & Perron, 1988). The ADF test valid when ε_t is white noise. The model is written as:

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^p a_i \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

Meanwhile, the PP test is indicated by using the equation as written below:

$$Y_t = a_0 + a_1 Y_{t-1} + \varepsilon_t \quad (3)$$

Table 1 displays the result of unit root tests under Phillips-Perron and Augmented Dickey Fuller tests.

Table 1: Augmented Dickey-Fuller and Phillip-Perron Unit Root Test Results

	ADF		Phillip-Perron	
	Level			
	Intercept	Intercept and trend	Intercept	Intercept and trend
CAB	-2.3455(6)	-2.3731(6)	-1.5677	-2.1398
INF	-2.9974(6) ***	-2.0147(6) **	-2.3283***	-3.6262**
UEM	-2.3442(6)	-2.0456(6)	-2.5611	-2.1019
POV	-1.5598 (6)	-1.7899 (6)	-1.7718	-1.9173
MIN	-1.1789 (6)	-1.5233(6)	-1.8561	-1.8912

First Different				
CAB	-7.1198(6)***	-7.0122(6)***	-5.6781***	-5.6099***
INF	-7.2877(6)***	-7.0201(6)***	-7.2377***	-7.9266***
UEM	-5.3274(6)***	-5.1922(6)***	-5.7312***	-5.6202***
POV	-4.7729(6)***	-4.8847(6)***	-4.9200***	-4.3782***
MIN	-5.5478(6)***	-5.2145(6)***	-5.8442***	-5.6786***

Notes: *, **, *** denotes 10%, 5% and 1% significance levels respectively

As depicted in Table 1, none of the variables are stationary at an order more than one $I(1)$ thus permits us to proceed with the ARDL bounds techniques. The stationarity of each variables is necessary to confirm in order to ensure none of the variables are integrated of order $I(2)$ as this condition will provide invalid result (Alimi & Ofonyelu, 2013).

The ARDL Long-run Cointegration Approach
ARDL Bound Test

After checking the stationarity, next is to examine the cointegration relationship between child abuse cases and economic conditions by employing the ARDL bounds test (Pesaran & Shin, 1995, 1996). Below depicts is the general model to explain the

$$\Delta CAB_t = c + \beta_1 CAB_{t-1} + \beta_2 INF_{t-1} + \beta_3 UEM_{t-1} + \beta_4 POV_{t-1} + \beta_5 MIN_{t-1} \quad (4)$$

$$+ \sum \alpha_{1i} \Delta CAB_{t-i} + \sum \alpha_{2i} \Delta INF_{t-i} + \sum \alpha_{3i} \Delta UEM_{t-i} + \sum \alpha_{4i} \Delta$$

$$POV_{t-i} + \sum \alpha_{5i} \Delta MIN_{t-i} + \varepsilon_t$$

For certain conditions, both criteria select the similar order of lagged number for the conditional ECM in equation (1). The estimation results are described in Table 2 below:

Table 2: Estimated Results for the Existence of Long Run Cointegration Relationship

Interest rates	<i>F</i> -statistic	SBC (p,q)	ECMt-1	<i>p</i> -value
CAB	6.937**	(12,6)	-0.051	0.072
INF	7.925***	(12,12)	-0.022	0.036
UEM	4.814**	(12, 8)	-0.039	0.021
POV	6.981***	(12,6)	-	-
MIN	7.248***	(12,6)	-0.045	-0.082

Notes: *, **, *** denotes 10%, 5% and 1% significance levels respectively.

Table 3: Critical Values for ARDL Bounds Test

Critical Value	Lower Bound	Upper Bound
1% significant level	6.84	7.84
5% significant level	4.9	5.73
10% significance level	4.04	4.78
Null Hypothesis: No Cointegration		

Notes: The Critical Value Developed by Pesaran et al. (2001) Under Case III: Unrestricted Intercepts; No Trends

According to the critical value presented in Table 3, F-statistics for all variables in Table 2 ARDL bounds test have fallen above the upper bound at 1%, 5% and 10% significant level. Inflation rate (INF) displays the computed F-statistics more than the upper bound critical value at 1%. Meanwhile unemployment (UEM) record computed F-statistics above the upper bound critical value at 10%. Likewise, the poverty rate (POV) and minimum wage (MIN) show the computed F-statistics exceed the upper bound critical value at 5%. Therefore, the findings from ARDL bound test findings infers that a set of economic conditions which include INF, UEM, POV and MIN are found to cointegrate with number of child abuse cases in Malaysia. After validating the cointegration in the ARDL bounds test, next step to proceed with ARDL level relation test to validate the present of cointegration relationship is significant in the long-run by estimating Error Correction Model (ECM).

Pesaran et al. (2001) suggest the existence of cointegration in the ARDL bounds test does not confirm a perfect cointegration between the variables. These authors recommend a significant and negative value of error correction terms (ECMt-1) indicate the cointegration is significant and stable in the long run. Table 2 displays the results on the coefficient of ECMt-1 for all variables are negative and significant, except for POV.

According to Table 2, inflation (INF) rate appears to own a significant positive relationship with the number of child abuse cases. This situation elaborates in the long run, as inflation increases it led to a higher number of child abuse cases reported. High inflation rate describes a situation when rising price of goods that promotes to higher living cost. This issue brings difficulties to the parents as they need to strive within the limited income and makes them depress. Consequently, there are higher tendency for a depression parent to beat and neglect their children (Shaari et al., 2019).

Furthermore, Table 2 displays unemployment (UEM) own a significant and positive relationship with the number of child abuse cases. This condition explains increase in unemployment rate will reduce the number of child abuse cases in the long run in Malaysia. Unemployment more likely could lead to divorce, which may encourage to abuse if children are exposed to new family members if the parents have new partners who may be prone to abusive

behaviour. Things also get the similar consequences for a single parent households may have less resources to provide basic needs for children. The findings are consistent with the study from Anderberg et al. (2015), they suggested an increase unemployment can result in a failure to provide a child's basic physiological and physical needs.

Next, Table 2 reveals minimum wage has a negative and significant relationship with the number of child abuse cases. This state describes an increase in minimum wage led to a lower number of child abuse cases reported. The level of minimum wage aligns with the income that affects the ability of the parents to provide a basic need of a children. Pelton (2015) suggest lower minimum wage among the parents is relevant with regard to neglect, which is often defined by inadequate provision of food, shelter, clothing, medical care, and inadequate home conditions.

Lastly, poverty (POV) is found not significant to support long run cointegration with child abuse cases reported in Malaysia. The findings suggest the number of child abuse cases are not fully adjusted by the movement in poverty.

Diagnostic Test

In addition, the regression model has undergone the diagnostic test such as Lagrange Multiplier (LM) and Cumulative Sum Recursive Residuals (CUSUM) test to ensure the model has no serial correlation problem and dynamically stable. The LM test indicates that no serial correlation problem exists (p-value is greater than 0.05). While for CUSUM tests, it shows the stability test is within the bounds and significant at 5% level. This condition suggests the model is dynamically stable to validate all the results.

CONCLUSION AND RECOMMENDATION

This research investigates the impact of economics determinants of child abuse cases in Malaysia by using the ARDL approach. Data spanning from 1988 to 2019 were analysed and the findings reveal except for poverty, in the long-run all economic variables namely inflation, unemployment and minimum wage are cointegrate with the number of child abuse cases in Malaysia. These findings infer that in the long-run, higher inflation rates result to increase in child abuse cases in Malaysia. Periods with high inflation can reduce the purchasing power of money, which inflicts pressure on parents and thus it can cause child abuse, especially in low-income families. This finding is consistent with Shaari et al., (2022) where they proposed in developing countries, higher inflation will result in a rise in general price thus encourage them to hit the children as to release their pressure. Therefore, we can infer since Malaysia is one of the developing countries, higher inflations rates can give a significant impact to the rise number in child abuse.

Apart from that, in the long-run, rise in unemployment also leads to higher number of child abuse cases. This might cause parents to allocate more time at home without financial sources. As a result, they will be stressed thus the child abuse occurs. On the other hand, the study also found the higher minimum wage among the parents will result in the lower number of child abuse reported. The government take a proactive action when they frequently revised the amount of minimum wages that proportionate with the living cost in Malaysia. Hence, we can infer that higher level of minimum wage for the parents grants them the ability to fulfill basic needs of the children. Such situation may avoid the parents from depression thus reduce the cases of child abuse.

The outputs from this study contribute new knowledge to the body of child abuse literature and also the theories. Few theories that are associated to child abuse have been introduced such as attachment and family systems and ecological theories. Moreover, these findings are also significant for policymakers as they may readjust their existing policy as they can shed some light on how to curb child abuse from reaching an epidemic proportion. Policy makers also should control the rates of unemployment and inflation. For instance, the government may organise entrepreneurship programs that offer more job opportunities and incentives from the government should be introduced in order to help beginner entrepreneurs. Furthermore, central bank was the authorise body appointed by the government should control the inflation through implementation of monetary policies contractionary fiscal or monetary policies.

The findings of this study also benefit employers since they may propose to provide nursery in the workplaces to employees so that children can be easily reached and given attention by the parents. This study owns several limitations. First, it considers only four independent variables, namely inflation, unemployment, poverty and minimum wage and the results possible might not thoroughly capture the other determinants of child abuse cases in Malaysia. There are several potential variables that influence child abuse such as population and economy growth. Second, this study must focus each state in Malaysia so that able to capture the determinants of child abuse in every state. Therefore, a panel regression analysis must be employed.

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ETHICAL STATEMENT

In accordance with international publication guidelines and our duty to uphold research ethics, we declare that we have no conflicts of interest and all respondents agreed to be interviewed and the research has considered all possible ethics implications throughout the research project. The risk and benefit to researchers, participants and others (for example, potentially stigmatised or marginalised groups) as a result of the research and the potential impact, knowledge exchange, dissemination activity and future re-use of the data has also been considered as part of the ethical research work.

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RIVERBANK PROTECTION STRUCTURE FAILURE FACTORS AND REMEDIAL APPROACH: A CASE STUDY IN KELANTAN MALAYSIA

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Abstract

Numerous structural mitigation measures have been implemented to ensure the sustainability of socio-environmental systems. Riverbank erosion can be avoided through the installation of reinforced walls, groynes, and sheer piles, among other measures. However, these structures sometimes fail to protect riverbanks from collapsing due to various factors, including environmental and anthropogenic influences. Therefore, this study aims to identify the factors contributing to the failure of riverbank protection structures and determine remedial approaches to enhance them. The study utilized a combination of site visits, document analysis, and interviews with riverbank protection structure engineers and contractors to gather the necessary information to achieve study objectives. The study found that geomorphology; hydraulics; and unstable sheet pile construction were the factors to the riverbank failure. Besides, study also recommend the suitable remedial approach in terms of design; construction and maintenance to build a stable riverbank protection structure (rock embankment). The findings of this study can contribute to the development of more effective and sustainable riverbank protection measures, which are essential to protect vulnerable communities and ecosystems from the impacts of environmental hazards. The study's results can guide policymakers, engineers, and other stakeholders involved in riverbank protection to better understand the factors that contribute to structure failure and how to mitigate these risks. It can also contribute to the advancement of knowledge in the field of riverbank protection, specifically in identifying the most effective mitigation strategies.

Keywords: Environmental Hazards, Riverbank Collapse, Sustainable Development and River Remedial Structure

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INTRODUCTION

Rivers is very important to play the role to sustain life and the environment (See Too et al., 2023; Saad et al., 2023). Water resources are extensively used for domestic, agricultural, and industrial purposes. They also support recreational activities and provide habitat for aquatic plants and animals (Shu et al., 2019; Mustaffa et al., 2023). However, river bank is very fragile to eroded by the hydraulic action and this may lead to the loss of land, property, and infrastructure (Hague and Zaman, 1989). In Malaysia, riverbank erosion is a major environmental problem that affects the country's economy and the community's livelihood (Azid et al., 2015; See Too et al., 2023). Force of flowing in hydrology system cause the erosion of the riverbed and banks (Avendario and Lopez, 2013; Toriman et al., 2015). Erosion process in massive rivers such as Kelantan River can be complex and involve various factors, including the type of sediment, the flow rate, river morphology, the structural measures and the bank vegetation (Jaafar et al., 2010; See Too et al., 2022).

Hydraulic action and structural factors make up the bulk of riverbank erosion factors. Through hydraulic action, the force of flowing water can pressurise sediment out of the riverbed and the banks (Avendario and Lopez, 2013; Abdul Maulud et al., 2021). Massive rivers can experience widespread erosion, which can have a significant impact on the morphology and course of the river (Dekaraja and Mahanta, 2020). In addition to creating landforms like meanders and deltas, erosion can also deposit sediment in floodplains and canyons over time (Rasheduzzaman et al., 2007).

One specific case of a riverbank protection structure failing occurred in the Philippines' town of Molo in 2011 (Dekaraja and Mahanta, 2020). The town was located alongside the Jalaur River, which was vulnerable to erosion and flooding during periods of intense rainfall. In response, the town was shielded from erosion and flooding by a concrete dike that the local government had built along the riverbank. Numerous factors, including subpar construction, insufficient maintenance, and the overwhelming force of the floodwaters, were blamed for the protection structure's failure (Dekaraja and Mahanta, 2020). The town of Molo suffered severe repercussions from the collapse of the riverbank protection structure, including the loss of residences, commercial buildings, and agricultural land. The local government and international aid agencies worked to repair and reinforce the riverbank protection structure and enhance disaster preparedness measures in response to the disaster (Cavaille et al., 2013). This illustration demonstrates the significance of correctly building, maintaining, and monitoring riverbank protection structures as well as the requirement for efficient disaster preparedness and response measures in regions vulnerable to flooding and erosion (Berkovich et al., 2019).

In 2014, another instance of riverbank protection structure failing in Kuala Krai, Malaysia (Berita Harian, 2015). One of the worst floods to ever affect

the area hit the district, severely damaging buildings, infrastructure, and agricultural land. The existing riverbank protection structures were destroyed as a result of the floodwaters' severe erosion along the riverbank. In Kuala Krai, the structures used to protect the riverbanks were constructed from a mix of gabion baskets, concrete walls, and vegetation. However, the riverbank suffered severe erosion and buildings nearby could not withstand the force of the floodwaters. The failure of the riverbank protection structures in Kuala Krai serves as a reminder of the significance of proper riverbank protection structure design, construction, and maintenance in Malaysia.

Since river bank failure is a significant issue, it brings numerous negative impacts to the local community and social activities around the affected area. Therefore, this article holds significant importance in investigating the factors and suggesting approaches to enhance the river bank structure. This study may also be serving as a reference point to the local authorities and decision-makers, before they take action to improve the river bank structure.

LITERATURE REVIEW

River Bank Failure in Malaysia

In Malaysia Sungai Batu Pahat river, there was a case of sheer pile failure due to riverbank erosion. The urban river frequently floods and erodes because it is located there. Along the riverbank, a concrete dike with a sheer pile foundation was built to reduce the effects of erosion. However, the sheer pile foundation of the dike failed during a period of intense rain in 2017, causing significant damage and riverbank erosion. A number of factors, such as soil instability, scour, and wave action, were blamed for the failure. Riverbank erosion is significantly influenced by poor construction methods (Jun Yang, 2023). Common instances of subpar construction include the use of inferior materials, improper installation, insufficient quality assurance, and inadequate consideration of hydrological factors (Knut et al., 2020). The failure of riverbank protection structures can be significantly impacted by inadequate maintenance (Hadayani et al., 2023). The effectiveness of structures and their ability to withstand the forces of erosion and water flow over time depend on routine maintenance. Inadequate maintenance can lead to a number of factors, including vegetation growth, soil erosion, wear and tear, and weathering.

Although soil erosion is a natural process that happens over time, human activities like changing land use, deforestation, and improper water resource management can speed up the process (Jun Yang, 2023). Soil erosion, if unchecked, can damage riverbank protection structures' structural integrity and result in failure. Inadequate maintenance leading to riverbank protection structure failure all over the world, including in Malaysia (Berita Harian, 2015). For instance, due to inadequate maintenance, riverbank protection structures have failed numerous times in the Kuala Krai district of Kelantan, Malaysia. A section

of the district's riverbank protection structure collapsed in 2014, resulting in flooding in the nearby areas (Berita Harian, 2015). Insufficient maintenance, which had caused soil erosion and the building's gradual weakening, was identified as the cause of the failure.

RESEARCH METHODOLOGY

The experts in riverbank protection, including construction engineers, employees of the Department of Irrigation and Drainage Malaysia (DID), and contractors working on the riverbank stabilisation project, were consulted as part of this study's qualitative approach to gather crucial and pertinent data. After the government decided to rebuild and stabilise the riverbank, the interview sessions were held in person. This strategy was used to make sure that the study got information from the right people who were knowledgeable and experienced in protecting and building riverbanks. In addition, the study made thorough site visits starting from the project's inception to gather historical information and gauge the sizes of structural cracks. The social and environmental effects of the riverbank failure could be seen firsthand during these site visits. In addition, a document analysis was done to extract specific data from the DID. In order to do this, it was necessary to review pertinent documents like engineering reports, design plans, and project specifications.

The study was able to gain insightful knowledge and a thorough understanding of the riverbank protection measures implemented by the DID by examining these documents. The study aimed to gain a thorough and trustworthy understanding of the riverbank protection approach and the ongoing construction by utilising this combination of qualitative data gathering techniques, including interviews, site visits, and document analysis. The inclusion of experts, first-hand observations, and careful document analysis ensured the gathering of pertinent and useful data for the study's goals.

RESEARCH LOCATION

Kelantan is located in East Coast of Malaysia. More extreme rainfall events were experienced during the monsoon season, which had an impact on the morphology and community settlements along the Kelantan River. The Kelantan River's morphology features may significantly contribute to riverbank failure. In addition, the lower stream of Kelantan River was vulnerable to river bank failure due to its located in the flood-prone area (See Too et al., 2022). Kelantan River also has high capacity for transporting sediment and its meandering and braided channels, the riverbanks may experience significant erosion. The study area is located across from the Kelantan River's meander as it passes through Pasir Mas. Prior to the riverbank failure incident in February 2021, Pasir Mas had not experienced a serious major riverbank failure despite experiencing heavy rain and flooding every year during the monsoon.

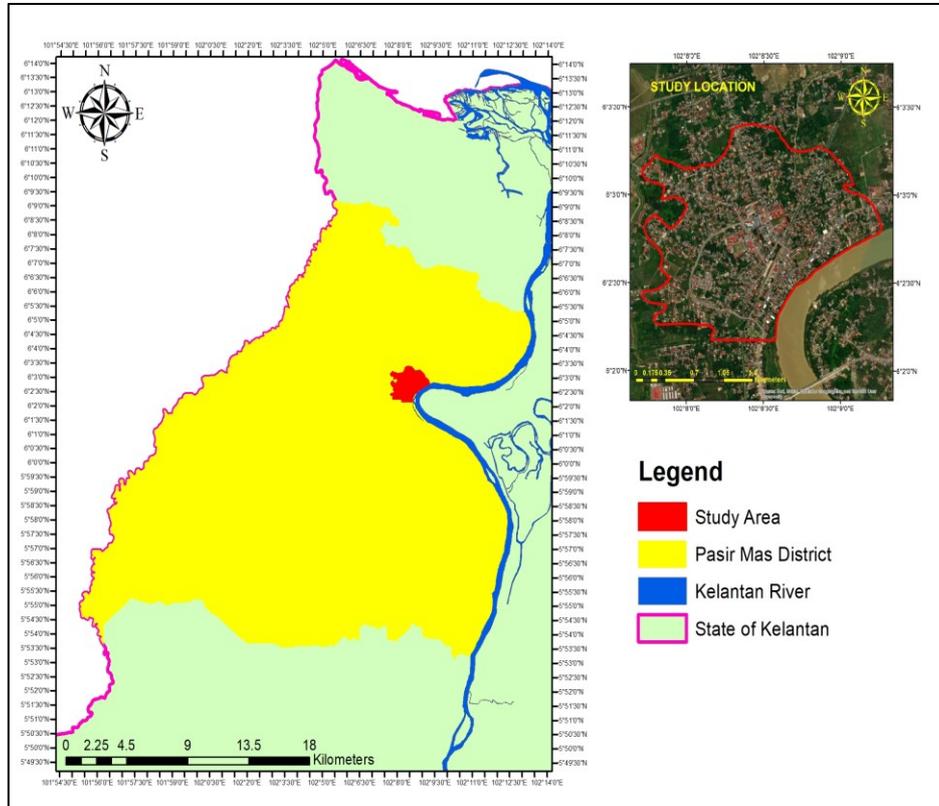


Figure 1: Research Location

RESULT AND DISCUSSION

Chronology of riverbank failure at research location

The local community in Kg. Pohon Celagi, Kelantan, has been significantly impacted by the riverbank failure that started on February 17, 2021 (Table 1.). They were surprised by the incident, which happened around 7 am, when the riverbank suddenly collapsed vertically. Authorities desperately warned residents to evacuate to safer areas has resulted of this sudden failure. Two vehicles were engulfed and carried away by the crumbling soil, demonstrating the severity of the collapse and underscoring the potential dangers associated with riverbank failures.

Table 1: Structures Cracking Data (Feb 2023)

Date Day Time	18	19	20		21	22	23	24	25	26	27
	Thu 5:00 pm	Fri 4:00 pm	Sat 10:00 am	Sun 3:00 pm	Mon 10:30 am	Tue 9:00 am	Wed 9:00 am	Thu 10:00 am	Fri 10:00 am	Sat 12:00 pm	Sun 10:00 am
WL (m)	1.73	1.83	1.66	1.79	1.60	1.55	1.50	1.46	1.50	1.52	1.59
No. 1	7	7	7	7	7	9	9	10	11	6	7
No. 2	7	8	10	17	24	29	35	41	N/A	50	52
No. 3	9	12	24	31	35	42	48	53	N/A	68	70
No. 4	6	7	7	8	5	5	5	5	N/A	5	5
No. 5	105	120	155	184	220	223	225	227	260	230	235
No. 6	27	27	28	28	28	33	33	38	40	33	43
No. 7	28	28	29	29	46	50	51	52	70	75	70
No. 8	10	N/A	N/A	N/A	12	N/A	15	17	N/A	22	N/A
No. 9	8	8	8	8	8	8	8	8	8	7	5
No. 10	12	12	12	12	12	12	12	12	12	6	N/A
No. 11	2	2	2	2	2	2	2	2	N/A	N/A	N/A
No. 12	568	568	568	568	573	575	571	571	N/A	N/A	N/A
No. 13	-	-	-	20	20	20	20	28	28	21	25
No. 14	-	-	-	10	N/A	12	12	12	12	10	N/A
No. 15	-	-	-	32	N/A	39	40	43	N/A	46	N/A
No. 16	-	-	-	58	65	71	78	80	N/A	97	N/A
No. 17	-	-	-	10	15	34	35	50	60	40	N/A
No. 18	-	-	-	-	14	28	24	30	35	52	N/A
No. 19	-	-	-	-	-	9	9	9	10	15	N/A
No. 20	-	-	-	-	-	10	23	35	55	85	N/A
No. 21	-	-	-	-	-	15	20	30	N/A	70	N/A
No. 22	-	-	-	-	-	13	16	22	N/A	20	N/A
No. 23	-	-	-	-	-	-	-	13	N/A	16	16
No. 24	-	-	-	-	-	-	-	45	45	45	45
No. 25	-	-	-	-	-	-	-	75	75	165	165
No. 26	-	-	-	-	-	-	-	50	50	51	51
No. 27	-	-	-	-	-	-	-	52	52	52	52
No. 28	-	-	-	-	-	-	-	-	22	30	N/A
No. 29	-	-	-	-	-	-	-	-	-	19	N/A
No. 30	-	-	-	-	-	-	-	-	-	71	120
No. 31	-	-	-	-	-	-	-	-	-	-	40
No. 32	-	-	-	-	-	-	-	-	-	-	24
No. 33	-	-	-	-	-	-	-	-	-	-	12
No. 34	-	-	-	-	-	-	-	-	-	-	10
No. 35	-	-	-	-	-	-	-	-	-	-	9
No. 36	-	-	-	-	-	-	-	-	-	-	10
No. 37	-	-	-	-	-	-	-	-	-	-	25

The incident in Kg. Pohon Celagi serves as a reminder of the unpredictable nature of riverbank failures and their capability to cause significant harm to both the community and its priceless assets. This study evaluated the severity of the harm caused to various structures within the impacted area in response to the incident. In order to understand the effects of the failure, the study included analyses of buildings, roads, sheer piles, and houses. The study's findings showed that there were 37 active cracking points, with both the size and number of cracks progressively growing larger as time went on (Table 1.).

This information not only highlights how persistent the riverbank failure is, but it also shows that even after several days have passed, things are

only getting worse. The worrying expansion of the cracking points is a glaring indication that the soil's instability is still a major cause for concern. The environment is extremely unstable due to the soil's ongoing slight movements, making the area dangerous for both the nearby community and the existing structures.

The riverbank failure factors

Geomorphology

Geomorphology, hydraulics, and shaky sheet pile construction are the causes of riverbank failure in the study area. Rivers are dynamic systems that are constantly interacting with their surroundings. Erosion, sedimentation, and channel dynamics are all significantly influenced by a river's geomorphological features (Mohd Ekhwan, 2007). This study explores the various ways that geomorphology affects riverbank stability and emphasises the significance of taking these factors into account during design and implementation. More energy is exerted on riverbanks by higher flow rates, which can result in more erosion and possible instability (Duró et al., 2018, 2019, 2020). Additionally, the distribution of flow forces along the banks can be influenced by the width and depth of the river channel, which can affect erosion patterns and the efficacy of protective measures (Duró et al., 2020). On the other hand, the movement of sediment within a river system has a direct impact on the stability of riverbank protection structures (Duró et al., 2018). Meanders, bends, and point bars are examples of geomorphological features that significantly contribute to bank erosion (Liu et al., 2017). On the other hand, according to Duró et al. (2018), the stability of riverbank protection structures is directly impacted by the movement of sediment within a river system.

This migration is also significantly influenced by geomorphology, which presents difficulties for riverbank protection structures. Existing structures may be destroyed or avoided as a river meander and changes its course, rendering them useless (Hasanuzzaman et al., 2022). It is crucial to take channel migration into account during the design process and create safety protocols that take long-term changes in the river course into account. The geotechnical characteristics of riverbanks, such as the soil composition, compaction, and stability, are also influenced by geomorphology. The stability of riverbanks depends on vegetation (See Too et al., 2023). The location and type of vegetation along riverbanks are influenced by geomorphology, which in turn affects erosion rates and slope stability. By providing root systems that bind the soil, dissipating hydraulic forces, and lowering erosion rates, riparian vegetation, such as grasses, shrubs, and trees, can improve bank stability. When designing protection measures, geomorphological assessments should take into account the presence and characteristics of vegetation.

River hydraulic

Understanding and predicting the stability of riverbank protection structures requires an understanding of river hydraulics, the behaviour and characteristics of flowing water (Knut, 2020). The hydraulic forces generated by river flow have a direct impact on the processes of erosion, scouring, and sedimentation along riverbanks (Glidas et al., 2019). One important hydraulic factor that affects the stability of riverbank protection structures is flow velocity. The amount of force and energy applied to the riverbanks depends on the river's flow velocity (Jun Yang, 2023). Huge erosion can result from faster flow rates, which can also make protection structures less stable. The importance of determining and controlling flow velocities near protection structures is highlighted by the fact that the erosive power of water is directly proportional to the square of the flow velocity (Glidas et al., 2019).

The Kelantan River is a huge river stream with dynamic morphology activities that may be influenced by human activity or natural forces. Due to its location downstream in the catchment, this river stream is extremely vulnerable. For instance, the collapse of the riverbank at Kg. Pasir Parit occurred during the monsoon season. More than 20 people lost their homes in the disaster, and the riverbank collapsed, destroying their homes and other property (See Too et al., 2022). The water level is between 1.46 and 1.83 metres during the river bank failure happened in the research location. The water velocity during the monsoon season may cause bank erosion and collapse when the soil was loose due to hydraulic activity.

Sediment transport within the river system is also influenced by hydraulic factors, which in turn affects the stability of defence structures (Glidas et al., 2019). The stability of riverbanks may be impacted by sediment particles carried by the flow if they deposit along the banks or cause scouring (Kamarudin et al., 2017). Excessive sedimentation close to the banks can put more strain on the defences, which could cause instability. Designing protection measures that take sediment dynamics into account and reduce associated risks requires an understanding of the sediment transport dynamics, including sediment load, transport capacity, and deposition patterns (Kamarudin et al., 2017). Human activities can also have a significant impact on river hydraulic factors and, as a result, the stability of riverbank protection structures. Examples include flow regulation and channel modifications (See Too et al., 2022). The natural flow characteristics, such as flow velocity, flow distribution, and sediment transport, are changed by dams, levees, or channel straightening. Increased erosion rates or altered patterns of sediment deposition are just two examples of how these modifications may have unintended effects on the stability of protective structures. To reduce potential risks and guarantee the long-term stability of protection measures, careful consideration of the hydraulic implications of any human interventions is required.

The common remedial methods that can be used to fix problems with existing structures are examined in this article. The rock embankment that the Malaysian Department of Drainage and Irrigation (DID) built is quite stable and effective in preventing bank erosion, according to the study that was conducted.

Design

The Kelantan River's riprap failure was classified by the National Water Research Institute of Malaysia (NAHRIM) as a sideslope failure (refer Figure 3). Instability or failure of a sloping landmass or embankment is referred to as a "sideslope failure," and it is typically characterised by the movement or sliding of soil, rock, or other materials along a sloping surface. It is a kind of slope failure that can happen on both naturally occurring slopes and slopes that have been engineered, like levees, retaining walls, or highway embankments. Additionally, debris flow was the specific cause of side slope failure in the research location. Heavy rainfall frequently results in debris flows, which is particularly important given Kelantan's monsoon season. High rainfall levels in the area during this time of year can cause increased runoff and the possibility of debris flows. The stability of the riverbanks is significantly at risk of these debris flows, which can also contribute to riverbank erosion.

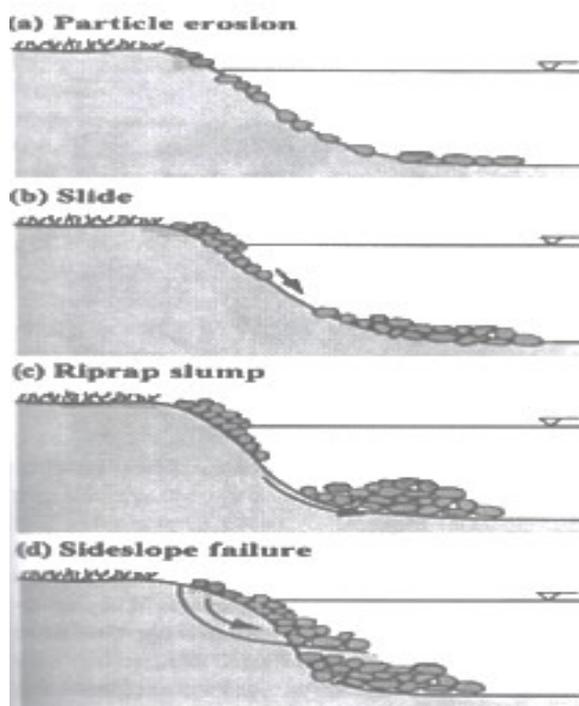


Figure 3: The Riprap Failures
(Julien, 2002)

To ensure the effectiveness of a rock embankment approach for protecting riverbanks from failure, several important factors and procedures must be considered. This study was carried out that soil characteristics, slope geometry, hydraulic conditions, erosive patterns and many more can be potential mechanisms for riverbank failure. The embankment design is created based on the site evaluation, geotechnical investigation, and hydraulic analysis. This involves figuring out the proper geometry, such as the setback distances, slope angle, and embankment height.

Construction

To make sure that the embankment is built in accordance with the design specifications, proper quality control procedures should be put in place during the construction phase. To achieve the desired stability and performance, construction methods like proper compaction, layering, and interlocking of the rock should be used. The site must be ready before construction can begin. In order to do this, the area must be cleared of all vegetation, any structures or debris must be removed, and the riverbank must be excavated to the necessary depth and slope. The stability of the embankment depends on its foundation. To achieve the needed bearing capacity, the foundation soil must be compacted. Additional precautions, such as soil stabilisation techniques, may be required if the foundation soil is fragile or unstable. Beginning at the bottom and gradually working their way up to the desired embankment height, the rocks are arranged in layers. To achieve the necessary stability, each layer is carefully positioned and compacted (refer Figure 4).



Figure 4: The Construction Progress

The rocks' mutual interlocking contributes to the stability of the structure. After the primary embankment construction is finished, the surface might be finished to add more security and appeal. To further increase the

embankment's erosion resistance, this may entail adding a layer of smaller rocks or using geotextiles or erosion control blankets.

Maintenance

It's crucial to maintain the rock embankment that serves as the finished riverbank protection structure. To find and fix any potential problems or degradation, routine inspections, monitoring, and maintenance activities should be performed. Erosion control measures should be replaced or repaired right away if they become damaged. This might entail fixing erosion-related issues, stabilising troublesome areas, or, if necessary, adding more rock to the embankment to strengthen it. When performing repairs and maintenance, it is important to use the right construction methods and supplies to ensure the embankment's durability and efficacy. To stop additional damage and protect the lives and properties of those who live close to the riverbank, immediate action and extensive mitigation measures are required (See Too, 2023). Even after the installation of protection structures, geomorphological factors still affect the stability of riverbanks (Kamarudin et al., 2017). Continuous monitoring is essential for determining any changes or potential risks, as well as for understanding how the system responds to the implemented measures. Establishing a regular maintenance schedule and allocating funds for ongoing monitoring and maintenance efforts are also crucial. For reference and evaluation purposes in the future, it is crucial to keep thorough records of maintenance activities, inspections, repairs, and monitoring results. This documentation guides in monitoring the performance of the embankment over time, spotting patterns or trends, and directing decisions regarding future maintenance and management. Determined by river hydraulics, the stability of riverbank protection structures is essential (Bruce and Ian, 2020). When developing and putting into practise protection measures, it is important to carefully consider variables like flow velocity, flow distribution, flow patterns, and turbulence, sediment transport, bank erosion, and the effects of human interventions. The stability of riverbank protection structures can be significantly impacted by unstable sheer pile construction (Ahmad, 2020). The potential instability of the piles and the entire structure is caused by inadequate pile design, improper installation methods, inadequate maintenance, hydraulic factors, soil conditions, and a lack of long-term monitoring and maintenance. To increase stability and prevent riverbank collapse, proper sheer pile construction must be designed, built, and maintained.

CONCLUSION

In summary, develop flood risk mapping and conduct flood risk index assessment in Kelantan floodplain is vital for reducing flood risk. It enables the identification of high-risk areas, informs land-use planning and infrastructure development, improves emergency preparedness and response, raises community awareness,

and facilitates the implementation of effective flood mitigation and adaptation strategies. By utilizing this study, Kelantan can enhance its resilience to floods and minimize the potential damage and loss associated with future flood events.

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DISCLOSURE STATEMENT

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

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**EXPLORING THE NEXUS OF FOOD DESTINATION REPUTATION,
PERCEIVED VALUE OF LOCAL FOOD CONSUMPTION, AND FOOD
DESTINATION ATTRACTIVENESS IN MELAKA, MALAYSIA**

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Abstract

This research examines the interrelationships among food destination reputation, the perceived value of local food consumption, and food destination attractiveness among tourists visiting Melaka as a renowned destination in Malaysia known for its vibrant culinary offerings. Through an online survey, a quantitative analysis was conducted, yielding a total of 135 responses that reflect tourists' viewpoints on the destination's food scene. The research employed Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the research hypotheses. The findings confirm that the perceived value of local food consumption mediates the relationship between a food destination's reputation and its overall attractiveness. These outcomes are valuable for tourism stakeholders and destination management organizations involved in the planning and developing Melaka as a food destination. This enables strategic decision-making for stakeholders to optimize their efforts to promote and enhance Melaka's culinary tourism experiences. Thus, ensuring the long-term viability of tourism in the region.

Keywords: Food Destination Reputation, Perceived Local Food Consumption, Food Destination Attractiveness, Melaka

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INTRODUCTION

In the tourism industry, a destination ability to be succeed in delivering excellent goods and services to tourists is evaluated from its destination attractiveness (Dwyer & Kim, 2003). Local food resources are viewed as distinctive values that is crucial for differentiating a destination from others (Rinaldi, 2017). Beyond traditional attraction of sea, sand, and sun, current tourists' patterns have shifted to experiencing local food delights and it has become of the primary reasons that contributed to a destination attractiveness (Thio et al., 2022).

Additionally, identifying the tourist's perceived value from the standpoint of local food "consumption value" can enhance our understanding of how tourists' consumption preferences influence destination attractiveness. Similarly, Wan Mohd Zain (2019) concurred that examining tourists' food habits is vital to understand their interest, knowledge, and motivation to try local cuisine that influencing their likelihood of returning.

Unfortunately, Choe and Kim (2019) noted a lack of research on the importance of study on local food consumption value, despite the valuable role of this value in promoting culinary tourism destinations. In response to this, the researchers have developed a new scale to have a better understanding on consumption value theory that focus on local food dimension perspectives. Which also served as the foreground reference for present study.

Moreover, it should be acknowledged that destination attractiveness is not developed in a vacuum. The reputation of a destination also represents competitive advantage for a destination (Widjaja & Khalifa, 2020). Marchiori et al. (2010) introduced The Destination Reputation Model (DRM) - products and services, leadership, innovation, performance, society, environment, and governance. Using the same model, Widjaja et al. (2020) revealed that among all dimensions, products and services had the most significant impact on destination reputations. However, previous study only explains the destination reputation's of product and service in general rather than an in-depth focus on local food products. In filling the gap, this study emphasizing the role of local food as an antecedent to destination reputation, specifically within the product and services dimension, and how this relates to tourists' perceived value of local food consumption.

This study specifically examines Melaka, a highly sought-after tourist destination in Malaysia. The research aims to explore the significance of local food consumption value among tourists and how it contributes to the overall attractiveness of Melaka as a destination. In addition, Melaka is recognized as one of the UNESCO World Heritage Cities. However, it faces stiff competition from other UNESCO-recognized destinations, such as Myanmar, Cambodia, and Indonesia, in terms of tourist arrivals (Tung et al., 2016). Also, the local food community in Melaka is encountering competition from multinational brands in

the area, as these well-established restaurants with recognized labels tend to dominate the local food options, posing challenges for the local food scene. It's worth mentioning that multinational restaurant chains tend to have a higher demand among tourists than locally-owned eateries and restaurants (Amir et al., 2017). Hence, understanding the tourist local food consumption value will benefit the policy maker and DMOs in promoting and boosting Melaka as a thriving food destination attractiveness and become the main reasons for tourists to reiterate visiting Malaysia.

LITERATURE REVIEW

Food Destination Reputation

For the tourism industry, both positive and negatives reputation are susceptible to reflecting on the industry's sphere. A destination with positive reputation is often based on its attributes like safety, appeal, hospitality, culture, sustainability, and the visitor experience (Foroudi et al., 2016). Conversely, a negative reputation can be linked to issues such as safety concerns, political instability, infrastructure problems, natural disasters, and negative visitor experiences (Ma et al., 2020)

The tourism industry relies on the environment to create the necessary infrastructure and services for a successful tourist destination. Concern arises from tourism's rapid growth and its potential environmental and economic impacts (Azinuddin et al., 2022a). However, finding appropriate equilibrium between environmental restrictions and sectoral growth is a challenging task, given the dynamic nature of tourism, local community complexities, destination lifecycles and global economic uncertainties (Azinuddin et al., 2022b). To reduce environmental impact and enhance travel experiences, sustainable tourism should promote both popular and lesser-known destinations. Promoting the exploration of lesser-known destinations among travelers can help maintain a more sustainable approach to tourism. Nonetheless, popular destinations attract more tourists than lesser-known or infamous destinations (Kim et al., 2018). In this sense, tourists' likelihood of revisiting a destination may be also influenced by the destination's reputation (Hassan & Soliman, 2021).

Artigas et al. (2015, p.147) defined tourist destination reputation as “the aggregation over time of the consumers’ perceptual representations and evaluative judgments of the destination’s past actions and performance”. Destination reputation creates a unique picture of the destination at every level of interaction (Su et al., 2020). This involves stakeholders, encompassing tourist attractions, services, fundamental infrastructure, tourists, local residents, local administrators, and businesses, which is essential in improving the destination's reputation (Azwar et al., 2023). Nevertheless, out of all mentioned elements, limited studies still explore the impact of “local food” on destination reputation

development. A previous study explored the effect of the authenticity of local food on tourism sustainability where it promotes positive reputation among tourists (Zhang et al., 2019). In turn, it encourages satisfied travelers to promote the destination through word-of-mouth and online recommendations on social networks.

As mentioned earlier, based on the Destination Reputation Model (DRM) indicate that product and service are the most robust factor that contributes to destination reputation development (Widjaja et al., 2020). However, the result was just shown in general findings of product and service rather than focus on the consumption behavior of local food product explicitly. Hence, this underlining the need for further investigation in this area.

Perceived Value Local Food Consumption

Consumption value theory was ideally grounded from the salient theory of customer's "perceived value," Zeithaml (1988, p.14) defined perceived value as "the consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given". Over the years, to comprehend the complex nature of perceived value, the "Theory of Consumption Value (TCV)" was introduced by Sheth et al. (1991) in the article titled of "*Why we buy what we buy: A theory of consumption values*". TCV is primarily concerned with elucidating the motivational factors underlying why individuals engage in consumption behaviors by predicting, characterizing, and explaining their selection based on their consumption value (Tanrikulu, 2021). TCV relies on five core values: *functional, conditional, emotional, social, and epistemic*.

In the tourism context, Choe and Kim (2019) further examined the theory of TCV and its relation in measuring tourists' local food consumption. The scholars developed seven consumption value aspects that offer a more thorough understanding of TCV. The seven-dimension mentioned will be explained herein; The *taste/quality* value refers to the predicted functionality, taste, and quality advantages of eating locally produced food. *Health value* is based on the food's nutritious that improves one's health, received by eating local food at a place. The *price value* is the notion that eating locally produced food at a trip will save money. *Emotional value* is the belief that eating local food when traveling has benefits because it creates desired emotions or favorable emotional states. *Prestige value* is the belief that eating locally produced cuisine when traveling improves one's sense of social self. *Interaction value* refers to the idea that eating local food while traveling will improve interactions with locals and one's social self-concept. *Epistemic value* is the idea that eating local food when traveling will satisfy one's curiosity, create novelty, and excite their interest.

Destination Food Attractiveness

Destination attractiveness is “the individual’s feeling, belief, and opinions about a destination’s perceived ability to provide satisfaction in relation to his or her special vacation needs” (Nasir et al., 2020, p. 446). According to Thio et al. (2022), tourists are more likely to find a destination attractive if it meets their expectations. Destination attractiveness plays a significant key in improving destination performance and the quality of destination attributes (Raimkulov et al., 2021). These attributes involve natural attractions, man-made attractions, and cultural attractions. (Mohamad et al., 2019).

From this point of view, potentially, destination attractiveness is the most influential factor in visitor destination selection, tourist loyalty and also influence tourists’ destination preferences, destination image, and revisit intention (Ćulić et al., 2021). Owing to its focal point contribution to the tourism industry context, a plethora of research has discovered the imperative of destination attractiveness in different fields. To name a few, wineries (Mazurek, 2022), national parks (Markowski et al., 2019), tradition and cultural (Raimkulov et al., 2021). Further, even immense studies relate destination attractiveness in tourism fields. However, there are still scarce studies that tend to discover the importance of local food in developing destination attractiveness (Su et al., 2020).

According to Almeida and Garrod (2017), food is one of the primary factors that determine the tourist experience of a destination. This evidence has contributed to the statement of Thio et al., (2022), where the scholars highlight that tourist participation in local food consumption directly impacts their destination selection, perception of the destination, and finally, destination attractiveness.

HYPOTHESES DEVELOPMENT

The reputation of a destination is a significant factor in tourist loyalty (Azinuddin et al. 2022c). A positive destination reputation can attract more visitors, influencing their destination choice and consumption behavior while traveling (Wang et al., 2021). Recent study revealed that destination reputation influenced the perceived value of epistemic, conditional, and functional value (Sangthong & Soonsan, 2023). Correspondingly, Choe and Kim (2019) and Kim et al. (2018) found that if tourists are aware of a destination's positive reputation, they are more likely to perceive a higher consumption value. With this in mind, the analysis from previous literature proposes the relationship of H1 herein:

H1: Food destination reputation influences perceived value of local food consumption

One of the primary attractions of a tourist destination for tourists is the local food; tourists who perceive high value when eating local food in a destination are likely to foster destination attractiveness (Thio et al., 2022). Equally, according to Björk & Kauppinen-Räsänen (2016), a destination that lacks prominent landmarks or an attractive nature scene needs to find alternative ways to establish an identity that entices tourists in order to boost local economic growth. One effective option that benefits tourists and the local community is to enhance the attractiveness of the local food culture (Batat, 2021). For this reason, identifying the perceived value of local food consumption by tourists can enhance the knowledge of how consumption preferences impact the attractiveness of a food destination. As a result, the analysis of previous literature proposes a hypothesis as follows:

H2: Perceived value of local food consumption influences food destination attractiveness

The role of consumption value as a mediator has been examined in various contexts through several studies, such as the role of consumption value mediates between environmental knowledge and intention to visit green hotels (Wang et al., 2018), consumption value mediates between consumer attitude and sustainable buying behavior of consumers towards organic food (Jose et al., 2022), consumption value mediates learning costs and intent to use mobile apps (Molina-Castillo et al., 2020), to name a few.

Nevertheless, to the best of our knowledge, the mediating effect of perceived value on the relationship between food destination reputation and destination attractiveness is yet to be discovered in any study. Ideally, when tourists perceive greater value in consuming local food, it strengthens the relationship between the destination's reputation for food and the overall attractiveness of the destination. Local food can be an essential factor in attracting and retaining tourists, and promoting the value of local food consumption can enhance the overall reputation and destination attractiveness. Although no study looked into the mediating effect of consumption value between reputation and destination attractiveness, however, a recent study has explored the mediator influence of consumption value where the result showed that consumption value fully mediates between destination reputation and environmentally responsible behavior intention (Sangthong & Soonsan, 2023). Based on this premise, therefore current study posits the following hypothesis:

H3: Perceived Value of Local Food Consumption mediates the relationship between Food Destination Reputation and Destination food attractiveness

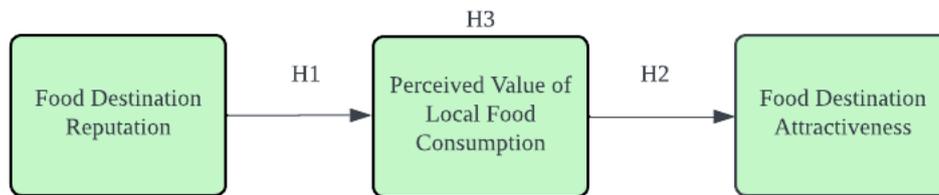


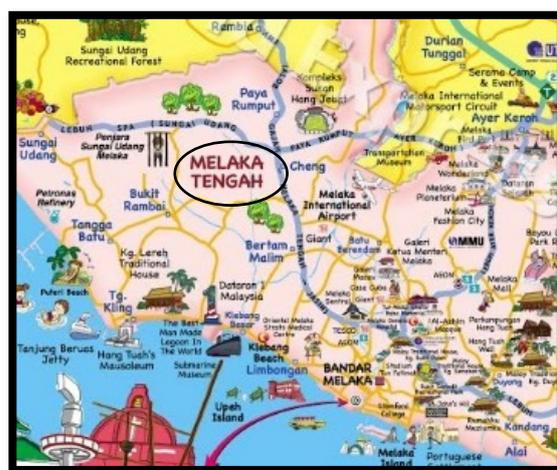
Figure 1: Research Framework

RESEARCH METHODOLOGY

The study employed a quantitative research framework and adopted a cross-sectional methodology to gather data from tourists who visited Melaka. Melaka is comprised of three districts, namely Jasin, Melaka Tengah, and Alor Gajah. The location of the research setting for present study was focused in Melaka Tengah as is illustrated figure 2. The data was collected through an online platform and the study population was purposively sampled. The primary segment of the survey encompasses the respondents' demographic characteristics, travel patterns, and behaviors. Subsequently, it focuses on identifying their most preferred local food in Melaka. The subsequent section measures food destination reputation (Artigas, 2015), the perceived value of local food consumption (Choe & Kim, 2019), and destination attractiveness (Guan & Jones, 2014). The constructs were assessed using a Likert scale consisting of five points, ranging from 1 (indicating strong disagreement) to 5 (indicating strong agreement) (see Appendix 1). This study utilized G*Power Version 3.1.9.6 software to analyze and calculate the minimum sample size. Based on the calculations, a sample size of 120 ($N=120$) is needed for this study. One hundred and thirty ($n = 134$) four completed responses were collected with the majority of responses being female tourists (67.2%). The findings of this study are consistent with other recent research, which also reported many female tourists visiting Georgetown as a UNESCO World Heritage Site (Noraffendi & Rahman, 2020). The reason for this demographic imbalance can be attributed to the worldwide phenomenon of women comprising the primary consumer base for both leisure and business travel. Additionally, women's prevalence in solo trips is growing rapidly, especially in Asian nations such as Malaysia, as highlighted by Awang and Toh (2018) and Singh and Gupta (2021). Additionally, the study found that 88% of the participants were between the age of 18 and 34, with the majority traveling for leisure purposes (76.1%).

This study employed the Partial-least Square-Structural Equation Modeling (PLS-SEM) technique to examine the proposed model and test the hypotheses. PLS-SEM was preferred in this research due to two main reasons. Firstly, the study aimed to explore the subject matter rather than confirm existing

theories. Secondly, the collected data exhibited a non-normal distribution, which had already been reported in prior studies (Hanafiah, 2020). Additionally, PLS-SEM is known to be effective in evaluating the intricate relationships among the constructs due to its strong and reliable ability to estimate structural models.



Source: Official Portal of Melaka State Government

Figure 2 The research setting for this study – Melaka Tengah

ANALYSIS AND DISCUSSION

Assessment of Measurement Model

According to Hair et al. (2019), the measurement models are assessed based on the constructs' reliability, convergence validity, and discriminative validity. Factor loadings, composite reliability (CR), Cronbach's alpha, and average variance extraction (AVE) can all be used to evaluate the constructs' reliability. As long as a construct's dependability value is more than the 0.7 minimum criterion, it is considered dependable (Hair et al., 2019). Convergent validity was attained for all variables, as evidenced by the item loadings and AVE statistics for each reflective indicator being greater than the suggested threshold (Hair et al., 2011). Using the Heterotrait-Monotrait (HTMT) ratio of correlation, discriminant validity was evaluated. The threshold value of 0.90 was not reached by any of the HTMT values for the latent variables, as presented in Table 1.

Table 1: Heterotrait-monotrait ratio (HTMT)

Construct	FDR	FDA	PVLFC
FDR			
FDA	0.619		
PVLFC	0.780	0.699	

Assessment of Structural Model and Hypotheses Testing

Given the satisfactory evaluation of the measurement model, the researchers (Hair et al., 2019) proceeded to examine the statistical significance of path coefficients, as well as the coefficient of determination (R2) and blindfolding-based cross-validated redundancy measure (Q2) of the structural model. The results indicate that the influence of FDR on PVLFC (R2 = 0.52) and PVLFC on FDA (R2 = 0.42) can be considered moderately predictive. However, when considering the Q2 values presented in Table 2, it is evident that the model lacks sample predictive relevance for both variables in the path model, as the Q2 values were close to zero.

Table 2: Structural model assessment

Construct	R ²	Q ²
PVLFC	0.52	0.30
FDA	0.42	0.31

Following that, the evaluation of the relationship between the components in the structural model was conducted using the path coefficients (β) and significance levels (P) in accordance with the methodology described by Hair et al. (2011). The estimation of the structural model's path coefficient results in Table 3 reported that FDR (H1: $\beta = 0.728^{***}$; $t = 15.662$; $P = 0.000$) significantly affects PVLFC, while PVLFC (H2: $\beta = 0.658^{***}$; $t = 11.427$; $P = 0.000$) also significantly affecting FDA. This means H1 and H2 are supported. In terms of the indirect effect of FDR on FDA through PVLFC as a mediator, the result is statically significant (H3: $\beta = 0.479^{***}$; $P = 0.000$). Hence, H3 is supported.

Table 3: Hypotheses testing

Path Analysis	Path Coefficient, β	T Statistics	P Values	Result
H1: FDR ->PVLFC	0.728***	15.662	0.000	Significant
H2: PVLFC ->FDA	0.658***	11.427	0.000	Significant
H3: FDR ->PVLFC-> FDA	0.479***	9.276	0.000	Significant

Note: *** (p < 0.001).

This study examines on how tourists' behaviors contribute to the attractiveness of food destinations by creating a comprehensive model that relates the food destination reputation (FDR), the perceived value of local food consumption (PVLFC), and the food destination attractiveness (FDA) among tourists in Melaka, Malaysia. This is one of the central theoretical contributions

of the study given the scarcity of empirical evidences that confirm the interrelationship between the above-mentioned variables. The research focuses on how PVLFC acts as a mediator between FDR and FDA, in better understand the mechanisms behind the factors that shape food destination attractiveness. The study finding shows that PVLFC significantly mediates the relationship between FDR and FDA. Although not explicitly investigated in the past literature, to a certain extent, the significant result between FDR and PVLFC is similar to the empirical insight by Sangthong and Soonsan (2023), where functional, epistemic, and conditional values are shaped by the former construct. This is also the case regarding the dynamics between PVLFC and FDA, where (Thio et al., 2022) revealed that tourists' destination attractiveness increased when tourists perceived the high value of local food consumption. This finding is also consistent with previous studies (Guan & Jones, 2014), tourists who attach significant value to local food while visiting a destination are more likely to contribute to the overall attractiveness of the destination. In essence, a destination's local cuisine plays a role in determining its attractiveness. Thus far, this is another important theoretical contribution where this study expands the understanding of the relationship between destination reputation on other values in consumption values. As mentioned before, the previous study indicates that destination reputation has the effects on functional, epistemic, and conditional value (Sangthong & Soonsan, 2023). While this study has demonstrated that in the realms of food, destination reputation significantly impacts other consumption values: taste, health, price, emotion, prestige, and interaction. With this in mind, the present empirical findings contribute to a deeper understanding by proving the connection between food destination reputation, the perceived value of local food consumption, and the food destination attractiveness of Melaka as a tourist destination.

For local food producers, the present empirical finding enhances the understanding of food business practitioners regarding the impact of food tourism in attracting tourists. An outstanding food destination reputation enhances the attractiveness of local cuisine, eventually enriching tourists' experiences while visiting the destination. A positive perception of the local food consumption value among domestic tourists further mediates and amplifies the destination's attractiveness. For destination stakeholders, this study suggests elevating the image of local regions' cuisines in the way to promote unique and distinctive food offerings as well as actively organizing a cultural and food festival with the aim to convey and attract more visitors.

CONCLUSION

The current research proposed the analysis of food destination reputation towards food destination attractiveness through the mediation impact of perceived value of local food consumption. Destination reputation is widely acknowledged as being able to elucidate tourists' attitudes and behaviors, in addition it also has the potential to influence their intentions to revisit and their levels of satisfaction. In relation to PVLFC as a mediator, it is clearly defined that food destination reputation can promote the overall local food consumption value. In the view of epistemic value, for instance, this value allows tourists to gain new experiences when consuming local food (Choe & Kim, 2019; Wong et al., 2018). Due to Melaka's local food reputation, which is closely associated with its multicultural and food-centric heritage, can offer a wide range of varieties and epistemic value, particularly for tourists interested in exploring unique culinary experiences. This can be seen through the marriage between Malay and Chinese individuals in Melaka and Penang saw the emergence of a distinct culture known as Baba and Nyonya, or Peranakan Chinese (Straits Chinese) (Ng & Karim, 2016). This unique fusion resulted in the creation of a hybrid culinary heritage called the Nyonya food (Omar & Omar, 2018). With this in mind, Melaka's food destination reputation certainly contributes to novel experiences when consuming local food product and enhance the epistemic value. The authentic flavors of Melaka's local dishes and their unique presentation, which reflects the local culture, make them undeniably appealing in terms of taste value. Emotional and interaction value, where excitement, happiness, pleasure, and romantic feelings might induce, especially when it comes to a situation where the tourists experience local food that is considered novel and peculiar for the tourists. While enjoying the food with friends and relatives promotes the interaction value while consuming local foods. Furthermore, foods consumed on special occasions, especially during travel such as Christmas, New Year, or special events associated with unique foods offering will inflict stronger positive emotions as these are considered "memorable meals". In light of this, it is reasonable to conclude that the food destination's reputation will foster its attractiveness when tourists are associated with the high perceived value of local food consumption. Although the current study advances the understanding of the attractiveness of food destinations, however it has its limitations. To broaden the understanding, additional mediating elements can be taken into account including food familiarity, food neophobia, and varied food cultural backgrounds of local food consumption among domestic and international tourists visiting Melaka. This enables more targeted planning and development initiatives. Furthermore, since more information may be acquired, undertaking a qualitative study may be worthwhile which could help improve the destination attractiveness in Melaka, Malaysia. The qualitative approach would allow for a more holistic exploration

of tourists' motivations, preferences, and behaviors related to local food consumption. Tourism stakeholders are able to develop tailored strategies to elevate the destination's appeal.

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EVALUATING THE TOD POTENTIAL OF LRT STATIONS IN MALAYSIA USING THE TOD INDEX

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Abstract

The fundamental principle of railway development is that rail stations are not merely nodes where people change from one mode of transport to another but also places where spatial concentrations of high-value activity are recognised as positively impacting cities. This can be a similar definition of transit-oriented development: integrating land uses (mixed-use activities) and transportation systems to improve urban issues, especially traffic congestion. This paper aims to quantitatively assess the current transit nodes using the TOD index by evaluating the standard criteria of the 5Ds that determine TOD levels. The TOD index was calculated for areas of 69 stations on the LRT Ampang/Sri Petaling and LRT Kelana Jaya Lines. Some stations are indicated as having a potential TOD but a poor built environment and accessibility, depending on the TOD index's value. With these results, the recommendations to improve TOD planning and implementation can become effective for each station, depending on its built environment factors and typologies. Therefore, using the TOD index, the study offers insights into the station's potential for TOD implementation at rail station development. It put forward recommendations for enhancing TOD planning and implementation towards a better passenger experience, optimising each station's potential, and achieving the objective of TOD implementation in the first place.

Keywords: Transit-Oriented Development, TOD Index, Transit, Rail Development

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INTRODUCTION

“If TOD design does not work, people will just take the car or choose to live elsewhere” - (Thomas et al., 2018)

Active mobility and public transportation can be well-promoted integrating transport and land use planning, which is critical for the sustainability of cities and communities (Cervero, 2013; Suzuki et al., 2013). However, urban planning faces challenges in many cities worldwide in terms of effectively planning and improving the built environment to support sustainable transport (Hrelja et al., n.d.). Previous research has demonstrated that land use significantly affects people’s travel pattern (Abdullah et al., 2022). It is also apparent that cities that have boosted public transportation ridership increased walking and cycling, decreased land consumption and dependence on cars have done so because land use and transportation planning have been integrated (Van Lierop et al., 2017). Transit-oriented development (TOD) as a planning and development approach for densifying the built environment around public transportation nodes and along transit corridors has resulted in these improvements (Zhang, 2022).

The spread of TOD growth began from the city centre, and the growth of the suburban started due to the urban sprawl that is suffering from bad transport connectivity and new township development in new suburban area (Jamme et al., 2019 & Van Lierop et al., 2017). As noted by Xia & Zhang (2022), land use and transport planning strategies have been significantly influenced and motivated by the widespread car dissemination at the turn of the 20th century, notably in Western countries like the United States and the United Kingdom. The automobile city, driven by concerns about traffic, has replaced the pedestrian and transit-oriented city, leading to urban sprawl, increased energy consumption, and dependence on cars. This scenario has resulted in an underestimation of the impacts of land use decisions and the consequences of relying heavily on cars. The car society model is a way of living that relies heavily on the fast and unchecked exploitation of non-renewable energy sources. In addition, it was supported by uneven industrial, economic, and land use policies because governments heavily subsidised the automotive industry through financial incentives and significant investments in infrastructure and transportation systems (Jamme et al., 2019).

Research on TOD concepts has proliferated in parallel with the growing popularity of planning urban growth around transit nodes. In the TOD literature, European cities, such as the Netherlands, Stockholm, and Copenhagen, are often mentioned as inspirations for the successful development of TOD. These cities are often held in high regard among TOD researchers for their proven competence in achieving a well-integration between land use and rail-based transportation (Pojani & Stead, 2015; Van Lierop et al., 2017).

As a city redevelopment strategy, multiple TODs are planned in tandem with the transport network to form a hierarchical network of TODs with variations in their size, form, and functions depending on the spatial context in which a TOD station is located (Ewing & Cervero, 2010). Thus, this study on TOD aims to provide a deeper understanding of measuring the density, land use mixture (diversity), design, distance, and destination accessibility built to support the passenger experience in the station area and when using the network. This study focuses on measuring an area within an 800-meter radius of transit stations using the TOD index, evaluating the potential for suitable TOD stations, and identifying which area can be improved. The results of the TOD Index are expected to be a comprehensive guideline and reference for establishing the criteria for planning, developing, implementing, and evaluating any current or future transit station.

To promote stations as TOD-compatible stations, this study thus set up two (2) objectives: (i) to compute a TOD index based on the 5D factors, including its station areas; and (ii) to compare the result of the TOD Index level, which generates a TOD score for each station.

LITERATURE REVIEW

Unfolding the Transit-oriented Development Concept

Since the 1990s, the number of studies dedicated to the emergence of TOD has been progressively growing, particularly in American and European cities and recently in Asian cities after many Asian cities also faced the challenges of urban issues. They analysed almost 330 articles published on the Web of Science until the end of 2018 by Ibraeva et al. (2020), providing evidence that the vast majority of the research on TOD originated in the USA. In Europe, Dutch universities like the University of Amsterdam and the Delft University of Technology are where most of the TOD research is presented, according to the Scopus database until 2022. In addition to this, the Asia-Pacific region is seeing a growing interest in TOD, particularly at Beijing University and the Universities of Hong Kong, Queensland, and Melbourne. It is clear that despite the unquestionable preponderance of the USA on this matter, TOD-related studies are becoming internationally widespread and have become the agenda of state and local governments, stemming from concerns about the sustainability of urban mobility and environmental responsiveness (Doulet et al., 2017).

The TOD concept is addressed first and foremost as expressed in *The Next American Metropolis* by Peter Calthorpe (1993), an architect, urban planner, and founder of American TOD. Calthorpe's original portrayal of TOD living envisioned a seamless daily routine. Residents would be able to descend from their apartment building, accessing retail facilities on the ground floor to purchase breakfast. They could then walk or bike to the nearby rail transit station, perhaps enjoying breakfast on a bench along the way or at the station entrance

while waiting for the next train. Ultimately, they would disembark the train within walking distance from their office, ensuring a smooth and efficient commute. Calthorpe defined TOD as a mixed-use community within an average 600 m walking distance within more or less 10 minutes of a transit stop and core commercial area (Calthorpe, 1993). He suggests that TOD mixes residential, retail, office, and open space in a walkable environment, making it convenient for people and employees to travel by transit, foot or bicycle, or car. Major commercial and workplaces should be located in close to a station and nearby public spaces to improve neighbourhood configuration and vitality. A residential zone should be developed in the remaining area, with densities decreasing (remaining 25-60 units per hectare). While the secondary zone might appear at a maximum distance of 1.6 km from the core zone, where low-density housing, vast park areas, school, and facilities for the local community could be located. The street network of the outer area should be easily accessible, fast, and direct access to the core area, mainly by foot or bicycle or public transportation (known as the first mile) and provide park-and-ride facilities. With various available routes, users are expected to choose local streets for their short displacements, allowing for higher street connectivity (see Figure 1).

Nevertheless, the importance of TOD on a larger regional scale was emphasized, mixing issues of local neighbourhood configuration with more ambitious public transport strategies. Calthorpe (1993) claims that the growth of regional structure is congruent with the development of public transport, with human scale as the basic element in urban planning and design to reshape and facilitate the multiple functions of surrounding areas of transit stations. In this light, many U.S. cities, such as San Francisco and Atlanta, are the first to adopt the TOD concept in urban planning.

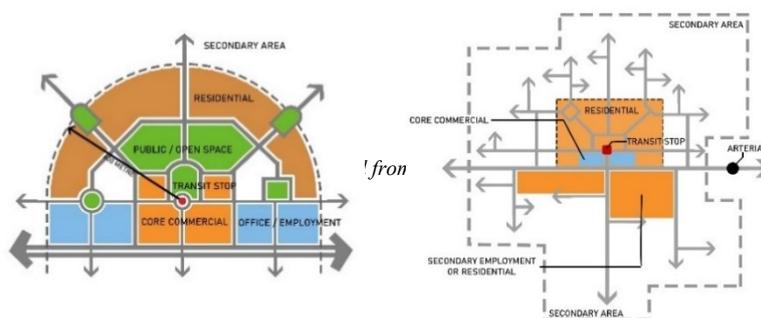


Figure 1: Diagrammatic representation of TOD that emphasises land use and train network integration in a city

Transit is one of the many goals of the TOD concept. It is a potential outcome that adds to a strategy with many other benefits for the city and its citizens. Among the benefits of TOD are the frequency of walking, transit use, driving, social capital and local engagement, public health, pedestrian and vehicle fatalities or accidents, property value, and travel time costs (Jamme et al., 2019). The rest of the benefits, as highlighted by Rice (2009) in (Bertolini et al., 2009; 2012), are:

- i. Reduce reliance on cars, which has substantial environmental and social benefits.
- ii. Improves the viability of public transport and facilitates the provision of better public transport services.
- iii. Enables a more compact city, providing housing and development opportunities without adding to city sprawl.
- iv. Enable more affordable housing. A basic apartment in an activity centre and should be able to be provided more economically.
- v. Creates more activity and community life in a centre by having more people living closer together and interacting with each other much more than if they lived further apart.
- vi. Improves the economic viability of businesses in the centre by creating a larger market with easy access to their products.
- vii. Revitalize older centres and shopping strips that have struggled to compete with car-based shopping malls.
- viii. Brings new development to replace areas perceived as old and rundown.

The TOD concept and principles were progressively adopted in California, Georgia, Massachusetts, Florida, New Jersey, Washington, and New York, later many European cities such as Amsterdam, Copenhagen, Helsinki, Lisbon, Munich, Stockholm, and Zurich followed (Bertolini et al., 2009; Cervero, 2013; Bernick & Cervero, 1997; Dittmar & Ohland, 2004; Vale, 2015). The recent decade has seen TOD applied in Asian cities, such as China, Singapore, South Korea, Japan, Thailand, Indonesia, and Malaysia, to formulate mass transit corridors and reduce traffic congestion due to urbanisation and population growth. Malaysia's TOD policy can be seen as outlined by PLANMalaysia in 2018 through *Garis Panduan Perancangan Pembangunan Berorientasikan Transit* and the Selangor State Transit-Oriented Development Planning Policy in 2016. Although TOD applications followed one basic philosophy in different cities, the main focuses varied greatly with cases. For example, most American planners emphasise the re-concentration of urban developments around transit nodes (Renne, 2009), while European cities highlight the redevelopment of existing transit station areas (Bertolini & Spit, 1998; Papa & Bertolini, 2015).

TOD Index

By concentrating development around public transit or transfer stations, bus stops, TOD is commonly defined as an approach to integrating transportation and land use planning that "...makes walking, cycling, and transit use convenient and desirable and that maximises the efficiency of existing public transit services" (Thomas et al., 2018). There is a need to define and characterise TOD by measuring the indicators. Many researchers believe that TOD planning needs to use two approaches since TOD emphasises the integration between T (transit) and D (development), as suggested by Singh et al. (2014):

1. Identifying areas where urban development has high transit orientation, but low TOD levels.
2. Identifying potential locations for transit networks characterised by high TOD levels but poor transit connectivity.

A review by Doulet et al. (2017) found that there are several different methods to conceptualise TOD. To illustrate this point, the 3Ds of the concept - density, diversity, and design have received much attention in research. They are among the most frequently applied in quantifying the TOD formulate by Certero & Kockelman (1997). Density refers to increasing the number of units per hectare; diversity is the need to increase the variety of uses within a development; and design refers to the attractiveness and efficacy of walking, bicycling, and public transportation. The distance to transit and destination accessibility are two more Ds listed by (Ewing & Certero, 2010). The D-framework can be explained: (1) Density – increased housing and employment near transit; (2) Diversity – a land use mix of housing, retails, services, and public space within walking distance of transit stations; (3) Design – encompasses the tangible and intangible aspects of the built environment, including the arrangement of buildings, streets, and public spaces, the design of individual buildings, landscapes, emotion, experience, and a sense of place or place attachment; (4) Distance to transit – access to transit station including the first and last mile which relates to the walkability; (5) Destination accessibility – the ease of access to trip attractions or destinations (see Table 1).

Singh et al. (2014) argue that a scientific analysis of measuring extant TOD levels is necessary for identifying the extent to which an area is transit-oriented and its potential. Singh et al. (2014, 2017) analyses the TOD network of the City Region Arnhem and Nijmegen by aggregating spatial indicators using a Spatial Multi-Criteria Analysis to determine an overall TOD level value. The TOD index uses quantitative GIS methods and statistical analysis to calculate the actual and potential TOD. Each index is measured at a different scale. For example, the actual TOD index must be measured around an existing transit node, considered the walkable limit from the node which is range between 400 meters

to 800 meters of comfortable 10 minutes walking distance. The potential TOD index needs to be measured over an entire region to see how index values vary from one location to another and whether there are areas where levels of TOD are already high.

For quantifying the suitability of TOD stations, Kamruzzaman et al. (2014) employ a similar methodology, taking into account the accessibility of public transportation, net residential and employment densities, land use mix, intersection and cul-de-sac density. According to Kamruzzaman et al. (2014), the TOD concept is applied using sets of indicators to help determine how effective and successful the TOD concept is in supporting the function of the rail station and its network and accommodating a liveable environment. For the same reason, TOD needs to be served by a high-quality transit service because the design and quality of the transit service significantly impact TOD's success potential. The TOD plan and implementation can only succeed if the transit service is good or the station is attractive and convenient (Zhou et al., 2019).

Table 1: TOD Indicators for Calculating the TOD Index

Indicators	Descriptions	Formula
Density	Population density (People per km ²)	$PD = NP/A$ Where PD = Population density, NP = District population, A = District area $PA = PD/SA$ Where PA = buffer area population, SA = buffer area coverage (2.01km ²) $Pd = PR/SA$ Where Pd = population density of the buffer area, PA = population residence area Average household in Malaysia is 3.9
	Commercial density (Number of commercial activities per km ²)	$CD = NC/SA$ Where CD = commercial density, PA = number of commercial activities, SA = Buffer area coverage
Diversity	Land use diversity (mix percentage)	$1 - \sum (a/A)^2$ Where a is the total area of specific land use (e.g residential, commercial, industry, facilities) within the buffer area A = total area of all land use categories within the buffer.
Design	Open spaces	Total area in acre
	Parking space	Total area in acre

Indicators	Descriptions	Formula
Distance to transit	Pedestrian path	Total length of pedestrian within the buffer area using ArcGIS.
	Intersection density	Calculate the number of intersections of the road networks within the buffer area.
Destination accessibility	Land use mixedness (Mixedness of residential land use with other land use categories)	$MI (i) = \frac{\sum_j L_o}{\sum_j L_r + L_o}$ <p>L_o = non-residential land uses for each L_r = residential land uses</p>

Source: Ewing & Cervero, (2010); Singh et al. (2014); Uddin et al. (2023)

INTRODUCTION OF THE SELECTED CASES: LRT LINES

This section briefly introduces LRT lines in the Klang Valley, why this research chose LRT lines as the case study for rail-based transportation, and how this choice relates to the research objectives. Some of these LRT station areas have a significant opportunity to develop and redevelop because of their well-accessible location, economic establishment, and existing attractions. Besides, these lines have been chosen due to their relevance and significance in the context of rail-based transportation in Klang Valley particularly.

The LRT lines are under the operation of RapidKL (Rapid Rail and Rapid Bus), a subsidiary of Prasarana Malaysia Berhad. This research decided to evaluate the TOD index for LRT Ampang/Sri Petaling Line and LRT Kelana Jaya, as both lines are well-established networks since 1996, have the highest ridership among other urban rail services, and are well-developed in the surrounding areas (see Figure 2). Kuala Lumpur Sentral Station is excluded from the case study because both stations are integrated stations that serve not only the LRT network but also KTM Komuter, Express Rail Link (ERL), KLIA Transit, Electric Train Service (ETS) as an intercity train, KL Monorail, and interstate buses.

The process of railway modernization in the Klang Valley region began in 1996 with the introduction of the first urban rail system, the LRT (Light Rail Transit), to link the area between Ampang-Sentul-Kuala Lumpur city centre. This route was known as LRT Ampang/Sri Petaling Line (formerly known as STAR LRT – *Sistem Transit Aliran Ringan*) before it was renamed in April 2005 after it was taken over by Prasarana in 2002. The total stations of the LRT Ampang Line are 47, with a length of 45.1 km. The Ampang Line started its operation with the Ampang-Sultan Ismail route, while the second stretch was Chan Sow Lin-Sri Petaling in 1998. The lines run a total route length of 27 km, of which 17.6 km is at grade and 9.4 km is on the viaduct. There are 25 stations, with 11 stations along

Sentul Timur-Chan Sow Lin and 7 stations along Chan Sow Lin-Ampang and Chan Sow Lin-Sri Petaling. The Sentul Timur-Ampang and Sentul Timur-Sri Petaling converge at the Chan Sow Lin interchange station. The merged line directs to the north and terminates at Sentul Timur. Since its operation, the Ampang Line has been intended to include interchangeability with other rail-based networks. The Bandaraya Station became the first to be designated as an interchange station, connecting to the Bank Negara KTM Komuter Station. After completing the Sri Petaling-Chan Sow Lin Line, the Bandar Tasik Selatan station was opened in 2022 to be integrated with the Ampang Line, KTM Komuter, and ERL.

In the eastern part of the Greater Klang Valley, the second LRT project of LRT2, the LRT Kelana Jaya Line (formerly known as *Projek Usahasama Transit Ringan Automatik - PUTRA LRT*), was operated as the first fully automated and driverless, connecting the urban sprawls of Gombak and Kelana Jaya. The lines were completed in 1998, and the extension was completed in 2016 with 13 new stations over 17 km from Kelana Jaya to Putra Heights, where it meets with the Sri Petaling Line for interchange. Presently, the Kelana Jaya Line consists of 37 stations with a total of 46.1 km track length, with 31 aboveground stations, 5 underground stations, and 1 at-grade station (Sri Rampai Station).

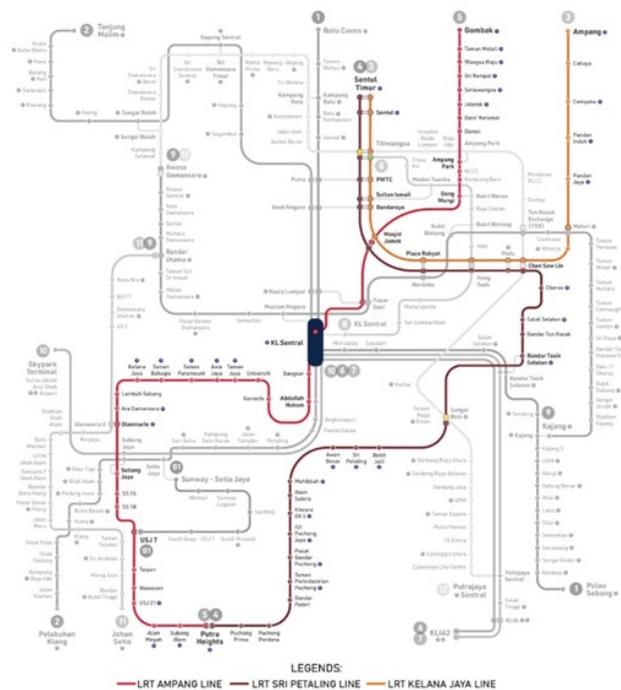


Figure 2: Two LRT lines in Klang Valley transit system map
Source: myrapid.com.my (2023)

To understand the physical characteristics of each station, Table 3 illustrates five (5) different typologies for each station: terminal building, station, space, function, and settlement hierarchy. For both lines, 13 stations are on-ground (1 – Kelana Jaya Line, 12 – Ampang/Sri Petaling Line), while the rest are elevated, and 5 stations on the Kelana Jaya Line are underground, crossing the main roads, the city centre of Kuala Lumpur, and the central business districts in major commercial areas. Most interchange and connecting stations produce a complex space typology connecting to other modes. However, not all stations with complex space typologies serve multiple functions, serving as transit stations and spaces for economic, service, and social activities as in-transfer areas. The example station that owns this typology is Dang Wangi Station. Each station has also been clustered based on the settlement hierarchy: urban, city centre, sub-city centre, commercial-business park, and neighbourhood centre. Ampang, PWTC, Titiwangsa, Ara Damansara, and KLCC Stations are in urban settlements, connecting to a wide range of destinations and significant activities, especially business, finance, and services.

Table 3: Typologies of LRT stations

Station	Typologies				
	Terminal building	Station	Space	Function	Settlement hierarchy
LRT Ampang/Sri Petaling Line					
Ampang	On-ground	Interchange	Linear	Mono	Urban
Cahaya	On-ground	Intermediate	Linear	Mono	Neighbourhood centre
Cempaka	On-ground	Intermediate	Linear	Mono	Neighbourhood centre
Pandan Indah	On-ground	Intermediate	Linear	Mono	City centre
Pandan Jaya	On-ground	Intermediate	Linear	Mono	Neighbourhood centre
Maluri	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Miharja	On-ground	Interchange	Complex	Mono	Neighbourhood centre
Chan Sow Lin	On-ground	Interchange	Complex	Mono	Neighbourhood centre
Pudu	Elevated	Intermediate	Linear	Mono	Commercial-business Park
Hang Tuah	On-ground	Interchange	Complex	Mono	Commercial-business Park
Plaza Rakyat	Elevated	Interchange	Complex	Mono	Sub city centre
Bandaraya	Elevated	Intermediate	Linear space	Mono	Commercial-business Park
Sultan Ismail	Elevated	Connecting	Linear	Mono	Sub city centre

Station	Typologies				
	Terminal building	Station	Space	Function	Settlement hierarchy
PWTC	Elevated	Intermediate	Linear	Multi	Urban
Titiwangsa	Elevated	Interchange	Complex	Mono	Urban
Sentul	Elevated	Intermediate	Linear	Mono	Sub urban
Sentul Timur	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Cheras	On-ground	Intermediate	Linear	Mono	Neighbourhood centre
Salak Selatan	On-ground	Intermediate	Linear	Mono	Sub urban
Bandar Tun Razak	On-ground	Intermediate	Linear	Mono	Neighbourhood centre
Sungai Besi	Elevated	Intermediate	Linear	Mono	Sub city centre
Bukit Jalil	Elevated	Intermediate	Linear	Mono	Sub city centre
Sri Petaling	On-ground	Intermediate	Linear	Mono	Neighbourhood centre
Awan Besar	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Muhibbah	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Alam Sutera	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Kinrara BK5	Elevated	Intermediate	Linear	Mono	Commercial-business Park
IOI Puchong Jaya	Elevated	Intermediate	Linear	Mono	Sub city centre
Pusat Bandar Puchong	Elevated	Intermediate	Linear	Mono	City centre
Taman Perindustrian Puchong	Elevated	Intermediate	Linear	Mono	Sub city centre
Bandar Puteri	Elevated	Intermediate	Linear	Mono	Commercial-business Park
Puchong Perdana	Elevated	Intermediate	Linear	Mono	Sub city centre
Puchong Prima	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Putra Heights	Elevated	Interchange	Complex	Mono	Neighbourhood centre
LRT Kelana Jaya Line					
Subang Alam	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Alam Megah	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
USJ21	Elevated	Intermediate	Linear	Mono	Neighbourhood centre

Station	Typologies				
	Terminal building	Station	Space	Function	Settlement hierarchy
Wawasan	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Taipan	Elevated	Intermediate	Linear	Mono	Commercial-business Park
USJ7	Elevated	Interchange	Complex	Mono	Commercial-business Park
SS18	Elevated	Intermediate	Linear	Mono	Sub city centre
SS15	Elevated	Intermediate	Linear	Mono	City centre
Subang Jaya	Elevated	Connecting	Complex	Mono	City centre
Glenmarie	Elevated	Intermediate	Complex	Mono	Sub city centre
Ara Damansara	Elevated	Intermediate	Linear	Mono	Urban
Lembang Subang	Elevated	Intermediate	Linear	Mono	Sub city centre
Kelana Jaya	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Taman Bahagia	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Taman Paramount	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Asia Jaya	Elevated	Intermediate	Linear	Mono	City centre
Taman Jaya	Elevated	Intermediate	Linear	Mono	City centre
Universiti	Elevated	Intermediate	Linear	Mono	Sub city centre
Kerinci	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Abdullah Hukum	Elevated	Intermediate	Linear	Mono	Sub city centre
Bangsar	Elevated	Intermediate	Linear	Mono	Commercial-business Park
Pasar Seni	Elevated	Interchange	Complex	Mono	City centre
Masjid Jamek	Underground	Interchange	Complex	Mono	City centre
Dang Wangi	Underground	Connecting	Complex	Multi	Sub city centre
Kampung Baru	Underground	Intermediate	Linear	Mono	Sub urban
KLCC	Underground	Intermediate	Linear	Multi	Urban
Ampang Park	Underground	Intermediate	Linear	Mono	City centre
Damai	Elevated	Intermediate	Linear	Mono	Sub city centre
Dato' Keramat	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Jelatek	Elevated	Intermediate	Linear	Mono	Neighbourhood centre

Station	Typologies				
	Terminal building	Station	Space	Function	Settlement hierarchy
Setiawangsa	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Sri Rampai	On-ground	Intermediate	Linear	Mono	Neighbourhood centre
Wangsa Maju	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Taman Melati	Elevated	Intermediate	Linear	Mono	Neighbourhood centre
Gombak	Elevated	Intermediate	Linear	Mono	Neighbourhood centre

Source: Author

RESEARCH METHODOLOGY

As given in Table 4, five (5) indicators - density, diversity, design, distance, and destination accessibility (Ewing & Cervero, 2010) were calculated in ArcGIS to measure the TOD index for 69 stations on the LRT 1 and 2 Lines. Each of the indicators can be measured using different performance variables. Some performance variables are excluded from this research due to a lack of data availability, such as employment density under the density indicators.

Table 4: Criteria for Calculating TOD Index and The Data Sources

Indicators	Measurement variables	Data source
Density	Population density (Number of persons per km ²)	www.dosm.gov.my/mycendash open.dosm.gov.my/kawasanku
	Commercial density (Number of commercial per km ²)	Land use of commercial Floor area ration (FAR)
Diversity	Land use diversity	ArcGIS and OSM
Design	Acreage of fully utilised of public space	Land use of public space
	Number of parking space	ArcGIS and OSM
Distance	Density of intersection per square kilometre (Number of intersections per km ²)	ArcGIS and OSM
	Length of pedestrian networks (Total length of walkable/cyclable paths in km)	www.pedcatch.com
Destination accessibility	Mixed-ness of land uses	ArcGIS and OSM

*Open Street Map (OSM)

The indicators were calculated and aggregated using ArcGIS 10.8 and Quantum GIS (QGIS) 3.28. Using both vector and raster data formats to generate the index made it easier and faster to calculate the TOD index, especially for a large number of stations. On the note, all indicators have been standardised using the maximum standardisation technique, which applied a 0-1 gradient to all values and aggregated them into the TOD index with an equal-weighted technique.

ANALYSIS AND DISCUSSION

The TOD area is pedestrian-friendly, with an 800-metre radius around transit stations. Within this buffer area, the 5D indicators directly affect ridership and act as an activity node. Based on the studies by Huang et al. (2018) and Niu et al. (2021), this study employs an 800-metre buffer around the transit station as the pertinent unit analysis for TOD planning in Malaysia. The size of the buffer encourages people to walk to or from the station along the pedestrian connectivity within 10 minutes or less. Figure 3 illustrates the buffers around the train stations for three (3) lines, i.e., LRT Ampang, LRT Sri Petaling, and LRT Kelana Jaya. The 800-metre buffers represent the land uses around the station areas, which have been analysed using GIS software. Once the TOD buffer areas are demarcated, the variables for the TOD index are identified. Thus, when such an index is computed for each station area, recommendations can be made to improve the TOD around stations.

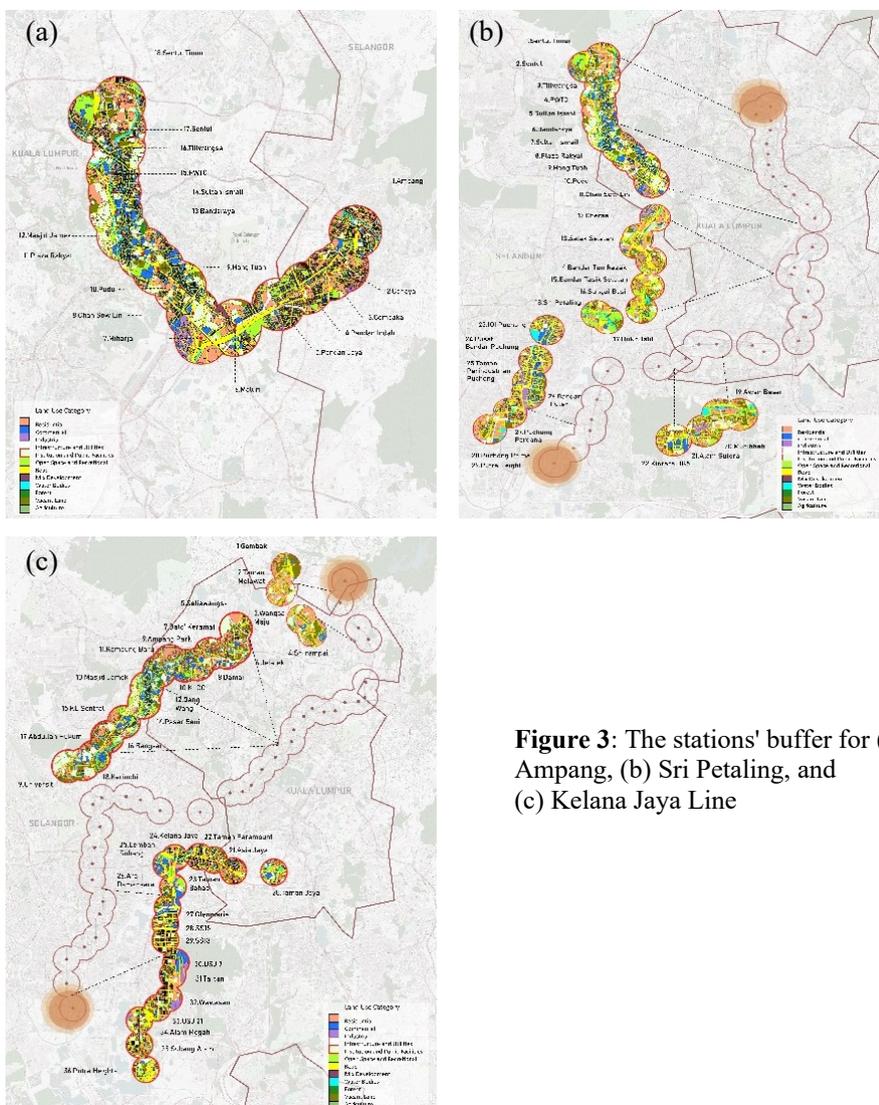


Figure 3: The stations' buffer for (a) LRT Ampang, (b) Sri Petaling, and (c) Kelana Jaya Line

TOD Measurement

This research has comprehensively analysed the TOD level for 69 LRT stations. The findings, tabulated in Table 5, offer valuable insights into the five (5) indicators of TOD and their potential for implementation in the station areas. Using these results, the station can be ranked based on the high and low scores of the TOD index value. According to the total scale of 0.00 to 1.00, the score can be classified into three (3) categories: 0.00 to 0.50 is the lowest score, 0.51 to 0.70 is the median score, and 0.71 to 1.00 is the highest. The range of TOD index values for the 69 LRT stations is from 0.39 to 0.97, with the briefs as follows:

1. The highest score is 0.97, which is dedicated to Glenmarie Station.
2. The lowest score is 0.39, which is dedicated to Universiti Station.

Among the 69 stations analysed, 49 scored above 0.70, thus indicating a good overall level of TOD in the city. The high-scoring stations are primarily located in the sub-city and neighbourhood centres, highlighting the significance of population and employment density in the station areas. Examples of sub-city centres with promising development opportunities include Glenmarie, Bukit Jalil, IOI Puchong, and Sungai Besi. However, these stations scored less in the diversity and density aspects. This suggests that although these stations have the potential for development, there is an area for improvement in the high intensity of development, which focuses on the mix and intensity of land uses.

On the other hand, the station with the lowest TOD score of 0.39 is Universiti Station. This low score is attributed to limited land use diversity, suboptimal design, and inadequate pedestrian infrastructure. Similarly, Kerinchi Station scored 0.40 and shares similar challenges with Universiti Station. These two stations are close by and exhibit higher diversity due to the presence of public facilities, institutions, and affordable residential developments. In addition, these stations are located beside the Federal Highway (railroad ROW), which limits people from other sides access to the station and discourages people from walking to the station as the pedestrian infrastructure needs better conditions and well-connected.

The study's findings indicate that a significant number of stations have scored low in design, density, and distance to transit. Specifically, stations such as Ampang, Cahaya, and Cempaka on the Ampang/Sri Petaling Line, as well as Gombak, Taman Melati, and Wangsa Maju on the Kelana Jaya Line, exhibit poor design and limited provision of public space in their surrounding areas. TOD patterns of public spaces are urban spaces enclosed by commercial storefronts and public buildings such as libraries, healthcare facilities, post offices, mosques, and police stations. The loading platforms are on the sidewalks, and the street works are public spaces. The public space around the station areas is an important component in the station context as it reflects the nature of activities and the

presence of people (environmental psychology). When there are no activities and fewer people, the area may create a negative user experience. The reasons for the negative experience are mainly the unwanted behaviour of other people, abandonment, darkness, poor visibility, and, in short, making the station unattractive.

Meanwhile, in the distance aspect, especially the distance and the provision of pedestrian infrastructure, many stations have scored low, such as Cahaya, Bukit Jalil, Puchong Prima, and Gombak Station. Implicitly incorporated in the TOD definition, walkability environments are crucial for the convenience of the users to walk from their origin to the station or from the station to any destination. Fostering walkability is essential to ensuring seamless first- and last-mile connectivity between the train systems and the users' origins and destinations because walking depends on the design of the streets, walkway infrastructure, and commercial activity. Understandably, the station uniquely connects to the pedestrian walkways, hence, integrating with cities without any barriers to create a good walkable condition. However, the walkable conditions of the TOD stations have revealed that the built environment, such as public space and commercial activities, influences the size of the walking distance because some stations have shorter and poorer continuity of pedestrian networks. It is noted that pedestrian activity triggers commercialization by creating public spaces and attracting pedestrians as potential transit users. Commercialization around the stations is closely associated with pedestrian movement when the arriving and departing passengers converge on and disperse from the station area. The examples of commercial activities around station areas can be observed in Putra Heights and USJ7 Station.

From the above discussion on the impacts of active pedestrians on commercial activity, this can be further discussed in terms of commercial density, as it has a strong association. The stations with the highest scores in density (commercial density) are Subang Jaya, Plaza Rakyat, and Dang Wangi Station. These three stations, however, have scored the lowest in pedestrian distance. This finding reveals that due to poor pedestrian connectivity and unsafe walkable conditions, the users prefer to travel by car to the station, as the stations have also provided a Park N' Ride, such as in Subang Jaya Station, and a limited parking space in Dang Wangi Station. Due to the high number of drivers, this scenario will contribute to the absence of commercial activity, either formal or informal activity, around the station areas, and the station will ultimately continue to serve only as a transit hub rather than being multifunctional as intended by TOD.

Table 5: The TOD Index Values of All 69 LRT Station Areas

Station	Density		Diversity	Design		Distance to transit		Destination accessibility	TOD Index
	Pop. density	Commercial density	Land use diversity	Parking	Public space	Pedestrian (km)	Intersection density	Land use mixedness	
Glenmarie	0.26	0.61	0.97	1.00	1.00	0.20	0.20	0.14	0.97
Taman Bahagia	0.94	0.09	0.78	1.00	0.43	0.18	0.50	0.45	0.97
Bukit Jalil	0.48	0.33	0.85	1.00	0.65	0.06	0.60	0.17	0.92
Awan Besar	0.70	0.03	0.92	0.30	1.00	0.39	0.50	0.28	0.92
Taman Paramount	1.00	0.07	0.71	0.88	0.30	0.16	0.40	0.53	0.90
Ampang	0.81	0.30	0.96	1.00	0.00	0.15	0.50	0.35	0.90
Taman Jaya	0.60	0.60	0.94	1.00	0.31	0.20	0.20	0.21	0.90
IOI Puchong Jaya	0.50	0.46	0.96	1.00	0.00	0.32	0.60	0.18	0.89
Sungai Besi	0.57	0.05	0.96	0.28	1.00	0.31	0.60	0.20	0.88
Putra Heights	0.24	0.10	0.92	1.00	1.00	0.29	0.30	0.13	0.88
Ara Damansara	0.50	0.62	0.97	1.00	0.00	0.42	0.30	0.17	0.88
Kelana Jaya	0.88	0.05	0.95	0.94	0.00	0.15	0.50	0.38	0.86
Asia Jaya	0.60	0.60	0.94	1.00	0.00	0.15	0.30	0.23	0.85
Pusat Bandar Puchong	0.64	0.38	0.94	0.66	0.00	0.31	0.60	0.23	0.84
Kinrara BK5	0.61	0.41	0.94	0.75	0.00	0.28	0.50	0.24	0.83
Maluri	0.56	0.22	0.96	0.10	1.00	0.15	0.50	0.19	0.82
Sentul	0.64	0.23	0.92	0.46	0.44	0.17	0.60	0.24	0.82
Sentul Timur	0.78	0.08	0.90	0.67	0.00	0.36	0.60	0.30	0.82
Sri Petaling	0.58	0.07	0.87	0.14	1.00	0.34	0.50	0.21	0.82
Alam Megah	0.57	0.02	0.95	0.37	1.00	0.37	0.20	0.19	0.82
KLCC	0.60	0.61	0.85	0.00	0.88	0.24	0.30	0.21	0.82
Cempaka	0.86	0.11	0.94	0.53	0.00	0.20	0.50	0.39	0.78
Pudu	0.21	0.59	0.88	0.92	0.00	0.24	0.50	0.11	0.77
Pandan Indah	0.81	0.13	0.88	0.40	0.15	0.21	0.50	0.34	0.76
USJ7	0.63	0.60	0.93	0.00	0.32	0.18	0.50	0.26	0.76
Wangsa Maju	0.90	0.08	0.85	0.58	0.00	0.21	0.40	0.38	0.76
SS15	0.70	0.58	0.87	0.00	0.30	0.20	0.40	0.32	0.75
Abdullah Hukum	0.27	0.60	0.97	0.00	0.67	0.52	0.20	0.14	0.75
Pasar Seni	0.05	0.52	0.81	0.00	1.00	0.54	0.40	0.04	0.75
Cahaya	0.90	0.10	0.93	0.45	0.00	0.03	0.50	0.41	0.74
Masjid Jamek	0.08	0.64	0.88	0.00	0.45	0.65	0.60	0.01	0.74
Sultan Ismail	0.54	0.56	0.87	0.00	0.00	0.60	0.60	0.17	0.74
Jelatek	0.71	0.08	0.89	0.21	0.56	0.15	0.40	0.33	0.74

Station	Density		Diversity	Design		Distance to transit		Destination accessibility	TOD Index
	Pop. density	Commercial density	Land use diversity	Parking	Public space	Pedestrian (km)	Intersection density	Land use mixedness	
Wawasan	0.70	0.05	0.90	0.00	0.64	0.26	0.40	0.32	0.73
Pandan Jaya	0.63	0.20	0.93	0.52	0.00	0.22	0.50	0.25	0.72
Bandar Puteri	0.24	0.36	0.93	0.00	0.63	0.46	0.50	0.13	0.72
USJ21	0.63	0.03	0.92	0.00	0.86	0.24	0.30	0.27	0.72
Bandaraya	0.13	0.53	0.87	0.18	0.00	0.82	0.60	0.05	0.71
Lembah Subang	0.62	0.60	0.93	0.12	0.00	0.38	0.30	0.26	0.71
Bangsar	0.70	0.24	0.90	0.00	0.40	0.33	0.30	0.32	0.71
Titivangsa	0.26	0.43	0.88	0.00	0.55	0.37	0.50	0.14	0.70
PWTC	0.24	0.57	0.87	0.25	0.00	0.46	0.60	0.12	0.69
Cheras	0.64	0.13	0.94	0.38	0.00	0.30	0.50	0.23	0.69
Muhibbah	0.60	0.03	0.94	0.66	0.00	0.23	0.40	0.24	0.69
SS18	0.94	0.04	0.86	0.00	0.24	0.20	0.40	0.41	0.69
Kampung Baru	0.71	0.52	0.89	0.00	0.00	0.26	0.40	0.33	0.69
Miharja	0.58	0.13	0.95	0.38	0.00	0.33	0.50	0.21	0.68
Gombak	0.69	0.03	0.91	1.00	0.00	0.05	0.10	0.30	0.68
Bandar Tun Razak	0.87	0.04	0.97	0.00	0.00	0.29	0.50	0.35	0.67
Taipan	0.70	0.23	0.89	0.00	0.00	0.38	0.50	0.33	0.67
Masjid Jamek	0.08	0.62	0.81	0.00	0.45	0.65	0.40	0.01	0.67
Setiawangsa	0.86	0.06	0.87	0.43	0.00	0.14	0.30	0.35	0.67
Taman Melati	1.00	0.01	0.72	0.00	0.00	0.33	0.40	0.52	0.66
Subang Jaya	0.60	0.71	0.90	1.00	0.00	0.36	0.20	0.16	0.65
Puchong Perdana	0.78	0.07	0.91	0.00	0.00	0.19	0.60	0.31	0.64
Puchong Prima	0.88	0.06	0.86	0.00	0.00	0.06	0.60	0.43	0.64
Dang Wangi	0.26	0.64	0.84	0.20	0.46	0.23	0.30	0.13	0.64
Ampang Park	0.62	0.56	0.91	0.00	0.00	0.23	0.30	0.28	0.64
Subang Alam	0.86	0.05	0.88	0.12	0.00	0.31	0.20	0.35	0.62
Damai	0.85	0.17	0.82	0.00	0.00	0.17	0.30	0.41	0.60
Dato' Keramat	0.87	0.17	0.87	0.00	0.00	0.14	0.30	0.37	0.60
Taman Perindustrian Puchong	0.12	0.31	0.95	0.24	0.00	0.40	0.60	0.05	0.59
Sri Rampai	0.60	0.23	0.86	0.12	0.00	0.30	0.30	0.25	0.59
Alam Sutera	0.58	0.02	0.95	0.00	0.18	0.27	0.40	0.21	0.58

Station	Density		Diversity	Design		Distance to transit		Destination accessibility	TOD Index
	Pop. density	Commercial density	Land use diversity	Parking	Public space	Pedestrian (km)	Intersection density	Land use mixedness	
Salak Selatan	0.12	0.42	0.86	0.20	0.00	0.42	0.50	0.04	0.57
Hang Tuah	0.22	0.61	0.88	0.00	0.00	0.27	0.40	0.12	0.56
Chan Sow Lin	0.20	0.46	0.97	0.00	0.00	0.13	0.50	0.11	0.53
Plaza Rakyat	0.16	0.67	0.83	0.00	0.00	0.22	0.30	0.12	0.51
Kerinchi	0.25	0.21	0.88	0.00	0.00	0.16	0.20	0.12	0.40
Universiti	0.25	0.13	0.86	0.00	0.00	0.11	0.30	0.11	0.39

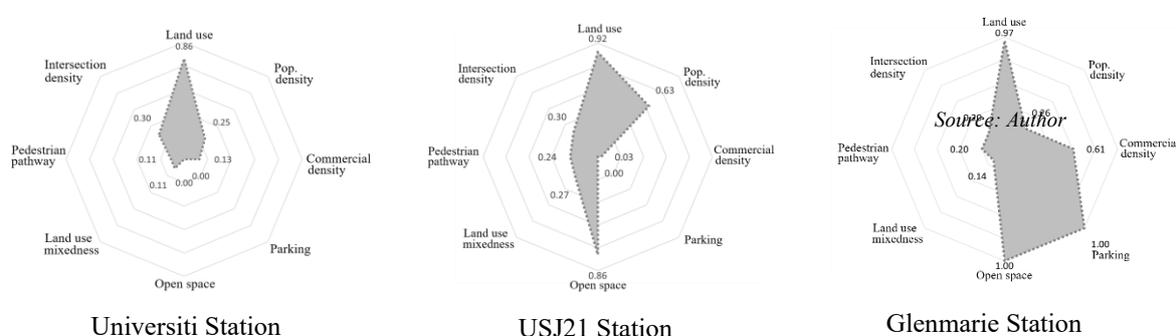


Figure 4: Hexagonal Diagram for the Lowest, Median, and Highest Scores of the TOD Index

Figure 4 illustrates the hexagonal diagrams of the characteristics of the three stations as an example case, which has scored the TOD index's lowest, median, and highest values. Each diagonal corner represents the score for eight (8) station indicators scaled from 0 to 1 in the same standardised technique - Universiti Station scores 0.39, with 0.00 for parking and open space in the design aspect. Located in the major redevelopment area of Kampung Kerinchi into high-rise residential, office towers, and shopping malls, the main land use within the buffer is public facilities and institutions, with a total of 74 hectares. Surrounded by low-cost apartments in a compact area, this station has no provision for parking or urban space as both are components of the built environment, which leads people to walk to the station conveniently. The poor connectivity of the pedestrian walkways to the station contributes to the lowest value for the design aspect.

The median score of the TOD index was 0.72 at USJ21 Station. The same score was also recorded for Bandar Puteri Station and Pandan Jaya Station. The highest indicators were land use (diversity) with 0.92 and open space (design) with 0.86. This station is surrounded by a mix of uses – mosque, shop lots, school, and a neighbourhood mall, all within walking distance. The major

land use development in the buffer area of the station is a medium-density residential type of landed house. While the open spaces are well-designed due to the neighbourhood unit concept, which has been applied in Subang Jaya, which is an old city in Selangor, since the 1970s. The street-grid pattern in USJ is particularly able to disperse traffic and allow for a tremendous variety of route options, which means that the roads are smaller and therefore walkable. This street system concentrates both traffic and destinations such as shop lots, schools, mosques, and parks on large secondary roads.

The highest TOD index score goes to Glenmarie Station. In the future, this station will integrate with Glenmarie 2 as an interchange station for the Shah Alam Line, which is also known as LRT3. The LRT3 project is expected to be fully completed in early 2025. Glenmarie Station has scored the highest for commercial density, land use diversity, parking, and open space provision. It can be said that this station's location is strategically located in between the airport (Subang Airport), adjacent to Kelana Jaya, Subang Jaya, and Shah Alam, and is connected to the Federal Highway. Surrounded by the industrial zone area, services, and commercials, this station has scored the lowest for land use mixedness as the residential land use is only 29.9 hectares, or 14.8%, of the total development area. The distance to the transit aspect of the station also scored the lowest value. From the OSM data, the pedestrian distance within the buffer area was only recorded at approximately 2.8 km from the farthest pedestrian walkway to the station. As the station is located beside the primary road of Jalan Lapangan Terbang Subang and the ongoing construction of the LRT3 line along Persiaran Kerjaya, thus, access by pedestrian walkways is impossible.

CONCLUSION

In conclusion, this study has explored an important key point to highlight the potential benefits of using the TOD index to facilitate TOD planning and implementation in Malaysia, aligning with the ambition to encourage more transit use instead of private vehicles in urban areas. The methodology adopted to calculate the TOD index is relevant, straightforward, and practical, especially in the Malaysian context. The study's findings provide valuable insights into the TOD potential of these LRT stations in Malaysia. Malaysia needs to align its policies and investment opportunities with TOD principles to capitalise on the benefits of TOD. This includes implementing appropriate land use zoning, promoting mixed-use developments with the right density and intensity of development near transit stations, improving pedestrian and cycling infrastructure, and enhancing connectivity between transit modes. Besides, Malaysian cities can implement the TOD concept, as their location is more robust. In recent years, this country has strived for a better public transportation system to face crucial urban challenges.

Since this study on the TOD index has been completed to measure 69 station areas for the first instance in Malaysia, there are no references available in the literature. Yet, the ridership statistic data must be corroborated in future research of the case stations with their TOD index to better understand the station's potential. The analysis of the 69 LRT stations revealed that the overall TOD level in the city is good, with 49 stations scoring above 0.71 on the TOD Index. The high-scoring stations were predominantly located in the sub-city and neighbourhood centres, indicating the significance of population density and employment opportunities in shaping the TOD level. Some stations, such as Glenmarie, Bukit Jalil, IOI Puchong, and Sungai Besi Station, exhibited potential for further development and redevelopment.

At the same time, it is envisaged that more data, such as employment density and investment or business value, will be collected and made accessible for TOD index calculations. Statistical data at a more in-depth level would also lead to higher accuracy in results. One can use this TOD index approach to plan for higher transit connectivity at the high-potential stations and lines and higher TOD levels around the extant transit nodes. The availability of passenger counts per station has also helped to highlight stations that would benefit from better access and a better-built environment for high-quality transit.

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POVERTY AND WELL-BEING: THE SUBJECTIVE WELL-BEING STATUS OF POOR CHILDREN IN KUALA LUMPUR, MALAYSIA

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Abstract

Poverty has a devastating impact on the subjective well-being of urban children. Policymakers, social workers, economists, and researchers employ subjective well-being measurement in policy formulation, improving living conditions, and welfare, and addressing the essential needs, health, environmental, social relationship, and emotional and psychological needs of poor children. Subjective well-being indicators consist of dimensions such as life satisfaction affects life experience, emotion, psychological well-being, and social relationship well-being. All these indicators are crucial in understanding children's needs, and important in policy formulation. This paper will discuss the subjective well-being of poor children in Kuala Lumpur, Malaysia. The discussion can be a direction for future researchers to conduct a similar study.

Keywords: Subjective well-being, Child subjective well-being, poverty, well-being

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INTRODUCTION

Poverty and subjective well-being are two interconnected concepts that are often studied in the field of social sciences. Poor children are among vulnerable groups that need attention from adults such as policymakers, social welfare providers, social workers, scholars, and researchers in addressing their needs and well-being. According to Save the Children nearly 1.2 billion children live in poverty with hundreds of million children remaining multidimensionally poor (Save the Children, 2023). In Malaysia Gross Domestic Product (GDP) and Poverty Line Index (PLI) were used to measure the level of well-being and policy formulation. This is because it is linked to the standard of living indicators such as income (Reinhart et al, 2010). However, economic and material measurement such as GDP, and PLI was not designed to measure welfare, quality of life and well-being of the society (Kapoor et al, 2019). Economic measurements such as GDP and PLI were designed to measure income level and not purposely to measure the perception and experience of individuals living in poverty. Living in poverty has a significant impact on the subjective well-being of poor children. According to Chen (2020), family income level and poverty were found associated with low-level of subjective well-being such as life satisfaction, and happiness.

Individuals living in poverty often face various challenges and hardships, such as limited access to education, healthcare, housing, and employment opportunities (Main, 2019). These material deprivations can contribute to feelings of stress, insecurity, and dissatisfaction, which can negatively affect subjective well-being (Gross-Manos & Bradshaw, 2022). Furthermore, poverty can lead to social exclusion, low-degree of subjective well-being such as feeling of guilt, shame, and a sense of powerless, all negative effects that can lead to low-degree of subjective well-being (Abu Bakar & Osman, 2021; Boardman et al., 2022). The experience of poverty can create a cycle of deprivation, where individuals may find it difficult to escape poverty due to limited resources, lack of opportunities, and the negative psychological effects it has on their well-being. In this paper, the researcher will explain the impact of poverty on the subjective well-being of poor children. The results of this study will be used to formulate an intervention policy framework to improve the subjective well-being of urban poor children in Malaysia. Subjective well-being measurement is important to ensure their healthy development, mental health, education, social relationship, and policy formulation. Assessing the subjective well-being of children will offer insight into how people and the community experience the aspect of their life.

LITERATURE REVIEW

The Subjective Well-being Definition

Subjective well-being (SWB), refers to self-reported well-being, refers to how people evaluate their experience and evaluate different aspects of their lives, includes negative and positive affect. The subjective well-being measurement is often used in measuring the degree of mental health status, and happiness, and it can be influences factor to individual well-being, individual health, wellness, and longevity (Abu Bakar, 2022; Cherry, 2023). According to Diener et al., (1999) and OECD (2013), subjective well-being refers to how people experience and evaluate their own lives based on their perception and insight (Diener et al., 1999). According to Diener (2021), subjective well-being is a scientific term referring to the happiness and life satisfaction of people, individuals, or communities. The degree of subjective well-being is influenced by both internal and external factors. Diener added internal factors such as inborn temperament, resilience, personality, and outlook, and external factors such as the society and community in which they live, social relationships, their ability to meet their basic needs, material and social resources, and desirable society is associated with the level of subjective well-being. Evidence proves that communities and people with a high level of subjective well-being are healthier, sociable, more productive, and have better citizenship as compared to those with low-level subjective well-being (Diener & Tay, 2012). These statements show that community and people with high-level subjective well-being have a better manners, health, and behaviour. The level of subjective is determined or measured by three elements namely:

- Life satisfaction (LS)
- Affect (Life Experience)
- Eudaimonia or Eudemonic well-being (psychological “flourishing”).

These three elements are crucial to measuring the subjective well-being of the community. According to Anand (2016), life satisfaction (LS) in subjective well-being is measuring and assessing people's moods, emotions, and how they feel about their directions and options for the future. It is a measure of subjective well-being in terms of feeling, mood, satisfaction with social relationships, achieved goals, self-concept, and self-perceived ability to cope with daily life (Gilman & Huebner, 2003; Abu Bakar et al., 2016). Many factors contribute to individual and community life satisfaction such as work, romantic relationships, social relationships with family and friends, personal development, health, wellness, and other factors that contribute to life satisfaction (Ackerman, 2021). People or communities with high life satisfaction typically experience good moods, good emotional states, good social relationships with family, friends, and peers, have a set of goals, and can cope with daily life problems (Figure 1).



Figure 1: Subjective-being measurement

METHODOLOGY

Study Design

The quantitative research method was employed by the researcher to collect raw data in this study. The method is used because it is more efficient to explore, observe, and gather opinion in more details on the issues (Lyubomirsky, Sheldon & Schkade, 2005). The self-report technique allows children to give their views based on their perspective without disturbance from any other party such as their parents.

Location, Population, and Sample of The Study

This study involved 360 poor children aged from 9 to 17 years old. The respondents were selected from three social housing programs built by the government for the poor, which are the People's Housing Program (PPR). Three housing programs namely PPR of *Lembah Pantai Kerinchi Kuala Lumpur*, PPR Pantai Ria, and PPR Pantai Mulia were selected as a study location. The researcher also select children from Sekolah Bimbimbang Jalanan Kasih (SBJK) and Buku Jalanan Chow Kit Kuala Lumpur, Malaysia. The chosen all these locations because it's populated by urban poor children.

Sampling Technique

Multistage sampling technique employed by the researcher to select the geographical location of the study, housing program, study area and children as a respondent of the survey. Firstly, the researcher employed purposive sampling technique to choose the geographical location of the study. For the purpose, *Kelantan, Kuala Lumpur* and *Selangor* were chosen as the geographic location of the study. The researcher was also purposive sampling technique to select three-housing program. In the second stage, the researcher employed the convenience sampling method to select housing area in three states and social

housing programs. For the final stage, simple random sampling technique was employed to select its 303 respondents, which resulted in 80 children sample from PPR Lembah Pantai Kerinch, 80 children from PPR Pantai Ria, 80 children from PPR Pantai Mulia, 50 children from *Sekolah Bimbingan Jalinan Kasih* (SBJK), and 13 children from Buku Jalanan Chow Kit.

Research Instrument and Data Collection

A research instrument: namely the “Subjective well-being of urban poor children” was designed by the researcher based on the social indicator approach and socially perceived necessities methodology. Items in the research instrument was inspired by the Child Perception and Experiences of Deprivation from Swords et al., (2011), UNICEF's Child Well-being Index and Child Indicators Index by Bradshaw et al., (2007). The researcher employed five like scale that used in measuring the subjective well-being of urban poor children namely “never”, “occasionally”, “sometimes”, “Always” and “Frequent”. The instrument was self-administered. However, the researcher will assist the respondents if they are illiterate, and face some form of disability, and challenges.

Data Analysis

The Statistical Package for Social Science (SPSS) version 27.0 was used to analyze the raw data acquired in this study.

Research Ethic

All procedures involving human subjects were conducted in accordance with the ethical standards of the Code of Research Ethics University of Malaya (CREUM). The researcher has received approval from CREUM committee member prior conducting this study. The code of ethics ensures this study follows the high standards of excellence and morality in the research activities. Apart from that, ethical consideration in research with children and young people is required at all stages of the research process.

Children are considered as a vulnerable group that needs to go through ethical guidelines to ensure they are safe from harm, exploitation and protect their rights. Researching with children necessitates obtaining children's consent in the respect of children's rights, and their capability to express their views to have these heard in matters that affect them. The consent can be obtained from parents, carers, and guardians of the children. This must be given voluntarily and be renegotiable, so that children may withdraw at any stage of the research process (Ethical Research Involving Children, 2019).

Participation of the children in this study was voluntary. Before answering the questionnaire, the researchers obtained written permission from the parents. The mother/father signed a consent form as a pledge that they allow

their children to participate in the study. All the raw data received in this study were kept safe and only are accessible to the researcher. The principle of confidentiality is one of the pillars of research ethics. The primary purposes of the code of confidentiality are to protect the anonymity and confidentiality of participants, to minimize the risk of harm, to obtaining informed consent, to avoiding deceptive practices when designing research, and to provide participants with the right to withdraw from the research at any time (McLeod, 2015).

RESULT AND DISCUSSION

Demographic Profile

Table 1 displays demographic profile of the respondents in this study. The results of the study found that the majority or 129 (42.6%) of the respondents were within the age of 10-12 years old. About 100 (33.0%) of the respondents were within the age of 13-15 years old and 74 (24.4%) of the respondents were within the age of 16-18 years old. This study found that Males 155 (51.2%) were more than females 148 (48.8%) involved in this study. Table 1 revealed that 265 (87.5%) of the total sample are Malays, 15 (5%) Sarawak and Sabah Bumiputera, 15 (5%) others race and ethnicity, 5 (1.7%) Chinese, and 3 (1%) Indian. This finding can be associated with the ethnic majority in Peninsular Malaysia. The demographics composition in the country shows that 50.4 per cent of the total population are Malays ethnic group. It no doubts that Malays are the majority ethnic group was involved in this study.

The researcher was asked about their religion it was found that out of the total sample 291 (96.0%) were Muslim, 7 (2.3%) Buddhist, 4 (1.3%) Christian, and 1 (0.35) Hindus. In relation to these findings, Malaysia contains of 61.3 per cent of population practise Islam and no doubts most of the study sample in this study are Muslim. The below table displayed that out of 303 sample, 182 (60%) respondents living with their fathers, mothers, and siblings.

The findings also discovered that 38 (12.5%) of the study sample living only with their fathers and mothers, 22 (7.3%) living with caregivers, 17 (5.6%) living with only fathers, 12 (4%) living with only mothers, 12 (%) living with others person/individual, 8 (2.6%) living with mothers and stepfathers, 7 (2.3%) living with friends, 4 (1.3%) living with fathers and stepmothers and 1 (0.3%) living with their siblings.

These findings indicate that, most of the respondents are from the nuclear family background which is contains of father, mother, and children. Statistical analysis also found that 201 (66.3%) of the total respondents were living in permanently in own home and another 102 (33.7%) renting (moving in and out due to not owning a home).

The results of the study show that most of the respondents in this study living in own home although they involve in street life. Based on Table 1, 153

(50.6%) of the respondents lived in 4 to 6 family, 58 (19.1%) lived in 7 to 9 family members, 48 (15.5%) lived in 1 to 3 family members, 40 (13.3%) lived in 10 to 12 family members, and 4 (1.3%) lived in 13> family members. This study also found that 150 (49.5%) of the children were from RM1001 – RM2,500 household income.

Table 1: Demographic Profile of the Respondents

Variables	Number (n=303)	(%)
Age Group:		
▪ 10-12	129	42.6
▪ 13-15	100	33.0
▪ 16-18	74	24.4
Gender:		
▪ Male	155	51.2
▪ Female	148	48.8
Race and Ethnicity:		
▪ Malays	265	87.5
▪ Sarawak & Sabah Bumiputera	15	5.00
▪ Others	15	5.00
▪ Chinese	5	1.70
▪ Indian	3	1.00
Religion:		
▪ Muslim	291	96.0
▪ Buddhist	7	2.30
▪ Christian	4	1.30
▪ Hindus	1	0.30
Place of Residents:		
▪ Fathers and Mothers, and Siblings.	182	60.1
▪ Fathers and Mothers	38	12.5
▪ Living with caregivers	22	7.30
▪ Only fathers	17	5.60
▪ Only mothers	12	4.00
▪ Others:	12	4.00
▪ Mothers and stepfathers	8	2.60
▪ Living with friends	7	2.30
▪ Fathers and stepmothers	4	1.30
▪ Living with siblings	1	0.30
Housing Status and Stability:		
▪ Living in permanently in own home	201	66.3
▪ Renting (Moving in and out due to not owning a home)	102	33.7

Variables	Number (n=303)	(%)
Family Members Numbers:		
▪ 1-3 person	48	15.8
▪ 4-6 person	153	50.6
▪ 7-9 person	58	19.1
▪ 10-12 person	40	13.3
▪ 13>	4	1.30
Family income:		
<RM1,000	50	16.5
RM1001 – RM2,500	150	49.5
RM2501 – RM3,500	100	33.0
RM3,501 – RM5,000	3	1.00
RM5,001>	0	0.00

Subjective Well-being of Poor Children in Malaysia

The researcher has divided the measurement of subjective well-being of urban poor children into two measurements, namely:

- i) Psychology and emotional well-being of poor children, and
- ii) Life experience of poor children

Psychology and Emotional Well-Being of Poor Children

Psychology and emotional well-being come from happiness and life satisfactions perspective with positive and negative psychology affects. According to WHO individual with positive psychology and emotional will allows individuals to fully engage with other, know how to cope with stress of life and realise their abilities (Liddle & Carter, 2015).

Table 2 display that 139 (44.8%) of the respondents reported they always feeling sad, 125 (40.3%) reported frequent feeling fear, 125 (40.3%) reported do not feel safe or peace, 119 (38.4%) reported frequent experiencing depression, 105 (33.9%) reported they always feeling anxiety, 104 (33.5%) reported they always feeling life is meaningless, 104 (33.5%) reported they always feeling lonely, 103 (33.2%) reported they frequent traumatic, and 96 (31.0%) reported they not happy with their life. This finding explained that urban poor children in this study experiencing multiple negative psychology and emotional well-being as result of living in poverty.

Table 2: Psychology and Emotional Wellbeing Status

Variables	Never (n=303/%)	Occasionally (n=303/%)	Sometimes (n=303/%)	Always (n=303/%)	Frequent (n=303/%)
Depression	69 (22.3)	63 (20.3)	29 (9.40)	23 (7.40)	119 (38.4)
Anxiety	52 (16.8)	50 (16.1)	20 (6.50)	105 (33.9)	76 (24.5)
Fear	63 (20.3)	59 (19.0)	45 (14.5)	11 (3.50)	125 (40.3)
Insomnia	107 (34.5)	119 (38.4)	50 (16.1)	22 (7.10)	5 (1.60)
Irritable	86 (27.7)	109 (35.2)	46 (14.8)	46 (14.8)	16 (5.20)
Always sad	69 (22.3)	59 (19.0)	28 (9.00)	139 (44.8)	8 (2.60)
Not happy	74 (23.9)	86 (27.7)	34 (11.0)	13 (4.20)	96 (31.0)
Lonely	125 (40.3)	56 (18.1)	15 (4.80)	104 (33.5)	3 (1.00)
Traumatic	67 (21.6)	30 (9.70)	12 (3.90)	91 (29.4)	103 (33.2)
Lack of confident	112 (36.1)	57 (18.4)	23 (7.40)	102 (32.9)	9 (2.90)
Frustrated	148 (47.7)	87 (28.1)	39 (12.6)	28 (9.00)	1 (0.30)
life is meaningless	99 (31.9)	57 (18.4)	35 (11.3)	104 (33.5)	8 (2.60)
Do not feel safe/peace	124 (40.0)	36 (11.6)	15 (4.80)	125 (40.3)	3 (1.00)
Blaming fate/destiny	220 (71.0)	44 (14.2)	17 (5.50)	19 (6.10)	3 (1.00)

Life Experience of Poor Children

In this section the researcher will interpret the findings of life experience of poor children with their family, peer and friends, school, and community. Table 3 to Table 6 display the findings for life experience of street children with family/caregiver, peer/friends, school, and society/community.

For the life experience of poor children with family and caregiver (see table 3), the study found that 95 (30.6%) reported occasionally beaten by their family, 77 (24.8%) of the respondents reported their family never support them, 76 (24.5%) reported their family never help them, 53 (17.1%) reported ignored by their family, and 36 (11.6%) occasionally emotional abused by their family.

Table 3: Life Experience of children with Family and Caregiver

Variables	Never (n=303/%)	Occasionally (n=303/%)	Sometimes (n=303/%)	Always (n=303/%)	Frequent (n=303/%)
Beaten	124 (40.0)	95 (30.6)	67 (21.6)	15 (4.80)	2 (0.60)
Don't like spending time with parents	218 (70.3)	50 (16.1)	20 (6.50)	12 (3.90)	3 (1.00)
Ignored	226 (72.9)	53 (17.1)	22 (7.10)	2 (0.60)	0 (0.00)
Unloved	232 (74.8)	44 (14.2)	18 (5.80)	9 (2.90)	0 (0.00)
Hate to family	259 (83.5)	32 (10.3)	9 (2.90)	3 (1.00)	0 (0.00)
Sexual harassment	271 (87.4)	19 (6.10)	3 (1.00)	9 (2.90)	1 (0.30)

Variables	Never (n=303/%)	Occasionall y (n=303/%)	Sometimes (n=303/%)	Always (n=303/ %)	Frequent (n=303/%)
Family always supports me	77 (24.8)	70 (22.6)	45 (14.5)	76 (24.5)	35 (11.3)
Family always helps me	76 (24.5)	65 (21.0)	46 (14.8)	82 (26.5)	34 (11.0)
Emotional abused	236 (76.1)	36 (11.6)	27 (8.70)	4 (1.30)	0 (0.00)
Sexual abused	295 (95.2)	7 (2.30)	1 (0.30)	0 (0.00)	0 (0.00)
Don't trust parents	264 (85.2)	28 (9.00)	8 (2.60)	2 (0.60)	1 (0.30)

As shown in Table 4 only small number of the respondents experiencing negative life experience with peers and friends. For instance, out of 303 (100%) of the total respondents, 82 (26.5%) mentioned that they occasionally humiliated by peers or friends, 81 (26.1%) mentioned that they occasionally excluded by peers or friends, 70 (22.6%) reported they occasionally bullied by peers or friends, 59 (19.0%) reported occasionally beaten by peers or friends, and 12 (3.90%) reported occasionally being sexual harassment victim. This finding implies that, most of the respondents experiencing positive life experience with peers and friends.

Table 4: Life Experience of children with Peers/Friends

Variables	Never (n=303/%)	Occasionall y (n=303/%)	Sometimes (n=303/%)	Always (n=303/ %)	Frequent (n=303/%)
Humiliated	163 (52.6)	82 (26.5)	39 (12.6)	15 (4.80)	4 (1.30)
Excluded by friends/peers	185 (59.7)	81 (26.1)	25 (8.10)	10 (3.20)	2 (0.60)
Bullied	175 (56.5)	70 (22.6)	38 (12.3)	18 (5.80)	2 (0.60)
Encourage to engage in antisocial behaviour	221 (71.3)	41 (13.2)	30 (9.70)	11 (3.50)	11 (3.50)
Beaten	229 (73.9)	59 (19.0)	9 (2.90)	4 (1.30)	2 (0.60)
Sexual Harassment	287 (92.6)	12 (3.90)	4 (1.30)	0 (0.00)	0 (0.00)

Table 5 revealed life experience of poor children with the school. Based on Table 3, most poor children in this study experiencing positive life experience with school compared to negative life experience.

Table 5: Life Experience of children with School

Variables	Never (n=303/%)	Occasionally (n=303/%)	Sometimes (n=303/%)	Always (n=303/%)	Frequent (n=303/%)
Feeling safe	41 (13.2)	73 (23.5)	57 (18.4)	85 (27.4)	47 (15.2)
Teacher always helps me	63 (20.3)	71 (22.9)	54 (17.4)	86 (27.7)	29 (9.40)
Classmate always help me in lesson	78 (25.2)	76 (24.5)	57 (18.4)	68 (21.9)	24 (7.70)
Teacher always supports me	60 (19.4)	73 (23.5)	60 (19.4)	79 (25.5)	31 (10.0)
Classmate/schoolmate support me	91 (29.4)	73 (23.5)	53 (17.1)	67 (21.6)	19 (6.10)
Excluded by teacher	229 (73.9)	35 (11.3)	15 (4.80)	18 (5.80)	6 (1.90)
Excluded by classmate/schoolmate	223 (71.9)	46 (14.8)	20 (6.50)	12 (3.90)	2 (0.60)
The teacher always humiliates me	268 (86.5)	25 (8.10)	6 (1.90)	4 (1.30)	0 (0.00)
Classmate always humiliates me	230 (74.2)	38 (12.3)	28 (9.00)	3 (1.00)	4 (1.30)
Bullied	232 (74.8)	41 (13.2)	21 (6.80)	6 (1.90)	3 (1.00)
Beaten	252 (81.3)	28 (9.00)	16 (5.20)	5 (1.60)	2 (0.60)
Sexual harassment by class/schoolmate	288 (92.9)	8 (2.60)	2 (0.60)	3 (1.00)	2 (0.60)
Sexual harassment by teacher	293 (94.5)	8 (2.60)	1 (0.30)	1 (0.30)	0 (0.00)

From 303 (100%) of the respondents only 91 (29.4%) of the respondents were reported that their classmate/schoolmate never support them in the school, 78 (25.2%) were reported that their classmate never help them in lesson, 63 (20.3%) were reported teacher never help them in lesson or in school, 41 (13.2%) reported occasionally bullied by their peers or friends, 41 (13.2%) reported never feeling safe in the school, 38 (12.3%) their classmate occasionally humiliate them, and 28 (9%) reported occasionally being beaten by their school friends or mates.

Lastly, Table 7 revealed life experience of poor children with society or community. Out of 303 (100%), 171 (55.2%) of the respondents reported never supported by society or community, 163 (52.6%) reported never assisted by society or community, 77 (24.8%) reported they occasionally humiliated by society or community, 34 (11%) were reported occasionally excluded by society or community, 34 (11%) reported occasionally beaten by society or community, and 14 (4.5%) reported being a sexual harassment victim. This study expressed that, most of the respondents in this study experiencing positive life experience with society or community, even though there are two item shows high percentage for negative life experience (i.e., never supported by society or community and never assisted by society or community).

Table 6: Life Experience of children with Society/Community

Variables	Never (n=303/ %)	Occasionally (n=303/%)	Sometimes (n=303/%)	Always (n=303/%)	Frequent (n=303/%)
Humiliated	197 (63.5)	77 (24.8)	21 (6.80)	3 (1.00)	5 (1.60)
Excluded by society/community	247 (79.7)	34 (11.0)	15 (4.80)	4 (1.30)	3 (1.00)
Beaten	252 (81.3)	34 (11.0)	11 (3.50)	3 (1.00)	3 (1.00)
Sexual harassment	286 (92.3)	14 (4.50)	3 (1.00)	0 (0.00)	0 (0.00)
Touched in the private part	285 (91.9)	10 (3.20)	3 (1.00)	5 (1.60)	0 (0.00)
Supported by society/community	171 (55.2)	62 (20.0)	44 (14.2)	20 (6.50)	6 (1.90)
Assisted by society/community	163 (52.6)	68 (21.9)	54 (17.4)	16 (5.20)	2 (0.60)

Pearson Correlation and Multiple Regression Analysis

In this study, the researcher has employed Pearson correlation and multiple regression analysis to find the influence factor to subjective well-being of urban poor children. The study found that (see Table 7) only one variable recorded a strong significant correlation at the level of 0.05* parents and caregiver working status with subjective well-being of urban poor children ($r = .358, p = .048$). For the other six variables, the Pearson Correlation test demonstrated a positive significant correlation at the level of 0.01** between housing physical environment ($r = -.446, p = .000$), emotional and psychological wellbeing ($r = .389, p = .000$), life experience with peers ($r = .238, p = .000$), life experience with school ($r = .290, p = .000$) with the subjective well-being or urban poor children. The findings of Pearson correlation analysis show that housing environment, emotional and psychological problems, and life experiences with peers and school influence street children’s involvement in risk behavior.

Table 7: Pearson Correlation Analysis between Influences Factors and Street Children's Involvement in Antisocial Behaviour

Variable	R	P
Parent's and caregiver's working status	.358*	.048
Housing physical environment	-.446**	.000
Emotional and psychological wellbeing	.389**	.000
Life experience with family	.052	.371
Life experience with peers	.238**	.000
Life experience with school	.290**	.000
Life experience with community	.095	.099

Note: * Correlation is significant at the level 0.05 level (1. tailed).

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

The multiple regression model (see Table 8) in the model summary table reveals R2 value is .448, which means that the influencing factor explains 44.8 per cent of subjective well-being variance. The other 55.2 per cent were influenced by other factors that are not covered in this study. Overall, the model fits reveal that independent variables statistically significantly predict the dependent variable ($F(7, 23) = 2.672, p < .035$).

Table 8: Summary Results of Regression Model Influence Factors to Subjective Well-being of Urban Poor Children

Model	Unstandardized Coefficients		Standardized	t	p
	B	Std. Error	Beta (B)		
Constant	-47.730	42.356		-1.127	.271
Parents working status	5.853	3.250	.327	1.801	.085
Housing environment	1.386	2.346	.132	.590	.561
Emotional and Psychological wellbeing	.862	.547	.314	1.575	.129
Life experience with peers	-3.172	1.500	-.609	-2.114	.046
Life experience with school	1.068	.576	.329	1.854	.077

Note: Dependent Variable = Risk Behaviour; $R = .670$; $R^2 = .448$; Model Fits = $F(7, 23) = 2.672, p < .035$; parents working status = $B = .327, t = 1.801, p = .085$; housing environment = $B = .132, t = .590, p = .561$; emotional and psychology wellbeing = $B = .134, t = 1.575, p = .129$; life experience with peers = $B = -.609, t = -2.114, p = .046$; life experience with school = $B = .329, t = 1.854, p = .077$.

These results imply that the regression model is well fit to predict the subjective well-being of urban poor children. Concerning this, the Coefficients model reveals that parents working status ($B = .327, t = 1.801, p = .085$), housing environment ($B = .132, t = .590, p = .561$), emotional and psychological wellbeing ($B = .134, t = 1.575, p = .129$), life experience with school ($B = .329, t = 1.854, p = .077$) were not significantly predicted the subjective well-being of urban poor children. Otherwise, life experience with peers ($B = -.609, t = -2.114,$

$p = .046$) significantly influencing the subjective well-being of urban poor children.

CONCLUSION

Poor children in this study reported that they frequently experienced psychological and emotional problems such as depression, anxiety, and trauma. They also reported occasionally being beaten by their family, humiliated by peers, and never supported by classmates and community. The result of the study also found that most of poor children reported that they have a chance to spend their time with friends/peers, family, school, and community. These findings indicated that living in poverty does not affect children social relationship. These findings can be used as a guideline for future researcher, policymakers, and child social services provider in policy and social services formulation for poor children.

COMPLIANCE WITH ETHICAL STANDARDS

Conflict of Interest: I have received research funding from the University of Sultan Zainal Abidin (UniSZA) under research grant Dana Penyelidikan Universiti (DPU 1.0). This funding covered the cost of data collection and analysis.

Ethical Approval: All procedures performed in this study involving human participants were in accordance with the Ethical Standards of the University of Malaya Research Ethics Committee. No animals were harmed in the process of conducting this research.

Informed Consent: Informed consent was obtained from all participants over the age of 18. Informed assent (with parental/guardian informed consent) was obtained from children and adolescents under the age of 18

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request. Data sharing complies with Planning Malaysia Journal data sharing policy. Access to data is subject to ethical and privacy considerations.

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ENVIRONMENTAL FLOW ASSESSMENT MODEL ON SUSTAINABILITY PLANNING STRATEGIES, KENYIR LAKE BASIN, MALAYSIA

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Abstract

The study presents the Environmental Flow Assessment (EFA) model on sustainability planning strategies to reduce damage in the main area of Kenyir Lake Basin. The XPSWMM model have been used to simulate the EFA in this study. Based on simulation in the Terengganu River, which has a most effective discharge of 42.78 m³/s with depth on 3.94 m and a water velocity of 0.54 m/s, which are expected to meet the development needs of fish species, the analysis for both study rivers found the minimum river discharge values with the frequency probability in the period of 20 years needs to be maintained. While, based to the simulation in the Petuang River, the maximum discharge is only 0.08 m³/s, the maximum depth is 0.4 m, and the maximum water speed is 0.04 m/s, which is adequate for a small number of small-sized fish species. With output deficiency of less than 20% from an actual situation, the two lowest values later obtained were adopted as input in low flow analysis. A more effective management approach ensures the ecosystem's sustainability and maintains an optimal equilibrium among the many uses. Environmental flows aren't considered a luxury but instead an integral component of contemporary water management given the global misuse of water resources and the resulting degradation of ecosystems and their functions. It is a strategy that requires widespread adoption.

Keywords: Environmental Flow Assessment (EFA), Sustainability planning, Mitigation Strategies, Kenyir Lake Basin, XPSWMM

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INTRODUCTION

The peak discharge, the amount of time it takes for the flood to reach its height, and runoff all appear to be increased by logging or other land uses that alter the natural ecosystem within the context of development, such as a forest reserve or a planting area inside a drainage basin. Although forestry is a significant source of livelihood it also contributes to the degradation of river basins by increasing sedimentation issues along river basins due to high soil erosion caused by increased surface runoff and contamination of the lake alongside chemicals and fertilizer. There is an indirect rise in the concentration of chemicals in the water and sediment throughout the river basin (Pokhrel et al., 2018; Mustaffa et al., 2023). According to Kamarudin et al. (2019), the hydrological processes and the causes of floods are significantly impacted by changes in land use in urbanising watersheds. These floods occur more frequently, and increasing flood volumes may adversely affect the public more severely. Therefore, the planning, design, and construction of roads, stormwater drains, and other structures must take these distinctive river or drainage systems into consideration. Poor drainage planning is frequently a factor in property failure or significant damage, including to stormwater drainage systems that can remove water. Considering that it reduces surface erosion, the approach of increasing forest canopy density was a very effective means of reducing erosion and higher flow, which contribute to the sedimentation and flood phenomenon (Al-Ghadi et al., 2020).

The “Act of Nature” and “Act of Human” determine the fate of the river ecosystem sustainability, known as the source of disruptions and alteration resulting in deleterious and degradation effects on the environmental ecosystem. The ecological integrity of the river will be compromised if a change is made to a component of the flow regime. Almost all the users dependent on the flow are affected by a change in the flow regime and significant changes in the flow may have negative effects, notably for the permanent change (Vigiak et al., 2018). This is also evident in other sectors such as tourism where the ecological integrity of the river-based destination for instance, might be compromised and thus degrading the place sustainability and economic performance (Azinuddin et al., 2022). Based on this premise, the flow regime has been viewed by many aqualogists as a key component of the ecosystems of the river and the floodplain. There are four key principles to highlight the necessary of mechanisms in the integrated of hydrology and aquatic biodiversity components affected by the alteration of flow regimes characteristics. The first principle is “Flow and habitat preferences” as flow is a major element of physical habitat in streams, which affect the habitat complexity and change the biotic diversity. Secondly is “Adaptation to disturbance” as the temporary or permanent disturbance effects during the critical stage and its depends on the species’s survival strategies. Then, the third principle is “Connectivity” as the water abstraction or regulating structure limits the free moving ability (natural patterns of longitudinal and lateral

connectivity) and affect the migratory and recruitment success of species. Lastly, the fourth principle is “Exotic species succession” as the modified of flow regime characteristics favored by the exotic and introduced species in rivers (Bunn and Arthington, 2002) (Refer Figure 1).

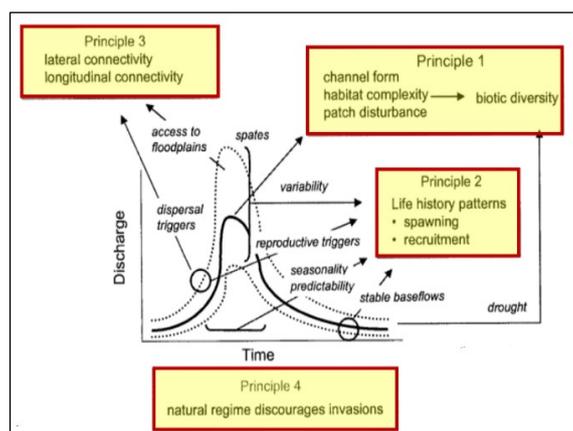


Figure 1: Flow Regime Components Play Different Role in Sustaining the Equilibrium State of Ecological Integrity

Source: Bunn and Arthington, 2002

The hydrological and hydraulic models provide thorough analysis for hydraulic transports, flood resilience projects, and hydraulic structures like dams and reservoirs. It must be constructed to a high standard and suitable for the intended use. It is possible to simulate how precipitation moves from the surface through structures and facilities to the water receipt using the important, complicated urban stormwater model known as XPSWMM. The floods, water resources, and water quality scenarios have all been simulated using this software, which was created by MWH Soft Ltd. in Australia. The model can replicate either a single occurrence or a series of events. Storm water management systems' hydraulic and hydrologic components are represented using a 1-dimensional model. The drainage system was represented using XPSWMM using a node-link concept based on the cross-sectional data that was gathered. Similar to connections, nodes represent the system's hydraulic flow components, and the model offered a variety of additional conduit types for modelling, including sewer pipes, the channel reaches, or culverts, and nodes, which could represent lakes, ponds, junctions, or other physical transition sites along the links. The river was modelled as a network of conduits with a weir added, creating numerous links (Dao et al., 2022). This study was conducted in Terengganu River (outlet river of Kenyir Lake) and Petuang River (inlet river of Kenyir Lake). It is located within latitude (between 5°01'57.3"N until 5°14'149.9"N) and longitude (between

102°55'37.6"E until 102°39'37.4"T). In order to facilitate the analysis of the E-Flow, these two study areas will be divided into three sampling sub stations, namely Terengganu River I, Terengganu River II, Terengganu River III, Petuang River I, Petuang River II and Petuang River III. Besides that, the study was conducted for two seasons as September 2018 (covering the dry season as Low Flow Scenario Model) and July 2019 (covering the normal season as Basic Scenario Model). Figure 2 showed the specific coordinate and map location of each sampling station.

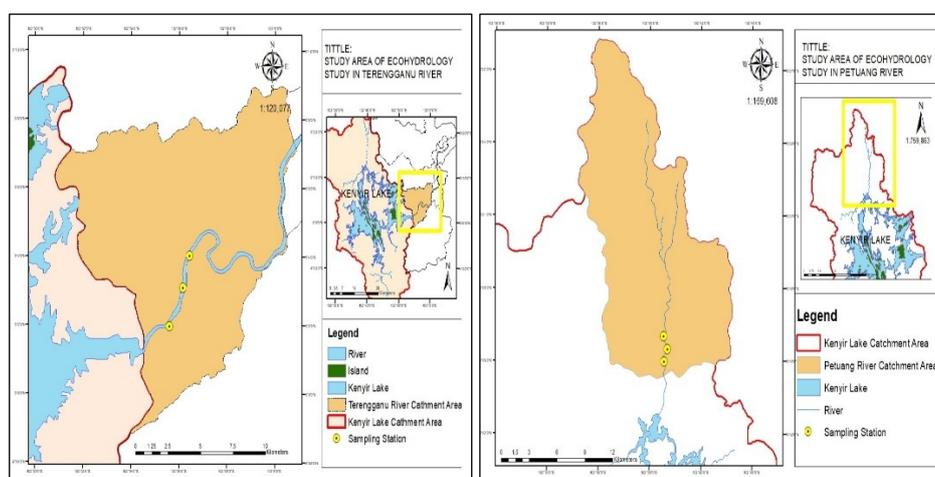


Figure 2: Sampling Location in Terengganu River (outlet of Kenyir Lake) and Petuang River (inlet of Kenyir Lake)

RESEARCH METHODOLOGY

This investigation applies flood modelling that combines hydrology with hydraulic modelling using XPSWMM to two major river systems in the study areas: the Terengganu River (the lake basin's outlet) and the Petuang River (the lake basin's inlet). The monsoon flood, which can occur multiple times annually, is the type of flooding that is regularly encountered in the study region. The hydrodynamic modelling of the water level and discharge in this study incorporates the river geometry system and flood plain zones. The upstream inflow hydrograph produced by Runoff Mode is used in hydrology hydraulic modelling to carry out hydraulic routing of flood flow in the network of rivers at research regions. The area that is most vulnerable to flooding under different scenarios (both present and future) will be determined by the simulated water surface profile and discharge. The three model simulations' modelling scenarios will encompass the research area's present and future conditions as well as any existing and proposed future mitigation measures.

The average recurrence interval (ARI) design peak Q will be used as the basis for the model scenario. According to Hassan et al. (2019), the Rational Method is the most popular technique for calculating flow peaks. Utilising Average Recurrence Interval (ARI), one of these experimental approaches may enhance flash flood forecasting by adding another way to describe flash flood events as they take place. According to numerous studies, rainfall ARIs can be calculated in real-time to more effectively convey the severity of a flood as it develops. These initiatives have made it possible for the NWS weather forecast office to operate with real-time rainfall ARI estimations. On the best way to apply this new knowledge, however, there hasn't been much research. A hydrological hydraulic projection model with the proposed development of projects without mitigation strategies has been simulated to reflect the worst-case scenario in the proposed project locations. This model is based on 100-year average recurrence interval (ARI) design peaks Q and current geometric river survey data. It should be noted that the model simulates both low and high flows, which were accurately calibrated earlier. The flow value at the time of sampling was chosen as the basic scenario for the simulation. The low flow analysis produced by the ARI computation was the extra base scenario that was chosen. It is a fundamental tenet that other variable elements, such as river upstream moisture, have an impact on the ARI of the flow. It is advised that drainage system performance be evaluated to ensure satisfactory performance, regardless of the design foundation (Bayat et al., 2019). The on-site drainage system for the areas undergoing redevelopment must be planned so that the predicted peak flow rate from the site for the design ARI of the acquiring minor system is no higher than what would be anticipated from the current construction (Bayat et al., 2019). Figure 3 showed the *node* and *link* of each sampling station in Terengganu River and Petuang River in simulation modelling of all stations at Kenyir Lake Basin. There are three *link* which are represent the classification of four location stations such as *link 1* (*node* Terengganu River (ST)/ Petuang River (SP) 1 until *node* ST/SP 2), *link 2* (*node* ST/SP 2 until *node* ST/SP 3), *link 3* (*node* ST/SP 3 until *node* ST/SP 4).

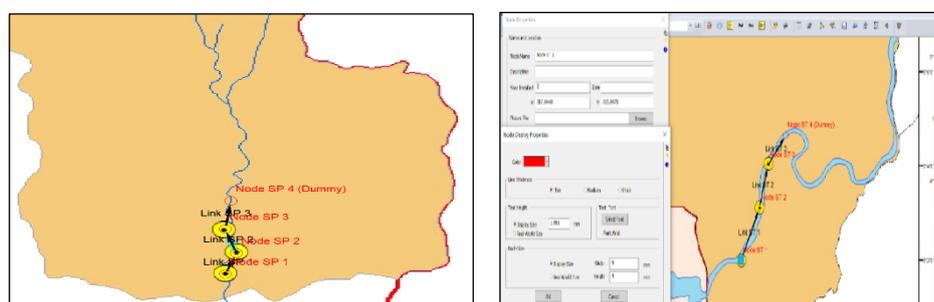


Figure 3: node and link of each sampling station in Terengganu River and Petuang River

RESULT AND DISCUSSION

Table 1(a) and Table 1(b) showed the information data of *Conduit Profile* for *link* along the river channel of Terengganu River and Petuang River. There are required information data such as *Upstream Invert Elevation*, *Downstream Invert Elevation*, *Length* dan *Roughness*. This data input applied in XPSWMM software automatically to identify the percentage values of slope (gradient) based on calibration of each *node*. Then the *link conduit* dialog box and the *Conduit Profile* information entry registration process that covers three segments for each study river channel such as *link* ST 1, *link* ST 2, *link* ST 3 for Terengganu River and *link* SP 1, *link* SP 2 dan *link* SP 3 for Petuang River.

Table 1(a): The Information Data of *Conduit Profile* for *link* in Terengganu River I (ST 1), Terengganu River II (ST 2) and Terengganu River III (ST III)

<i>link</i>	Upstream Invert Elevation (m)	Downstream Invert Elevation (m)	Length (m)	Roughness	Shape
<i>link</i> ST 1	151.26	141.26	2978	0.014	Natural
<i>link</i> ST 2	141.26	135.560	2199	0.014	Natural
<i>link</i> ST 3	135.560	135.560	2199	0.014	Natural

Table 1(b): The Information Data of *Conduit Profile* for *link* in Petuang River I (SP 1), Petuang River II (SP 2) and Petuang River III (SP III)

<i>link</i>	Upstream Invert Elevation (m)	Downstream Invert Elevation (m)	Length (m)	Roughness	Shape
<i>link</i> SP 1	158.60	151.90	425	0.014	Natural
<i>link</i> SP 2	151.90	151.0	2065	0.014	Natural
<i>link</i> SP 3	151.0	151.0	2065	0.014	Natural

Figure 4(a) shows an illustration of the view of normal simulation for *links* ST1, ST2, and ST3. Based on the simulation results of normal flow in the Terengganu River, the maximum depth reached by each station in the normal season is in the range between 3.74 m and 4.94 m, where ST 1 (upstream) recorded the lowest depth (3.74 m) and discharge values of 184.196 m³/s compared to other stations and a maximum flow speed of 1.91 m/s. It was found that the speed of the river flow affects the flow rate in each section of the *link conduit*, where even though the stations located in the middle (ST 2 and ST 3) have a higher depth than the stations in the upstream part, the flow rate of the river in that section is directly proportional to the flow trends (Bayat et al., 2019; Budhathoki et al., 2021). This is due to the flow becoming slower when it reaches the downstream part due to the presence of a dam structure in the area before entering the Terengganu River Basin. The structure acts as a barrier to the flow of water, where the flow is controlled by the overflow bank at a rate of 1.43 m/s

in the normal season to control the water depth so that it is not less than 1.0 m (refer to Figure 4(b) and Table 2). Figure 5(a) shows an illustration of the view of low flow simulation for *links* ST1, ST2, and ST3. Based on the results of this simulation, the maximum depth reached by each station in the dry season is in the range of 3.64 m to 3.94 m (ST 1 upstream recorded the lowest depth (3.64 m) and discharge values of 14.26 m³/s compared to the other stations and a maximum flow speed of 0.79 m/s). It was found that the speed of the river flow affects the discharge rate in each section of the *link conduit*, where although the stations located in the middle and downstream (ST 2 and ST 3) have a higher depth, the river discharge rate in the section in question is directly proportional to the flow rate. This is because the flow becomes slower when it reaches the downstream side compared to the upstream side due to the presence of a dam that acts as a structure that releases water periodically in the dry season (Saad et al., 2023). The structure acts as a barrier to the flow of water, where the flow is controlled by the banks of the overflow channel at a rate of 0.54 m/s in the dry season to control the water depth so that it is not less than 1.0m (refer to Figure 5(b) and Table 3). It can be concluded that the maximum depth of 3.94 m with a rate of 42.78 m³/s in the downstream part can only accommodate medium-sized fish individuals compared to the normal season. Compared to the normal season, a lower discharge rate was recorded in Sungai Terengganu during the dry season, with a maximum discharge rate not exceeding 42.78 m³/s (simulation) and 8.52 m³/s (observation) recorded.

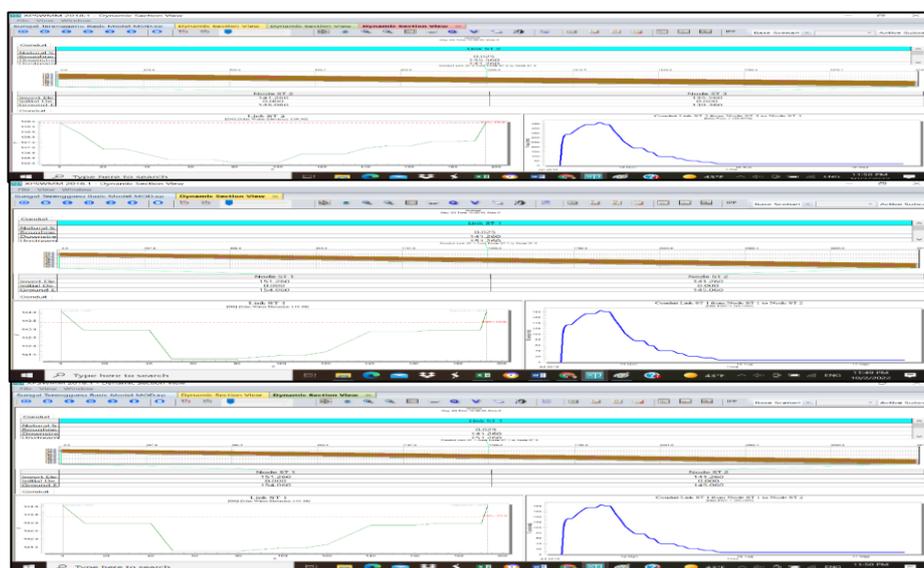


Figure 4(a): Dynamic View of Normal Simulation for link ST 1, link ST 2 and link ST

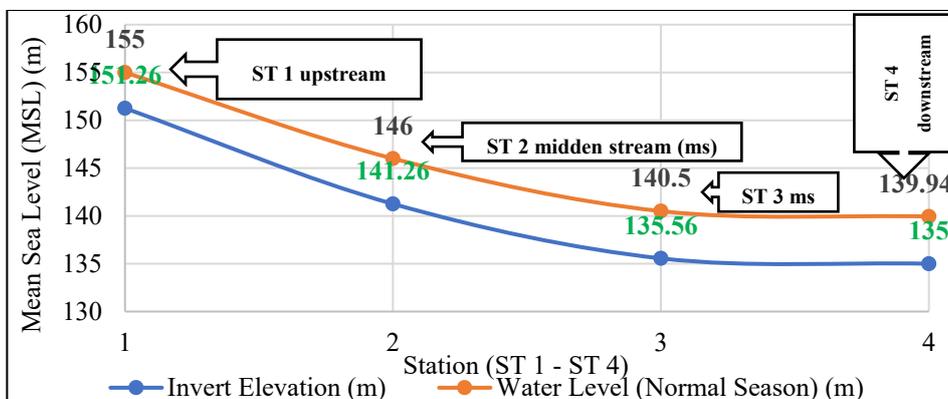


Figure 4(b): The Longitudinal View of *node* dan *link* in Terengganu River During Normal Simulation

Table 2: The Longitudinal Characteristics of *node* dan *link* in Terengganu River During Normal Simulation

Station	ST 1	ST 2	ST 3	ST 4
Invert Elevation (m)	151.26	141.26	135.56	135.00
Water Level (Normal Season) (m)	155.00	146.00	140.50	139.94
Maximum Velocity (m/s)	1.91	1.97	1.43	
Maximum Discharge (m ³ /s)	184.1964	466.8354	505.7206	
Maximum Depth (m)	3.74	4.74	4.94	

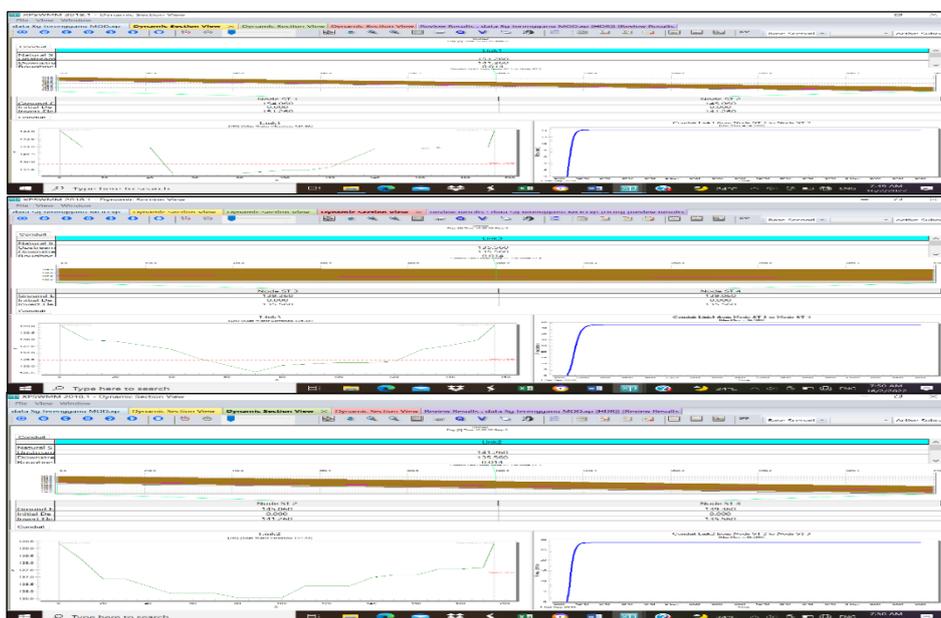


Figure 5(a): Dynamic View of Low Flow Simulation for *link* ST 1, *link* ST 2 and *link* ST 3

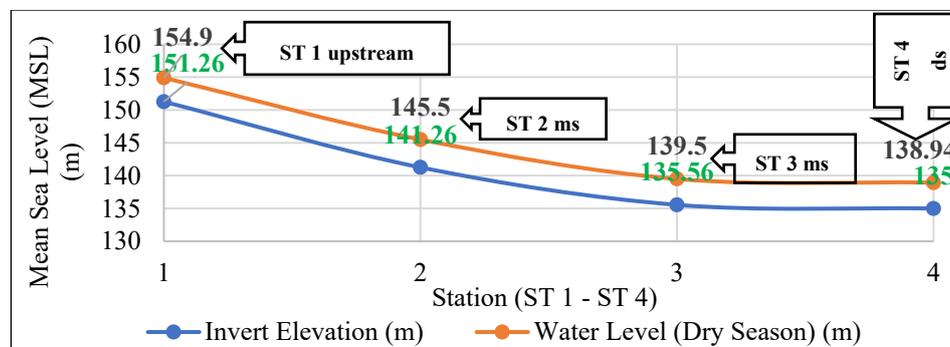


Figure 5(b): The Longitudinal View of *node* dan *link* in Terengganu River During Low Flow Simulation

Table 3: The Longitudinal Characteristics of *node* dan *link* in Terengganu River During Low Flow Simulation

Station	ST 1	ST 2	ST 3	ST 4
Invert Elevation (m)	151.26	141.26	135.56	135.00
Water Level (Normal Season) (m)	154.90	145.50	139.50	138.94
Maximum Velocity (m/s)	0.79	0.80		0.54
Maximum Discharge (m³/s)	14.260	28.52		42.78
Maximum Depth (m)	3.64	4.24		3.94

Figure 6(a) shows an illustration of the view of normal simulation for *links* SP1, SP2, and SP3. It was found that the speed of the river flow affects the discharge rate in each section of the *link conduit*, where the stations located in the middle and downstream (SP 2 and SP 3) have a higher depth (over 0.5 m), but the river discharge rate in the section in question is directly proportional to the flow rate. The base invert height of SP 2 and SP 3 from sea level is lower than that of SP 1, causing the downstream part of the river to receive more water than the capacity of the drainage section. At the end of the simulation, the maximum value of discharge magnitude in the downstream part of the river (SP 4) received discharge at a rate of 0.91 m³/s, which is at a depth of about 0.9 m from the river bed. At that depth, it was found that a large number of medium-sized and small fish species are still able to inhabit the drainage habitat in small numbers (refer to Figure 6(b) and Table 4) (Raman et al., 2020). This is because the flow becomes faster when it reaches the downstream part due to the outflow factor from the river drainage in the upstream part of the lake basin towards the lake outlet, which is also near the dam structure. Figure 8(a) shows an illustration of the view of low flow simulation for *links* SP 1, SP 2, and SP 3. Based on the results of this simulation, the maximum depth that can be reached by each station in the dry season is in the range of 0.1 to 0.4 m, where the upstream station SP 1 recorded the lowest depth (0.1 m) and has a maximum discharge value of 0.1063

m^3/s compared to the other station and a maximum flow speed of 0.56 m/s. It was found that the speed of the river flow affects the flow rate in each section of the link conduit, where, although the stations located in the middle (SP 2 and SP 3) have a higher depth, the river flow rate in the section in question is not directly proportional to the flow rate, especially in the downstream part, due to the effects of external environmental factors such as anthropogenic and climatological factors. It can be observed that the speed of the flow is deteriorating when it reaches the downstream part of the river, with the maximum value of the speed of the flow at the last station (SP 4) being only 0.04 m/s. This proves that the highest depth was recorded in the downstream part of the river, giving a higher area of wet perimeter. However, the water level does not pass the level of the overflow bank of the dam structure in the upstream part of the river, causing the flow speed to be very slow (Kamarudin et al., 2017). This is contrary to the original purpose of the construction of the structure, which was to prevent the water level from being lower than the 1.0 m depth level. Figure 8(b) and Table 5 show the longitudinal display of all nodes and links in Sungai Petuang for the lowest discharge simulation. It can be concluded that at the end of the simulation, the maximum value of the discharge magnitude in the downstream part of the river receives discharge at a rate of $0.886 \text{ m}^3/\text{s}$ and a maximum depth of 0.40 m.

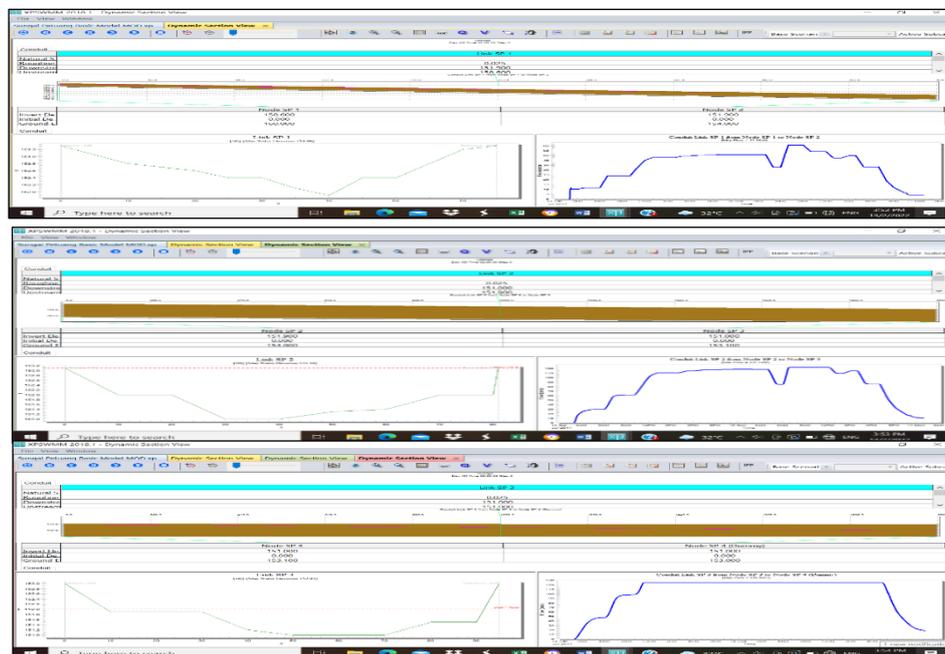


Figure 6(a): Dynamic View of Normal Simulation for *link SP 1*, *link SP 2* and *link SP 3*

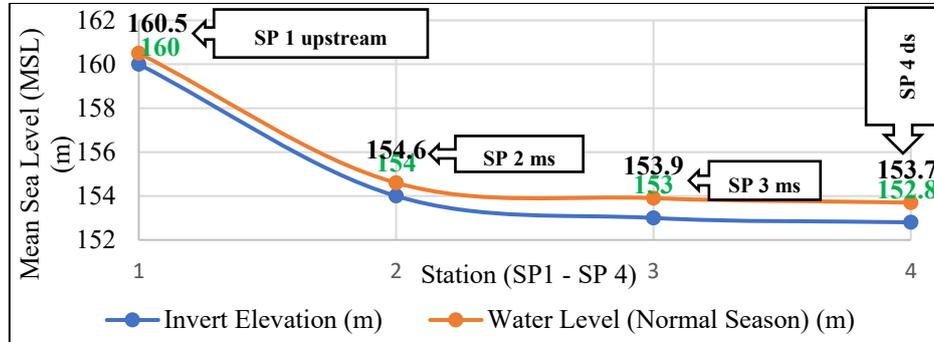


Figure 6(b): The Longitudinal View of *node dan link* in Petuang River During Normal Simulation

Table 4: The Longitudinal Characteristics of *node dan link* in Petuang River During Normal Simulation

Station	SP 1	SP 2	SP 3	SP 4
Invert Elevation (m)	160.00	154.00	153.00	152.80
Water Level (Normal Season) (m)	160.50	154.60	153.90	153.70
Maximum Velocity (m/s)	2.09	1.06	0.91	
Maximum Discharge (m ³ /s)	55.7640	122.5366	124.623	
Maximum Depth (m)	0.5	0.6	0.9	

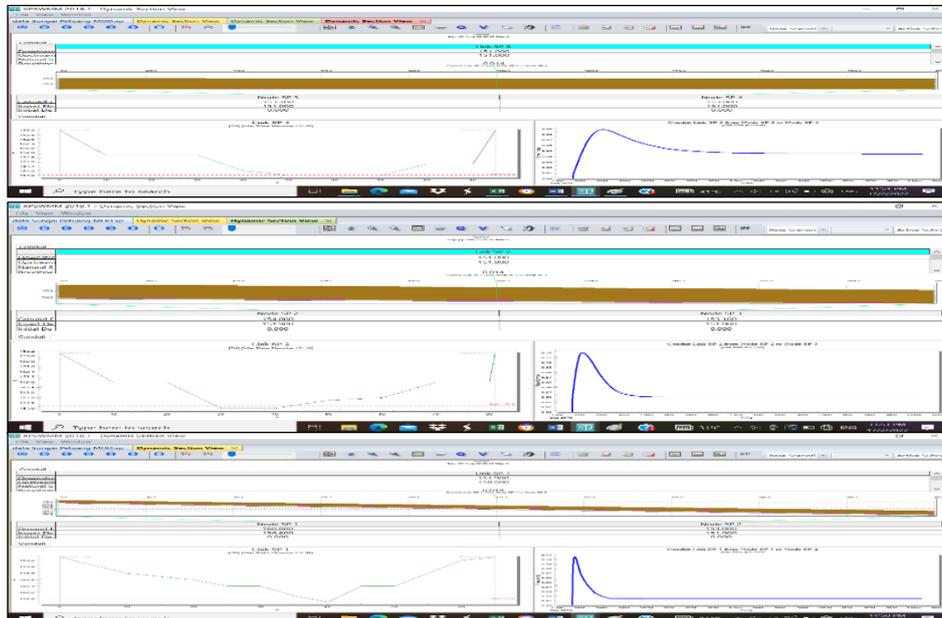


Figure 7(a): Dynamic View of Low Flow Simulation for *link SP 1, link SP 2 and link SP 3*

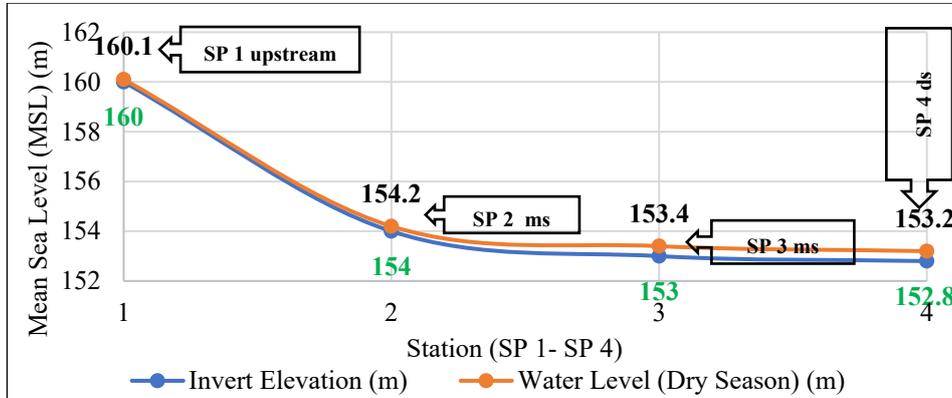


Figure 7(b): The Longitudinal View of *node* dan *link* in Petuang River During Low Flow Simulation

Table 5: The Longitudinal Characteristics of *node* dan *link* in Petuang River During Low Flow Simulation

Station	SP 1	SP 2	SP 3	SP 4
Invert Elevation (m)	160.00	154.00	153.00	152.80
Water Level (Normal Season) (m)	160.10	154.20	153.40	153.20
Maximum Velocity (m/s)	0.56	0.13		0.04
Maximum Discharge (m ³ /s)	0.1063	0.1198		0.0886
Maximum Depth (m)	0.1	0.20		0.40

HYDROLOGY HYDRAULIC MODEL DEVELOPMENT WITH SUSTAINABILITY PLANNING (MITIGATION MEASURES)

The strategy for mitigation actions can be taken in a variety of ways, including choosing appropriate technologies for the construction, selecting a standard design, using the code of ethics of the construction, adhering to the recommendations for the implementation of security, and complying with all requirements of the regulation. Both the development and operating phases should employ these procedures.

Soil Erosion and Sedimentation Management

It is strongly advised that erosion and sedimentation control measures be built in the proper places before any development activity is started (Abdul Maulud et al., 2021). The following are the major components of the suggested soil erosion and sediment management measures:

a) Scheduling and Staging of Development

Scheduling and arranging all of the actions will protect the soil's top layer and any vegetation that is already present and is not directly impacted by the land's transformation. During the rainy season, land-clearing activities are prohibited.

b) Implementation of Land Disturbing Prevention Pollution and Mitigation Measures (LDP2M2)

Through comprehensive and methodical preparation, execution, monitoring, and inspection of mitigation strategies for soil erosion and sedimentation, LDP2M2's primary goal is to protect, restore, and further improve the quality of the environment at the project site and its adjacent areas. Before beginning any development activities, the LDP2M2 for the project advancement must be provided for approval by the DOE. The following diagram illustrates the control strategies that target soil erosion and sedimentation. There are seven components that make up the LDP2M2 (Guideline for Erosion and Sediment Control in Malaysia, DID 2010);

- i. Minimizing soil erosion
- ii. Preserving top soil & other assets
- iii. Access route & site management
- iv. Runoff control & management
- v. Earthwork & erosion control
- vi. Sediment prevention control
- vii. Site maintenance

c) Inspection and Maintenance during the Construction

Application of applicable compliance BMPs proposed mitigation measures for land development activities and its control. Table 6 showed the inspection and maintenance during the construction will be applied for development along the Kenyir Lake Basin.

Table 6: The Inspection and Maintenance During the Construction

ESCP	Development Period	Maintenance Required
Sediment Basins	Initial Stage before grading works.	Weekly inspection and after a rainfall event or rainfall reading equal to or greater than 12.5 mm. Remove trapped sediment when one-third full.
Earth Drain Channels	Initial Stage before grading works.	Weekly inspection and after a rainfall event or rainfall reading equal to or greater than 12.5 mm
Check Dams	Initial Stage before grading works but after development activity of temporary diversion channels.	Weekly inspection and after a rainfall event or rainfall reading equal to or greater than 12.5 mm. Remove trapped sediment when one-third full.
Silt Fence	Initial Stage before grading works.	Weekly inspection and after a rainfall event or rainfall reading equal to or greater than 12.5 mm.

d) River Buffer Zone

The Forestry Department created *Manual Perhutanan Jilid III, 2005*, to serve as a manual for logging operations and as a criterion for issuing logging licences to loggers. The ideal width of the river reserve for the river bank created by the forestry department. When a development damages a river that is not on the *Warta Rezab Sungai Negeri* list, the rule will be enforced. The fundamental tenets of measures to prevent soil erosion are to shield the soil surface from precipitation and direct runoff away from exposed areas, while the fundamental tenets of measures to prevent sedimentation are to preserve the quality of discharged runoff by removing eroded soil particles from the site before they enter water courses.

CONCLUSION

This strategy must be used to improve the requirements for the river by utilising the most effective practises currently available, maximising environmental monitoring techniques or the most effective management practises for river basin management, particularly in areas close to anthropogenic development processes, and acting as a controller for the high-level runoff intensity flows out into the lake basin. These mitigation techniques are used in the study areas to reduce flow in small temporary channels that are currently degrading, where permanent stabilisation is impractical due to the transient nature of the problem, and to reduce flow in small eroding channels where construction delays or weather conditions prevent timely installation of non-erosive liners. This is due to the effectiveness and suitability of all mitigation methods employing simulation modelling for the system of Kenyir Lake Basin.

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DETERMINANTS OF INVESTMENT TO ATTRACT INVESTMENT IN AFFORDABLE HOUSING PROJECTS IN MALAYSIA

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Abstract

The provision of shelter is a fundamental human right as defined by the *maqasid al-shariah* hence, the Islamic financial system should give undivided attention by assisting to provide affordable housing. This, however, is relatively hard to do given that market forces dictate property prices that many cannot afford. Unaffordable housing is a serious issue being faced by major cities around the globe, including Malaysia. Naturally, most individuals resort to government assistance, as the issue warrants social and political attention. With limited fiscal capacity, governments have fewer options to build affordable housing. Similarly, private developers will not build houses that are not profitable. One possible solution is to seek investments from institutional investors who, with deep pockets, could resolve this conundrum. This study attempts to investigate factors that motivate institutional investors to invest in affordable housing projects in Malaysia. A qualitative approach was applied to identify six attributes of investments, namely fund structure and mandate, market return, social return, risk mitigation, governance and transparency, and government support. These findings provide valuable insight for policymakers in structuring investment vehicles with the identified attributes, which may attract institutional investors to invest in this initiative.

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

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INTRODUCTION

While owning a house is a basic human need, the Islamic basis for providing shelter to people is explained by the *maqasid al-shari'ah* (the objective of *shari'ah*), where shelter constitutes one form of the *dharuriyyat* (basic needs) (Chapra, 2008). *Dharuriyyat* is something indispensable for human beings; something that humans cannot afford to live properly without. This is an essential element that must be fulfilled, the absence of which could bring chaos and disorder into human life, both in this world and in the hereafter (Mohammad & Shahwan, 2013). There are five categories of *dharuriyyat* categorized by Imam Abu Hamid Al-Ghazali (d. 1111 AD), which are the maintenance of religion, human life, progeny, wealth, and intellect (Chapra, 2008). House is a basic element for the protection and maintenance of human life.

In the western tradition, the need for shelter is a form of physiological needs in Maslow's hierarchy of needs and constitutes the most fundamental needs that human beings must possess along with air, water, food, and clothing. Forming the foundation of the pyramid, housing is essential for human beings to ensure they can function properly as individuals as well as in community (A.H. Maslow, 1943). Abu Bakar (2022) argues that affordable house and amenities are one of the most crucial elements in the development of subjective wellbeing.

The government has provided for the poor many subsidized low-cost housings, while the private sector has constructed a significant amount of high-end and luxury units for the upper and middle classes. However, escalating house prices in the past few years have changed the scenario. Complaints from the people, especially from the middle class and people just entering the workforce and looking for a house, are becoming louder. They are ineligible to obtain low-cost subsidized housing from the government but, at the same time, unable to acquire homes on the open market due to high prices (Shuid, 2015). Sohaimi (2022) discovers that young professionals in Greater Kuala Lumpur have limited access to affordable house, especially for the B40 group.

One of the major impediments to increasing the supply of affordable housing is the issue of funding. Under fiscal constraint, the government is unable to subsidize the construction and sale of affordable housing. While the developers are less interested in catering to this market segment due to its low profitability, prospective buyers themselves are not able to obtain bank loans or financing due to their low financial status. It is based on these problems that motivate this research to study the role of institutional investors, as opposed to the private sector and government, in their funding provisions to help increase the supply of affordable housing. With a large amount of funds available under their control, institutional investors can potentially utilize a small portion of these funds for investment in affordable housing projects. In addition to seeking a reasonable financial return, institutional investors also have an obligation to pursue social

goals, in line with their investing mandate, that can correlate with affordable housing.

This study contributes to knowledge in three ways. First, the research on investment variables, in particular for the affordable housing initiative is scarce, despite its significant need in the current context. Secondly, this research is among the limited research done on gathering insights from institutional investors, who are the major stakeholders in investment initiatives. Thirdly, although the study has a specific agenda in outlining investment variables that may attract institutional investors to invest in affordable housing projects, the determinants are also applicable to other socially responsible investment initiatives.

The remainder of this article covers the literature on investment determinants, followed by a description of research methodology and an analysis of results. We conclude this paper by outlining the major findings and their implication for policymakers.

LITERATURE REVIEW

Constraints on public and private institutions since the onset of the global financial crisis have prompted policymakers in the UK and Australia to attract institutional investors, along with research in this area (Milligan, Yates, Wiesel, Hal, et al., 2013; Milligan, Yates, Wiesel, Pawson, et al., 2013; Montague, 2012). These were inspired by the success-story in the United States with the implementation of the Low Income Housing Tax Credit (LIHTC) system, which garnered significant interest from institutional investors to invest in affordable and social housing (Lawson et al., 2010). Although widely and officially publicized (M Berry et al., 2006; Mike Berry, 2000), the move to attract investment from institutional investors failed to garner any interest, either via a REIT structure in the UK (Crook & Kemp, 2011) or any mode of investment (equity investment, mortgages, REITs, housing supply bond, and public-private partnerships) in Australia (Milligan, Yates, Wiesel, Hal, et al., 2013). Mohd Daud et al. (2020) highlighted that there should be calls for more supply of affordable housing by attracting more investment from institutional investors in such projects. However, progressive affordable housing policy is a prerequisite for such investment to materialize, with resolving current issues in affordable housing being the main agenda (Mohd Daud et al., 2022).

Milligan et al., (2013); and Pawson & Milligan, (2013) outlined several determinants that affect investments in supplying affordable rental housing. Among the major determinants are resilient demand for rental housing, growth in population and household size, dynamics in social and economic structure that delay homeownership, major disruptions in the availability of traditional financing due to the global financial crisis, shortage in housing supply falling behind demand, and housing affordability issues. They also summarized several

major hindrances for institutional investors to invest in affordable housing in Australia. Keys are lower returns in comparison with infrastructure investments; stamp duty, land taxes, and the other compliance charges; house price risk; limited market information; counter-party risk; scale constraints; liquidity risk due to the absence of a secondary market; and complex administrative issues. In addressing these issues, a few recommendations were made, related to mitigating risks, proper governance structure, and the need for government support, especially to kick start the project. The most crucial element that they suggested was for the related risks to be lowered to entice institutional investors to invest, despite the low yield, with a reasonable risk-adjusted rate of return.

Since the literature on factors that influence institutional investors to invest in affordable housing is scarce, the study extended the review to include Socially Responsible Investment (SRI). Investment in affordable housing can be construed as a social investment. Five major determinants were identified: social return, market-based return, risk mitigation, transparency and corporate governance, and government support.

The first determinant is social return. Benson & Humphrey (2008) stated that SRI funds are less sensitive to return than conventional funds. In this aspect, a number of variables are taken into consideration by investors, such as non-financial benefits or utility (Beal et al., 2005; Bollen, 2007); social relations (Galema et al., 2008); collectivism (a form of social cohesion); religiosity; and environmental attitude (Sreekumar Nair & Ladha, 2014).

Market-based return still plays a major role in attracting investment (Bland et al., 2015; Galema et al., 2008). Mukherjee & Roy (2011) found that for mutual funds in the India market, return on equity for debt instruments influenced investment decisions, but not for equity instruments. Galema et al., (2008) argued that administration costs should be low enough to ensure a sufficient market return.

Sufficient risk mitigation is another important determinant in attracting investments. Among the major risks are property risk, operational risk, and management risk. In addition to that, due to the unique and novel structure of the investment, more risk premium is required by investors (Lawson, Berry, Milligan, & Yates, 2009; Lawson et al., 2010; Milligan, Yates, Wiesel, Hal, et al., 2013; KLCCP REIT, 2013; Al-Salam REIT, 2015). Bland et al., (2015) outlined default risk, liquidity risk, and market risk as major determinants of depositors' demand for Texas's government investment instruments. Ferreira & Matos (2008) stated that mutual funds put greater emphasis on liquidity than insurance companies and banks. They also emphasize the need to have a sufficiently large fund to reduce information asymmetry.

Government support can come in two ways; by reducing the associated cost of the development and by reducing the risk premium of the investment. In terms of associated costs, the components are tax benefits, subsidies, lower

compliance requirements, increased density, soft loans, and lower transaction costs for the investment. In terms of the risk premium, it mainly entails government guarantees (Gurran & Phibbs, 2013; Lawson et al., 2009, 2012; Milligan, Yates, Wiesel, Hal, et al., 2013).

Transparency and corporate governance are needed due to information asymmetry amongst stakeholders. Detailed examination reveals a number of variables that can attract investment, such as investor protection (Abdioglu et al., 2013; Aggarwal et al., 2005); high information disclosure (Abdioglu et al., 2013); transparency in the market (Gelos & Wei, 2005); issuance of instruments by strong institutions (Cai & Warnock, 2006); separation between ownership and control (Kim et al., 2011); diluted ownership structure (Ferreira & Matos, 2008); and transparent accounting policies (Aggarwal et al., 2005).

RESEARCH METHODOLOGY

Purposeful sampling techniques were used to identify research participants for interview. Maximal variation sampling strategy was employed, where diverse individuals who were expected to give distinctive views on pertinent matters related to the research questions were selected.

Semi-structured interviews are conducted with senior managers and above with vast experience and involvement in investment related activities at institutional investment firms in Malaysia, which may consist of the Employee Provident Fund (EPF), Retirement Fund Incorporated (KWAP), Permodalan Nasional Berhad (PNB), Pilgrims Fund Board (Tabung Haji), Khazanah Nasional Berhad (Khazanah), and the Armed Forces Fund Board (LTAT). Besides that, input was also sought from the developers to understand their limitations and impediments to providing affordable housing.

In total, eight individuals were interviewed, which consisted of senior management of institutional investors with cumulative experience of more than 185 years. The number of interviews was deemed appropriate once theoretical saturation was achieved (Merriam & Tisdell, 2016). The interviews were transcribed and analysed using the content analysis method.

ANALYSIS

Insights from the interviews and the review of the literature are used to find investment factors that may encourage institutional investors to invest into projects to build affordable housing. These determinants are structure and mandate, market return, social return, governance and transparency, risk mitigation, as well as government support.

Structure and Mandate

The first determinant identified that may attract institutional investors to invest in an affordable housing project is the structure and mandate of the investment

vehicle. In this aspect, the instrument needs to be explicitly labelled as a Socially Responsible Investment (SRI), as this label is crucial to institutional investors as some of them have a mandate to invest only in SRI, ESG, or UNPRI compliance investments. Institutional Investor 4 highlighted this.

“From the investment perspective, we are not yet SRI compliance, but we are SRI aware, or ESG aware. In fact, in the selection of an external fund manager, we ask whether you are ESG compliant and ESG friendly. We even ask whether you are UNPRI (United Nations Principle of Responsible Investment) certified.”

Regarding the structure of the investment, the responses received are mixed. Some institutional investors prefer the instrument to be diversified and not focus solely on investment in affordable housing. Institutional Investor 4 shared the following:

“They should diversify, unless the mandate is specific. Let’s say the mandate is for a socially conscious organization, that’s a different story. For example, the Tabung Haji has no option except to invest in shari’ah compliant instruments. They have to go into Sukuk even though conventional bond gives higher returns.”

On the other hand, other institutional investors do not consider the specific mandate of the investment to be a significant determinant.

Market Return

One of the most important determinants of attracting investment is market return. And, as expected, the majority of respondents raise this issue frequently. In general, the respondents argued that as custodians of the funds, they have a fiduciary duty to their investors to provide the highest possible returns. Thus, some of the respondents were pessimistic about investments in affordable housing, as they opined that the investment might not provide sufficient returns. Institutional Investor 3 shared the following:

“As a fund and as a sovereign fund, we have a duty to our stakeholders to invest responsibly and blindly. If somebody can come to us and say that there’s an avenue for us to invest in affordable housing and make it a workable investment for us that hits the right return, we would do it. But the issue right now is that affordable housing is not an investment asset class.”

Institutional Investor 5 pointed out that their role as a private entity is to maximize returns.

“The depositors may not be happy if we are doing government role. Because we are not the government, we are a private company.”

When prompted about their role to provide social security to the investors, Institutional Investor 2 opined that the role of providing social security is more on providing sufficient monetary income to their depositors (i.e., maximizing return from the depositors’ investment) and not on providing other types of social security.

“If there is no subsidy, somebody must be able to accept a lower return. Might not be higher. Zero returns do not make sense, but lower returns do. For example, if your typical development profit margin is 20%, you must accept 10% or 15%. It is something that, as custodians of the investment, we must ask ourselves: are we willing to accept a lower return when there is a potentially higher return somewhere else? Because we are custodians of the fund. We must make sure that we put money where it maximizes the return to our contributors. That’s our fiduciary duty.”

Institutional Investor 2 outlined the possibility of treating their depositors unfairly if they are seen “subsidizing” affordable housing.

“When we treat our contributors, we must make sure that we treat our contributors fairly. Meaning that, let’s say they accept a lower return, it may benefit certain contributors, but it does not benefit all of our contributors. Because then, the contributors who do not have access to affordable housing will say, “Wait a minute. You are giving my return away to subsidize other people.” So, there is always a conflict.”

On the other hand, Institutional Investor 1 said that their institution would be happy to invest in the affordable housing initiative if it could give them a good return on their investment. He shared the following:

“This is something that is very good for us. We want to increase our shari’ah assets and investments, and affordable housing is a good asset and shari’ah compliance. Moreover, it aligned with our value of investing in Environmental, Social and Governance (ESG) investments.”

Similarly, Institutional Investor 3 argued that they would invest in an affordable housing initiative, provided that the initiative is economically viable.

“I think affordable housing is something that we would love to do. But we’re not a charity. We are always liable to our stakeholders to ensure they have returns. And until there’s a position for us to say, look, that’s something that’s economically viable, we’ll do it.”

Institutional Investor 6 talked about their experience with giving their depositors affordable houses and said that they are able to do this because they have made enough money elsewhere and can give their depositors good returns.

“When you build affordable housing, obviously you are selling at a price that is lower than your cost. So, there’s a subsidy issue involved. And when you spend money on CSR, you are taking away money that you were supposed to use to pay the dividend, which is our primary responsibility. That is what we are established to do. We must invest to get a return. We must make sure we make money first, then only we can do all this donation.”

In conclusion, all respondents agreed that market return is very crucial in attracting investment. However, in term of returns, the responses received were mixed. Some investors want the highest possible returns, as it is their fiduciary duty to provide good returns to their depositors. On the other hand, some investors are content with lower but reasonable returns, provided that the investment creates a positive impact on society and their depositors/contributors.

Social Return

Another important determinant that may attract institutional investors to invest in affordable housing projects is social return. Social return refers to value created that is not usually reflected in the financial statements and includes social, economic, and environmental costs and benefits. By incorporating these elements, the measure aims to reduce inequality, mitigate environmental degradation, and improve wellbeing (Nicholls et al., 2012).

Institutional Investor 4 stated the importance of looking beyond market return from an Islamic economics perspective, where there is a need to balance material gains with social and spiritual considerations:

“If you leave it to laissez-faire, demand and supply, there is no way the support staff can afford a home. So, in any responsible government, we should not let everything to the free market. It must be a balance. So, here the concept of Islamic economics makes sense because they balance the physical or economic search with a social and spiritual journey.”

Institutional Investor 5 opined that there is an obligation to aid low-income earners.

“If you have blue-collar workers whose salary barely cover their basic needs, how can they survive in the city? They must find houses outside of the city to live in, which means that they have to spend more on transportation, which will make them worse.”

However, the issue of social return on investment in affordable housing projects received a mixed response from the respondents. On one side, the respondents argued that their investment objective is to maximize market return and should not be hampered by social issues, for which the government should assume responsibility. Institutional Investor 5 highlighted this:

“The social issue has to be addressed by the government. Social return is not applicable to private entities like us. The government and municipalities benefited a lot from taxation. The government has to take the responsibility because there is such a political motivation for affordable housing and also social and economic pressure. We cannot utilize the money that we have because we are just custodians of the money. This is not the money that can be used for social benefit without a reasonable return.”

Institutional Investor 5 emphasized this by giving an example of their CSR initiative designed to assist the hard-core poor.

“As a fund, we are very much return oriented. We do CSR, but when selecting for CSR projects, we are helping those that are hard-core poor.”

Institutional Investor 7 looked at balancing between market return and social return. Institutional Investor 7 outlined their affordable housing initiative that also benefited its members.

“We cannot make purely profits without having any thought of social responsibility. Yes, we invest their money and give them a good return, but we also want to give something back to them, and I think 98% of the people who bought those houses are our members.”

Institutional Investor 4 argued that SRIs can be competitive and make a decent profit.

“I believe SRI can be competitive! There’s nothing stopping them from being competitive. There are already green Sukuks or green bonds, that comply with the ESG criteria, SRI, or even UNPRI and they look beyond yield. The yield can be good from an issuer perspective because when you’re green, there’s more demand globally, so they are more liquid.”

Institutional Investor 1 talked about how the investment with a good social return could have a multiplier effect, which could be good for the institution.

“If we invest in this initiative, there will be more houses being built. To build more houses, we will need a larger workforce, which will translate into more money being deposited with us. As a result, it’s a win-win situation for us”.

Overall, people had different ideas about whether the government should be the only one responsible for looking into social return, which could lower the market return, or whether society as a whole should be responsible for it as well. Fundamentally, an investment with a good social return and a decent market return would attract investors, as more institutional investment firms are looking into SRI, ESG, or UNPRI compliance investments.

Governance & Transparency

The issue of governance and transparency was also often highlighted during the interviews. The need for good governance and more transparency seems more crucial as institutional investors are always under public scrutiny, given recent corporate scandals. However, the Malaysia Securities Commission (SC) has already provided relevant governance frameworks and standards, which should be adhered to by all funds and corporations in the capital market. When asked whether the current governance framework and standards adopted by the SC are sufficient to cater for this initiative, Institutional Investor 2 responded:

“We do not need a special way of doing things for regulations just for the affordable homes fund. I think is sufficient because I think the idea of any regulation is to ensure that it suits not only one particular purpose but also various purpose.”

Whilst government guarantees are highly sought after by investors, the instrument can attract a better premium on the yield if the issuer has good governance. Institutional Investor 4 highlighted this:

“If the government wants to have a better premium on the yield, the governance should be better. Contractors, for example, are chosen through open tender, with more competitive bidders and a focus on the market. So, then, the investors feel more comfortable. Even though it is a government guarantee, the premium would be lower if corporate governance was more transparent.”

Institutional Investor 2 disclosed that their institution will only buy government-guaranteed issuances with good governance and a transparent structure.

“We do not have any issue with the government guarantee. However, we don’t blindly buy government guarantees. We prefer government guarantees that have better disclosure and transparency. Because as a social security fund, we have the social concern to know where the money goes.”

Institutional Investor 4 highlighted the importance of having good governance and transparency, especially in attracting foreign investment.

“Some government guarantees have a narrower spread because they are more transparent. They engage with investors, and we like them. So, we do not mind buying a lower spread. And foreign investors will be attracted to it too, not only local investors. So, it helps deepen the market. When the market for such government guarantees is deeper, it is easier for us to exit; hence we do not mind a narrower spread.”

Risk Mitigation

From the interviews, it became clear that reducing risk is another important factor that can get institutional investors interested in affordable housing projects. Risk mitigation refers to processes and procedures that can be undertaken to subsequently reduce the risk and provide a better risk-return profile. In other words, having risk mitigation will attract investors to invest, although the return provided might be less. Some of the discussions in this theme paralleled the theme of Government Support, which is discussed in the next section. Hence, this section only focuses on risk mitigation procedures that require no or minimal intervention from the government.

Institutional Investor 1 shared success factors from joint-venture initiatives between their institution and a municipality, whereby the firm provided the financing and let other processes to be handled by the municipality.

“Number one is making sure that anybody who is delinquent, you have no hesitation in taking action. Meaning you repossessed the house and did not tolerate. Otherwise, people will take advantage he second step is to ensure that a proper collection process is in place. Because unlike the banks, we do not have the infrastructure to allow people to pay easily. There must be a proper loan management process.”

When prompted about the risk of default (from the tenant/ buyer) and reputational risk to the institution if people are evicted, Institutional Investor 1 pointed out that the institution only provides financing and bears the counterparty risk (in this case the municipality). The municipality shoulders all other risks.

“We are not in the business of managing that risk or managing reputational risk. What we did with one city council was that if there was any failure of payment, the foundation that supported the city council would step in. Essentially, the Foundation guarantees the payment to us. They bear all the risk. How they are going to recoup the money is not our problem. We just need to ensure that our contributors’ money is repaid. What we can do is structure the investment similar to the one that we had with the municipality, whereby we provide financing, and they take care of everything. We do not have the expertise and capability to monitor all this repayment process, default, maintenance issue, etc.”

Institutional Investor 8 highlighted the risk of having unsold units as well as the potential inability of the contractor to deliver the project, which will cause a significant increase in cost.

“We are worried about unsold units. Besides that, contractor risk. If contractor fails to deliver, higher cost for us, as we need to re-tender, etc.”

Institutional Investor 7 highlighted their initiative of working together with PPA1M (a government agency) as a measure to reduce the risk of unsold units.

“We are going to PPA1M because we are passing everything along for them to sell. Normally if you don’t have a PPA1M coming in with the subsidy, we will lose money.”

Government Support

Government support is another major determinant that is crucial in attracting institutional investors to invest in affordable housing projects. This is especially true when the housing market is perceived as distorted and requires intervention

to correct the imbalances in the market, which primarily should come from the government.

Institutional Investor 7 highlighted the importance of government support and argued that without government support (in terms of subsidies) affordable housing projects will not be viable.

“When the land is more expensive, the subsidy element will become bigger. I think it’s very difficult to set up a fund purely for affordable housing and expect returns at the same time. Most of the time, government gives grant and allocation. To do this on sustainable ways and expect a return without government assistance would be impossible.”

The easiest way for the government to help institutions get financing is to issue Sukuk and back them with government guarantees. This will significantly reduce the yield required for the Sukuk. However, the majority of the respondents opined that it is difficult to issue a Sukuk and get guarantees from the government currently, given the fiscal constraints and huge contingent liabilities of the government. Institutional Investor 4 outlined the risk if the government provides guarantees.

“If PRIMA (a government agency) is issuing Sukuk guaranteed by the government, it’s not on the balance sheet, but it’s in the contingent liabilities of the government. If the government’s contingent liabilities continue to go up, it may affect our credit rating. The credit rating agencies might be uneasy with that, and they may downgrade us. The problem is that our debt level is already high, and you add more contingent liabilities. In the end, it will affect our cost of funding because when the rating was downgraded, the cost of funding increased.”

With the limitations of getting government guarantees backing Sukuk issuances, the research looks into establishing a trust fund as an avenue for funding. This approach is novel and untested, particularly in Malaysia, and government support is necessary to kick start the initiative and mitigate the risk to the investors. Institutional Investor 2 highlighted this:

“Like everything new, there must be a driver in place who has strategic initiative. For example, any strategic initiatives that we have, there is always a government body that steps in to ensure investors that at some point there will be a return for them. That’s where I would say the appropriate structure will be, where you have government backed funding. If nothing happens, or don’t sell the house, or whatever, the capital, the return is secured for the investor. So, in that manner, we can price the risk

a bit better. Otherwise, we will price the risk, and then it will be too expensive. When the funding cost is too high, then the product will become unaffordable.”

In structuring the fund, the government can provide security to the investors by injecting equity in a mezzanine structure, thereby reducing the investors' risk. Institutional Investor 5 discussed this mechanism:

“It’s not a government guarantee. What you can do is make a mezzanine structure of investment; everyone puts their equity but in a mezzanine structure. So, the government has put some cushion into the structure. There is no need for government guarantee, but the government will take the first hit. If the scheme performs, the government can receive an annual return. But for some reason, if the fund loses money, the government will lose their money first. This is how the government can assist.”

Another way the government can support the initiative is by providing land for development. This can be done via open-tender, as described by Institutional Investor 2.

“Private-Public Partnership and open tender would be a great model. For example, the government can provide land and then open it for bidding. The developer must build based on certain specifications, to be sold at a predetermined price. Whoever can provide a better specification at the lowest price wins the bid. In that manner, we can ensure that the developer will take the minimum, or just enough profit.”

CONCLUSION

This study explores the determinants of investments that can attract institutional investors to invest in affordable housing projects in Malaysia. Six variables, which are structure and mandate, social return, market return, governance and transparency, risk mitigation, and government support, were unearthed from the interview process. Identifying and outlining these variables is crucial for policymakers, as this will allow them to structure investment vehicles that can be utilized to attract private investment into this initiative. For this to succeed, a new business model of housing delivery with limited profit and rent-capped housing should be adopted. Essentially, the goal of providing one million affordable housing units as set by the Malaysian government can only be realized via a holistic approach to housing financing and development with the participation of institutional investors. With this goal in mind, affordable housing needs to be created as an asset class. The next step is to investigate and rank which variables are more critical for the success of this initiative.

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EXPLORING MEDICAL TOURISM COMPETITIVENESS IN MALAYSIA, THAILAND, AND SINGAPORE: THE INDONESIAN TOURISTS' PERSPECTIVES

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Abstract

Malaysia, Thailand, and Singapore are popular destinations for affordable and high-quality medical treatment in Southeast Asia. However, there is limited research on the competitive advantages of these countries as medical tourism destinations. This study compares the competitive advantages of Malaysia, Thailand, and Singapore as medical tourism destinations. The interviews were conducted among 49 Indonesian patients who patronised Malaysia, Thailand, and Singapore for medical tourism services. Based on the study's findings, Malaysia, Thailand, and Singapore have several competitive advantages as medical tourism destinations. Malaysia's main competitive advantage is its affordability. In contrast, Thailand's main competitive advantage is its reputation as a hub for medical tourism, with a well-established and extensive network of hospitals and medical facilities. Meanwhile, Singapore's main competitive advantage is its reputation for offering world-class medical services, with advanced medical technologies and highly trained medical professionals. At the same time, limited availability of halal foods is their limitation. Policymakers and healthcare providers could consider the study findings in developing and implementing strategies to enhance their competitiveness as medical tourism destinations. Notably, the identified contrasts between Malaysia, Singapore, and Thailand could be marketed to help prospective medical tourists make informed decisions when choosing a destination for medical treatment.

Keywords: Medical Tourism Destination, Tourism Competitiveness, Medical Services, Tourism Management

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INTRODUCTION

In the early age of medical tourism, patients from less developed countries with stable incomes searched for advanced medical services in developed countries. However, a reverse trend emerged in the early 1990s as more patients travelled to developing countries searching for low-cost and better-equipped medical facilities (Ab Dulhamid et al., 2022; Mohit, 2009). Since then, the level of competition within the global medical tourism industry has grown, with an increasing number of developing countries, particularly in the Southeast Asia region, taking advantage of this opportunity to earn a share of the industry's disposal revenue (Thomas, 2019). This could be seen from the total of medical tourists, approximately over 60 million in 2018 that visited Southeast countries, especially Thailand, Singapore, and Malaysia, as key players in earning income in the medical tourism area (Sarker et al., 2021)

Recently, Asia has been a significant driver of medical tourism (Deeparechigi et al., 2018) because of cheaper fees, modern medical facilities, availability of medical expertise, and destination proximity. Malaysia, Thailand and Singapore are popular medical destinations due to political and economic stability, high-quality medical facilities, affordable medical care, and favourable exchange rates. Based on past reports, Malaysia's cardiology, and orthopaedics alongside fertility and rehabilitation treatment are among the popular medical services (Yunus, 2019). Meanwhile, Thailand offers many niche medical services including dentistry and cosmetic surgery. Singapore, in contrast, has many internationally credentialed hospitals (Guru et al., 2022).

The success of the medical tourism industry in Thailand, Singapore and Malaysia has positioned them as pioneers in providing affordable and high-quality medical treatment in Southeast Asia. They are the top three most desirable medical tourism destinations, with the potential to control more than 80% of the Asian market in the long term. Notably, Indonesian demand in the medical tourism industry is significant, supported by the high number of Indonesian travelling for medical treatment abroad (Ganguli & Ebrahim, 2017). Hence, it is critical to understand how the competitors could navigate their competitiveness to drive medical tourism demand. Due to limited empirical studies on the competitive advantage of medical tourism destinations in influencing Indonesian medical tourists' choice in selecting their medical destination, this study aimed to identify Malaysia's competitive advantages as a medical tourism destination for Indonesian medical tourists compared to Thailand and Singapore.

GROUNDING THEORY

The Resource-Based View (RBV) theory suggests that a firm's competitive advantage is influenced by its unique resources and capabilities. This theory

asserts that competitive advantage is not solely dependent on the industry or market but also on resources and capabilities that are hard to imitate (Silva & Oliveira, 2020). By leveraging these unique attributes, a firm can gain sustained competitive advantage and create value for stakeholders. RBV theory aids in identifying a firm's strengths and weaknesses, facilitating the development of strategies that capitalize on strengths to enhance competitiveness (Barney & Hesterly, 2020). It finds application in various fields, including business, strategic management, and marketing. In tourism, RBV theory can uncover a destination or tourism enterprise's unique resources and capabilities, thus enabling the development of strategies to enhance value for tourists and stakeholders (Kruesi & Bazelmans, 2023). In tourism studies, RBV theory posits that a tourism enterprise or destination's resources and capabilities, such as attractions, skilled employees, technology, and management, contribute to competitiveness (Assaker & Hallak, 2019). These attributes differentiate them from competitors and create value for stakeholders. The widespread adoption of technology platforms, driven by their user-friendly nature and cost-effectiveness, has consequently intensified competition within the tourism sector (Mior Shariffuddin et al., 2023). RBV theory helps identify these resources and capabilities and develop strategies to enhance competitiveness (Ogotu et al., 2023). Thus, RBV theory is a valuable perspective in studying tourism competitiveness, emphasizing the importance of resources and capabilities in the tourism industry.

RESEARCH METHODOLOGY

The study utilized a qualitative case study approach, conducting interviews with Indonesian patients who had cardiac treatment at Kuala Lumpur's National Heart Institute (IJN). Participants were selected based on their willingness and availability. Initial interviews refined the questions, covering demographic profiles, treatment experiences in their home country, and reasons for choosing Malaysia. Interviews were conducted from October 2022 to February 2023 after obtaining authorization and official approval from IJN. Interview schedules were tailored to patients' convenience. Participants were informed of the voluntary nature of their involvement, confidentiality, and anonymity.

Snowball sampling was employed, with participants chosen with hospital administration and patient consent, ensuring reliability. The sample size was determined by data saturation. Two sets of carefully crafted semi-structured questions were used, one in English and the other translated into Malay. Recordings were made with consent, lasting 40 minutes to one hour. Thematic data analysis using the narrative method was employed with 49 interviews. Interview transcripts were coded using NVivo Version 12.0, and themes were categorized and summarized.

ANALYSIS AND DISCUSSION

All participants in the study were married, with the majority being middle-aged to senior aged males. The medical tourists' companions were typically their spouses and children. More than three-quarters of them came from the Capital Region, Sumatra, and Java regions. They primarily resided in major cities, with a majority having received a higher level of education, such as completing senior high school. Only a few had completed junior high school. The majority of the medical tourists identified as Muslim, while a small number followed other religions. Lastly, the duration of their stay ranged from a minimum of one day to over seven days.

Based on the interviews conducted, it was found that approximately half of the participants (27/49) who were medical tourists had previous experience receiving medical treatment in Malaysia. However, the remaining participants were visiting Malaysia for medical purposes for the first time. Prior to coming to Malaysia, some of the participants (22/ 49) had sought medical treatment in other countries. Among these, the majority had visited Singapore (12/ 22) or Thailand (6/22), while a small percentage had visited both countries (4/22) for medical reasons. Since more than half of the medical tourists had previous experience with medical treatment in Malaysia, they were asked about their perceptions of medical care in Singapore and Thailand. The participants mentioned various factors that influenced their perceptions of medical treatment in these two countries.

Competitiveness Medical Tourism Services

Some medical tourists (16/27) believed that receiving medical treatment in Singapore would be too expensive due to the currency difference between Indonesia and Singapore. For Thailand (4/27), the cost was not the main issue, and only one medical tourist claimed the cost of medical treatment in Thailand might be too expensive due to the country's popularity among international medical tourists. There was consistency in decision making and one participant expressed

I think medical costs in Singapore are too expensive and for Thailand, I think the cost of medical care is a bit lower than Singapore's. Still, I think Thailand's medical costs are higher than Malaysia's because the country receives a high number of international patients.

Some medical tourists, especially Muslims, stated it was hard to find Halal foods in both countries since Singapore (11/27) and Thailand (12/27) have a majority of non-Muslim populations. Participants also expressed concerns

about the quality of food that may be served if they needed to be admitted to the hospital:

Singapore and Thailand are not Islamic countries, and it's hard to find halal food. I prefer to receive my treatment in Malaysia as it is a majority Muslim country with easy access to halal food in and outside the hospital.

I must consider several things if I travel to Singapore or Thailand for medical tourism. For example, if I need to be admitted to the hospital, would they serve me Halal food.... what about my family accompanying me? Is it easy for them to find Halal food while caring for me?

In addition, most medical tourists believed that receiving medical treatment in Thailand (14/27) might involve more communication barriers than in Singapore (4/27). For them, understanding their health condition was the most important component of medical tourism. Thailand was assumed to involve more barriers than Singapore since people were more likely to communicate in English.

I think they speak a completely different language in Thailand, and I realised that some of them could speak English. However, when you travel primarily for medical purposes, you are mainly concerned about understanding your health condition.

I never considered going to Singapore or Thailand, but both countries offer good medical services. [.....] In Thailand, the language will be the issue compared to Singapore where at least the people are well versed in English but I prefer Malaysia as we speak the same language.

Medical tourists had similar views of geography. Travelling to Singapore (7/27) may be time-consuming, as limited direct flights are available in some parts of Sumatra and Java, Indonesia and Thailand (9/27), and is associated with long-distance travel even with a direct flight. Respondents discussed the perceptions of travelling distance below:

There are only a few direct flights from Medan to Singapore and to travel from Medan to Thailand is quite far, and it will take longer to arrive at the destination.

There are direct flights from Padang to Kuala Lumpur, but to Singapore usually connecting flights. However, I think I need to transit to Malaysia for a trip to Thailand.

Other medical tourists perceive Thailand (8/27) as a medical destination mainly catering to aesthetic treatments like plastic surgery. They felt Thailand might not offer other medical treatments for cardiac health issues. This raised the question of why they did not find information through the internet to confirm their perceptions, but older medical tourists perceived seeking information through the internet was complicated:

I think Thailand is famous if you want to have plastic surgery. I am unsure if that country offers any health-related medical treatment other than cosmetic surgery.

I know Thailand is well known for medical tourism destinations but, as far as I know, it's a medical destination if you want to change your gender or if you want to be beautiful.

The narratives highlight Singapore's reputation for high medical costs, along with communication barriers and Thailand's association with cosmetic surgery. Additionally, concerns about halal food quality and availability in non-Muslim countries and travel logistics from Indonesia were key issues for Muslim medical tourists. The study identifies competitive advantages in Malaysia, Thailand, and Singapore for medical tourism. Malaysia stands out for affordability, providing quality medical services at lower costs than Singapore and Thailand. It offers diverse medical services, including traditional and wellness options, catering to a wide range of tourists. Thailand's key strength is its renowned medical tourism hub with a vast network of hospitals and services, including cosmetic surgery, dental care, and reproductive medicine. Its affordability and halal food options attract Muslim medical tourists. Nevertheless, language barriers and concerns about healthcare quality might deter some. Singapore excels in world-class medical services, advanced technology, and well-regulated quality care, accompanied by comfort, excellent transportation, and diverse accommodation options. However, high living and medical costs may challenge affordability for some medical tourists. Overall, each country has its strengths and weaknesses as a medical tourism destination, and the choice of destination ultimately depends on the medical tourist's preferences, needs, and budget.

Service Experience of Medical Tourism in Malaysia, Singapore, and Thailand

Different perceptions by medical tourists toward medical treatment in Malaysia, Singapore, or Thailand, whether confirmed or not, thus influenced decision-making. Nearly (8/12) of those who had travelled to Singapore usually considered that the costs were too expensive for heart treatment and general health check-ups there. Similar medical treatment and services were less expensive in Malaysia. Once again, there was a considerable consensus on this:

Before I visited IJN (Malaysia), I used to do my health check-up in Singapore. However, I find Singapore's medical costs more expensive than at IJN. Although the cost of treatment in Singapore is expensive, the hospital procedure is simple, and the treatment is good. The same goes for IJN; the hospital gave me good medical services at a better price.

Previously my family and I used to visit hospitals in Singapore for our health check-ups. From time to time, medical costs in Singapore continue to increase and become more expensive than our previous visits. Since we were used to medical treatment in Singapore, we continued to visit the hospital until we knew about medical care in Malaysia. In Malaysia, the costs of treatment are lower than in Singapore.

Due to the exchange rate in Singapore, medical costs and travel expenses were almost triple those in Malaysia. These travel expenses, including accommodation, local transportation, and outside food, are discussed below:

Before Malaysia, I used to go to Singapore for medical treatment. As Singapore's currency is in the dollar, treatment costs are tripled compared to Malaysia. For example, I pay the same amount for a doctor consultation in Malaysia which is MYR200 and SGD200 in Singapore. But, the currency is triple when we convert it; thus, the medical costs in Singapore are three times higher than in Malaysia, with the same quality of medical treatment, services, and expertise.

Some medical tourists (6/12) had made Singapore their first option for treatment to seek a second opinion related to their heart treatment after being made aware of their condition in an Indonesian hospital. However, they received a medical recommendation similar to Indonesia, so they travelled to Malaysia for another opinion at IJN.

[.....] I went to two hospitals in Singapore to get Minimally Invasive Cardiac Surgery (MICS) before coming to Malaysia. However, doctors at both hospitals in Singapore recommended heart surgery, which my Indonesian doctor advised me, and the same advice I received at a hospital in Johor Bahru, Malaysia. But IJN managed to conduct MICS 2 years ago.....

My Indonesian doctor advised me to have heart surgery and I received similar medical advice in a Singapore hospital. But, when I visited IJN for the first time, the doctor mentioned I didn't have to undergo any surgery.

Malaysia is sensitive and responsive specifically to the needs of Islamic patients. This was a significant factor in continuing their treatment in Malaysia for many medical tourists. Around (8/12) of medical tourists received medical treatments in Singapore but preferred to receive ongoing treatment at IJN as the Islamic practices by the medical professionals calmed them while receiving their treatment.

[.....] most important thing is that doctors and nurses in the IJN practice Islam when treating patients. It made me feel more confident when I received my treatment. Doctors and nurses in IJN would read 'Bismillah' before treating me and it made me feel better, I had never seen this in a Singapore hospital before.

I prefer receiving my treatment in Malaysia as IJN has an Islamic element while providing a treatment I don't experience in Singapore. For example, the nurses in IJN will recite 'Bismillah' before taking my blood sample, which makes me feel at ease.

Despite receiving high-quality medical services in Singapore, some medical tourists encountered communication barriers (Singapore, 5/12; Thailand, 4/6; Singapore and Thailand 2/4) as the main issue. One of the medical tourists received eye surgery in Thailand, while his family members had general health check-ups in Thailand or Singapore hospitals. All his family members experienced difficulties in communicating, particularly in Thailand. Likewise, another medical tourist received knee surgery in Thailand and encountered communication barriers as he struggled with English.

I have visited Singapore and Thailand for medical purposes. I received eye surgery at Bumrungrad Hospital in Thailand. I'm satisfied with the treatment there. Besides me, other family members also travelled to Thailand or Singapore for general health examinations as the quality of medical services

is good but too expensive. I found it easy for me in Singapore to communicate as some of them spoke Bahasa, but in Thailand, we must communicate fully in English, which is a bit complicated.

I had no problem going to Thailand because the medical service was good, and I was happy with my knee surgery. It was difficult to communicate because I had to speak English which I was not good at. The hospital offers translation services, but I prefer to communicate with the doctor directly.

Other medical tourists experienced similar issues when travelling to Singapore and Thailand for fertility treatment. He preferred Malaysia as it was easy to understand the language.

When I had my fertility treatment in Singapore, the doctor communicated in English or Mandarin, which I struggled to understand. However, in Thailand, doctors communicated in English. This was my first time receiving treatment at IJN and it was very easy to communicate with my doctor in Bahasa. Since my previous fertility treatments were unsuccessful, I was planning to get another treatment in Malaysia as it might be easier to understand the treatment fully.

Some medical tourists confirmed the availability of halal foods to be limited in Thailand (4/6) and Singapore (7/12) when they visited the countries for medical care, stating it was hard to find halal food there and they were not confident to simply consume food without knowing its status. Other medical tourists shared their experience travelling to Singapore or Thailand, if not for medical purposes. Some medical tourists were travelling to Singapore for business and mentioned it was hard to find halal food in that country as most of their population is Chinese. Other medical tourists' companions mentioned similar constraints as her whole family had a vacation in Singapore after her husband's treatment in Malaysia a few years before.

There was halal food in Thailand, but the choice is limited, unlike Malaysia, where there are various choices of halal food and even other ethnic cuisines like Chinese and Indian that are also halal.

Besides, my husband has visited Singapore for his medical treatment. We travelled there for the New Year celebration. I was concerned about the halal food status and found it quite hard to find Muslim food sellers, especially street food.

This is added as some medical tourists preferred to travel to Malaysia (4/6) as it was closer to Indonesia; travelling to Thailand for medical purposes, especially with a health condition, was difficult and time-consuming.

I found too much effort was needed when I travelled to Thailand. The medical services are undoubtedly excellent, but it is too far from Jakarta, as it took me around 3 hours or more to arrive in Bangkok. Compared to travel in Kuala Lumpur which took me around 2 hours flight. With my health condition, I am concerned about travelling long distances.

Other medical tourists mentioned visiting Singapore and Thailand (3/4) for leisure and medical treatment. For them, travelling to Thailand was not particularly costly in terms of travel expenses, especially the costs of food and shopping, unlike Singapore, where travel costs are quite expensive, especially hotels and local transportation. They enjoyed their stay in both countries and found communication difficult as they needed to speak in English throughout their visit.

Thailand is an amazing place for vacation. The hotel, local transportation and the best part are the food was cheap. My family had a great time shopping in Bangkok. The country is clean in Singapore, but I found the travelling costs were expensive. Maybe because of the 'dollar' currency, everything seems expensive there if we convert.

A similar point was stated by other respondents who had travelled to Thailand for a holiday (1/6). He stayed in Bangkok and had a great time but struggled with English and faced communication barriers.

A few years ago, I visited Thailand for a short escape with my family. The country is beautiful and has a variety of cuisines. We had a great time there and were lucky to travel with my son. He became our spokesperson as I am not that good with English.

Overall, Indonesian medical tourists had similar perceptions and experiences in Singapore and Thailand. Both groups found Singapore expensive for medical treatment, while Malaysia offered cost-effective, high-quality care. However, medical tourists visiting Thailand did not mention high treatment costs. For vacationers, Thailand was cheaper for food, hotels, transportation, and shopping. Experienced medical tourists initially favored Singapore over Malaysia. However, as Singaporean doctors offered similar advice to what they received in Indonesia, many turned to Malaysia for actual treatment, especially

at IJN. Some even went to Malaysia for a second medical opinion after finding a similar option in Singapore. While experienced medical tourists appreciate the quality of care in Singapore and Thailand, it's not just about quality. Factors like cost, travel convenience, language, food preferences, and Islamic hospital practices also played a vital role.

This research provides valuable insights into medical tourism, focusing on Indonesian medical tourists' experiences in Malaysia, Singapore, and Thailand. These findings can benefit medical providers by improving services based on tourists' preferences. The study reveals both commonalities and differences among medical tourists in these countries. While all three countries offer high-quality medical services, medical and travel costs are relatively high in Singapore, and language barriers and limited availability of halal food are some of the common limitations faced by medical tourists in Singapore and Thailand. In Malaysia, however, medical tourists mainly seek medical treatment due to inadequate medical expertise in their home country.

According to, Md Zain et al. (2022) Indonesian medical tourists choose Malaysia primarily for quality medical services, while cultural and language differences are crucial in their choices which suggests this group of Indonesian medical tourists is culturally conservative. The study provides valuable insights for medical tourism providers to tailor their services to meet patients' preferences. The decision of medical tourism destination is influenced by cultural similarities, language, and proximity, favouring Malaysia over Singapore and Thailand (Afzal et al., 2019). Language barriers further emphasised the importance of effective communication. Costs, halal food, and cultural affinity, driven by IJN's reputation, also played key roles in patient decisions (Jones & Comfort, 2020). The study reveals that the choice to travel to Malaysia extended beyond medical treatment, with cultural factors and short distances playing a significant role.

Medical tourism decision-making is influenced by a complex interplay of various factors (Mackenzie & Gannon, 2019). Patients travel to Malaysia due to a multitude of reasons, extending beyond healthcare. Government responsibility for citizen welfare, socio-cultural, economic, and political factors, alongside familiarity with culture, language, proximity, and medical expertise, all play a significant role (Baum et al., 2020). These factors shape the consumption and preference for medical destinations, particularly the enduring relationship between Malaysia and Indonesia (Berenschot et al., 2018).

IMPLICATION

This study adds to the current knowledge on this topic from a medical tourism perspective. The findings of this study have significant implications for medical tourism providers in Malaysia, Singapore, and Thailand. First, the study highlights the importance of understanding the needs and preferences of medical

tourists to improve the quality of their services and meet the demands of their clients. Providers can leverage the information gathered in this study to tailor their services to the specific requirements of medical tourists from Indonesia. Medical tourism providers can benefit from the explicit contrasts made by medical tourists between the three countries. Third, the study identifies some similarities in the perceptions and experiences of medical tourism in Singapore or Thailand, such as the high medical and travel costs in Singapore. By addressing these issues, providers can improve the affordability and accessibility of their services, which could attract more medical tourists.

The study also highlights some common limitations medical tourists face, such as communication barriers, limited availability of halal foods, and a lack of appropriate knowledge. Medical tourism providers can address these issues by providing language support and translation services, offering halal food options, and educating medical tourists on the cultural norms and practices of the country they visit. Furthermore, the study suggests that medical tourism providers must consider the multiple rationales that drive medical tourists to travel based on factors that shape their decisions. For instance, Indonesian medical tourists are driven primarily by the need to seek quality medical services in Malaysia due to inadequate medical expertise in their home country. Providers can use this information to develop specialised services that cater to specific medical needs.

From a theoretical perspective, the Resource-Based View (RBV) offers a valuable framework for medical tourism enterprises and destinations to develop strategies that leverage their resources and capabilities to enhance their competitiveness. This study emphasises the importance of assessing medical tourism enterprises' and destinations' resources and capabilities to identify their strengths and weaknesses. By leveraging their unique resources and capabilities, medical tourism providers can develop new products or services, invest in training and development, and enhance the skills of their employees. The RBV provides a useful tool for identifying the resources and capabilities contributing to a destination's competitiveness in medical tourism. Medical expertise, state-of-the-art medical technology, quality healthcare facilities, and highly skilled healthcare professionals are resources and capabilities that can differentiate a destination from its competitors. For example, a destination may have highly qualified healthcare professionals, state-of-the-art medical facilities, or specialised medical services that differentiate it from its competitors.

The RBV can assist in identifying the uniqueness of a destination's medical resources and capabilities, the difficulty of replicating them, and the availability of substitutes. Based on this assessment, medical tourism enterprises and destinations can develop strategies that leverage their unique resources and capabilities to develop a competitive advantage. The policy contribution of this study is to encourage medical tourism enterprises and destinations to adopt the

RBV framework to evaluate their resources and capabilities to enhance their competitiveness. This will benefit the enterprises and destinations and contribute to the growth and development of the medical tourism industry. Policymakers can use the findings of this study to develop policies that promote the adoption of RBV in medical tourism enterprises and destinations. This can help to create a more competitive and sustainable medical tourism industry, which can contribute to the economic growth of the countries involved. As suggested by Azinuddin et al. (2022a), the significant rise of tourism as a global economic driver has triggered extensive research into its connection with sustainability, underscoring the difficulty of maintaining a balance between environmental conservation and sectoral growth. This is due to the destructive impacts of the industry on nature (Azinuddin et al., 2022b). Therefore, by leveraging their unique resources, and capabilities whilst promoting sustainability, medical tourism enterprises and destinations can enhance their competitiveness and attract more medical tourists, benefiting the entire industry. Overall, the study provides valuable insights that could enable medical tourism providers in Malaysia, Singapore, and Thailand to enhance their competitiveness and appeal to medical tourists from Indonesia. By responding effectively to the demands of medical tourists, providers could increase their market share and position themselves as preferred destinations for medical tourism.

CONCLUSION

Some medical tourists made explicit contrasts between Malaysia, Singapore and Thailand. There were some similarities in perceptions and experiences of medical tourism in Singapore or Thailand in terms of the high medical and travel costs in Singapore. Other limitations were communication barriers, limited availability of halal foods and lack of appropriate knowledge. Even though most believed that both countries provided high-quality medical services and treatment, high costs of medical services, language difficulties, and limited availability of Halal food were significant considerations in medical travel decisions. The limitation of this study is the view of Indonesian patients; therefore, our results may not represent the complete spectrum of medical tourists' experiences in Malaysia, Singapore, and Thailand. However, we are certain that the accounts were written by actual Indonesian medical tourists who had visited Malaysia and were knowledgeable about or had first-hand experience with medical tourism in Thailand and Singapore. Most subjects provided adequate information and detailed feedback, including personal information in narratives about their experiences. Future research could therefore examine the perspectives of medical tourists from other nationalities and contrast them with the results of this study.

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ETHICAL STATEMENT

The research reported in this paper is conducted in accordance with general ethical guidelines in psychology-related research and obtained approval from Research Ethics Committee (REC) Universiti Teknologi MARA (UiTM).

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STRATEGIC LEADERSHIP TOWARDS SUSTAINABLE PLANNING FOR COMMUNITY DEVELOPMENT IN MALAYSIA

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Abstract

Strategic leadership is recognized as a vital tool in the transformation of rural organisation. Thus, this qualitative research study aimed at assessing the role of strategic leadership in the transformation of rural organisation. The study used a semi-structured interview schedule to collect data. Purposive sampling was used to select a cohort of sixty members of Villages Development and Security Committee (JPKK) of Malaysia. Those selected as participants include chairmen, secretaries and ordinary members. The study used an inductive approach for data analysis. The data analysis led to the development of five main themes of ‘strategic direction’, ‘ethical practices’, ‘exploitation and maintenance’, ‘development of human capital’ and ‘sustaining a corporate culture’.

Keywords: Community leadership, local leader, rural development, strategic leadership, planning

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INTRODUCTION

For rural communities to be sustainable and successful, rural leadership is essential. Strategic leadership is critical to building sustainable and thriving communities in rural areas. Developing strategies to address their communities' particular needs and difficulties is the responsibility of rural leaders (Rami et al., 2022). Rural leaders must possess a range of skills, including the ability to set a clear vision, develop effective strategies, communicate effectively, and inspire and motivate others towards a common goal. By leveraging these skills, rural leaders can build strong and resilient communities that are capable of adapting to changing circumstances and building a brighter future for their residents.

Most policies concerned with rural development always aimed at creating a highly progressive, and knowledgeable population in the rural communities to establish a secure and better place for a community to live (Tantoh and McKay, 2020). The implementation of different policies or initiatives requires strategic leaders who are able and willing to influence a positive change in the community (Bertolini, 2019). Rashid, Ngah and Misnan (2019) and Rami et al. (2020) indicate that maintaining a desirable rural community development trend requires a strategized development program aimed at the general transformation of rural communities in the areas of economic development, infrastructure transformation, human capital development, and enhancement of social welfare. These various effective development strategies allow leaders to achieve success in different socio-economic development programs. Previous studies also mentioned that rural development programs must be efficient to boost the process of rural community transformation. Ensuring effectiveness of the development programs is feasible by enhancing the program implementation strategy through strategic leadership.

BASELINE RESEARCH

Strategic Leadership and Community Development

The relevance of community leadership has also been observed in the times of COVID-19. Local leaders have acted on behalf of the government to ensure successful implementation of Standard Operating Procedures (SOPs) as ways of preventing the spread of Coronavirus in the rural areas. It is evident that strategic leadership is the focal point of rural community transformation though there may be other supporting factors such as establishing good relationships with the local population, cooperating with the top government leadership, and ensuring proper utilisation of resources.

In essence, the supposition drawn from the above is that the importance of strategic leadership is not in doubt when it comes to the development or transformation of a particular community. That is to say, it plays a far-reaching role in the matter of fortune or failure of the populace. Contemporary researchers, such as Muzee (2016) and Olaka (2017) have confirmed that the effectiveness

and performance of compelling strategic leadership in rural areas are associated with such leadership, and is heavily influenced by the ideals of the community leader. Moreover, in the ambiance of rural study, strategic leaders are an important component in community development and are very influential in deciding the direction of developmental programs and consequently determine the success level of development programs, especially in the social-economic perspective.

These community leaders are usually appointed by the government to act as community transformation agents of the government, whereby they act on behalf of top leaders in trying to actively participate in community development initiatives. Hence, community leaders can always be recognized as an intermediate agency that links people’s needs to the different top government authorities (Olaka, 2017). Community leaders play a vital role in a matter of lobbying, implementation and supervision of different developmental programs in the community that are aimed at enhancing rural community development (Fuertes et al. 2020). This section presents the components of strategic leadership.

Strategic Leadership	Strategic direction
	Ethical practices
	Exploitation and maintenance of core competencies
	Development of human capital
	Sustaining a corporate culture

Source: Fuertes et al. (2020)

Determining Strategic Direction in the Community

Strategic leadership is the essential method of determining the strategic trajectory of a community. Such approach makes certain the development of a long-term and sustainable vision to steer the community toward achieving various strategic goals and objectives. In 2020, Fuertes posited that community heads should actively participate in formulating or establishing the most sustainable strategies to foster community development. Lear (2012) had previously suggested that enhanced business and organisational thinking has increased the need for community empowerment, involving equal participation of stakeholders or community in the different developmental activities.

Fuertes (2020) further proclaimed that achieving the desired level of transformation in the community requires extremely strategic leaders that have the ability and the enthusiasm to make proper decisions and consequently deliver merits. To add weight to this assertion, Ching and Loke (2016) also establish a staunch and indisputable connection between strong leaders and effective strategies as regards community development.

Ethical Practices

A large and established body of research evidence has shown the significance of literature concerning ethical practices in leadership and how they are able to influence community development tremendously. A case in point, according to Lear (2012), though ethical leadership is a subset of strategic leadership and it plays a conspicuous lead in the general development of people and their surroundings. However, most of the literature only covers the element of leading ethically without further discussion on the various attributes of ethical leadership, especially in the context of community development. In light of this statement, yet there was deterioration by most community leaders which then brought ethical leadership and strategic leadership to the public eyes.

As mentioned by Lear (2012), strong ethical leadership is based on very effective leadership strategies that help to enhance the level of morality in society thereby enhancing the level of community development.

Exploitation and Maintenance of Core Competencies

According to Lear (2012), core competencies simply mean the different resources and capabilities that help an organisation to enhance its competitiveness. Vanclay et al (2013), stress further that core competencies enable community leaders to perform effectively beyond their capability in order to achieve community's imminent transformation or development.

In the community development perspective, competencies are basically associated with the different resources and personnel that help the community to achieve its desired growth or development. Most recent studies have pointed out that the most ideal source of sustainable development originates from the community's core competencies, which are associated with skills, morals, and abilities of both leaders and local population (Muzee 2016; Ching and Loke, 2016). Certainly, these traits ought to be nurtured.

Development of Human Capital

Olaka (2017) claimed that human capital is much associated with knowledge and skills of the organisation's employee group. In conjunction with the community perspective, human capital can be explained as a representation of different skills or capability of community leaders and the local population that influence the level of community transformation. This clearly emphasises that adequate human capital is absolutely necessary in the matter of utilisation of core competences towards enhancing rural community transformation.

Studies by Vanclay, Baines and Taylor (2013) suggested that a reliable group of leaders in a community that are associated with different attributes enable them to achieve different developmental goals and objectives.

Sustaining A Corporate Culture

Corporate culture represents a complex set of core values, ideologies, thoughts or symbols which are shared by various stakeholders of an organisation along with stimulating the level of performance (Olaka, 2017). Apropos of community context, corporate culture is composed of different core values shared by the different community leaders and their subordinates. Thus, according to Schneider et al. (2013), the importance of corporate leaders are: (i) knowing the corporate culture, (ii) changing the corporate culture and/or (iii) leverage the corporate culture to create competitive advantage.

Moreover, it is important to emphasise that strategic leaders' characters are essential to promote the spirit of entrepreneurship and self-reliance in people, which consequently nurture a desirable culture which promotes concentrated learning, sharing of knowledge and improved community development (Olaka, 2017).

Community Leader Competencies

Evidently, strategic leaders are constantly immersed in decision making to help their community to effectively develop, nurture, invigorate, leverage and consequently exploit core competencies (Olaka, 2017). In no doubt, the nature of decisions undertaken by leaders greatly influences the level of transformation in the community (Muzee, 2016). Muzee (2016) and WN Jasmina (2023) confirms that hiring the right person for the job is the essential key to organisational success.

Research indicates that utilising the different competencies in communities involves equal allocation of resources across all essential units in the community (Olaka, 2017). Therefore, it signifies that dedicated performance of top community leadership is fundamental for maintaining a sustainable level of development in the community.

METHODOLOGY

This research responded by aiming to understand leadership difficulties by a thorough investigation of the lived experience of local leaders, moving away from demonstrating or disputing predefined theories. Accordingly, it was decided that a qualitative method would be better suitable for this study (Taylor et al, 2015), since it provides unfiltered inputs that may be used to uncover the subjective experiences of local leaders. In order to address the issues addressed by this study, a qualitative phenomenological research methodology was used.

The phenomenological approach may qualitatively map out the various ways that individuals are engaged in their experiences, conceptualization, perception, and knowledge of a phenomena as a study tool (Green and Thorogood, 2018).

Data Collection

The study was conducted in the states of Terengganu, Kedah, Selangor and Johor Malaysia, which has the highest number of rural areas in Peninsular Malaysia. This study employed semi-structured interviews for data collection and used an inductive approach to conduct the analysis. Purposive and snowball sampling methods were used as sampling. The state's designated zone and localities, where research data were gathered through interviews and observations, served as the study area. As a result, the research included people, local community members, officials from the appropriate government agencies, and community leaders (JPKK) as stakeholders (See in Table 1).

Table 1: Research participants from selected zone

Community	Chairman	Secretary	Members
East Zone - Terengganu	2	2	10
North Zone - Kedah	2	2	10
Southern Zone - Johor	2	2	10
Central Zone - Selangor	2	2	10
Stakeholders	-	-	7

The interview questions probed on subjects related to their daily activities, a leader's role in managing community affairs, including gatherings and meetings, as well as the relationship between local communities and government and non-government agencies in selected villages in Malaysia.

Data Analysis

The method of data collection in this study is through in-depth one-to-one interviews and focus group discussion. A total of 60 respondents were selected which comprises community leaders, locals residence and officials in the relevant government agencies. Each interview lasted at least 30 and up to 45 minutes. The study followed four steps of trustworthiness mentioned by Lincoln and Guba (1985) by checking credibility, transferability, dependability, and confirmability. To locate major and minor themes, Atlas.ti was utilised to obtain reliable sources gathered through interviews and records. Moreover, to verify the challenges of community leadership, respondents from various fields of expertise and backgrounds were interviewed.

FINDINGS OF THE STUDY

The review confirms the fact that strategic leadership is embedded in different components such as strategic direction, ethical practices, exploitation and maintenance, development of human capital and sustaining a corporate culture. The findings of studies indicate that the strategic direction of a community is normally aligned with the community's strategic intent and this involves all

community leaders and the local population being committed to working together towards achieving specific development goals in a manner that is highly unique as compared to other communities.

Strategic direction set by the community leaders

The result clearly shows that success of different community development projects, most especially in rural areas, is greatly influenced by the level of strategic leadership applied by different stakeholders of development in the community. The different strategies applied by the community leaders help to break the barriers that could have affected the effectiveness of different community development programs or initiatives (Rami et al., 2020).

"... For your information, we have a village planning plan. This planning was made for a period of 5 years with the help of the district office and an officer from INFRA..."(Chairman3)

"...This Blueprint covers aspects of economic development, personality and social development of youth and education... This year alone, we have successfully organised 7 programs for single mothers, youth and other programs with allocations from the ministry, KEMAS and district offices..." (Chairman3)

"...During the covid19 pandemic period, JPKK has drawn up a plan to help the community remain competitive. The impact of this pandemic has had a major impact on the socioeconomic development of rural communities. In fact, to rise immediately, the state government has given a one off allocation of RM4000 to each JPKK to implement programs in their areas..." (Chairman3)

"...As one of the exemplary communities in this district, we set aside political differences. Always cooperate in making the activities and response of each program organised very well. Everyone is involved..." (Secretary1)

"...All parties will be involved in providing input to policies or activities that will be organised by us. After all the input and enough information, we will seek expert advice before making a decision in the meeting..." (Secretary1)

The effectiveness of a leader's leadership and functioning is determined by how he uses his ability to influence the behaviour of others (Yukl, 2010). Community leaders should build relationships with internal and external

stakeholders. Moreover, it is important to address that leaders are fundamentally required to enhance, strengthen and initiate long term goals with the stakeholders as they are “informant agents”. However, with the presence of competent leaders who have a strategic direction, complaints of problems and one-off assistance from the government can be channelled accurately and fairly to the affected groups. Along with the same line, community leaders need to prioritise the needs of the community despite having different political backgrounds.

Ethical practices

Leaders who practise the concept of ethics are still debated to this day. However, in a pandemic environment that probes the ability of local leaders in performing their duties fairly and responsibly. The results of the interviews show that the concept of ethics in performing duties has been understood by JPKK leaders.

“...I understand the word ethics in performing duties, yes I agree, as a leader, ethics should be given priority in ensuring that we perform duties with full trust ...”

“...Sometimes it is difficult for us to apply this ethical practice. Because our organisation is a community organisation that does not have full authority like working in an office. Everything is done willingly and ethics has to be forgotten ...”

Leaders who take a transformational approach often set extremely high expectations for moral and ethical conduct. However, based on these study findings, it illustrates that on certain occasions, ethical practice in leadership is formidable to apply especially in uncertain circumstances. In contrast to leaders of formal organisations or leaders of public organisations, community leaders need to be more flexible and find it extremely difficult to be bound by ethical practices.

Exploitation and maintenance of core competencies

In the perspective of community development, capabilities are essentially associated with the different tools and resources that enable the community to achieve its desired growth or development. Based on the findings, local leaders have shown that strategy implementation core competencies contribute to the JPKK committee as a whole in various functional skills.

“...Throughout 2019, we have implemented programs for the community. Nearly 15 programs were implemented and 3 programs were implemented on a large scale. But, this year (2020) we have to cancel many programs because of this Covid-19 situation...”

"...Our JPKK members have a clear vision and path to ensure that our community benefits from all development activities, no one is marginalised..."

The findings demonstrate that community leaders have always been vital to the success of rural community development programs. Furthermore, competencies have been identified as another vital component affecting strategic leadership's effectiveness in enhancing community transformation. This is possible by the implementation of various methods, such as partnering with government officials, universities, training institutions and also involving in the community decision-making processes relating to rural community development projects. However, Covid-19 calls on all community leaders to conduct an unforeseen action for the communities. Novelty threat and new norms demand new skills set from the leaders to adopt and adapt. In this light of pandemic, even though the government may provide suitable platform and guideline for the leaders, their competencies in tackling new matters are in fact can be complicated and unbearable, but as a leader, skills need to be learned and earned despite they are also a part of the community that also affected with the threat.

Development of human capital in rural community

Leadership is an important element in human capital. Human capital can be viewed from a community perspective as a reflection of various skills of community leaders and the community that affect the level of community transformation. This clearly demonstrates that sufficient human capital is essential for the use of core competencies in order to enhance the transformation of rural communities. Based on the interviews conducted, main leaders of JPKK agreed that the aspect of human resource development is indeed still weak. This is because the social and economic factors of different populations are different. However, they have tried to diversify their main methods in the field of education, skills upgrading by organising programs with government and private agencies.

"...We are in the early stages, we ensure that our area is equipped with basic facilities to increase economic, social activities and facilitate the movement of people..."

"...Youths are given vocational skills while students at primary and secondary levels provide free tuition services..."

"...Transforming rural areas requires physical and economic development as well as enhancing human capital which is the core engine of growth..."

The development of infrastructures can lead to an increase in economic activities in the rural areas, which in turn would translate into higher income for the rural population. This can be combined with education and skills enhancement, as well as capacity building for rural communities, to enable rural populations to be resilient to current and emerging challenges.

Sustaining a corporate culture

To ensure good community governance, community leaders are advised to adopt a corporate work culture to be able to develop the socio-economy of local people (Rami et al, 2021), generate employment for youth in rural areas (Ricketts, 2008) ensure rural communities are not left behind in development. In the philosophy of strategic leadership in profit-based organisations, the thinking of the leader should always find a way, creating opportunities for the organisation to be more competitive. In the rural context, this culture is still lacking because community organisations are still based on voluntary work by not prioritising profit making and community management is very different from the corporate structure.

"...Changing the work culture requires a lot of time and energy, especially changing the culture of rural communities..."

"...Yes, I understand ... A systematic work culture and management is very important in more effective rural governance. However, a voluntary community work culture requires a more friendly and more tolerant approach..."

"...It is difficult for us to adopt work slavery as public and private organisations. Rural communities, different from the others..."

Strategic leadership is an essential aspect of effective management that involves the ability to set and execute the long-term vision of an organisation. It involves the capacity to anticipate and respond to changes in the external environment, while also aligning the organisation's internal resources and capabilities towards achieving its goals. Strategic leaders must possess a range of skills and traits, including a strong strategic vision, effective communication skills, and the ability to inspire and motivate others towards a common goal.

One key aspect of strategic leadership is the ability to develop and communicate a clear and compelling vision for the organisation's future. This vision should be grounded in a deep understanding of the organisation's strengths, weaknesses, opportunities, and threats, and should be aligned with the organisation's values and mission. By communicating this vision to all stakeholders, including employees, customers, investors, and partners, strategic

leaders can build buy-in and create a sense of shared purpose that can help drive the organisation forward.

In addition to setting a clear vision, strategic leaders must also be able to develop and implement effective strategies to achieve that vision. This involves assessing the organisation's current position in the marketplace, identifying key trends and opportunities, and developing plans to leverage the organisation's strengths while mitigating its weaknesses. Strategic leaders must also be able to anticipate potential obstacles and develop contingency plans to ensure that the organisation can adapt and thrive in a rapidly changing environment.

Effective communication is another key aspect of strategic leadership. Strategic leaders must be able to communicate their vision and strategy clearly and convincingly to a range of stakeholders, including employees, customers, investors, and partners. This involves not only presenting complex ideas in a simple and accessible manner but also listening actively to feedback and incorporating it into their plans. By fostering open and transparent communication channels, strategic leaders can build trust and credibility with their stakeholders, which can help to mitigate risks and build long-term partnerships.

Finally, strategic leaders must possess strong interpersonal skills and be able to inspire and motivate others towards a common goal. This involves creating a culture of collaboration, innovation, and continuous improvement, where employees feel empowered to contribute their best ideas and work together towards achieving the organisation's goals. Strategic leaders must also lead by example, demonstrating a commitment to the organisation's values and mission and setting high standards for themselves and others.

In conclusion, strategic leadership is an essential aspect of effective management that involves setting a clear vision, developing and implementing effective strategies, communicating effectively, and inspiring and motivating others towards a common goal. By possessing these skills and traits, strategic leaders can build organisations that are adaptable, resilient, and capable of thriving in a rapidly changing environment.

CONCLUSION

The literature review study clearly shows that strategic leadership positively influences the level of rural community development. The study indicates that the different aspects of strategic leadership, most particularly strategic direction, capacity to learn, managerial wisdom and capacity to change play a key role in the general transformation of rural communities. For rural communities to achieve the desired level of development, leaders must be in position to apply the different components of strategic leadership in engaging with the local population and other stakeholders of development in such rural areas. This speeds up the

process of rural transformation since it limits the different barriers to development such as intolerance or lack of cooperation from the local population.

The active role of community leaders is associated with basing in the different components of strategic leadership to organise the community, spearhead the decision making and implement processes of development initiatives. This is in addition to playing a supervisory role through monitoring and evaluating the ongoing or completed projects. Critical assessment of the different requirements for rural community transformation shows that it is always complex to achieve the desired objectives without applying the most effective developmental planning strategies. This justifies the importance of strategic leadership in enhancing the sustainable community planning and development.

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MEASURING TOURIST PREFERENCES AND BEHAVIOR TOWARD SMART TOURISM DESTINATION PLANNING

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Abstract

This research examines how tourists perceive and engage with technology and sustainability concepts, particularly in relation to their utilization of QR codes at tourist sites. The investigation conducted by the researchers explores four key factors hypothesized to influence tourists' preferences and behaviors regarding technology: a) habits, b) risks, c) sustainability attitude, and d) motivation. An online survey was completed by 316 participants, including both locals and foreign visitors to the KL QR Trail. The data was collected between January and March 2022 and analyzed using the SmartPLS 3.1.1 software. The findings reveal that tourists' habits and sustainability attitudes influence significantly on their satisfaction, while motivation and risks were found to be insignificant predictors. Furthermore, customer satisfaction was found to influence behavioral intention. These outcomes underscore the significance of tourists' established habits and sustainability commitments for the effective implementation of smart tourism initiatives. Additionally, this study contributes to the comprehension of technology acceptance model and its integration with sustainability attitudes, particularly as it pertains to the adoption of QR codes at tourist destinations.

Keywords: smart tourism, QR Code, destination, sustainability attitude, habit, risk, motivation, tourist behavior

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INTRODUCTION

Technology plays a vital role in the sustainable development of tourist destinations. The concept of "smart tourism" emphasizes the interconnection and interactive use of multiple technologies, which has been found to improve tourist satisfaction (Höjer & Wangel, 2014). In fact, research in this field is increasing, particularly regarding how technology impacts tourist behavior and experiences (Mior Shariffuddin et al., 2023). Tourists nowadays demand various smart technologies, including IoT devices, AR, VR, and QR codes (Hamid et al., 2023). Among these, QR codes have gained widespread use due to smartphone adoption and can store significant data, making them useful for information dissemination, payment, and even pandemic control (Vu, 2020). Furthermore, Azmadi et al. (2022) note the rising trend of QR code usage in tourism destinations.

Moreover, the notion of smart tourism destinations integrates technology and sustainability, promoting sustainable progress and aligning with the technology acceptance model, as supported by various scholars (Azinuddin et al., 2022a; 2022b; 2022c; Azwar et al., 2023). Recent literature also underscores the importance of sustainability principles and their practical implementation, integrating green IT, smart energy, and waste management into tourism development, with an emphasis on technology adoption and sustainability attitudes (El Archi et al., 2023). However, there remains a need for further research in these areas.

According to Ye et al. (2020), various theories are employed when studying the use of technology. The Unified Theory of Acceptance and Use of Technology (UTAUT2) is a popular theory with significant relevance in technology adoption research. UTAUT2 proposes that individuals' technology usage is influenced by three additional factors: hedonic motive, cost or perceived value, and habit. UTAUT2 has come to dominate the field of technological advances adoption. However, there is still room for further development by incorporating other relevant variables that may influence technology adoption.

In this research, the investigation revolves around the behavior of tourists concerning the implementation of QR codes at various destinations, specifically regarding technology and sustainability. The QR Code trail is designed to encourage tourists to scan QR codes in order to access specific information about the tourist spots they visit along the trail. The study was conducted at the KL QR trail, which is recognized as the pioneering tourist destination to adopt this trail. Figure 1 demonstrates the theoretical framework. The primary focus of this study centers on four factors: i) habits, ii) risk, iii) sustainability attitude, and iv) motivation, which are hypothesized to have an impact on tourist satisfaction and loyalty.

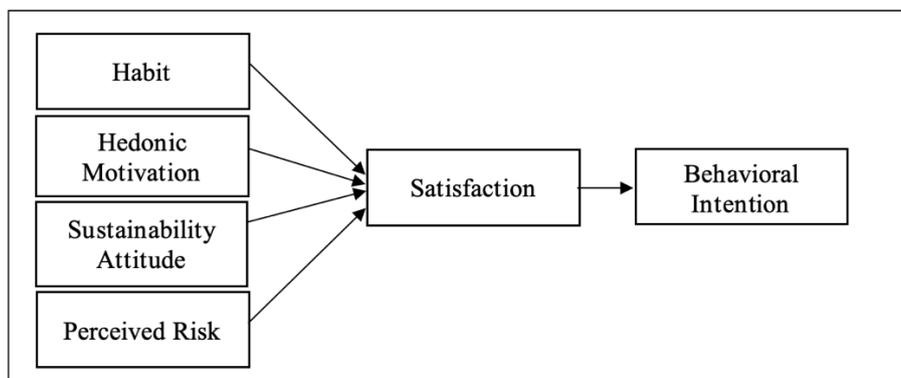


Figure 1: Theoretical Framework of the study

LITERATURE REVIEW

Adoption of QR codes in tourism

The QR code is an innovative advancement of the traditional barcode (Bi et al., 2008). The key attribute of the QR code system is its ability to authorize the retrieval of content from a website through a smartphone. To make this possible, the necessary web pages must be developed and integrated into a customized website (Emek, 2012). Emek's study (2012) examines the use of QR codes in various sectors of the tourism industry, including museums, galleries, accommodations, air travel, restaurants, bars, guided street tours, and open-air museums and shops. However, more research still needs to be done on the effectiveness, awareness, and customer satisfaction associated with using QR code technology. This contributes to the professional development of tourism destinations and technology integration and creates optimal conditions for tourists to access detailed information about destinations (Vu, 2020).

Theoretical Basis and hypothesis development

Venkatash et al. (2003) developed the Unified Theory of Acceptance and Use of Technology (UTAUT) to integrate and enhance several previous theories that sought to explain user acceptance and use of technology. These earlier theories include Davis's (1989) Technology Acceptance Model (TAM), Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA), and Ajzen's (1985) Theory of Planned Behavior (TPB). TAM focused on two crucial factors, perceived ease of use and perceived utility, to predict an individual's intention to adopt a technology: perceived ease of use and perceived usefulness. On the other hand, according to TRA, an individual's intent to engage in a behavior is determined by their attitude toward the behavior and subjective norms. TPB added the variable of perceived behavioral control, which represents an individual's perception of their capacity to perform the behavior, to TRA.

Venkatesh et al. (2012) introduced the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) as a comprehensive framework to build upon the UTAUT. UTAUT2 introduces three new constructs to the original UTAUT: hedonic motivation, cost or perceived value, and habit. In addition to the original UTAUT constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions, these constructs are influenced by age, gender, and experience (Marikyan & Papagiannidis, 2021). UTAUT2 therefore incorporates the following concepts: performance expectation, effort expectation, social influence, facilitating conditions, hedonic motivation, price value, and habit.

Habit

Habit can be characterized as the degree to which a person engages in behaviors instinctively based on learned impulsiveness (Limayem et al., 2007). Venkatesh et al. (2012) further elaborated that habit reflects the impact of previous experiences or behaviors. A study by Tiara Imani and Herlanto Anggono (2020) on adopting QR codes in e-commerce emphasized that habit is the most influential factor in determining behavioral intention. Consequently, gaining insights into tourists' habitual use of technology can facilitate adoption in specific destinations.

H₁: *Habit has a significant influence on satisfaction.*

Hedonic Motivation

In accordance with a study by Venkatesh et al. (2012), pleasure or satisfaction associated with technological advances refers to hedonic motivation. Motivation is indispensable in predicting the adoption and usage of technology, as noted by Brown and Venkatesh (2005). Similarly, Zhang et al. (2012) suggested that the perceived entertainment degree of a specific technology positively influences a consumer's intention to use it. However, testing this factor in smart destinations after the pandemic is still limited. Therefore, there is a need to investigate further the impact of hedonic motivation on smart tourism destinations.

H₂: *Hedonic Motivation has a significant influence on satisfaction*

Sustainability Attitude

According to Hamid and Isa (2018), sustainability emphasizes three main pillars: economic, social, and environmental. Achieving sustainability requires active engagement from various stakeholders. A study by Abdullah et al. (2019) emphasized that tourists must possess a positive attitude toward sustainability to act responsibly. These attitudes encompass social, economic, and ecological

factors and public and personal involvement (Šaparnienė et al., 2022). However, existing research on sustainability attitudes predominantly focuses on environmental aspects. This in spite of the concept of sustainable tourism has posed a puzzle for individuals in the industry, as well as for policymakers, researchers, and governmental bodies, for an extended period (Rasdi et al., 2023). Therefore, it is imperative need to examine the sustainable attitudes of tourists that could impact their adoption of technology.

H₃: *Sustainability attitude has a significant influence on satisfaction*

Perceived Risk

Adeola (2007) defines perceived risk as the evaluation of prospective threats to a person's health or well-being. This risk perception can result in ambiguous and unexpected outcomes. The perception of risk in tourism is significantly influenced by both the physical and psychological characteristics and processes of travelers, including attention, perception, the impact of representation, memory, reasoning, and language abilities (Cui et al., 2016). The emergence of COVID-19 was perceived as a significant concern that would influence tourist behavior. Hanafiah et al. (2022) conducted a study that shed light on why participants evaluated the perceived health hazard as moderately high whereas expressing relatively low travel intentions. Consequently, it is necessary to investigate the connection between risk perception and tourist satisfaction.

H₄: *Perceived risk has a significant influence on satisfaction*

Usage Satisfaction and Behavioral Intention

According to Sánchez-Rebull et al. (2018), customer satisfaction is primarily associated with anticipation before traveling and experiences after traveling, which contribute to emotions of satisfaction or dissatisfaction. Several studies, such as those conducted by Bayih and Singh (2020) and Marques et al. (2021), have emphasized the factors that influence tourist behavior and satisfaction and their behaviors after visiting a destination. This highlights the significance of tourist satisfaction as it can influence their behavior towards the destination.

H₅: *Satisfaction has a significant influence on behavioral intention*

RESEARCH METHODOLOGY

Study Setting

The Dataran Merdeka Kuala Lumpur QR trail is chosen as the study setting as it exemplifies the characteristics of a smart tourism destination. The trail incorporates a QR code system that provides information about various

attractions along the trail. The seventeen featured attractions on the trail, which include the Kuala Lumpur City Gallery, Kuala Lumpur City Library, Dataran Merdeka Flagpole, Victoria Fountain, Zero Mile Kuala Lumpur, National Textile Museum, Lebuhraya Bridge, Kolam Biru River of Life, Jamek Mosque Pedestrian Bridge, Jamek Mosque, Sultan Abdul Samad Building, Union Jack Flagpole, Dataran Merdeka, St Mary Cathedral, Royal Selangor Club, Rumah Tangsi (Loke Chow Kit Mansion), and Kuala Lumpur Tourism Bureau.

METHODOLOGY

The study employed a causal research design, precisely a quantitative approach based on survey methodology. The choice of this approach was motivated by the aim of investigating tourists' behavior towards technology and their attitude towards sustainability when using QR codes at the KL QR Trail. To collect the data, non-probability purposive and snowball sampling techniques were utilized. The target population for this study was domestic tourists in Kuala Lumpur, which had an estimated population of 9.1 million in 2021. A total of 316 responses were obtained for the study; however, 17 online responses were deemed invalid due to needing to pass the screening questions or missing data. Therefore, only 299 responses were considered valid and included in the data analysis and hypothesis testing.

This study's questionnaire contained three distinct sections. Section 1 consisted of two queries to validate respondents' eligibility. Section 2 measured factors such as habit, hedonic motivation, sustainability attitude, perceived risks, tourist satisfaction, and behavioral intention. Section 3 collected demographic information, including gender, age, marital status, education level, occupation, monthly income, and frequency of technology usage. A Likert scale with five available responses—one for "strongly disagree" and five for "strongly agree"—was used in the survey. Pilot research was undertaken to verify the validity and reliability of the research instruments before the questionnaire in English and Malay was finalized. This study's instruments were adapted from previous research relating to the UTAUT theory (Çakiri & Çiftçi, 2019; Chang, 2012; Hanafiah et al., 2022; Malik et al., 2019; Vuksanović et al., 2021).

From January through March 2022, three months of data were collected at the attractions listed on the KL QR Trail. Questionnaires were distributed to tourists who scanned the QR codes provided on the trail and online for individuals who had previously visited the trail but had yet to complete the survey.

Statistical Package for the Social Sciences (SPSS) software was utilized to analyze the collected data. Prior to data analysis and reporting, the reliability of the data was assessed through reliability analysis to ensure consistency, stability, and goodness. Both constructs achieved acceptable reliability results, with Cronbach's Alpha coefficient values exceeding the minimum value of .70,

which is considered acceptable. Descriptive analysis was conducted using SPSS. The assessment and measurement model were tested using SEM PLS software to examine the hypothesis.

ANALYSIS AND DISCUSSION

Descriptive analysis of respondents

The study's sample consisted entirely of domestic tourists, with females accounting for 60.9% and males accounting for 39.1%. In terms of age, the findings revealed that 10% (n=30) of the participants were under 18 years old, 18.1% (n=54) were between 18 and 24 years old, 42.1% (n=126) fell into the 25-34 age range, 13.7% (n=41) were aged 35-44, 7.4% (n=22) were aged 45-54, and 8.7% (n=26) were 55 years old or older. In terms of daily technology usage, the majority of respondents, 62.5% (n=187), spent 5 to 7 hours using technology, followed by 28.1% (n=84) who spent 8 to 10 hours. A smaller percentage, 6.0% (n=18), used technology for more than 10 hours, 3.0% (n=9) used it for 2 to 4 hours, and the remaining 0.3% (n=1) used it for less than an hour.

Measurement model result

Initial evaluation of the reflective measures included convergent and discriminant validity analyses. Examining factor loadings, composite reliability, and average variance extracted (AVE) helped determine convergent validity. The majority of reflective products exceeded the prescribed loading threshold of 0.70. The composite reliability (CR) values, which ranged from 0.856 to 0.986, indicated a high degree of consistency among the items representing the latent construct, exceeding the recommended minimum of 0.7. The extracted average variance ranged from 0.530 to 0.945, exceeding the recommended cutoff of 0.5. Table 1 summarizes these findings.

Table 1: Loadings, composite reliability and average variance extracted

Construct	Items	Loadings	AVE	CR
Habit	Using QR codes to obtain information has become a habit for me.	0.883	0.736	0.918
	I am addicted to using QR codes to obtain information about the trail.	0.845		
	I always prefer to use QR codes to obtain information about the trail.	0.821		
	It is natural for me to use the QR code while visiting the trail.	0.882		
Sustainability Attitude	I support and buy local sellers' products while travelling.	0.890	0.522	0.852
	I use services provided by the local people while travelling.	0.834		

Construct	Items	Loadings	AVE	CR
Risk	I respect the local cultures and traditions.	0.872	0.907	0.967
	I participate in local tourism activities while travelling.	0.817		
	I feel nervous about travelling because of the high number of COVID-19 cases.	0.937		
	Travelling is risky for my health because of COVID-19.	0.947		
	I feel it is dangerous to travel because of COVID-19.	0.973		
Hedonic Motivation	Using the QR codes to obtain information about the attractions at KL QR Trail:		0.914	0.977
	Is fun for me as a tourist.	0.956		
	Is enjoyable for me as a tourist.	0.961		
	Is entertaining for me as a tourist.	0.957		
	Gives me a delightful feeling	0.949		
Satisfaction	I am satisfied with the QR code system (flow, design, and information provided) at the trail.	0.969	0.943	0.985
	I am satisfied with my QR code experience (smooth QR code system, sufficient information obtained, etc.) at the trail.	0.976		
	I am satisfied with the quality of the information provided by the QR code.	0.976		
	I am satisfied with the content provided by the QR code at the trail.	0.964		
Intention	I am willing to use the QR code provided at the KL QR Trail to obtain information again in the future.	0.955	0.931	0.976
	I am willing to recommend this QR code experience to other tourists in the future.	0.966		
	Given the opportunity, I will use/scan QR codes to obtain information at other tourism destinations.	0.973		

The second part is the discriminant validity that determined by comparing the AVE from each construct with its communal variances shared with other constructs. As suggested by (Henseler et al., 2015), the discriminant validity

is validated in this study with all the HTMT values below 0.90. The HTMT value from this study is highlighted in Table 2.

Table 2: HTMT Table

	habit	intention	motivation	risk	satisfaction
habit					
intention	0.143				
motivation	0.305	0.387			
risk	0.393	0.055	0.120		
satisfaction	0.250	0.347	0.324	0.049	
sustainability attitude	0.367	0.442	0.504	0.275	0.456

Table 3 displays the results of applying the Fornell and Larcker criterion validity criteria. Evidently, the latent AVE variables exceeded the minimum value of 0.50, and the AVE square roots were greater than the correlation values of the latent variables, establishing discriminant validity.

Table 3: Fornell-Larcker criterion

	habit	intention	motivation	risk	satisfaction	sustainability attitude
habit	0.858					
intention	0.153	0.965				
motivation	0.304	0.375	0.956			
risk	0.349	0.048	0.120	0.953		
satisfaction	0.249	0.338	0.318	0.053	0.971	
sustainability attitude	0.203	0.419	0.485	0.160	0.428	0.722

Structural model result

The structural model's validity was evaluated using the standard bootstrapping procedure, employing 5000 bootstrap samples and analyzing 203 cases to determine the significance of the path coefficients. The guidelines outlined by Hair et al. (2017) were adhered to, and the comprehensive estimates of the structural model can be found in Table 5. To begin with, the model reveals various direct and indirect effects. The findings indicate that habit has a significant impact on intention ($\beta=0.058$, $p=0.004$). Additionally, habit influences satisfaction ($\beta=-0.172$, $p=0.001$). On the other hand, motivation does not have a significant influence on intention ($\beta=0.035$, $p=0.139$) or satisfaction ($\beta=0.102$, $p=0.102$). The results also indicate that risk does not exert an influence on intention ($\beta=-0.026$, $p=0.284$) or satisfaction ($\beta=-0.076$, $p=0.267$), whereas satisfaction has a noteworthy effect on intention ($\beta=0.338$, $p=0.000$). Lastly,

sustainability attitude significantly influences both intention ($\beta=0.120$, $p=0.000$) and satisfaction ($\beta = 0.356$, $p=0.000$).

Table 4: Structural Model (direct)

	Beta value (B)	Standard Deviation (STDEV)	T Statistics	P Values	Decision
habit -> intention	0.059	0.020	2.899	0.004**	Supported
habit -> satisfaction	0.172	0.051	3.350	0.001**	Supported
hedonic motivation -> intention	0.035	0.023	1.481	0.139	Not supported
hedonic motivation -> satisfaction	0.101	0.063	1.639	0.102	Not supported
risk -> intention	-0.024	0.024	1.072	0.284	Not supported
risk -> satisfaction	-0.071	0.068	1.111	0.267	Not supported
satisfaction -> intention	0.344	0.053	6.440	0.000**	Supported
sustainability attitude -> intention	0.125	0.033	3.650	0.000**	Supported
sustainability attitude -> satisfaction	0.362	0.070	5.102	0.000**	Supported

Note: ** $p \leq 0.05$

The study findings, presented in Table 4, indicate a notable correlation between sustainability attitude, satisfaction, and intention ($\beta=0.120$, $p=0.000$). However, there was no significant association observed between risk, satisfaction, and intention ($\beta=-0.026$, $p=0.284$). Furthermore, the results reveal a significant influence ($\beta=0.058$, $p=0.004$) among the variables of habit, satisfaction, and intention. Table 5 provides a summary of the study's outcomes.

Table 5: Structural Model: Indirect

	Beta value (B)	Standard Deviation (STDEV)	T Statistics	P Values	Decision
sustainability attitude -> satisfaction -> intention	0.125	0.033	3.650	0.000**	Supported
risk -> satisfaction -> intention	-0.024	0.024	1.072	0.284	Not supported
habit -> satisfaction -> intention	0.059	0.020	2.899	0.004**	Supported

Note: ** $p \leq 0.05$

The R^2 value of 0.115 and 0.223 is above the 0.13 value as suggested by (Cohen, 1988), which indicates that this is a weak model. The effect size (f^2) in this study is small. Finally, predictive relevance (Q^2) is examined using the blindfolding process. The Q^2 value in this study is 0.104 & 0.209, which is larger than 0, indicating that the model has sufficient predictive relevance (Chin, 2010).

DISCUSSION AND IMPLICATIONS

This research highlights the positive impact that integrating smart tourism technologies, such as QR codes, can have on shaping tourist behavior and satisfaction. By leveraging technology, destinations can improve the travel experience for visitors, leading to greater happiness and a higher likelihood of tourists revisiting. The study specifically focuses on the adoption of QR codes and its influence on tourist satisfaction and revisiting intention, emphasizing the crucial role of this technology in shaping perceptions and experiences. These findings stress the importance of embracing smart tourism initiatives, including innovative technologies like QR codes, which can significantly enhance tourist satisfaction, happiness, and revisiting intention, ultimately benefiting the tourism industry.

This study's initial focus revolves around examining habit as a key determinant. Previous research has already established the significance of habits in various contexts. Additionally, this study provides evidence to support the notion that the habit of using technology directly influences the behavior of tourists at their destination. The findings of Abdul-Halim et al. (2022) align with the present research, emphasizing the impact of habit on individuals' behavioral intentions to utilize technology. Furthermore, this current study establishes a connection between habit and satisfaction, thereby supporting the hypothesis that habit significantly influences overall satisfaction. The current breakthroughs articulate the habits of the younger generation, revealing their inclination towards using QR codes and their frequent reliance on the internet in their daily lives. Furthermore, the study conducted an assessment of Sustainability attitudes using the UTAUT 2 model, which revealed a significant impact on both technology satisfaction and the intention to reuse it. The concept of sustainability attitude encompasses considerations related to the economy, society, and the environment, as Biasutti and Frate (2017) highlighted. This finding holds great importance today, as it indicates that individuals with such attitudes are likelier to incorporate technology into their everyday routines.

CONCLUSION

The findings revealed that two factors, namely habit and sustainability attitudes, had a significant impact on tourist satisfaction and their intention to revisit smart tourism destinations. This suggests a relationship between people's attitudes

toward sustainability and their engagement with technology at these destinations. However, two other factors, hedonic motivation, and perceived risk, were not found to significantly impact tourist behavior regarding the use of QR codes and their intention to revisit smart tourism destinations. Furthermore, with the current status of COVID-19 no longer being a global health issue, it is evident that people no longer consider it as a motivator or barrier to travel.

These insights can be valuable for Destination Management Organizations (DMOs) in reassessing their policies and strategies for smart tourism destinations. By maximizing the utilization of technological applications like QR codes, DMOs can enhance the competitiveness and performance of these destinations. Moreover, this study contributes to understanding the technology acceptance model and its integration with sustainability attitudes, specifically in the context of QR code adoption at tourism destinations. Future studies can explore other technologies adopted in smart tourism destinations and examine additional factors influencing satisfaction with QR code usage and the intention to revisit. Furthermore, it would be beneficial to investigate the integration of sustainability attitudes and technology habits concerning the adoption of technology for smart tourism destinations.

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EXPLORING GENDERED WALKING BEHAVIOR AND ENVIRONMENT PERCEPTION IN HERITAGE CITY: THE CASE OF GULANGYU, CHINA

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Abstract

Gender differences in walking may manifest as disparities in walking behaviour and perception. However, there is a lack of a comprehensive study on walking behaviour between gender and their differences in the environment perception in Chinese heritage cities. Some Chinese heritage cities, like Gulangyu, China are car-free destinations where walking is an essential transportation mode. However, many previous studies suggest that women may be more inclined to fatigue due to intense walking or perceive a greater threat while walking. The inequality of gender in walking has led to the need for gender studies to receive more attention in Chinese heritage cities with car-free destinations. This study explores gender differences in walking behaviour and perception of Chinese heritage cities, intending to create a healthier and more comfortable walking environment for both males and females. Therefore, the data for this study were analyzed using SPSS software, employing ordered regression models and independent sample t-tests. The findings indicate that males are more likely to engage in walking behaviour than females, and they also rate the walking environment higher than females in Gulangyu, China. Moreover, males rated comfort higher than females. These results suggest disparities in walking behaviour and environmental perceptions between male and female walkers in Gulangyu, emphasizing increased attention to healthy walking behaviour and perceptions of females in Chinese heritage cities.

Keywords: Female; Gender; Walking behaviour; Environment perception; Chinese heritage city

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INTRODUCTION

Walking activity is widely recognized as beneficial for physical and mental health (Vich et al., 2019). Growing research focuses on pedestrian walking behaviour and the perception of the walking environment, aiming to promote healthier walking habits. Gender research has emerged as a crucial aspect in previous studies exploring walking perception and behaviour (Pollard & Wagnild, 2017). In this context, 'gender' pertains to masculinity and femininity in the biological sense (Tcymbal et al., 2020). Research findings indicate that gender differences in walking activities manifest in behaviour and environmental perception. For instance, variations exist in daily walking distances, overall environment satisfaction, and perceptions of safety, comfort, and other factors between males and females (Pirra et al., 2023). The design and construction of urban environments can influence the walking activities and experiences of both males and females (Park & Garcia, 2020). Therefore, it is crucial to identify which environmental factors may impact males and females differently.

Walking is often considered a suitable physical activity for females due to its minimal requirement for muscular strength (Kavanagh & Bentley, 2008). Repeated exposure of females to the environment can increase their engagement in walking activities and foster a sense of belonging to the area (Ivory et al., 2015). Female-friendly urban environments serve as catalysts for females' healthy walking behaviours. However, studies indicate that females in 159 out of 168 countries have lower physical activity levels than males (Ding et al., 2016; Talmizi et al., 2022). This disparity in physical activity between genders may stem from various factors, such as differences in physical fitness and social norms (Kavanagh & Bentley, 2008). Compared to males, females require more attention and consideration in walking.

Walking is a significant mode of heritage appreciation, yet research focusing on walking in heritage cities is still lacking (Wang & Wong, 2020). Heritage cities are characterized by their rich history. They are protected under the Tangible Cultural Heritage Convention and regional heritage policies. Heritage cities in China are also subject to the constraints of the Heritage Convention and heritage protection policies at the provincial and municipal levels where the heritage sites are located. Many cities feature narrow historic pathways with distinctive surroundings and interiors (Nayan et al., 2022). In China, the siting of heritage cities is influenced by concepts such as Feng Shui and Taoism, with a keen emphasis on environmental beauty and the distinct characteristics of historical cities (Zheng et al., 2018). During the era when these cities were established, motorization had not occurred, resulting in the construction of narrow, winding roads and a dense network of thoroughfares. China contains 56 World Heritage Sites, including 38 World Cultural Heritage Sites, 4 Dual World Cultural and Natural Heritage Sites, and 14 World Natural Heritage Sites. Nine cities and villages fall under the designation of heritage cities and villages,

including Beijing, Pingyao, Lijiang, the southern Anhui villages of Hongcun and Xidi, Macau, Kaiping, Gulangyu, Liangzhu, and Quanzhou. Many Chinese heritage cities, especially the delineated core and buffer zones, are car-free destinations like Lijiang and Gulangyu.

Research on gender differences in walking is relatively few in China (Shen, 2019). Existing studies on gender and walking in China primarily focus on major cities such as Beijing and Shanghai. Research on gender and walking in heritage cities remains largely unexplored. Zhang's (2008) study on gender travel behaviour in Beijing revealed that males primarily commute for work and rely more on cars, and females do more shopping and leisure walking (Zhang, 2008). Furthermore, Lei's master thesis (2015) analyzed gender differences in walking behaviours within the urban block of Chongqing. It concluded that street diversity influenced male travel patterns, while safety considerations impacted female walking behaviours (Lei, 2015).

Based on the theoretical background presented above, limited conclusions regarding behavioural and perceptual differences among pedestrians of different genders in car-free heritage cities in China. Chinese heritage cities serve as residential communities and tourist destinations where walking behaviour and environmental perception research provide the basis for improving psychological feelings and promoting healthy walking among pedestrians. Gender study has concluded for male and female walking needs, offering guidance for walking among genders in Chinese heritage cities and providing recommendations for the sustainable development of the historic environment.

LITERATURE REVIEW

Walking in Heritage Cities

The literature and urban development show the importance of pedestrian paths for cities (de Freitas Miranda & da Silva, 2012). Lack of walking in cities will cause numerous issues, including traffic safety, personal health, and environmental pollution (Ewing et al., 2003). Although many studies have confirmed the relevance of walking to the environment, it is still a subject worthy of study for cities and communities, especially heritage cities. "World Heritage City" was defined as an urban settlement where one or more World Heritage properties would be located (Rodgers, 2010). The legacy city is a unique sort of city with values that other cities cannot replace. Historical locales, environments, and structures with conventional and regional features are valuable in history, culture, and the arts. There is little research on the pedestrian environment and the walking experience in heritage areas in China, with most existing walking research focusing on neighbourhood and community scales and little attention paid to the inner heritage areas (Li et al., 2020).

Walking Research in Gender Difference

The topic of females' perceptions of public amenities and environments has garnered more interest in scholarly research on walking behaviour (Hidayati et al., 2020). According to Rodríguez and Joo (2004), there is a perception that females are more susceptible to vulnerability in outdoor activities, resulting in a 72 to 83% lower likelihood of utilising non-motorized ways compared to males. According to a study conducted by Agrawal and Schimek (2007), it has been observed that males tend to cover greater distances while walking in comparison to females. Nevertheless, several research have indicated that there is a higher level of engagement in leisure walking among females compared to males (Ball et al., 2001). According to Bengoechea et al. (2005), the provision of affordable or no-cost recreational amenities inside the community can also promote autonomous walking among females, separate from their male counterparts. In addition to the study of walking activity, numerous academics have focused their investigations on the relationship between gender and the perception of walking. Several studies have identified disparities in the walking requirements between males and females (Salvo et al., 2018). According to Humpel et al. (2004), there is a belief among researchers that there exist distinct walking requirements for males and females. The study aims to examine the various aspects that influence walking behaviours in both genders. The impact of various walking settings on individuals differs according on their gender, with females exhibiting greater concerns regarding aesthetics, safety, and accessibility compared to males (Ball et al., 2001; Humpel et al., 2004; Pirra et al., 2023).

Females also exhibit greater concern for walking at night and traffic safety (Bengoechea et al., 2005; Lalonde et al., 2019). Females are often more sensitive to environmental safety risks and are more likely to alter their walking behaviour due to feelings of unease (Clifton & Livi, 2005; Herrmann-Lunecke et al., 2021). Without company, females may walk less recreationally because of safety concerns (Ball et al., 2001). Females are less likely than males to be satisfied with walking path facilities (Pirra et al., 2023). In addition, females may also bear a greater responsibility for household and childcare, which adds difficulty to their walking trips (Eyer & Ferreira, 2015). While safety factors may not significantly influence males' walking behaviour, nearby park facilities in the community may encourage more males walking (Foster et al., 2004).

Walking Behaviour and Perception of Environment Factor

It is widely recognized that social and physical environments can influence physical activity levels (Frank et al., 2010). Published research has demonstrated that the physical environment can enhance physical activity and promote healthier walking behaviour (Herrmann-Lunecke et al., 2021). In many studies, participants' daily walking duration and distance are assessed as indicators of their physical activity levels (Tan et al., 2020).

Environmental perception is subjective feelings and psychological judgments about the surrounding environment and its changes (Peng & Zhou, 2001). In many studies, findings on environmental perceptions are derived by investigating respondents' satisfaction with environmental factors. The environment in this study refers to the artificial and natural environment in a heritage city that pedestrians can feel, touch, and see. Many gender-based studies on walking have concluded that there are differences in the perception of safety between different genders. However, other walking research factors, like function and comfort, may influence pedestrians' satisfaction with the environment (Arellana et al., 2020). In this study, to explore which factors may contribute to gender differences in pedestrian perceptions in Chinese heritage cities, we reviewed 35 articles published after 2000, focusing on identifying the factors that impact walking most. Based on the most frequently mentioned items in the literature, the researcher categorized these items-- function, safety, comfort, aesthetic, and pleasure (Table 1).

Table 1: The Frequency of Environmental Factors Associated with Walking

Factors	Items	Frequency	Main Authors
Function	Accessibility	10	(Arellana et al., 2020; Erna & Amin, 2016; Lee et al., 2016)
	Sidewalk quality	8	
	Sidewalk presence	7	
	Sidewalk width	6	
	Obstructive	4	
	Slop	3	
	Barrier-free facilities	3	
Safety	Walking safety	12	(Southworth, 2005; Zakaria & Ujang, 2015)
	Lighting	6	
Comfort	Walking facility	7	(Alfonzo, 2005; Erna & Amin, 2016; Tan et al., 2020)
	Walking comfort	6	
	Street furniture	5	
	Shade	4	
	Cleanliness	3	
Aesthetic	Green/Tree	13	(Cain et al., 2014; Gorrini & Bertini, 2018; Humpel et al., 2004)
	Building frontage	6	
	Building feature	6	
	Attractive	4	
	View	4	
Pleasure	Public space	9	(Ozbil et al., 2019; Yang et al., 2019; Zang et al., 2020)
	Walking pleasurable	4	

Source: Literature

Function, safety, comfort, aesthetics, and pleasure that may influence environmental perception were selected based on the summarization and screening of the above literature. The definition and range of factors included in these five factors are summarized from the literature. Function: The sidewalk's

accessibility, condition, and walking quality (Ozbil et al., 2019). Safety: A person feels safe from the threat of crime, traffic, or disorder (Southworth, 2005). Comfort: Walking comfort comes mainly from the perception of nature, like climate, and men-made comforts, such as shade, cleanliness, etc. (Alfonzo, 2005). Aesthetic: Aesthetics include environmental appeal (natural beauty, public art, etc.) and architectural elements (colour, height, age, etc.) (Cain et al., 2014). Pleasurable: Pleasantness is among the factors influencing walking, with public recreational facilities, squares, green spaces, etc. (Ozbil et al., 2019).

RESEARCH METHODOLOGY

Research Area

The research is in Gulangyu, Fujian Province, China (Figure 1). It is an island with an area of 1.91 km² and a population of 12.59 million. In July 2017, Gulangyu entered the World Heritage List under the 'Historical International Community' theme. Gulangyu is an island across the sea from Xiamen and is connected to Xiamen by ferry, with no bridges or roads for vehicles. Gulangyu is famous for being a pedestrian island, and walking is the only mode of transport. A study of gender differences in the walking behaviour and perceptions of Gulangyu's walkers will help to understand the perceptions of male and female walkers of their environment and activity behaviour in this pedestrian area. This study provides evidence for promoting healthy walking among male and female pedestrians in Chinese heritage cities and offers recommendations for creating a human-friendly environment in Gulangyu.



Figure 4: Research Area
Source: Google Maps, 2022

Participants and Data Collection

This study administered a questionnaire to walkers in Gulangyu to investigate the relationship between walking behaviour and environmental perceptions. The

questionnaire consisted of three parts. The first part was to collect basic information about the respondents, gender, age, and education. The second part evaluated the walkers' perceptions of the environment, divided into an overall evaluation and an evaluation of five environmental factors. The overall evaluation of indicators was evaluated using a 5-point Likert scale. The environmental factors were evaluated on a two-level scale, with respondents choosing 'yes' if they felt the factor affected their walking experience. The third section surveyed respondents' walking behaviour, focusing on their average distance and daily walking time.

The survey was conducted in January and June 2022, using a random sampling method for the questionnaire. The survey locations were chosen randomly in different areas of Gulangyu, such as the pier, the centre square, the stores, and the streets. Since residents and tourists are primary walkers on Gulangyu, both groups are considered respondents for this study. Sample sizes are calculated based on the number of residents and tourists in Gulangyu—determination of sample size by the Krejcie and Morgan method (Krejcie & Morgan, 1970). According to the 2022 statistics, Gulangyu's inhabitants are approximately 12,590. Therefore, for $N = 10,000$, $S = 370$ (N is the population size, and S is the sample size). The number of visitors to Gulangyu in 2022 is about 2.21 million per year (>1 million), so the minimum sample size is 384. The Confidence Level and Margin of error were considered 95% and $\pm 5\%$, respectively. The researcher are 341 distributed 781 questionnaires and recovered 753 valid questionnaires during the survey period. Of the valid questionnaires, 372 were residents, and 381 were tourists. The gender of the respondents was randomly selected in the survey. Finally, there male and 412 female respondents.

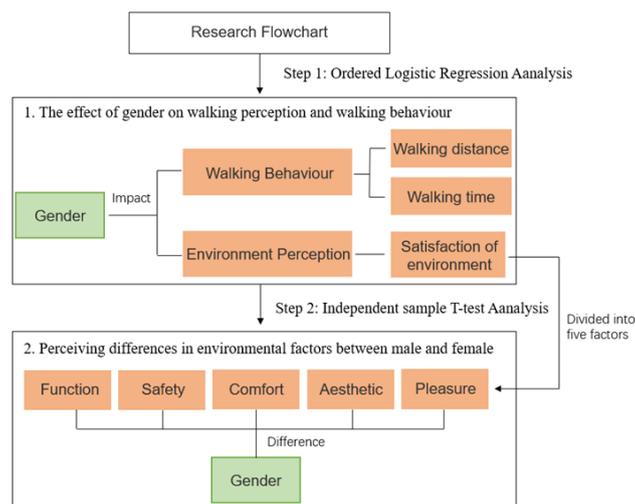


Figure 2: Research Flowchart

Statistical Analyses

The data analysis for this study was divided into two main steps, both of which were completed using SPSS 26 (2019) (Figure 2). The first step began by using ordered logistic regression analysis to derive the effect of respondents' gender on walking behaviour and perceptions. The first logistic regression step shows the level of gender influences walking behaviour and perceptions. The second step explores the differences in perceptions of environmental factors between males and females. This step uses an independent samples t-test, showing which environmental factors differ in gender.

RESULT

The Participants' Demographics

In this survey, there were 341 male and 412 female respondents. Most respondents in this survey were in the 21-30 age group, while fewer people were over 61 years old. The proportion of males and females in the other age groups was similar. Secondly, most of the respondents in this survey were educated above high school, with the largest number of people with bachelor's degrees. The education level indicates that most respondents can understand and perceive this survey. The ratio of males and females regarding age and education is consistent with the overall distribution pattern.

Table 2: The Participants' Demographics

		Overall=753		Male=341		Female=412	
		n	%	n	%	n	%
Age	11-20	84	11.16	38	11.14	46	11.17
	21-30	364	48.34	179	52.49	185	44.90
	31-40	182	24.17	76	22.29	106	25.73
	41-50	73	9.69	27	7.92	46	11.17
	51-60	29	3.85	11	3.23	18	4.37
	61+	21	2.79	10	2.93	11	2.67
Education	Primary School	14	1.86	8	2.35	6	1.46
	Junior Middle School	66	8.76	30	8.80	36	8.74
	Senior Middle School	132	17.53	60	17.59	72	17.47
	Diploma	148	19.65	60	17.59	88	21.36
	Bachelor Degree	297	39.44	135	39.59	162	39.32
	Master's Degree and above	96	12.75	48	14.08	48	11.65

Source: Author's Calculation

The Descriptive Analysis of Walking Behavior

Respondents in Gulangyu were surveyed on their daily walking time and distance, and their walking behavioural status was stated using descriptive analysis (Figure 3). Most respondents in Gulangyu walked 1-2 hours daily, and more walked 3-6 km. It is a relatively healthy time and distance of physical activity (Lee & Buchner, 2008). There is a difference in walking behaviour

between respondents of different genders. The proportion of females is higher than males for walking distances of 0-6km and walking time of 0-2 hours. The proportion of males is higher than females walking over 6km and 2 hours. In summary, women were likelier to walk fewer hours and distances, while more men than women walked longer hours and distances daily.

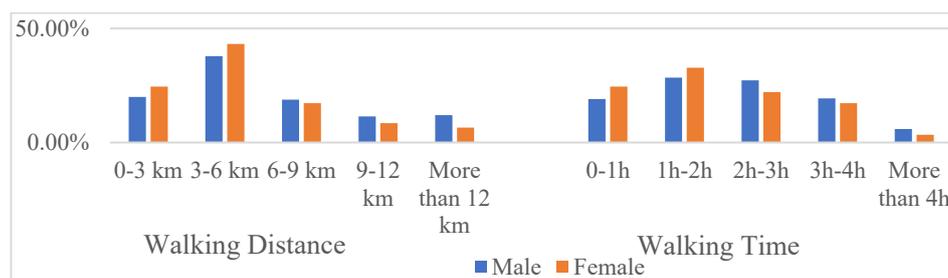


Figure 3: The Walking Distance and Time for Males and Females in Gulangyu
Source: Author's Calculation

The Ordered Logistic Regression Analysis

Ordered logistic regression models verify the causal relationship between the independent and dependent variables. The independent variable X denotes the factors that may have an effect, and the dependent variable Y denotes the levels of a measurement scale (Harrell & Harrell, 2015). The regression coefficients from the ordered logistic regression analysis predict the relationship between the categorical variables and one or more variables (Bender & Grouven, 1997). In the other gender walking research, logistic regression analysis was also used to compare male and female walking behaviour and perception (Foster et al., 2004).

This study assumes that walkable distance, walking time, and perception of the environment are all influenced by gender. The perception of the environment is rated from 1-5, indicating very unsatisfactory, unsatisfactory, general, satisfactory, and very satisfactory. Walking distance is also divided into five categories, from 1-5, indicating the average daily walking distance of 0-3km, 3-6km, 6-9km, 9-12km, and above 12km. A walking time scale of 1-5 reflects respondents walking for less than 1 hour, 1-2 hours, 2-3 hours, 3-4 hours to more than 4 hours per day. As the three dependent variables, walking distance, walking time, and overall evaluation of the environment, are all categorical variables, the ordered logistic regression model was applied to regression models where the dependent variable was categorical.

In the result of Ordered Logistic Regression, B (β - Coefficient) represents the coefficients in the model, also known as regression coefficients. OR (Odds Ratio) means quantifying each independent variable's impact and is the exponential function of the "B" value. The OR represents the odds ratio of two different levels or categories of a single independent variable. CI (Confidence

Interval) stands for Confidence Interval and measures the uncertainty associated with parameter estimates. According to the results in Table 3, the OR for the effects of gender on perception of the environment, walking distance, and walking time is 1.510, 1.493, and 1.400 for males, indicating that males are longer than females in terms of walking distance and time and are more satisfied with their environment than females. The likelihood of walking distance, time, and satisfaction increasing by one level is 1.400-1.510 times greater for males than females. The data means that males are more likely to increase the distance and length of their walks and are more likely to be satisfied with their environment.

Table 3: Ordered Logistic Regression for Perception, Walking Behaviour, and Gender

		B	OR	OR value of 95% of CI	p-value
Threshold (Environment perception)	[EP = 1]	-4.841	0.008	0.003-0.019	0.000
	[EP= 2]	-4.248	0.014	0.007-0.028	0.000
	[EP= 3]	-1.504	0.222	0.177-0.279	0.000
	[EP = 4]	1.156	3.177	2.572-3.924	0.000
Gender	Male	0.412	1.510	1.140-2.000	0.004
	Female	0	1.000	---	--
Threshold (Walking distance)	[WD = 1]	-1.072	0.342	0.279-0.419	0.000
	[WD = 2]	0.723	2.061	1.698-2.500	0.000
	[WD = 3]	1.649	5.201	4.156-6.509	0.000
	[WD = 4]	2.505	12.247	9.231-16.249	0.000
Gender	Male	0.401	1.493	1.149-1.939	0.003
	Female	0	1.000	--	--
Threshold (Walking time)	[WT = 1]	-1.115	0.328	0.267-0.402	0.000
	[WT = 2]	0.272	1.313	1.091-1.581	0.004
	[WT = 3]	1.390	4.015	3.249-4.961	0.000
	[WT = 4]	3.221	25.052	17.340-36.194	0.000
Gender	Male	0.346	1.400	1.093-1.829	0.008
	Female	0	1.000	--	--

Source: Author's Calculation

Perceiving Differences in Environmental Factors in Male and Female

Next, the analysis is conducted to determine if there are differences in people's perceptions by gender on the five factors of function, safety, comfort, aesthetics, and pleasure, and the results can guide the process of specific environmental enhancement. The analysis is carried out through independent sample t-tests. The t-test has also been used in other studies investigating gender differences in physical activity. (Tester & Baker, 2009).

The test results in Table 4 show a significance level of 0.009 for the comfort factor to test for differences between male and female perceptions of the environment in Gulangyu. Therefore, there is a statistically significant difference between males and females for the mean of the comfort factor ($t = -2.606$, $p = 0.009$). Furthermore, based on the negative t-value, it can be concluded that females perceive comfort factors to be more important than males. On the other

hand, function, safety, aesthetics, and pleasure are not gender-specific. However, as can be seen from the results in the table, males generally consider road function more important than females. In other research findings, it has been suggested that males are more concerned about road width than females (Sapawi & Said, 2012). In contrast, more females consider the three factors of safety, comfort, and aesthetics to influence their perception of the environment and the pleasurable factor to be approximately equal in the ratings of males and females.

Table 4: The Independent Samples T-test for the Environment Perception and Behaviour According to Gender

Environment perception	T-test for Equality of Means					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Function	0.996	751	0.320	0.036	-0.035	0.108
Safety	-1.572	751	0.116	-0.057	-0.128	0.014
Comfort	-2.606	691.885	0.009	-0.084	-0.147	-0.021
Atheistic	-0.484	751	0.629	-0.015	-0.074	0.045
Pleasure	-0.015	751	0.988	-0.001	-0.072	0.071

Source: Author's Calculation

DISCUSSION AND FINDINGS

According to the results of this study's description analysis on walking behaviour and ordered logistic regression model, it is also proven that males in Gulangyu are more likely than females to walk in terms of walking behaviour. According to the regression model results, males were about 1.40 to 1.49 times more likely than females to increase walking distance and time by one level (e.g., from 3-6 hours to 6-9 hours). However, according to a review of studies on gendered walking (Pollard & Wagnild, 2017), females under 60 do more leisure walking than males (Beenackers et al., 2013). And a phenomenon attributed to the fact that females may have more childcare and family responsibilities (Pollard & Wagnild, 2017). Without categorizing the purpose of walking (recreational and purposeful walking), there are no obvious conclusions regarding the relationship between walking activity and gender (Pollard & Wagnild, 2017). However, some of these findings are similar to the present study, with males walking more than females (Eyler et al., 2003), partly because they tend to work closer to home than males (Pollard & Wagnild, 2017). As Gulangyu is a car-free destination, work and leisure activities rely on walking. Males may be more likely to be responsible for household financial income and therefore have more walking activities.

Furthermore, according to the logistic regression model results, males are more likely to rate the perceived environment of Gulangyu higher than females, with an OR of 1.51. It means that males in Gulangyu are more likely to feel satisfied with the environment, while females are less satisfied than males. In other findings, it was also concluded that females were harder to be satisfied

with the walking facilities (Pirra et al., 2023). Therefore, it is important to pay attention to the psychological needs of pedestrians, particularly females, in developing the walking environment and facilities in car-free heritage cities.

Next, five environmental factors are tested for gender differences, and the results are that comfort differed significantly by gender. Some researchers have also mentioned that females have a higher need for comfort. For instance, it has been found that males tend to feel more comfortable in hot weather conditions during walking compared to females (Jin et al., 2019). In addition to gender differences, comfort factors seem to be highly important in Gulangyu. In the study conducted by Li (2020), it was discovered that comfort significantly influenced the walking perception of residents in Gulangyu (Li et al., 2020). The findings of this study also reveal the unique importance of comfort for walkers in Gulangyu, particularly for females. Enhancing the perception of comfort requires the provision of more shading, resting areas, and signage systems, which can help alleviate physical and weather-related concerns for females during walking.

Both previous research and the results of this study highlight the importance of aesthetics and safety for females (Garrard et al., 2008; Humpel et al., 2004; Ortoleva & Brenman, 2004). According to the results of this study, there is no significant gender difference between safety and aesthetics in the independent sample t-test, but a greater number of females feel that safety and aesthetics are more influential in their perception of the environment when walking. The aesthetics of Gulangyu are generally good, with the island surrounded by the sea, covered by a high density of vegetation, and the majority of its historic buildings well-maintained and harmonious overall. As a World Heritage Site, more attention is paid to the city's natural and artificial aesthetics. The security of Gulangyu comes from the full CCTV coverage and the mandatory security checks before visitors enter the island by ferry. Therefore, Gulangyu's aesthetic and safety advantages lead to different results on these two factors regarding gender than previously concluded. But comfort is a factor that needs to be taken into account, and in particular, the factors affecting the comfort experience of females need to be further researched to provide a better walking experience for walkers in Gulangyu.

CONCLUSION

This study examines people's walking behaviour and perceptions of the walking environment in the absence of car travel in Chinese heritage cities. It explores gender differences in walking behaviour and environmental perceptions. This study enriches the findings of heritage city walking studies and provides a reference for enhancing heritage environments to develop Chinese heritage cities into more walkable communities and tourist destinations. Our findings allow us also to draw some practical conclusions (Figure 4):

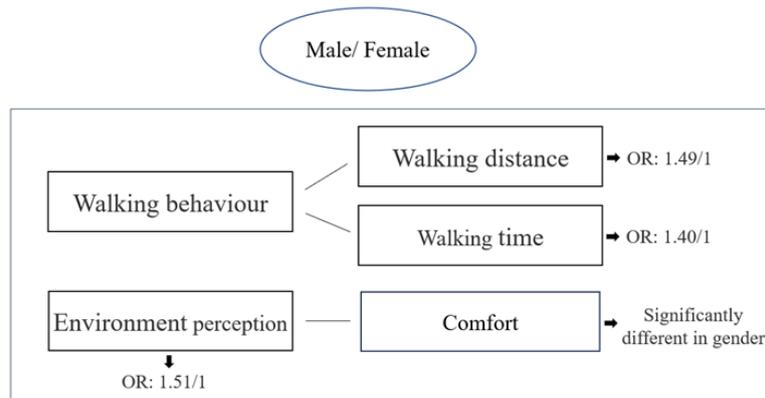


Figure 4: The Gender Differences in Walking Behaviour and Perception

Most respondents walked within a healthy time and distance range of 1-2 hours and around 3-6 km daily. The proportion of females walking for short periods and short distances is higher than males, with longer walking times and distances being more common for males in Gulangyu (Foster et al., 2004). Males are more likely than females to walk for longer periods and distances, with a likelihood ratio of 1.49:1 and 1.40:1. Overall, the findings of this study are consistent with previous research, which indicates that males tend to have better physical fitness compared to female, resulting in higher levels of walking activity (Agrawal & Schimek, 2007). Males are 1.51 times more likely than females to be satisfied with their perception of the environment.

Only the comfort factor shows a significant difference in perception by gender. The perception scores for the three factors of safety, comfort, and aesthetics are lower for females than for males. The result means that when walking in heritage cities, females are more likely to show dissatisfaction with safety, comfort, and aesthetics, especially regarding the comfort factor. Improvements in safety, comfort, and aesthetics for female pedestrians in heritage cities can be achieved through various measures, including adequate lighting for nighttime visibility, the provision of shade and resting facilities for enhanced comfort, and the integration of plants and historic architecture to enhance the visual appeal of the environment.

The attention and maintenance of walking conditions for females are crucial for the sustainable development of urban systems (Pirra et al., 2021). Promoting walking activities in heritage cities should consider the specific needs and preferences of both males and females, providing a basis for future environmental improvements and sustainable development in heritage cities. Based on this study, promoting healthy walking and environmental enhancements in Chinese heritage cities should prioritize considering females' requirements for environmental comfort, aiming to encourage more females to engage in healthy

physical activities. There are also certain limitations to this study. The current study did not specify the types of walkers for residents and tourists, purposeful walking, leisure walking, etc. Also, environmental perception factors were not broken down into detailed factors in this study, and exactly which comfort factors differed by gender will need to be discussed further in future studies.

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MEDIATION ROLE OF INTENTION IN THE ENVIRONMENTAL ATTITUDE-BEHAVIOR RELATIONSHIP

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Abstract

The issues related to environmental quality have plagued the minds, harmony and well-being of all humankind. The mentioned environmental issues involve crucial aspects directly related to the behaviour and lifestyle of societies that prioritize economic and material development over environmental conservation for future generations. Therefore, this study aims to assess the role of intention in the relationship between attitude and environmental behaviour. A survey design with a quantitative approach was used in this study. The study focused on rural area located in contaminated river basins in the state of Terengganu. Using a cluster sampling technique, cross-sectional self-report data were collected from residents living within a 500-meter radius of Terengganu's categorized polluted river (n = 373). This study employed partial least squares structural equation modeling (PLS-SEM) to evaluate the proposed relations between the variables. The findings indicated that intention was a mediating variable in the relationship between attitude and environmental behaviour. The results also discovered that the information exposure through media does not act as a moderator between intention and environmental behaviour. Raising environmental awareness and practicing sustainable behaviors are essential to strengthening a country's capacity for sustainable development and cultivate a responsible and environmentally concerned society.

Keywords: Environmental Attitude, Intention, Exposure Message through Media, Environmental Behavior

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INTRODUCTION

The river management issue has recently become critical due to the worsening of the river pollution problem. River management is an effort to preserve and conserve the river so that it remain safe and free from pollution.

In other words, river management offers a mechanism to regulate and direct how people interact with this aspect of the environment so that the river's quality and the significance of living things, notably people, are constantly maintained. River management's primary goals include preserving the current river for usage now and in the future, reducing the effects of diverse human activities on the river, and improving the quality of the river.

There are numerous programmes or campaigns have been conducted to improve the river's water quality. However, the level of civic consciousness of the community towards the environment, especially river care, is still low. An officer from the Department of Rivers and Drainage of Terengganu reported that trash traps have been installed in the rivers to collect waste disposed into the river, helping to lessen the pollution in the river. However, irresponsible actions by the local community have turned these trash traps into places where they also disposed their waste. As a result, the accumulation of garbage in these traps can become breeding grounds for *Aedes* mosquitoes (Ismail, 2020). This irresponsible behavior has negative implications for the residents and the wildlife inhabiting the surrounding environment. This problem can be evidenced by the experiences of residents who go to the river to catch fish and find that aquatic life, such as fish, snails, and shrimp, dies due to poisoning caused by water pollution (He et al., 2022). It also affects the health of people who use the river as a source of drinking water, experiencing symptoms like diarrhea, vomiting, and headaches (Preko et al., 2021). Sadly, humans are often unaware that their actions are harming the environment.

The issue of improper waste disposal in rivers has led to environmental pollution, adverse effects on local inhabitants, and disruptions to the natural ecosystem. The need for greater civic awareness and responsible behavior is crucial for protecting the environment and preserving the cleanliness of water bodies (Alias et al., 2023; Ismail et al., 2023). According to Wyss (2022), environmental attitudes are a helpful way to comprehend the collection of ideas, interests, or norms that affect environmental behaviour. While intention is defined as motivation, or someone's desire and willingness to perform a particular behavior. Based on the Theory of Planned Behavior, intention is the main factor determining a behavior's implementation (Ajzen, 2012; Ajzen, 1991). The higher a person's desire to act, the more likely that person is to perform a particular behavior (Pan et al., 2018).

As a result, numerous studies have been conducted to assess the level of knowledge and awareness among the general public, teachers, and students

regarding environmental issues, and the results have been unsatisfactory (Bertossi & Marangon, 2022; Kyriakopoulos et al., 2020; Rezaei et al., 2022; Wut et al., 2021; Yu, 2022). A study by Pelcher (2023) shows sport management students in higher education institutions across North America have values, beliefs, and norms moderately connected to pro-environmental stances. Next, the finding from a study by Giannetti (2021) shows that the happiest and most academically astute participants were only slightly environmentally sustainable or not sustainable at all.

The inconsistent findings across various studies on environmental behavior indicate the existence of gaps and inconsistencies that need to be explored in new research to understand the determining factors of behavior toward the environment. Therefore, this study aims to examine the role of intentions in influencing attitudes towards behavior among the community regarding river pollution in the state of Terengganu. This study also investigates the role of information exposure through media as a moderator on the relationship between intentions and environmental behavior. Figure 1 depicts the research framework of this research.

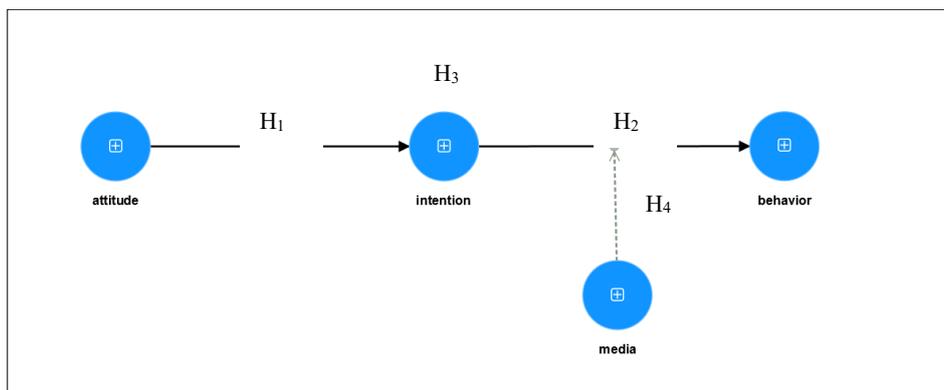


Figure 1: Research Framework

According to this study, attitude predicts environmental behavior. Additionally, this study suggests that intention predicts environmental behavior. The objective of the study is to examine intentions' role in mediating the relationship between attitudes towards behavior. Also, this study aims to confirm exposure messages through media as a moderator between intention and environmental behavior. The following hypothesis is proposed:

H₁: Environmental attitude significantly influences intention.

H₂: Intention has a significant influence on environmental behavior.

- H₃: Intention mediates the significant relationship between environmental attitude and environmental behavior.
- H₄: Exposure messages through media moderates the significance of intention on environmental behavior.

This determinant is the basis for creating a community aware of the environment, thus producing a more ethical Malaysian society. Measures to correct attitudes, mindsets, and behaviors need improvement to ensure the sustainability of the environment (Azinuddin et al., 2022a; 2022b; 2022c). This is especially crucial in collaborative efforts involving the community and stakeholders in development (Azwar et al., 2023). The aspiration to become a developed country can only be realized when environmental conservation progresses hand in hand with physical development.

RESEARCH METHODOLOGY

Data collection was performed by administering a questionnaire to a sample of residents living within a 500-meter radius of Terengganu's categorized polluted river (n= 373). The questionnaire consisted of five sections regarding environmental attitude, intention, exposure messages through media, environmental behavior, and demographics. Concerning content validity, all constructs were adopted from previous studies. All constructs used seven-point Likert scales from 1 = strongly disagree to 7 = strongly agree. This study employed partial least squares structural equation modeling (PLS-SEM) to evaluate the proposed relations between the variables. The study adopted a two-step process in evaluating PLS-SEM, i.e., assessing the (1) measurement model and (2) the structural model by using Smart PLS 4.

ANALYSIS AND DISCUSSION

Demographic profile

Respondents involved in this study are those aged 16 and above. The results revealed that the majority of respondents, with a percentage of 25.7% (96), were between the ages of 30 and 39, followed by 24.9% (93) between the ages of 20 and 29. Following that, 20.9% (78) of respondents aged 40 to 49 years and 12.1% (45) aged 50 to 59 years. There were 11.5% (43) respondents aged 16 to 19 years old and 4.8% (18) respondents aged 60 and above. Next, the results show that most respondents are female, with a percentage of 55.5% (207). Meanwhile, 44.5% (166) of the respondents were men. The rate in terms of married couples is as much as 64.6% (241) respondents, followed by 29.2% (109) single respondents, 3.5% (13) respondents whose widowed, and 2.7% (10) respondents who are divorced.

Measurement Model Assessment

The measurement model was assessed by examining internal consistency, convergent validity, and discriminant validity, as recommended by Hair et al. (2014). As a result, the validity of the measurement model is satisfactory when the indicator loading was greater than 0.7, composite reliability (CR) was greater than 0.70, and the convergent validity measured by average variance extracted (AVE) was greater than 0.50 (Hair et al., 2014). The discriminant validity was determined by examining the heterotrait-monotrait (HTMT) ratio, which must be between HTMT 0.90 (Henseler et al., 2015). Hence, the analysis indicates discriminant validity was appropriate.

Table 1: Reflective Measurement Model Result

Latent Variable	Indicators	Outer Loadings	Composite Reliability	AVE	Cronbach Alpha
Env Attitude	D1	0.825	0.824	0.644	0.817
	D2	0.798			
	D3	0.787			
	D4	0.800			
Exposure Message through Media	H1	0.741	0.841	0.554	0.839
	H2	0.740			
	H3	0.765			
	H4	0.707			
	H5	0.780			
	H6	0.732			
Intention	J1	0.844	0.893	0.693	0.888
	J2	0.843			
	J3	0.876			
	J4	0.874			
	J5	0.715			
Env Behavior	K6	0.857	0.889	0.685	0.885
	K7	0.857			
	K8	0.761			
	K9	0.836			
	K10	0.824			

Table 1 shows the loadings for each item, and Figure 2 presents the indicator loading visually. Twenty items have loading values greater than 0.70, ranging from 0.707 to 0.876. Table 1 also displays Cronbach's alpha values between 0.817 and 0.888, and the results revealed that CR for each construct in this study ranges from 0.824 to 0.893. Thus, acceptable test results of Cronbach's alpha and CR are obtained. Meanwhile, all obtained values of average variance extracted (AVE) exceed the recommended threshold value of 0.50, ranging from 0.554 to 0.693. The results demonstrated the existence of convergent validity.

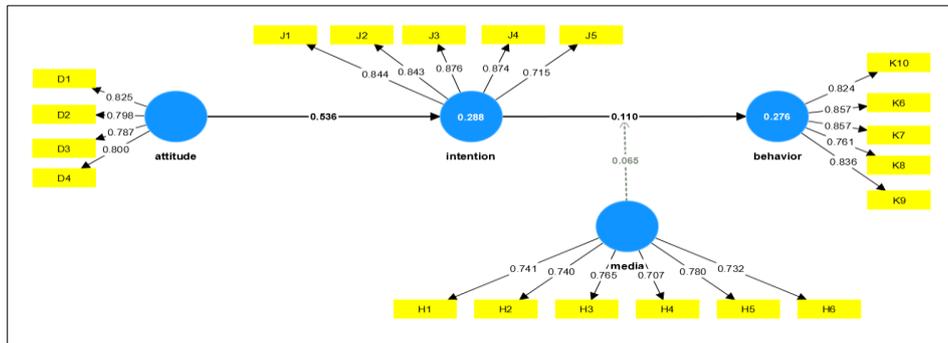


Figure 2: Measurement Model of the variables studied.

Table 2 shows that all constructs were less than the proposed values of 0.90, indicating that discriminant validity was not a problem. Overall, the findings supported each indicator in the measurement model for this study, as shown in Figure 2, demonstrating the measurement model's satisfactory reliability and validity. As a result, these indicators were reliable and suitable for estimating the structural model's parameters.

Table 2: Heterotrait-monotrait ratio (HTMT)

	Env Attitude	Env Behavior	Intention	Exposure Message through Media
Env Attitude				
Env Behavior	0.133			
Intention	0.624	0.214		
Exposure Message through Media	0.169	0.590	0.237	

Structural Model Assessment

Path analysis was used to test the proposed hypotheses. The structural model was tested using the bootstrapping approach with 5,000 subsamples, and the path coefficients' relevance and statistical significance were reported to accept or reject the hypotheses (Hair et al., 2019). This study examined the coefficients and significance to investigate the relationship between two latent variables. Following the suggestion of Hair et al. (2019), this study reported the coefficient of determination (R^2), predictive relevance (Q^2), and effect sizes (f^2).

The R^2 value is the proportion of the variance in the dependent variable that the independent variables can explain. According to Hair et al. (2017), 0.75, 0.50, and 0.25 represent significant, moderate, and weak levels of prediction accuracy, respectively. However, Hair et al. (2011) state that the acceptable value of R^2 may vary depending on the research discipline. For social science research, the R^2 values are suggested as 0.26 for strong, 0.13 for moderate, and 0.02 for weak (Cohen, 1988). Table 3 shows that environmental attitude explained 28.8%

of the variance in intention. At the same time, intention accounted for 27.6% of the variation in environmental behavior. As a result, R^2 value of 0.288 for intention and environmental behavior was classified as weak because R^2 was close to 0.25, indicating an almost weak level. However, as previously stated, R^2 for intention and behavior can be considered strong in this discipline of social science research if it is greater than 0.26.

Next, according to Cohen's (1988) guidelines, f^2 values of 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively. According to Table 3, environmental attitude towards intention has a large effect size of 40.4%. While intention towards environmental behavior has an almost small effect size (1.5%).

Table 3 also reveals that intention has a Q^2 value of 0.195, and environmental behavior has a value of $Q^2 = 0.184$. They all were higher than zero, showing that the model is sufficiently predictive.

Table 3: Path Coefficients of Testing Model

Hyp	Relationship	β	R^2	Q^2	f^2	T-Statistics	P-Values	Results
H ₁	EA -> I	0.540	0.288	0.195	0.404	13.886	0.000	Accepted
H ₂	I -> EB	0.109	0.276	0.184	0.015	2.188	0.029	Accepted

As shown in Table 3, the results show that environmental attitude has a significant relationship with intention ($\beta = 0.540$, t-value = 13.886, p-value = 0.000). Since the p-value is <0.05 , it was significant, and the finding indicated that H₁ was accepted. As a result, community attitude plays a vital role in contributing to the behavior intention toward river conservation. This result confirms previous findings on attitude as a determining factor in behavioral intention in the theory of planned behavior. Second, the result specifically demonstrated that intention has significance towards environmental behavior ($\beta = 0.109$, t-value = 2.188, p = 0.029). Statistically, the p-value is <0.05 . Thus, H₂ was also accepted. Community intentions and behaviours are critical for environmental conservation. Therefore, identifying enabling factors is vital. The higher a person's desire to act, the more likely that person is to perform a certain behavior (Pan et al., 2018). Promoting good development in people may allow them to actively contribute to their surroundings via positive attitudes and behaviours. Figure 3 depicts the development of three direct hypotheses between the constructs and the outcome of the path analysis.

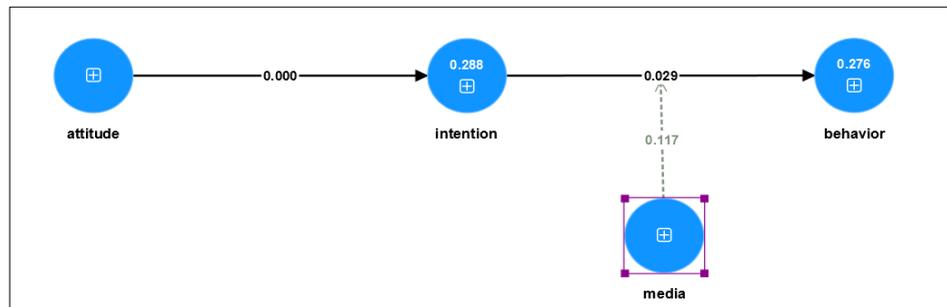


Figure 3: Structural Model

Mediation Analysis

According to Aguinis et al. (2017), mediation considers the existence of an intermediary variable or process that connects the impact of an independent variable to the outcome. The bootstrapping method was used to conduct the mediation studies (Hayes, 2013). The Hair et al. (2014) procedural guideline was adhered to to run the mediation analysis. The results in Table 4 show that intention mediates the relationship between environmental attitude and environmental behavior. The impact of intention on environmental behavior through intention was found to be significant ($\beta = 0.059$, $t = 2.163$, $p = 0.031$), supporting H₃. In summary, the result on attitudes and intentions suggests that individual attitudes give birth to intentions, which lead to behaviour. The findings of this study are consistent with the theory of planned behaviour, which states that attitudes are fundamental to conduct but do not directly cause action; attitudes impact behavioural intentions, which shape our actions (Ajzen, 2012).

Table 4: Mediation Analysis

Hyp	Relationship	β	SD	T-Statistics	P-Values	Results
H ₃	EA -> I-> EB	0.059	0.027	2.163	0.031	Accepted

Moderator Analysis

A third variable that modifies the relationship between the independent and dependent variables is referred to as a moderator variable. The result in Table 5 revealed that no moderation effect of exposure messages through media was found between intention and environmental behavior ($\beta = 0.063$, $t = 1.566$, $p = 0.117$), which suggests that H₄ is not supported. It means exposure messages through media are not a moderator variable in relation between intention and environmental behavior. This may be because the environmental awareness section of the mainstream media isn't being enlarged with engaging presentations suited to the needs of each community group.

Table 4: Moderation Analysis

Hyp	Relationship	β	SD	T-Statistics	P-Values	Results
H ₄	Media x I-> EB	0.063	0.041	1.566	0.117	Rejected

CONCLUSION

It should be noted that this attitude of neglect and love to destroy the environment and selfishness reflects the irresponsible human spirit. The act of polluting the river is an act that is against ethical and religious values. This irresponsible attitude of society also negatively affects the environment and the quality of human life. Therefore, creating a prosperous river environment depends on the community's attitude and intention to the adverse effects of an individual's actions. The river's well-being can only be achieved if all levels of society play their respective roles with full responsibility.

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FROM MASLOW TO THE ENVIRONMENT: INVESTIGATING THE INFLUENCE OF HUMAN NEEDS IN SHAPING ECO- PERSONALITY

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Abstract

This paper discusses Eco-Personality and Lifestyle [PL] in relation to three notions, namely Human Interdependence [HI], Subjective Well-being [SWB], and Maslow's Hierarchy of Needs [HON]. *Research Questions:* Does the fulfilment of human needs have positive impact on PL? Is it possible for PL to develop in spite of unmet human needs? *Purpose:* This paper examined the level of PL between the difficulty and convenience of fulfilling human needs. *Approach:* Mann-Whitney U Test was performed to determine the mean variance of PL across the convenience and difficulty of satisfying 24 human needs. *Findings:* The convenience with which 18 out of 24 human needs could be met increased PL significantly. Moreover, fulfilling these 18 human needs established a conducive environment for nurturing PL. The results also showed that PL did not differ substantially across the convenience and difficulty of satisfying five human needs, which was unlikely to have an impact over PL. Additionally, fulfilling these five human needs and fostering PL were found to develop along different trajectories.

Keywords: eco-personality and lifestyle, human interdependence with the environment, subjective well-being, Maslow's hierarchy of needs

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INTRODUCTION

This paper explored how satisfying human needs influences the growth of ecological personality and lifestyle as part of the ongoing research on Human Interdependence with the Environment [HIE]. It was based on the findings of previous studies that formed an integral part of the investigation. The research also stands as an extension of empirical investigations on the relationship between Human Interdependence [HI], Subjective Well-being [SWB], and Maslow's Hierarchy of Needs [HON], building upon the existing body of knowledge in the positive psychology realm.

HUMAN INTERDEPENDENCE

Recent studies have unveiled a fresh perspective on a key determinant that can impact long-term Subjective Well-being [SWB], known as Human Interdependence [HI]. SWB refers to the study of individual's assessment of happiness, emotions, and life satisfaction that encompasses the affective, cognitive, and psychological dimensions of well-being. While SWB is commonly oriented on the present evaluation of well-being, HI is directed toward the future and revolves around the concept that one's well-being is connected to the well-being of others in their environment due to their contributions. As a result, the contributions that one voluntarily or involuntarily imparts to others can positively influence their SWB. Some authors strongly contend that HI is instrumental in promoting sustainable well-being (Garcia et al., 2015; Kjell, 2011).

The attributes of HI cover a wide range of aspects, spanning from internal emotions to external circumstances. These attributes consist of belief systems, learned experiences, involuntary actions, daily routines, and intentional behaviours – all of which play a role in initiating changes within the surrounding environments, thereby influencing individuals' sustainable SWB. The two most recognized contexts of HI are Human Interdependence with other Humans [HIH] and Human Interdependence with the Environment [HIE], each giving rise to four dimensions (see Figure 1).

As part of the efforts to expand the empirical investigation on the topic (Abu Bakar et al., 2020a; Abu Bakar et al., 2020b; Abu Bakar et al., 2018; Abu Bakar et al., 2017a; Abu Bakar et al., 2017b), this paper concentrates on the first dimension of HIE, namely Eco-Personality and Lifestyle [PL].

ECO-PERSONALITY AND LIFESTYLE

Eco-Personality and Lifestyle [PL] is the first dimension of HIE that centers on personality, mindset, inner strength, willpower, wisdom, awareness, and life prospects in relation to the natural environment. Among the numerous traits of PL are ecological mindsets, collectivistic cultures, modesty and moderation in material pursuits, and environmental mindfulness (Abu Bakar et al., 2020a; Abu Bakar et al., 2020b).

HI DIMENSIONS	Human Interdependence with other Humans (HIH)	Human Interdependence with the Environment (HIE)
DIMENSION 1	Personal Empowerment (PE)	Eco-Personality & Lifestyle (PL)
Lifestyles, personality, inner-strength, willpower, wisdom, awareness, and life prospects.	Focus And Resilience, Sense of Control, Self-Determination, Goal Orientation and Self-Improvement	Ecological Mindset, Collectivistic Cultures, Modesty and Moderation in Material Pursuits, and Environmental Mindfulness.
DIMENSION 2	Positive Relationship (PR)	Interaction With Nature (IN)
Intimacy, closeness, familiarity, empathy, affection, voluntary and involuntary interactions.	Affection, Compassion, Forgiveness, Ability to Tolerate Others, Sense of Inclusion and Self-Regulation.	Closeness to Nature, Knowledge of and Empathy Towards Nature, And Health Associated Attributes in Relation to Surroundings.
DIMENSION 3	Organizational Opportunity (OO)	Environmental Behaviour (EB)
Engaging with the surrounding, executing roles or tasks, proving skills and responsibility.	Articulatory and Versatility, Initiatives of Positive Interactions and Cooperative Engagements towards Professional Growth.	Careful and Conscious Decision-Making, Smart Consumerism, Recycling, Energy-Saving Initiatives, and Waste Handling.
DIMENSION 4	Community Movement (CM)	External Condition (EC)
Attitude towards circumstances, interpersonal behaviours with the larger public, etc.	Proactivity, Public Participation, Friendliness, Openness, Respect for Diversity and Sense of Belonging.	Attitudes towards Surroundings Convenience and Encouragements to be Environmentally Responsible

Figure 1: Dimensions of HIH and HIE

Source: Abu Bakar et al., 2017

PL highlights the attitudes, values, and mindset in relation to the environment. Eco-personalities often prioritize on mindfulness, collectivism, modesty and moderation, and consciousness towards natural resources. PL gives rise to voluntary modesty which value environmental knowledge and ethical behaviour. PL relates to collectivist culture, emphasising communal practices in sustainable living. This suggests that individuals with PL recognize their well-being in correspondences to their surroundings. Through PL, everyday activities are perceived as influential towards the ecosystem and other living creatures, encouraging HIE. Adopting an eco-personality and lifestyle encourages HIE and generates transcendent experiences through a profound connection to both natural environment and future generation. Individuals with PL not only improve their current SWB but also lead to greater and sustained SWB. The indicators of PL are generated from a synthesis of diverse literature sources (Abu Bakar et al., 2018; Abu Bakar et al., 2017a; Abu Bakar et al., 2017b) (see Table 1).

Table 1: Definition, Factors and Indicators of Eco-Personality and Lifestyle (PL)

Definition	Factor	Code	Indicators
Personal orientation portraying collectivistic worldviews and humility towards others and environmental awareness	Collectivistic Culture	PL01	favoring relationships with others over personal success
		PL02	choosing to disappoint self over disappointing family
		PL03	taking account others' opinions in making life decisions
		PL04	taking the pleasure of working with others
	Voluntary Modesty	PL05	practicing moderation in purchasing and using resources
		PL06	feeling unconcerned if not being able to afford things
		PL07	believing that having many assets does not lead to happiness
	Environmental Consciousness	PL08	being mindful about environmental destruction
		PL09	feeling affected by the environmental loss of other countries
		PL10	Viewing media as a platform of environmental campaign

HUMAN NEEDS FULFILLMENT AND WELLBEING

Maslow's Hierarchy of Needs [HON] initially comprised five levels outlining the stages of human motivation (Maslow, 1943). Deficiency Needs and Growth Needs were the initial two sets of the hierarchy. The four most prominent components of Deficiency Needs were Physiological Needs, Safety Needs, Love and Belonging Needs, and Esteem Needs, which were respectively arranged by priority. On the other hand, the urge for Growth Needs was associated to self-actualization. The five stages of HON were later expanded to eight stages in the 1960s and 1970s when Maslow (1962) incorporated Cognitive Needs and Aesthetic Needs within the Growth Needs. Later, Maslow (1970) incorporated transcendence needs as the eighth and final level (see Figure 2).

Deficiency Needs are the survival necessities arising from deprivation. If left unmet, the drive to satisfy these needs will grow over time. For example, prolonged hunger will intensify the hunger. In contrast, Growth Needs are psychological in nature that can be satisfied through engagement in intellectual and artistic endeavours. It commonly emerges from an inner drive to improve and develop as an individual. Meanwhile, transcendence needs, which are the apex of HON, may be realized if lower-level Growth Needs are addressed. However, life adversities, such as marital conflicts or career layoffs, can lead to fluctuations in HON. In real life, individuals are unlikely to go through HON in a one-way direction, but rather they oscillate between different levels of the hierarchy.

Maslow (1943) initially claimed that individuals must first meet the lower-level needs before moving on to the subsequent levels of HON. For instance, achieving Esteem Needs is necessary prior to achieving Cognitive Needs, and similar rule applies across all HON levels. Maslow (1987) later brought more clarity by conceding that meeting a need is not an absolute, all-or-nothing event. He concurred that his prior words might have given the incorrect impression that a need must be completely met before individuals can advance to the next one. Lower-level needs in HON are often the ones individuals have made the greatest strides against and most individuals appear to have partially satisfied these needs. Human needs are dynamic and flexible; hence, individuals can work on different needs concurrently (Abu Bakar, 2022).

The literature presents two opposing perspectives. First, human needs must be satisfied in order to achieve SWB. That is, SWB is not possible without attending to these needs. Secondly, overcompensating some of the needs can result in unhappiness. For instance, excessive wealth that brings ill-being serves as an example of how meeting some of the needs can be shallow. Overcoming obstacles, such as unmet needs, allows individuals to feel more deeply connected to meanings and purposes in life. It is interesting that, in some circumstances, having partially met or unmet needs can offer more meaning to life and boost SWB. Through extensive literature review, this research revealed 24 indicators that represent human needs under the eight stages of HON (see Figure 3).

	HON	UNDERSTANDING
DEFICIENCY NEEDS	1	Physiological Needs The body's need for balance and consistent levels in different bodily systems is called homeostasis. It is driven by survival instincts like seeking shelter, water, food, warmth, rest, and good health. Until this need is met, all other needs are secondary.
	2	Safety and Security Needs The need for safety and security in one's life and surroundings involve seeking protection from violence, health threats, sickness, and economic pressures in order to thrive in modern societies.
	3	Belonging and Love Needs The need for love and a sense of belonging is fulfilled through supportive and communicative friendships, family, and intimate relationships. Deprivation of these needs can lead to feelings of guilt, loneliness, depression, or low extraversion values.
	4	Esteem Needs The need for self-confidence and recognition is fulfilled through positive feelings of self-worth achieved via accomplishments, appreciation, and recognition. Without meeting this need, one may experience feelings of inferiority.
	5	Cognitive Needs The need for knowledge and understanding is fulfilled by yearning for learning, exploration, discovery, and creation to better understand the world. Failure to fulfil this need may result in confusion and identity crisis.
GROWTH NEEDS	6	Aesthetic Needs The need to appreciate and connect with nature's beauty which involves taking time to immerse oneself in natural surroundings, allowing the sights, sounds, and sensations of the environment to refresh and rejuvenate the mind and body.
	7	Self-Actualization The instinctual need to maximize one's abilities and strive to be the best leading to a feeling of generativity –the desire to vote, contribute, volunteer, nurture and guide others to the well-being and growth of future generations or to outlast oneself.
	8	Transcendence Needs The need to surpass self-centeredness, and assist others in self-fulfilment and unlocking potential, also known as spiritual needs – when fulfilled, results in a sense of integrity, elevating one's existence to a higher plane.

Figure 2: Understanding the Stages in the Hierarchy of Human Needs
 Source: Abu Bakar et al., (2022)

STAGES OF HUMAN NEEDS	HON	#	HUMAN NEEDS INDICATORS
Essential Requirements <i>In the absence of them, the living system of mankind is obstructed.</i>	Physiological Needs	HN01	Nutritional and Wholesome Food
		HN02	Access to Medical Care
		HN03	Clean Water (for Drinking and Washing)
		HN04	Clean and Fresh Air
		HN05	Functional and Well-Maintained Lavatory
	Safety & Security Needs	HN06	Sufficient Electrical Supply
		HN07	Affordable Housing and Conveniences
		HN08	Financial Security and Stability
		HN09	Personal Safety and Security
		HN10	Health Insurance
Supplementary Requisites <i>In the absence of them, the living system is not obstructed but lives would be challenging</i>	Belonging & Love Needs	HN11	Work-Life Balance
		HN12	Social Acceptance and Cultural Inclusivity
		HN13	Reliable Communication Network
		HN14	Access to Internet with Reliable Connectivity
Aspired Prospects <i>In the absence of them, the living system is not obstructed and lives would not be too challenging</i>	Esteem Needs	HN15	Primary Education Attainment
		HN16	Secondary Education Attainment
	Cognitive Needs	HN17	Tertiary Education Attainment
		HN18	Employment Prospects and Opportunities
	Aesthetic Needs	HN19	Well-Kept Areas for Recreational Activities
		HN20	Rich Biodiversity of Flora and Fauna
	Self-Actualization	HN21	Rights to Participate in Leadership Selection
		HN22	Freedom of Expression
		HN23	Opportunities Free from Corruption
		HN24	Artistic and Cultural Freedom

Figure 3: Human Needs Indicators
 Source: Abu Bakar et al., (2022)

TRANSCENDENCE AND ECO-PERSONALITY AND LIFESTYLE

Maslow's HON offers an insightful view on the factors that can determine SWB. Individuals can boost their SWB by being aware and attending to human needs. However, depending on circumstances and characteristics, individuals may prioritize and experience HON in different ways. Nevertheless, both HON and SWB are highly individualized and there is no standard approach for pursuing them. Some individuals may find SWB through artistic works while others may experience SWB through social interactions or giving back for the greater good. Maslow (1970) also believed that very few of the world's population have experienced transcendence since it is the pinnacle stage of HON that necessitates tremendous self-improvement and introspection. By improving the lives of others and serving for the common good, those who do reach transcendence will experience a profound sense of fulfilment and inner peace.

Transcendence is the desire and capacity that allows individuals to connect with something greater or beyond themselves, ultimately transcending their own unique identities and concerns (Koltko-rivera, 2015). It entails achieving a sense of selflessness and discovering meanings in a greater cause. Depending on an individual's beliefs and values, transcendence represents the need to experience a feeling of oneness with the world, nature, or a higher force.

Insofar as its characteristics entail a change in emphasis from individual self-interest to a greater knowledge and a sense of duty towards the greater good, Eco-Personality and Lifestyle [PL] corresponds to fulfilling transcendence needs. Individuals with heightened PL contribute to causes beyond themselves and strive toward a more sustainable and peaceful union between the environment and mankind (Abu Bakar et al., 2020a; Abu Bakar et al., 2020b). Individuals who adopt an eco-conscious attitude frequently have a greater sense of purpose. This is consistent with the idea of transcendence, in which individuals attempt to transcend their own needs and desires in order to change the world for the better.

RESEARCH QUESTIONS

With this understanding in mind, the paper seeks to examine the following questions: Does heightened PL depend on fulfilment of human needs, and if so, which human need elevates PL? Alternatively, is it possible for PL to rise regardless of unmet needs, and if this is true, which human needs do not necessarily influence PL?

METHOD

Following the data screening procedure, a sample of 4,315 Malaysian respondents was examined, in response to an online survey, using given an 11-point Likert scale. The data was not normally distributed, according to the results of the Kolmogorov-Smirnova test. Mann Whitney U-Tests served to determine the mean of PL across the convenience and difficulty of meeting 24 human needs.

FINDINGS

The following tabulations demonstrate the (i) mean distribution of PL items, (ii) Mann Whitney U-Test results and (iii) the result's interpretation.

Table 2: Mean Distribution of PL Items

Indicators	Code	\bar{x}	\bar{xPL}
Good relationships are more important than personal achievement	PL01	8.39	
Disappointing myself is better than to disappoint my family	PL02	8.26	
I take into account others' opinions in making my life decisions	PL03	8.24	
I feel happy working with others	PL04	8.44	
I am moderate in purchasing and using my daily resources	PL05	8.28	8.24
I don't mind if I cannot afford to buy the things I like	PL06	8.09	
Having many assets will not give me happiness	PL07	8.09	
I always think about the destruction we are doing to the environment	PL08	8.11	
Deforestation of other countries affect me	PL09	8.08	
Media plays a big role in raising awareness on environmental issues	PL10	8.46	

Note. Mean Distribution of PL Items (\bar{x}) and Overall Mean of PL (\bar{xPL})

Table 3: Mann Whitney U-Test Results

HON STAGES	HUMAN NEEDS	Difficult			Convenient			U	z	p
		N	\bar{xR}	\tilde{x}	N	\bar{xR}	\tilde{x}			
Physiological Needs	HN1	336	2098.18	8.3	3979	2163.05	8.4	648374.0	-917	.359
	HN2	423	1989.22	8.2	3892	2176.34	8.4	751764.0	-2.935	.003
	HN3	392	2203.65	8.4	3923	2153.44	8.4	751014.5	-7.761	.447
	HN4	1330	1955.98	8.2	2985	2248.01	8.5	1716333.5	-7.113	.000
	HN5	805	1966.33	8.2	3510	2201.96	8.4	1258481.5	-4.842	.000
Safety & Security Needs	HN6	428	2025.40	8.2	3887	2172.60	8.4	775064.5	-2.321	.020
	HN7	1114	2147.27	8.4	3201	2161.73	8.4	1771007.5	-3.334	.739
	HN8	1861	2076.61	8.3	2454	2219.73	8.4	2131971.0	-3.739	.000
	HN9	1578	1982.11	8.2	2737	2259.41	8.5	1881946.0	-7.044	.000
	HN10	1325	1947.30	8.2	2990	2251.37	8.5	1701698.0	-7.398	.000
Belonging & Love Needs	HN11	1582	1967.39	8.2	2733	2268.33	8.5	1860261.0	-7.649	.000
	HN12	1310	1929.27	8.1	3005	2257.71	8.5	1668635.5	-7.966	.000
	HN13	328	2128.39	8.4	3987	2160.44	8.4	644157.5	-4.448	.654
Esteem Needs	HN14	923	2218.38	8.5	3392	2141.57	8.4	1509680.5	-1.661	.097
	HN15	313	2092.88	8.4	4002	2163.09	8.4	6059930.5	-9.961	.337
Cognitive Needs	HN16	390	1954.75	8.2	3925	2178.20	8.4	686108.5	-3.379	.001
	HN17	836	1985.43	8.2	3479	2199.47	8.4	1309952.5	-4.462	.000
Aesthetic Needs	HN18	1678	2087.71	8.3	2637	2202.73	8.4	2094488.5	-2.958	.003
	HN19	1430	1971.66	8.2	2885	2250.36	8.5	1796308.5	-6.920	.000
	HN20	1453	1931.11	8.1	2862	2273.19	8.5	1749567.0	-8.527	.000
Self-Actualization	HN21	1823	1996.97	8.2	2492	2275.80	8.5	1977894.0	-7.265	.000
	HN22	1957	2048.28	8.3	2358	2249.06	8.5	2092586.0	-5.272	.000
	HN23	2247	2101.05	8.3	2068	2219.88	8.4	2195427.0	-3.131	.002
	HN24	1531	1932.05	8.1	2784	2282.26	8.5	1785225.5	-8.838	.000

Note. Mean Rank of $\bar{x}\Sigma PL$ across Difficult and Convenient; **Bold and highlighted** shows higher mean rank.

The results in Table 3 showed that 18 out of 24 test results were statistically significant, inferring that PL was statistically greater with the convenience of satisfying all of the emphasized human needs.

Table 4: Mann Whitney U-Test Results Interpretation

HON	HUMAN NEEDS	INTERPRETATION
Physiological Needs	Nutritional and Wholesome Food	Respondents who indicated convenience had higher mean rank (N = 3979, $\bar{x}R = 2163.05$) than those who reported difficulty (N = 336, $\bar{x}R = 2098.18$), but the difference did not reach statistical significance (U = 648374.0, p = .359).
	Access to Medical Care	Respondents who indicated convenience had higher mean rank (N = 3892, $\bar{x}R = 2176.34$) than those who reported difficulty (N = 423, $\bar{x}R = 1989.22$). A significant statistical difference was observed (U = 751764.0, p = .003).
	Clean Water (For Drinking and Washing)	Respondents who indicated difficulty had higher mean rank (N = 392, $\bar{x}R = 2203.65$) than those who reported convenience (N = 3923, $\bar{x}R = 2153.44$), but the difference did not reach statistical significance (U = 751014.5, p = .447).
	Clean and Fresh Air	Respondents who indicated convenience had higher mean rank (N = 2985, $\bar{x}R = 2248.01$) than those who reported difficulty (N = 1330, $\bar{x}R = 1955.98$). A significant statistical difference was observed (U = 1716333.5, p = .000).
	Functional and Well-Maintained Lavatory	Respondents who indicated convenience had higher mean rank (N = 3510, $\bar{x}R = 2201.96$) than those who reported difficulty (N = 805, $\bar{x}R = 1966.33$). A significant statistical difference was observed (U = 1258481.5, p = .000).
Safety and Security Needs	Sufficient Electrical Supply	Respondents who indicated convenience had higher mean rank (N = 3887, $\bar{x}R = 2172.60$) than those who reported difficulty (N = 428, $\bar{x}R = 2025.40$). A significant statistical difference was observed (U = 775064.5, p = .020).
	Affordable Housing and Conveniences	Respondents who indicated difficulty had higher mean rank (N = 3201, $\bar{x}R = 2161.73$) than those who reported convenience (N = 1114, $\bar{x}R = 2147.27$), but the difference did not reach statistical significance (U = 1771007.5, p = .739).
	Financial Security and Stability	Respondents who indicated convenience had higher mean rank (N = 2454, $\bar{x}R = 2219.73$) than those who reported difficulty (N = 1861, $\bar{x}R = 2076.61$). A significant statistical difference was observed (U = 2131971.0, p = .000).
	Personal Safety and Security	Respondents who indicated convenience had higher mean rank (N = 3887, $\bar{x}R = 2259.41$) than those who reported difficulty (N = 1578, $\bar{x}R = 1982.11$). A significant statistical difference was observed (U = 1881946.0, p = .000).
	Health Insurance	Respondents who indicated convenience had higher mean rank (N = 2990, $\bar{x}R = 2251.37$) than those who reported difficulty (N = 1325, $\bar{x}R = 1947.30$). A significant statistical difference was observed (U = 1701698.0, p = .000).
Belonging and Love Needs	Work-Family Balance	Respondents who indicated convenience had higher mean rank (N = 2733, $\bar{x}R = 2268.33$) than those who reported difficulty (N = 1582, $\bar{x}R = 1967.39$). A significant statistical difference was observed (U = 1860261.0, p = .000).
	Social Acceptance and Cultural Inclusivity	Respondents who indicated convenience had higher mean rank (N = 3005, $\bar{x}R = 2257.71$) than those who reported difficulty (N = 1310, $\bar{x}R = 1929.27$). A significant statistical difference was observed (U = 1668635.5, p = .000).
	Reliable Communication Network	Respondents who indicated convenience had higher mean rank (N = 3987, $\bar{x}R = 2160.44$) than those who reported difficulty (N = 328, $\bar{x}R = 2128.39$), but the difference did not reach statistical significance (U = 644157.5, p = .654).
	Access to Internet with Reliable Connectivity	Respondents who indicated difficulty had higher mean rank (N = 923, $\bar{x}R = 2218.38$) than those who reported convenience (N = 3392, $\bar{x}R = 2141.57$), but the difference did not reach statistical significance (U = 1509680.5, p = .097).
Esteem Needs	Primary Education Attainment	Respondents who indicated convenience had higher mean rank (N = 4002, $\bar{x}R = 2163.09$) than those who reported difficulty (N = 313, $\bar{x}R = 2092.88$), but the difference did not reach statistical significance (U = 6059930.5, p = .337).
	Secondary Education Attainment	Respondents who indicated convenience had higher mean rank (N = 3925, $\bar{x}R = 2178.20$) than those who reported difficulty (N = 390, $\bar{x}R = 1954.75$). A significant statistical difference was observed (U = 686108.5, p = .001).
Cognitive Needs	Tertiary Education Attainment	Respondents who indicated convenience had higher mean rank (N = 3479, $\bar{x}R = 2199.47$) than those who reported difficulty (N = 836, $\bar{x}R = 1985.43$). A significant statistical difference was observed (U = 1309952.5, p = .000).
	Employment Prospects and Opportunities	Respondents who indicated convenience had higher mean rank (N = 2637, $\bar{x}R = 2202.73$) than those who reported difficulty (N = 1678, $\bar{x}R = 2087.71$). A significant statistical difference was observed (U = 2094488.5, p = .003).

Note. Result Interpretation of Mann Whitney U Test; Bold & Highlighted shows statistically significant output.

Table 4: Mann Whitney U-Test Results Interpretation (continued)

HON	HUMAN NEEDS	INTERPRETATION
Aesthetic Needs	Well-Kept Areas for Recreational Activities	Respondents who indicated convenience had higher mean rank (N = 2885, $\bar{x}R = 2250.36$) than those who reported difficulty (N = 1430, $\bar{x}R = 1971.66$). A significant statistical difference was observed (U = 1796308.5, p = .000).
	Rich Biodiversity of Flora and Fauna	Respondents who indicated convenience had higher mean rank (N = 2862, $\bar{x}R = 2273.19$) than those who reported difficulty (N = 1453, $\bar{x}R = 1931.11$). A significant statistical difference was observed (U = 1749567.0, p = .000).
Self-Actualization Needs	Rights to Participate in Leadership Selection	Respondents who indicated convenience had higher mean rank (N = 2492, $\bar{x}R = 2275.80$) than those who reported difficulty (N = 1823, $\bar{x}R = 1996.97$). A significant statistical difference was observed (U = 1977894.0, p = .000).
	Freedom of Expression	Respondents who indicated convenience had higher mean rank (N = 2358, $\bar{x}R = 2249.06$) than those who reported difficulty (N = 1957, $\bar{x}R = 2048.28$). A significant statistical difference was observed (U = 2092586.0, p = .000).
	Opportunities Free from Corruption	Respondents who indicated convenience had higher mean rank (N = 2068, $\bar{x}R = 2219.88$) than those who reported difficulty (N = 2247, $\bar{x}R = 2101.05$). A significant statistical difference was observed (U = 2195427.0, p = .002).
	Artistic and Cultural Freedom	Respondents who indicated convenience had higher mean rank (N = 2784, $\bar{x}R = 2282.26$) than those who reported difficulty (N = 1531, $\bar{x}R = 1932.05$). A significant statistical difference was observed (U = 1785225.5, p = .000).

Note. Result Interpretation of Mann Whitney U Test; Bold & Highlighted shows statistically significant output.

Table 5: Summary of Findings

Statistically Significant Difference Established (p < .000)		Difference Did Not Reach Significance
Condition 1:	Condition 2:	Condition 3:
PL Increase with Difficulty	PL Increase with Convenient	Neither Change PL
The difficulty to meet the human need increases PL, or PL is greater with difficulty to meet the human need.	The convenience to meet the human need increases PL, or PL is greater with convenience to meet the human need.	Neither convenience or difficulty to meet the human need increases PL, or PL does not change with convenience nor difficulty to meet the human need.

	HON	Code Human Needs	Findings/Condition
DEFICIENCY NEEDS	Physiological Needs	HN01 Nutritional and Wholesome Food	Condition 3
		HN02 Access to Medical Care	Condition 2
		HN03 Clean Water (for Drinking and Washing)	Condition 3
		HN04 Clean and Fresh Air	Condition 2
		HN05 Functional and Well-Maintained Lavatory	Condition 2
	Safety & Security Needs	HN06 Sufficient Electrical Supply	Condition 2
		HN07 Affordable Housing and Conveniences	Condition 3
		HN08 Financial Security and Stability	Condition 2
		HN09 Personal Safety and Security	Condition 2
		HN10 Health Insurance	Condition 2
	Belonging & Love Needs	HN11 Work-Life Balance	Condition 2
		HN12 Social Acceptance and Cultural Inclusivity	Condition 2
		HN13 Reliable Communication Network	Condition 3
		HN14 Access to Internet with Reliable Connectivity	Condition 3
Esteem Needs	HN15 Primary Education Attainment	Condition 3	
	HN16 Secondary Education Attainment	Condition 2	
GROWTH NEEDS	Cognitive Needs	HN17 Tertiary Education Attainment	Condition 2
		HN18 Employment Prospects and Opportunities	Condition 2
	Aesthetic Needs	HN19 Well-Kept Areas for Recreational Activities	Condition 2
		HN20 Rich Biodiversity of Flora and Fauna	Condition 2
	Self-Actualization	HN21 Rights to Participate in Leadership Selection	Condition 2
		HN22 Freedom of Expression	Condition 2
		HN23 Opportunities Free from Corruption	Condition 2
		HN24 Artistic and Cultural Freedom	Condition 2

The mean distribution across PL items varied between 8.08 to 8.46, thus indicating that the Malaysian respondents had a strong positive sentiment on PL (see Table 2). The respondents were asked to indicate whether the human needs were convenient or difficult to satisfy. Most of them—between half and three-quarters—claimed that it was convenient to meet all of the 24 needs (see Table 3). Mann-Whitney U test was then performed using the average mean(s) of all PL items. The mean variations of PL were compared across the two positions (convenience and difficult).

The statistical results showed that PL increased when it was convenient to satisfy 18 of the human needs. This implies that the convenience of satisfying the highlighted human needs led to increased PL (see Table 4 and Table 5). However, PL did not significantly change with convenience nor difficulty to fulfill certain human needs, namely (i) nutritional and wholesome food, (ii) clean water, (iii) affordable and convenient housing, (iv) reliable communication network, (v) access to internet with reliable connectivity, and (vi) primary education attainment (see Table 4 and Table 5).

DISCUSSION AND CONCLUSION

Our findings revealed that the convenience to fulfil the majority of human needs prompted an increase in PL. It means that the respondents tend to prioritize on meeting their human needs prior to fostering eco-personality and lifestyle. This makes sense given that individuals who struggle in satisfying their deficiency needs may lack the time and energy to act for the greater good.

From a distinct yet related perspective, the findings imply that fulfilling the 18 human needs can nurture eco-personality and lifestyle. This is because meeting the human needs creates a favourable environment for fostering PL. However, it was also observed that fulfilling human needs and fostering PL could develop along different trajectories. This was evidenced by the absence of statistical interactions between PL and the remaining five human needs.

The findings further showed that meeting the growth needs, particularly cognitive needs, aesthetic needs, and self-actualization, encourages empathy and a sense of interdependence with one's surroundings. Individuals who are more self-aware, creative, and committed to their own development often have greater purpose, which motivates them to be mindful about the way their lifestyles affect the environment and work towards living in harmony with it. These individuals are more inclined to take ownership of their actions and engage in acts that benefit the common good when they feel competent and capable to do so.

It is also crucial to recognize that individual characteristics, cultural influences, and other external factors play a significant impact on PL. Their PL may differ significantly depending on beliefs, experiences, and degree of exposure to environmental issues. Nonetheless, addressing human needs can establish a climate that is conducive to promote environmental stewardship.

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CAPACITY BUILDING PLANNING FOR FISHERMEN COMMUNITY'S EMPOWERMENT

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Abstract

Efforts to promote fishing community empowerment frequently face obstacles owing to inefficient measures carried out by multiple parties that do not result in substantial improvements in the fishing communities. The persistence of this problem, however, can be linked to a lack of capacity building activities, particularly in the context of sustainability, which is critical for long-term development among fishermen. This research intends to investigate the reality of fishermen's capacity building in Terengganu, Malaysia, using the aspects of economic sustainability, institutional environment, and fishermen's technology. The study included 220 coastal fishermen who were sampled in stages. Questionnaires were used to collect data, which was then analysed using descriptive statistics and Partial Least Square-Structural Equation Modelling (SEM-PLS). According to the study's findings, the development of sustainability capabilities (technological, economic, institutional, and technological) influences the empowerment of fishing communities. As a result, community empowerment programmes should focus on capacity building in order to foster a well-empowered community.

Keywords: Fisheries, capacity building, sustainability

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INTRODUCTION

The existence of resources, relationships, networks, leadership, and skills in the group process is defined as capacity (Baillie et al., 2008). Capacity building refers to the process of creating human capital, organisational structures, institutions, and social systems (Baillie et al., 2008; Merino, 2012). Capacity development is typically a never-ending process (Baillei et al., 2008; Koutra et al., 2012). According to Philips and Pitman (2009), capacity building is a type of community development that involves community development procedures.

Capacity building entails the development of key aspects in which capabilities emerge through the expansion of existing knowledge and skills (Mills & Porty, 2010). Changes in performance and the results obtained can be used to assess capacity growth (Merino, 2012). Capacity building is investigated as a non-static process that grows through development procedures to attain desired outcomes. Capacity building also means the absence of external elements or elements entering the community, but rather the utilisation of existing resources and their enhancement to a higher level for the benefit of the entire community.

According to Yadama and Dauti (2010), The sustainability component can be used to study capacity building. Sustainability has several facets, including institutional, economic, social, and environmental sustainability. (Ciegis et al., 2009; Puziah Ahmad et al., 2013; Turcu, 2012). In Abiona and Bello (2013), introduce technology as an extra variable to quantify sustainability. These five criteria can be used as an indicator framework to analyse community sustainability. Capacity building fosters long-term efforts to make a community better. Through Malaysia's government is committed to achieving a world-class living standard for the entire country by 2025 through sustainable development.

Community development projects include community empowerment as well. Participation (Azizan Bahari, 2013; Lyndon et al., 2011) and self-reliance (Fawcett et al., 2010) are two components of community empowerment. Tremblay and Gutberlet (2010) define empowerment as "community-driven efforts and changes implemented by community members themselves." Community members are recognised as major driving forces within a community when they are empowered. It recognises the community's ability to effect change. Community members are the ones in charge of making their community better.

LITERATURE REVIEW

Coastal communities in general work predominantly as fishermen, particularly small-scale fishermen, and rely on marine resources as a source of income (Hughes et al., 2011). Small-scale fishermen contribute significantly to the economy, notably in the Asia-Pacific region (Kittinger, 2013). According to Kittinger (2013), the economic system of fishermen consists of a small capital allocation gained through individual and family help as opposed to large-scale

fishermen supported by businesses. This explains why small-scale fishermen have less capacity than those who use larger fishing vessels. In fact, in order to continue earning a living as small-scale fishermen, they rely on the aid of family members. Families obviously display a huge resource with the potential to influence their economy.

The economic sustainability of fishermen is quite concerning. According to Nor Hayati (2011) and Wan Mohd Zaifurin (2009) studies, the majority of the younger generation of fishermen is no longer interested in continuing the fishing activity as a source of income. Regulations that discourage young people from entering the fishing sector, as well as the rising costs of fishing methods, contribute to the movement of young people (Smith et al., 2014). These facilities, according to Smith et al. (2014), in order to promote the wellbeing of fishing communities, provide young people with the opportunity to obtain fishing licences and underline the importance of youth involvement in the fisheries industry. These challenges may have an impact on the sustainability of the fishing industry, which is one of the country's most important.

The use of technology is one of the variables that contributes to increasing sea yields. According to academics Lam and Pitcher (2012), it has a direct impact on enhancing efficiency and extending business opportunities in the trade of plentiful marine resources through facilities and technological improvements. Glass et al. (2015) agrees, claiming that the utilisation of technology is the most important aspect in creating a large income for fishermen. However, due to budgetary constraints, most coastal fishermen do not have access to modern technology resources (Lam & Pitcher, 2011). This clearly shows that technical tools may help fishermen increase their income generation through improved fishing tactics. High-quality marine resources can attract better market opportunities.

Institutional sustainability, this can be evaluated in terms of fishermen's associations, which are important for the develop of fishing communities. However, as mentioned by Siti Rahmah et al. (2004), many challenges exist within a fishermen's association where the fishermen's organisations in the community are not engaged in giving socioeconomic aid to the fishing community. Existing fishermen's groups, according to Mohd Taib (2008), continue to rely on traditional operations such as selling oil, marketing fish, and selling ice. Furthermore, according to Mohd Taib (2008), established community fishermen's associations have the ability to progress forward if the board of directors and members of the association are aware of the need to diversify their activities inside the association.

The expansion of marine resources corresponds to population and economic growth, which have a direct impact on the sustainability of marine resources (Robert & Brink, 2010). Marine resource conservation is critical, particularly for community development (Hughes et al., 2011). However,

economic exploitation of marine resources has been jeopardised by community efforts (Nobre, 2009). Exploitation is still prevalent as fishermen catch fish regardless of the season, whether summer or winter (Verliin et al., 2013). Overfishing has had an influence on the marine ecosystem as well as fishermen's revenue (Launay, 2008; Cinner et al., 2013). This is visible on the West African coast, where overfishing has affected the environment (Witbooi, 2008). However, in addressing concerns such as overexploitation of marine resources, Witbooi (2008) suggests that sustainable management should not be just the duty of a single country but should also necessitate cooperative management across several nations. Unfortunately, many countries, especially those in the European Union and West Africa, are not taking advantage of this strategy.

Capacity building within a community is a process that has an impact on overall community development (Philips & Pitman, 2009). Lovren (2010) defines capacity building as a process of empowering the community. Through its ability to alleviate social exclusion, capacity building has a significant relationship with community development.

Participation within the fishing community is critical to their efforts to improve community capability. The fishing community's participation at various levels of community development is critical (Aldon et al., 2011). Indeed, according to Aldon et al. (2011), the challenges that occur in Indonesia regarding the development of the fishing community by the government frequently do not involve the fishermen's engagement in their community activities. The impact of growth without community engagement results in the fishing community's facilities being unable to develop (Stanford et al., 2014). It was clear that active participation by loyal local community contributed significantly to human and social capital, implying that community empowerment may be critical for future growth (Mohd Kusin et al., 2019). According to Malik et al. (2018), state and local governments can help by encouraging local community participation. Based on these considerations, it is possible that initiatives to empower fishermen can be strengthened through capacity-building components. As a result, the purpose of this article is to identify and analyse the impact of capacity building on the empowerment of fishermen in Terengganu, Malaysia.

RESEARCH METHODOLOGY

This study used a survey approach to identify capacity building for the empowerment of Terengganu fisherman. A questionnaire was used to collect the data. In the fishing community, sustainability includes economic, environmental, social, institutional, and technological sustainability. The capacity building variables, which were classified into the areas of economic, institutional, social, technological, and environmental sustainability.

Meanwhile, community empowerment variables include domains such as active involvement and self-reliance. Active participation is the term used to

describe the involvement of community members in all element of community development, including that of fishing. It encompasses the procedures of identifying issues and needs, planning, implementing, monitoring, and improving in order to build the community. (Alias et al., 2023; Sudarmono, 2009). Furthermore, self-reliance can be defined as the capacity to manage, mobilise, and use one's current resources as investments for a better life. (Thomas & Pawar, 2010). Improving the socioeconomic results of families through entrepreneurship, working extra hours, and part-time jobs based on fishing-related talents or abilities unrelated to fishing occupations are further examples of self-reliance skills.

According to Cronbach's alpha, which is displayed in Table 1, the survey questionnaire in the study has a high reliability rating that is greater than 0.65. This means that the questionnaire's prepared question items have a high level of reliability.

Table 1: Cronbach's Alpha

Variable	Capacity Building	Community Empowerment
Cronbach's Alpha	.846	.956

326 coastal fishermen make up the study population. Respondents were drawn from a sampling frame collected from the Kuala Terengganu District Fisheries Office (154 fishermen) and Kuala Besut (172 fishermen), both in Terengganu, Malaysia. The following criteria are included in the study's unit of analysis: i) They must be full-time coastal fishermen; ii) They must own their own small boats; and iii) They must be registered with the District Fisheries Office.

This choice was made because full-time coastal fishermen are the most common type of fisherman in the occupation. Furthermore, coastal fishermen are a group that receives government attention in socioeconomic development because they are the most affected sector during the monsoon season, particularly on Peninsular Malaysia's East Coast.

The study's sample size is 220 people, with 100 (Kuala Terengganu) and 120 (Kuala Besut) Terengganu, Malaysia. Using Cochran formula, the sample size was estimated, with a maximum sampling error of 5% (Corbetta, 2003). Purposive sampling was utilised in this study. Purposive sampling involves selecting a sample based on specified criteria relating to the unit of analysis in the study.

The data was analysed using SPSS software and descriptive statistics to determine fisherman capacity building. Meanwhile, structural equation modelling-partial least squares (SEM-PLS) analysis was used to develop the model on the impact of capacity building on community empowerment.

ANALYSIS AND DISCUSSION

The results of this study show the findings according to the research objectives, which are to identify the capacity building of the fishing community and its subsequent relationship with the impact of capacity building on fishermen's empowerment.

Demographics of Respondents

Table 2 displays the study findings in relation to the age and experience level of fishermen. According to the survey findings about the age of fishermen, more than half, or 60%, of the fishermen are between the ages of 41 and 65. Meanwhile, 18 percent are over the age of 66, and 16 percent are between the ages of 21 and 40. Furthermore, 4% of the fishermen are under the age of 20.

In terms of fishing experience, 47 percent of fishermen have more than 40 years of experience, 18 percent have 30 to 39 years of experience, and 15 percent have 20 to 29 years of experience. Fishermen with 11 to 19 years of experience account for 14%, while those with less than 10 years of experience account for 6%.

The age distribution period corresponds to the age range of income-generating activities, with the productive labour force age range of 15 to 64 representing the productive labour force age in pursuing economic resources. Additionally, most fisherman possess the necessary skills and knowledge within the context of their vocation and are willing to share their expertise and experience for future generations.

The capacity of a fisherman to sustain their livelihood is impacted by their level of experience. According to the findings of the study, over half of the respondents, 47% have prior experience in the fishing industry. This lengthy expertise can be attributed to a genetic component that has been there since childhood, and the fishing community has long been exposed to the maritime environment. Their prolonged exposure to the sea environment has given them a grasp on fishing-related challenges.

Table 2: Demographics Of Respondents (N=220).

Age		Fishermen Experience	
20 and below	2 (4%)	10 and below	13 (6%)
21-40 years	35 (16%)	11 to 19 years	31 (14%)
41-65 years	143 (65%)	20 to 29 years	33 (15%)
66 years and above	40 (18%)	30 to 39 years	40 (18%)
		40 tahun and above	103 (47%)

SEM-PLS Analysis

The first step in analysing the SEM-PLS technique is model testing. To verify the validity and reliability of the study variables, the measurement model is tested. Internal consistency, indicator reliability, concept validity, convergent validity,

and discriminant validity are the model's validity and reliability, according to Hair et al. (2014). Cronbach's alpha values are used to measure the internal consistency of each variable dimension, as shown in Table 3. The Cronbach's alpha values for all variables meet the criteria, according to the table. The composite reliability (CR) values of each measured variable dimension are also considered for internal validity.

Table 3: Cronbach,s Alpha, Composite realibility & Average Variance Extracted (AVE)

Variabel	Cronbach,s Alpha	Composite realibility	Average Variance Extracted (AVE)
PK	0.624	0.838	0.721
PKE	0.669	0.807	0.590
PKI	0.820	0.874	0.583
PKP	0.697	0.814	0.525
PT	0.954	0.965	0.845

Note:

- | | |
|---|--|
| PK Empowerment Community | PKP Capacity Building (Enviroment Sustainability) |
| PKE Capacity building (Economic Sustainability) | PT Capacity building (Technology Sustainability) |
| PKI Capacity building (Institution Sustainability) | |

This means that the variable dimensions utilised in this study are accepted and meet the convergent validity criteria. The measurement model is depicted in Figure 1, which explains the outer loadings for each factor that meets the criteria.

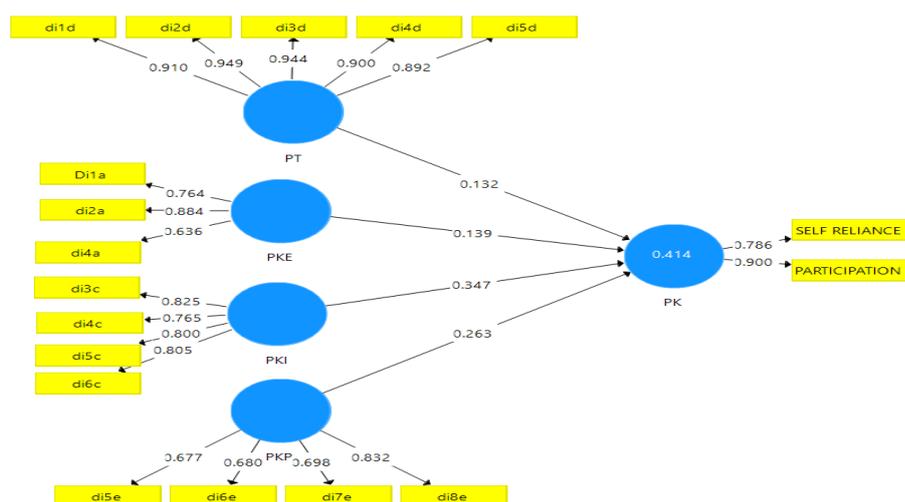


Figure 1: Outer Model

The structural model testing in Figure 2, is used to verify whether the variables in a model fit the criteria of being appropriate, valid, and reliable by examining the relationships between the structural model's latent variables (Davicik, 2014). Paths in the structural model explain the relationships between variables.

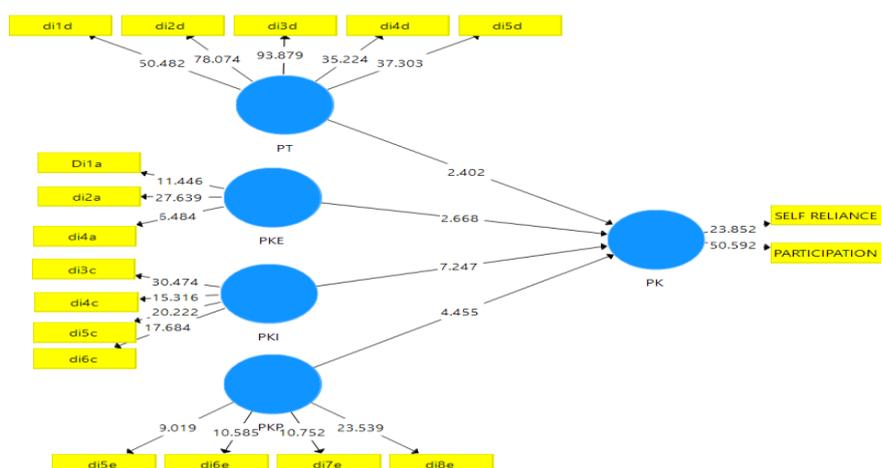


Figure 2: Structural Model

Meanwhile, Table 4 presents the R2 values for the community empowerment model in the research. The table shows that community empowerment is contributed by the capacity building in economic sustainability, capacity building in institutional sustainability, capacity building in technological sustainability, and capacity building in environmental sustainability.

Table 4: R-Square

Variable	R-Square
Empowerment Community	0.405

According to Table 5, the findings of the convergent validity study, which comprises factor loading analysis, discriminant validity, and cross-loading, reveal significant results. The capacity-building factors (economic sustainability, institutional sustainability, environmental sustainability, and technical sustainability) have significant associations with t-statistics (>1.96). This suggests that aspects of sustainable capacity building can have an impact on community empowerment.

To improve their economic status, the present generation of fishermen not only implements hereditary knowledge and abilities but also expands their

knowledge and skills, including learning about the latest modern equipment. Furthermore, in order to maintain their current knowledge and skills, fishermen share their information by guiding and educating other fishermen. This may be because most fishermen are familiar with GPS, even if they do not own one. Fishermen can track fishing grounds using GPS technology, saving them time in locating fishing areas. The use of technology also allows them to spend more time at sea, allowing them to catch more fish.

Furthermore, as the fishing community has become more aware of the loss of marine resources, fishermen have taken the initiative to build fish breeding sites (unjang) to help sustain the marine environment. They also describe illicit fishing activities carried out by foreign and pull-net boats that trespass on fisheries officials' restricted zones. These findings are corroborated by Akpalu's (2010) study, which indicates that fishing communities' efforts to avoid overfishing directly contribute to an improved quality of life, lowering poverty rates within the fishing community. Poverty is linked with fishing towns, and one of the contributing elements is fishermen's persecution. Communities can address social exclusion by giving learning opportunities to the community (Ibrahim et al., 2023; Henderson, 2005), which leads to community development.

Table 5: Significant Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	*Sig
PT -> PK	0.129	0.130	0.054	2.411	0.016
PKE -> PK	0.136	0.139	0.055	2.479	0.014
PKI -> PK	0.356	0.355	0.052	6.863	0.000
PKP -> PK	0.260	0.265	0.058	4.469	0.000

*Significant P Value <0.05

CONCLUSION

Fishermen demonstrate capacity-building aspects in the context of sustainability. According to technological sustainability, fisherman have technological equipment and skills in using technologies such as GPS and sonar, among others. Most fishermen have experience handling technology as crew members on larger vessels outfitted with technical gear for acquiring sea resources. Efforts to improve ownership and usage of technology have aided fishermen in improving their personal lives and the total economic resources of their communities. To continue working as fishermen, the fishing community must emphasise ownership and the use of cutting-edge technology resources.

Economic sustainability in the fishing community has improved significantly. The economic element significantly affects how well fisherman can support themselves. Consistent attempts to improve must be made by the fishing community through an increased variety of marine goods. Diversifying marine product offerings can assist fishermen in generating economic gain. The creation

of marine-based items not only generates money but also adds value to the government's attempts to keep fishing jobs as one of Malaysia's occupations.

The fishermen's institutional sustainability in partnership with external institutions has been quite excellent, particularly in their community development activities. Continuous attempts to create relationships pay off, especially when it comes to giving various help facilities to fishermen. Fishermen can take the initiative to create positive results by empowering their community through fishing organisations to engage with other institutions.

The fishermen's community's environmental sustainability is inadequate. Fishermen have a low awareness of the need for environmental preservation for future generations and resource sustainability. Because of the dwindling marine resources, this lack of awareness has repercussions for the decline of fishing as a career. As a result, efforts to raise awareness, notably through education programmes, about the need for marine conservation for future generations must be stepped up. The fishermen's community's environmental sustainability is inadequate. Fishermen have a low awareness of the need for environmental preservation for future generations and resource sustainability. Because of the dwindling marine resources, this lack of awareness has repercussions for the decline of fishing as a career. As a result, efforts to raise awareness, notably through education programmes, about the need for marine conservation for future generations must be stepped up.

Capacity-building programmes have clearly impacted community empowerment. Capacity-building enhancements have successfully increased community empowerment. The fishing community's involvement and self-sufficiency are driving forces in empowering the fishing community. Positive outcomes are accomplished, including in the partnership process, through capacity-building activities in the context of sustainability, and they are able to choose their own needs. The enhancing component is one of the main characteristics of sustainability that can add value to community empowerment programmes. As a result, this article proposes that efforts should be made to improve the elements of sustainable capacity building in order to increase the empowerment of the fishing community.

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RURAL DEVELOPMENT: MOTIVATIONAL FACTORS IMPACTING COMMUNITY SUPPORT FOR RURAL TOURISM

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Abstract

Rural tourism has emerged as a viable domestic tourism option and a means of raising the standard of living and enhancing the environment for rural residents. Successful rural tourism greatly depends on rural tourism products and the local communities residing in particular areas. This study examines factors that influence rural community support for developing tourism in remote areas. The theoretical concept is framed by integrating social exchange theory with social representation theory. It employs a case study approach by examining multiple stakeholder views located in remote Kinabatangan, Sabah. Using a mixed-method approach and four labels of data convergence, the findings reveal conflicting views among the stakeholders pertaining to Indigenous motivation and participation in rural tourism activities. The study highlights employing a comrade approach to encourage aboriginal participation in tourism ventures, not merely depending on monetary incentives and tourism awareness campaigns.

Keywords: Rural tourism, Mixed method research, Dual theories, Indigenous people, Kinabatangan, Sabah

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INTRODUCTION

According to United Nation (2021), rural development refers to strategies and policies that aim to boost the economy, society, and environment, including to promote poverty eradication and pro-poor planning in rural areas. Absolute poverty is still widespread in Malaysia despite ongoing economic growth since independence in 1957 (Department of Statistics, 2021). The poorest people in the country are frequently located in rural areas, where families struggle to put food on the table and to pay for necessities for basic human rights like healthcare and education (United Nation, 2021; Department of Statistics, 2021). Sabah in particular continues to have the greatest prevalence of absolute poverty. In order to raise the social, economic, and living standards of rural residents, effective rural development that is in line with sustainable development goals (SDG) is urgently required. Rural tourism has played a vital role in reviving the rural economy (Ristić et al., 2019). Rural tourism is a type of vacation in which visitors spend a significant amount of their time enjoying recreational activities in rural areas or on farms surrounded by nature (Ristić et al., 2019; Rosalina et al., 2021). Rural tourism can also be a form of tourism that involves visiting rural places to partake in a variety of activities for tourists to experience rural life more authentically or to be closer to nature (Liu et al., 2020).

Malaysia views rural tourism as one of its key strengths, given the abundance of its natural resources, heritage, and diverse culture (Latip et al., 2019). Sabah, one of the thirteen states that make up Malaysia, is situated in Borneo's northern region. In particular, rural Kinabatangan, Sabah, supports essential ecosystems and endangered wildlife species (e.g., Bornean elephant, orangutan, and proboscis monkey), all of which are on the edge of extinction and listed as red species by the IUCN Red List (Estes et al., 2012; Pimid et al., 2020). Apart from the wildlife, this area is known for the nature and cultural values of the local Indigenous people, known as Sungai people (River people) (Pimid et al., 2020). With Sabah's rich living legacy and ethnic diversity, it is also regarded as one of the world's twelve mega-diversity locations, making it perfect for rural tourism (Latip et al., 2019). Many studies have examined the visitor perspectives, yet few have focused on the host communities (Rosalina et al., 2021; Wilson et al., 2001). Therefore, understanding factors that motivate local people to engage in rural tourism activities is critical in order to increase the rural economy, alleviate absolute poverty, and protect the natural resources.

LITERATURE REVIEW

Conceptual Framework to Assess Community Support for Rural Tourism

Based on social exchange theory (SET), scholars prove that local people are more supportive of tourism development if they perceive the benefits of tourism (i.e., social, economy, and environment) outweigh associated costs (Jurowski et al., 1997; Latip et al., 2018). In many studies, positive impacts of tourism in terms of

economic gain are argued to be a leading factor that influences Indigenous support for tourism development in rural areas (Nepal, 2002; Strickland-Munro, & Moore, 2013; Gunter & Ceddia, 2020). This is because tourism provides employment opportunities and revenues to Indigenous communities, including an exchange of cultural experiences (Thimm & Karlaganis, 2020). It is proven that tourism provides economic incentive for sustaining costs in managing protected areas, in a similar way conservation is essential for tourism to develop sustainably (Fennell & Weaver, 2005). Despite the fact that the SET is widely applied for investigating residents' attitudes towards tourism development (Hadinejad et al., 2019), it has been criticised for reducing human interaction to economic calculations, including its focus on fulfilling individual needs from individual perspective, suggesting that it may not be applicable to group behaviour (Li et al., 2015).

Other researchers apply social representation theory (SRT) to examine tourism impacts, perceptions and attitudes of residents, wherein "*the SRT is concerned with describing and understanding how and what people think in their ongoing everyday experiences and how a wider social reality influences these thoughts*" (Pearce et al., 1996, p. 29). Social representation theory allows groups to share a common social experience and provides guidelines to individuals for how to react to certain phenomena, but once social representation is created, it is spread through media and other social interactions (Moscardo, 2011). Social representation theory serves two purposes; (1) it enables groups who experience new phenomena, make a reference point and use it as a comparison against one's own prior knowledge (e.g. past experiences, social interaction, and media), and (2) it enables sharing of communication among similar members of community, facilitating an understanding, and provides the members with codes for social exchange and classifying various aspects of their individual and group history (Li et al., 2015). Therefore, by focusing on everyday thinking and communication, SRT establishes a link between social and psychological organisation of knowledge (Moscovici & Marková, 1998).

Cheng et al. (2022) apply SRT and report that local perceptions of tourism are related to direct experiences, social interaction, and other information sources like the media. In the context of social interaction, the usage of social media creates wider chances for many people to communicate in the tourism sector. There are some debates on how to make social media effective for tourism research, but little is known regarding its role for Indigenous people and tourism (Hussain et al., 2018; Hamid et al., 2020). Therefore, further research on this matter enables a better understanding of how social media influences Indigenous people to engage in and support tourism ventures.

Research that integrates both SET and SRT theories is limited, but a few studies have applied both theories to examining tourism impacts and residents' perceptions. Weaver and Lawton (2013) explain that local residents'

attitudes are complex social exchange dynamic and supporters/opponents rely on personal experience or social representation. Li et al. (2015) explains that both theories are distinctive; the SET provides a rational information processing based on cost and benefit assessments, while the SRT allows subjective reactions to tourism based on individual social values. However, the latter authors highlight that when both theories are combined, they greatly assist in deeper understanding of resident perception on tourism because it looks into both personal gain/loss of associated tourism activities and social representation of direct experiences. Considering the concepts of SET and SRT, it is appropriate to incorporate both theories to provide a critical understanding of community motivational factors that influence views about tourism in rural Kinabatangan, Sabah, so we can examine:

- 1) Community perceptions on social, economic, and environmental impacts.
- 2) How social exchange affects individual values and community interaction.
- 3) Evaluation of social media as a potential tool for advancing rural participation.
- 4) Multiple social challenges and difficulties related to tourism that the native people encounter.

Conceptual Framework for Rural Tourism in Kinabatangan, Sabah

The study assesses the three pillars of social exchange and social representation concepts on factors influencing Indigenous support for tourism (Figure 1). The community support for tourism is measured in terms of interest to learn and participate in tourism activities. The integration of both theories focuses on eight aspects of examining the motivational factors that influence community support for rural tourism. Individual perceived impacts of tourism on social, economic, and environmental components (items 1 to 4) are personal reflections on their daily lives and how they evaluate such effects influencing their social interaction with other community members. In addition, we are looking at how existing community norms for those already participating in tourism influence others who have not participated in tourism venture (items 5 to 8). Therefore, capturing the intersection between the perceived impacts of tourism, personal values/experiences, and how wider social interaction among the community members influence their thinking, hence identifying what factors motivate them to engage in rural tourism.

Using this framework, we aim to extend the understanding and application of SET and SRT to encouraging community involvement in rural tourism so that the people, tourism, and conservation can coexist sustainably in this region. To support the theoretical concept, we employ a mixed method research (MMR) by integrating quantitative and qualitative methods to assist in the validation of empirical results with qualitative findings, and generating wider

perspectives on the dynamic relationship of Indigenous attitudes and tourism development (Creswell, 2013; Fitzpatrick, 2016).

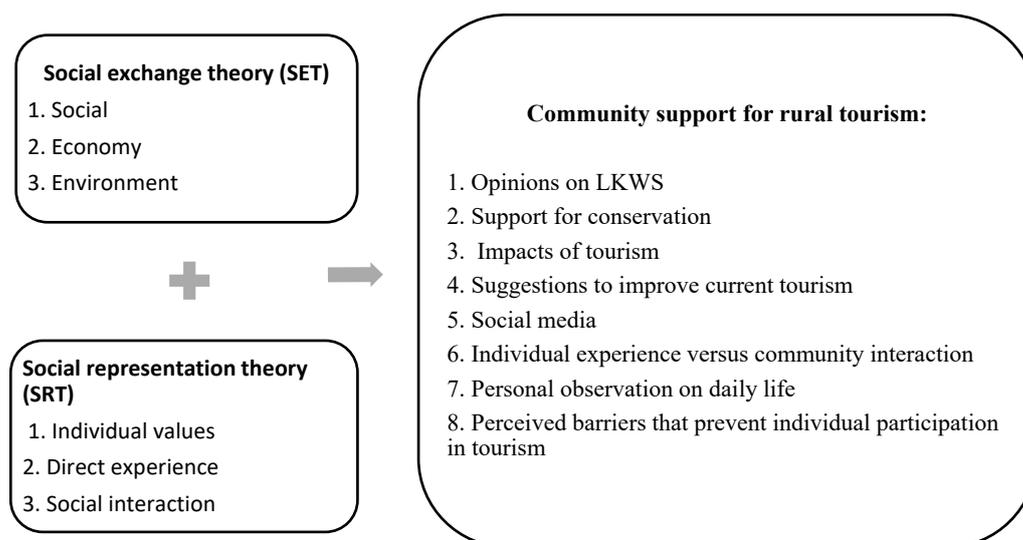


Figure 5: Conceptual framework on factors influencing Indigenous support for rural tourism.

Source: authors

RESEARCH METHODOLOGY

Study Site and Data Collection

The rural Kinabatangan is located in South-Eastern Sabah, Malaysia (5.5884°N and 117.8460°E). This study focused on two villages, Sukau and Batu Puteh located in this area. The Kinabatangan is dominated by the native, Indigenous people known as 'Orang Sungai' (River people). The majority of the Orang Sungai continue to maintain their daily life by engaging in traditional livelihoods such subsistence farming, fishing, season fruit harvesting, and the collecting and sale of forest harvest (Latip et al., 2015).

The study employed a mixed method research by integrating quantitative and qualitative methods, to address similar research questions with increased reliability, transparency, and consistency comparisons, starting from the development of the research questions through data collection, analysis, and discussion of findings. The selection of this method is based on the criteria that the study: (1) include multiple perspectives and more complete understanding to uncover the factors that influence the community support for tourism development; (2) validate and explain the quantitative results with qualitative

experiences; and (3) allow the presence of a researcher in a natural setting to best learn about community participation (Creswell, 2013).

For the quantitative method, 404 self-administered questionnaires were distributed to each house in Sukau and Batu Puteh villages, Kinabatangan Sabah. Five research assistants from the Kinabatangan were hired and trained in terms of understanding and explaining the research purposes to respondents in both villages. The questionnaire used was designed based on previous literature on Indigenous participation in tourism at or near protected areas (Latip et al., 2018; Kunjuraman & Hussin, 2020; Hamid et al., 2020). The questions were organised into three sections:

- 1) socioeconomic profile: gender, ethnic, age, and occupation.
- 2) perceptions on current tourism: current community participation in tourism, decision-making, power to voice out opinions, perceived economic value.
- 3) five factors that influenced Indigenous support for tourism: opinions on Lower Kinabatangan Wildlife Sanctuary (LKWS), social media, support for conservation, impacts of tourism, and suggestions on how to improve current tourism.

The section 3 applied 5-Likert scale (1 = totally disagree to 5 = totally agree). The questionnaire also included one open-ended question: Please write down your opinions regarding factors influencing native support for tourism, tourism issues, and suggestions to improve current tourism policy.

To enhance the quantitative findings, in-depth semi-structured interviews were conducted to 32 key informants comprised of five important stakeholder groups, including community leaders, government authorities, tourism operators, private sectors, and non-government organisations (NGOs). The interviewees were selected based on their expertise and experiences in tourism and conservation of protected areas in the Kinabatangan Sabah. Each interview was conducted face-to-face, audio-recorded, and typically lasted between 30 and 45 minutes. The interview questions focused on three themes: current Indigenous participation in tourism, factors that influenced Indigenous support for tourism, and future recommendations on how to improve current tourism.

Statistical Analysis

The quantitative data obtained from the surveys were subjected to exploratory factor analysis and multiple linear regression analysis using the Statistical Package for Social Sciences (SPSS version 23). The interview transcripts were analysed using a thematic analysis described by Gale et al. (2013) which was comprised of seven stages: transcription, familiarisation with interview data, coding, develop a working analytical framework, application of the analytical

framework, charting data into a framework matrix, and finally interpreting the data. In addition, this study also considered a manifest approach by Bengtsson (2016, p. 3) whereby the researchers “describe what the informants actually say, stays very close to the text, uses the words themselves, and describes the visible and obvious in the text.”

For triangulation, the results of quantitative and qualitative research were compared and contrasted using four labels of data convergence, namely confirm, contradict, mixed, and enhance (Fitzpatrick, 2016). When the results directly addressed a similar issue, they were labelled as either confirming or contradicting one another. The label ‘mixed’ was used when the data pointed both confirmation and contradiction. When the results provided different perspectives on a similar phenomenon or added a richness of understanding (but it neither directly confirm nor contrast one another), it was labelled as ‘enhance.’ Both quantitative and qualitative data findings were also compared with notes written during the field sampling.

RESULTS

Socioeconomic Profile of Respondents

The surveys yielded 328 completed questionnaires which indicated 81.2 % response rate. Majority of the survey respondents were male with 60.7 % while female was 39.3 %. Most respondents are local Indigenous people known as ‘Sungai’ people (75.9 %) while non-native people comprised of Bugis, Kadazan/Dusun, Malay and Chinese (24.1 %). A majority of them age between 34 to 49 years (48.5 %), followed by 18 to 33 years (37.8 %), and above 50 years (13.7 %). This area was famous for tourism activities such as wildlife viewing and homestay, but only 5.2 % of the respondents participated in this sector. Most of the respondents involved in subsistence work (25.6 %), conservation sector (25.3 %), or unemployed (23.5 %), while few were doing personal business (14.3 %) and working at government sector (6.1 %).

Assessment of Factor Analysis

A factor analysis using principal component analysis with oblimin rotation and Kaiser normalisation was employed to identify underlying structures of factors that influenced the local support for tourism development in this area (Table 1). The analysis resulted in five factors explaining 57 % of total variance. A reliability test showed an acceptable value of 0.86 for Kaiser-Meyer-Olkin with a significant Bartlett’s test of sphericity ($p < 0.001$), supporting the factorability of the correlation matrix. The five factors were opinion on LKWS, social media, support for conservation, impacts of tourism, and suggestions to improve current tourism with items loading for each factor were listed in the table 1. These factors were subjected to a multiple linear regression analysis to determine the best

predictors that influenced the local support for tourism development in the Kinabatangan Sabah.

Table 1: Assessment of factor analysis.

Constructs Items	Loadings					
	1	2	3	4	5	6
Opinions on LKWS						
1. Aware about LKWS conservation.	0.575					
2. Management of LKWS is good.	0.832					
3. LKWS involve local participation.	0.365					
4. LKWS protect natural resources.	0.358					
Social media						
1. I learn about tourism from social media.		0.955				
2. I promote tourism through social media.		0.834				
3. I learn about conservation from social media.		0.831				
4. Social media improves my tourism skills.		0.821				
5. Social media improves my conservation awareness.		0.732				
Support for conservation						
1. Share knowledge regarding conservation.			0.679			
2. Change negative attitudes for conservation.			0.656			
3. Participate in conservation activities.			0.610			
Impacts of tourism						
1. Encourage conservation in Kinabatangan.				0.484		
2. Generate job opportunities to local people.				0.801		
3. Tourism is owned by local people.				0.757		
4. Current tourism policy is good.				0.593		
Suggestions to improve current tourism						
1. Capacity building to train tourism skills.					0.751	
2. Financial assistance for local people.					0.793	
3. Improve tourism facilities in Kinabatangan.					0.686	
4. Prioritise tourism opportunities to local.					0.650	
Support for tourism development						
1. Interest to learn more about tourism.						0.737
2. Participate in tourism if given chances.						0.699

Current tourism policy refers to providing adequate income to Indigenous community. Source: authors

Assessment of Regression Model

Multiple linear regression was employed to assess the ability of five independent variables to predict factors influencing the support of Indigenous people for tourism development in the Kinabatangan Sabah (Table 2). Initial analyses showed the results adhered to the assumptions of normality, linearity, multicollinearity, and homoscedasticity. In particular, the independent variables had a correlation with “support for tourism development” with values above 0.3, and the correlation between each independent variable were less than 0.7 (Tabachnick & Fidell, 2007). The tolerance value was more than 0.1 whereas VIF value was less than 10, indicating the analyses did not violate multicollinearity assumption. Outliers were checked using Mahalanobis distance with a value of 28.54 which exceeded a critical value of 20.52 and Cook’s distance of 0.05 was

smaller than 1, thereby confirming an absence of outlier problem (Tabachnick & Fidell, 2007).

The total variance explained by the regression model as a whole was 39.4 %, and this model was expressed as $F(5, 322) = 41.94, p < 0.01$. The results showed the support of local Indigenous for tourism development was significantly influenced by the five factors, namely “opinion on LKWS, social media, support for conservation, impacts of tourism, and suggestions to improve current tourism.” The most important step was to compare the contribution of each independent variable towards dependent variable (i.e., support for tourism development) using the Beta values. In this study, the largest Beta coefficient was 0.34, which was for the factor “support for conservation.” It indicated this variable made the strongest unique contribution to explain the dependent variable, when the variance explained by other factors in the model was controlled. The second factor was “suggestions to improve current tourism” (Beta = 0.27, $p < 0.01$), followed by “opinion on LKWS” (Beta = 0.11 $p < 0.05$), “social media” (Beta = 0.11, $p < 0.05$), and “impacts of tourism” (Beta = 0.11, $p < 0.05$). Overall, the quantitative analysis empirically confirmed that the five factors influenced the Indigenous support for tourism development in this area.

Table 2: Regression analysis on the community support for rural tourism

Independent variables	Beta	t	Sig	Support factor	Tolerance	VIF
(Constant)	-	-0.405	0.686	-	-	-
Opinions on LKWS	0.105	2.157	0.032*	Yes	0.800	1.250
Social media	-0.106	-2.300	0.022*	Yes	0.889	1.125
Support for conservation	0.340	6.289	0.000**	Yes	0.643	1.556
Impacts of tourism	0.114	2.250	0.025*	Yes	0.731	1.367
Suggestions to improve current tourism	0.268	4.710	0.000**	Yes	0.582	1.718

Significant when * $p < 0.05$ or ** $p < 0.001$.

Source: authors.

Triangulation of Quantitative and Qualitative Analyses

The interviewees related the lack of community participation with inadequate capabilities and resources such as personal skills, knowledge, facilities, and finances. The Indigenous communities were not involved in the tourism decision-making and they were only informed after discussions.

The respondents who perceived the impacts of LKWS positively were more supportive of tourism development because they realised that tourism alone could not be sustained without protecting the natural resources, indicating three-way symbiotic link between the Indigenous, tourism, and conservation. They perceived positive impacts of tourism on employment opportunities, economic revenue, women empowerment, and wildlife protection. Nevertheless, the informants highlighted that a profit prevailed against a pure intention in protecting the tourism resources.

They also explained that the community support for rural tourism related to their unique interests, and that it was difficult to encourage others to join tourism programs. Due to a lack of knowledge, only few respondents used social media to promote tourism. The interviews enhanced the survey findings in terms of developing products and tourism sites at community level, strategies to integrate different opinions, resolve conflicts, a smart partnership to attract more tourists, as well as to find a balance between the stakeholders' needs, conservation, and tourism development. The interviews unveiled compelling issues that discouraged Indigenous participation such as tourism competition, a lack of avenue to openly talk about tourism problems, and that the stakeholders had vague understanding on their own roles in tourism. After the comparisons of quantitative and qualitative analyses, the study categorised the motivating factors into the four labels (Fitzpatrick, 2016):

- 1) Confirm: Indigenous participation in tourism, social media, and impacts of tourism.
- 2) Contradict: community involvement in the decision-making process and platform to openly talk about opinions.
- 3) Mixed: factors influencing Indigenous participation in tourism.
- 4) Enhanced: suggestions to improve current tourism.

DISCUSSION

The present study provides comparative views on motivational factors that influence communities' support and participation in rural tourism using a mixed method approach. In this study, the value of integrating two theories and apply the mixed method research is a deeper understanding of 'what, how, and why' because it provides a fuller picture of factors influencing community support for tourism in rural areas.

Factors Influencing Community Support for Rural Tourism

The empirical results showed that respondents who supported conservation, had positive perceptions on the LKWS performance, perceived tourism impacts positively (i.e., job opportunities and good incomes), and that rural tourism policy was drafted based on their opinions were more inclined to support tourism

activities, indicating consistent findings with previous studies (Fletcher et al., 2016; Özel & Kozak, 2017; Latip et al., 2018). Good economic development, social experience, tourism planning and management are prevailing factors that encourage successful rural tourism in developing countries (Rosalina et al., 2021; Isa et al., 2022). In this study, an empowered interrelationship between rural tourism benefits and successful conservation interventions is an added value that strengthen the Indigenous inspiration for living hardship in remote areas.

The analysis revealed that it was difficult to encourage a major portion of rural people who are not participating in rural tourism activities. This problem is compounded due to a low participation poses a sustainability issue – future tourism in this region might see a domination from outside inhabitants. Consequently, the rural people still maintaining subsistence livelihoods, not much involved in tourism development, slowly but eventually may be discouraged in preserving the environmental resources (Latip et al., 2015; Pimid et al., 2020). In Kinabatangan, rural community needs to experience tourism benefits, even in a small scale, hence to soften impacts of tight conservation regulation on restriction of resources consumption and slowed infrastructure development. Apart from achieving sustainable development, the economic benefits derived from rural tourism activities are essential element for protecting the ecosystem and cultural environment in rural areas (Ristić et al., 2019).

The present study highlights contradictory finding observed between communities' perspectives and stakeholders' perspectives about their abilities to make decisions and platform to openly talk about their opinions. Importantly, community exclusion in tourism decision-making, inefficient communication, and a lack of transparent governance are factors that discourage community support for rural tourism (Strickland-Munro & Moore, 2013; Wilson et al., 2001). In Kinabatangan, one possible reason for the discrepancy result observed here is that the interviewed stakeholders are directly related to tourism works, whereas questionnaire participants are representative of each house who might not directly involved in tourism. This indicates important methodological implication when conducting a mixed method approach. On hind-sight, it shows the benefit of employing triangulation approach to validate research findings (Fitzpatrick, 2016).

We found a significant effect of social media on community support for rural tourism development. Our findings revealed those working at private sector tourism were able to expand rural tourism coverage to both local and international tourists. Unfortunately, majority of local Indigenous, whom work at local tourism operators or doing homestays, do not know how to utilise social platforms:

“Local people use internet to connect and promote tourism here, but the numbers are few because not many know how to do so. There is a need to educate them in using digital platform to promote tourism products here.”
(Local resort operator, Respondent 21)

Although internet access is readily available in this region, application of advanced social media such as to establish a website to promote rural tourism packages, contactless payment, and sharing of tourists’ experiences online in remote areas, is currently not utilised among the villagers. From the SRT theoretical perspective, the locals could apply tourists’ experiences and social interaction with the rural community for promoting tourism packages (Moscovici & Marková, 1998; Munar & Jacobsen, 2014). Because tourism is place-oriented, management and marketing typically involve a collective community effort: the community as a whole and its image must be marketed, not just one attraction (Wilson et al., 2001). Therefore, community ability to practice digital platforms for marketing is important to promote high-quality tourism.

Strategic Approaches to Enhance Tourism in Rural Areas

Common challenges experienced by rural areas in developing countries are: struggle to establish a comprehensive planning, poor access to rural tourism destinations, seasonality, the competition and threats of outsiders (who might take the job opportunities) (Rosalina et al., 2021). Scholars highlight important success factors for rural tourism: good leadership, support from local government, sufficient funds, widespread community support, informative technical assistance, good convention and technical bureaus (Wilson et al., 2001; Liu et al., 2020). Notably, Kinabatangan encounters the same troubles, exaggerated by poverty incidences, local limited capacity to market rural tourism, and the few participations of local villagers. Therefore, understanding how to stimulate local support for tourism has become more prudent and timelier.

Consistent with the SRT concept (Pearce et al., 1996; Li et al., 2015), our findings showed the motivation factors that regulated the community support for rural tourism were shaped by their direct experience and social interaction within their communities. More importantly, motivating them is not all about monetary value and awareness talks, rather using comrade approach (exemplar):

“Most of the married women here are not working. That is why they think, rather than they sit and do nothing at home, it is better to join us. At least they get extra income. Of course, we do not get daily income, but when the tourists come here to stay for 2-3 days, we get money. When we explain like this, they feel more interested to join.” (Homestay owner, Respondent 30)

“It is not easy to motivate the villagers here... We can motivate others to join by giving them an equal income. For example, if I bring tourists for a morning river cruise, then I bring one or two guides for the cruise, I must pay an equal amount to both guides, including me – we have to share the benefits equally among the three of us...” (Local tourist guide, Respondent 15)

The interview findings showed the rural villagers were more inclined to listen to ‘what and how’ their comrades said and behaved, as compared to engaging them in public awareness campaigns on tourism development. Therefore, other villagers who already participate in homestay can show and explain to others the benefits they gain when participating in rural tourism activities. The exemplar approach is a crucial part of psychological learning, using a role model of known individual (e.g., family, friends, and relatives) among studied participants, and illustrates remarkable outcomes for individual changes towards positive attitudes in educational and health interventions (Jopp et al, 2017; Han et al., 2017). In this study, this approach shows a promise in motivating rural community who is uninterested in rural tourism.

Rural tourism policy needs to balance everyone’s needs for economic development and conservation goals, at the same time assuring the needs of local communities are not being compromised. Based on our findings, we list five recommendations to improve rural tourism policy:

- 1) Establish smart collaboration by integrating contradictory perspectives, but devise stakeholders’ structure to highlight the importance of inclusion of rural peoples in leadership roles, not merely taking lower-level roles.
- 2) Tourism policy should consider using exemplary approach, motivating rural Indigenous people through role model or comrade approach.
- 3) Improve local participation in governing rural tourism: establish two-way communication platforms that provides interactive and honest discussion on the ground to facilitate understanding of community difficulties with tourism. This approach helps resolve community exclusion in the decision-making of tourism development.
- 4) Where applicable, capture broader perspectives by soliciting multiple stakeholder views to assess real scenarios on the ground.
- 5) Rural community should be included and trained in digital platforms, by providing hands-on experience to utilise social media to maximise tourism revenue.

CONCLUSION

Rural tourism is an important development concept for many remote destinations, particularly those involving Indigenous people. Without the support of rural

community, the sustainability of rural tourism is questionable. The study supports that the SET and SRT are distinctly operative in different contexts but complement each other in explaining community participation in rural tourism. From the SET perspective, our results illustrate that the communities have positive perceptions on the impacts of social, economic, and environmental factors (i.e., supplementary incomes, cultural experiences, learn foreign languages, and encourage natural resources protection), which influenced their support for engaging in rural tourism activities. Beyond the SET concept, however, some villagers are simply lacking the desire to join tourism activities. In this regard, application of SRT concept greatly assists in understanding that the communities' direct experiences and interactions are more influential factors when motivating those uninterested villagers. Therefore, our study extends the applications of SRT to a rural tourism context by suggesting that using a comrade approach is more effective compared to the conventional methods (i.e., tourism awareness programs and public talk), and that motivation in rural tourism is not exclusively monetary.

The study is not without its limitations. Rural tourism is occurring at global scale, but rural attraction and economic development is very dynamic. In other words, community motivating factors for rural tourism can vary at different rural destination areas. The study in the Kinabatangan serves as guidelines in utilising mixed method research to examine multiple stakeholder views about rural tourism development. Future studies are necessary to address the aforementioned gaps and further examine the efficacy of comrade approach in rural tourism context.

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THE EFFECTS OF SEASONALITY ON MICE TOURISM DEMAND IN JORDAN

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Abstract

Seasonal tourism is a set of influences that determines tourism demand, and it is defined as the movement of tourists caused by climate and institutional changes. Most tourist destinations in the world are affected by seasonal phenomena. Destinations with high seasonal variability often face various challenges, such as high costs, overcrowding, and inadequate infrastructure in peak seasons, while in low seasons, the challenges are low numbers of tourists, lack of services and job opportunities. Thus, the purpose of this article is to investigate how Jordan's MICE tourism demand is affected by seasonality. A quantitative research method was applied in this study by distributing a survey to 331 respondents among domestic and international tourists who visited Amman, stayed in a hotel at least one night and participated in meeting, incentive, conference and exhibition (MICE) activities, using a non-probability sampling technique. Data was analysed using Statistical Packages for Social Sciences (SPSS) version 24.0 and Smart PLS software. The results of the study exhibited a significant and positive effect between two aspects of tourism seasonality (political and economic) and MICE tourism. The study indicates that MICE tourism is quite beneficial for the economy of a country to generate demand and to stimulate the tourism industry. MICE tourism that takes place should be systematically planned and developed, and should be established as tourist attractions, catalyst for further development, image builders and animators of the destination. Their success is mostly due to the backing of accommodations of a suitable caliber, the close coordination between travel agents, the accessibility of detailed information about events and related activities, and most crucially, effective marketing initiatives.

Keywords: Tourism Seasonality, MICE Tourism, Jordan

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INTRODUCTION

Tourism seasonality is defined by Allcock (1989) and Kocand Altinay (2007) as the movement of tourists caused by climate and institutional changes. Seasonal tourism is a set of influences that determines tourism demand due to recurring factors. The influences have been separated into various groups by researchers. First, a natural or climatic component, and this factor addresses weather and climate and their influence on seasonal tourism, especially changes in the temperature, duration of sunlight, and rain or snow. Secondly, the institutionalization of vacations, holidays, and public holidays. The third one is the religious factor, which increases the demand for tourism to religious and holy sites. Due to its vulnerability to internal, external, and seasonal shocks, the tourism industry is one of the most volatile industries. Additionally, economic, political, and social issues, as well as natural disasters and seasonality, have a significant impact on the number of tourists who visit a particular tourist location (Morales, 2003).

Additionally, Haji (2015) claims that there is little doubt that many people go on vacation during the tourism season, i.e, when offices, schools, universities are closed. Traditional holidays are frequently the ideal time to visit due to the weather. During specific year periods, the concentration of tourist flows has often been regarded as a critical part of tourism's seasonality. Seasonality is viewed as a physiological property of tourism and an unavoidable feature of the economic sector. Seasonality in commercial institutions broadly is a frequent pattern in a time series that spans a specific period during the year. In contrast, in tourism, seasonality it is the movement caused by changes in the weather, calendar, and timing of decisions, as manifested in tourist preparation, tourist spending, traffic, and other modes of transportation. Corluka (2019) summarized the most critical characteristics of seasonal tourism, stating that because tourist flows are concentrated in a relatively short period of the year, this period of tourism activity is likely to be inefficient due to the increased strain on the tourist destination.

Jordan has four distinct climates, each with its unique characteristics. The weather in Jordan is hot and dry during the summer, and the winters are mildly rainy. The weather in Jordan is an essential factor in attracting tourists. As a result, the country of Jordan is almost completely free of storms and heavy rain. Due to the favourable weather, tourist events, festivals, and celebrations can be held in a pleasant atmosphere (Ibrahim Bazazo 2020), and research shows that foreign visitors have a significant impact on the seasonality of tourist activity. It is possible to reduce tourism seasonality by creating a third peak summer season. To encourage Jordanians to travel outside of these peak seasons, planners and decision-makers must focus on diversifying tourism activities that cater to the interests of a wide range of visitors during summer vacation. In addition, the

government should encourage the holding of large-scale events like international conferences during off-peak times (Al-Zboun 2018). According to Oppermann (1996), the MICE industry is one of the most buoyant areas of overall tourism, is least sensitive to price variations, and helps to lessen "peak-trough" seasonal trends.

LITERATURE REVIEW

According to Butler (2014), tourism seasonality is a significant challenge for the tourist region as it limits the economic benefits of the tourist spot. The adverse effects of the tourist season can be minimized if the tourist destination can attract tourists to the region throughout the year. In a study carried out by Lee, Seers, Galloway & Mc Murray (2008), they agree that seasonality is complex and negatively impacts tourist facilities, as tourism is affected by natural and institutional factors, as explained below.

Natural Factor of Seasonality

The natural factor of seasonality is referred to as regular variations in visitor arrivals and activities that arise from weather patterns and natural environmental conditions in the context of tourism. These recurring trends often affect the number of tourists that visit a given location each year. According to Katab (1998), Al-Hawary (2001), Jang (2004), and Koc & Altinay (2007), the climate is a crucial aspect of the natural environment and a draw for visitors. Summer elements, such as fresh air, the sun, and temperature, are irresistible. On the other hand, extreme cold, rain, snow, dense clouds that obscure the sun, and high humidity offer significant barriers to winter tourism activities. Chen, Tingzhen (2010), Koenig Lewis & Bischoff (2005), and Jang (2004), Dengjun Zhang; JinghuaXie (2021), emphasize that the majority of tourism activities are highly dependent on weather conditions and natural seasonality affecting the host communities; the farther one travels from the equator, the greater the differences; the tropics significantly increase humidity and thus affect the rate of tourist arrivals. Al-Zboun (2018), addressed the issue of seasonal tourism in Jordan, identifying three distinct periods during the year during which the number of tourists varies. The first period runs from the first of November to mid-December in southern Jordan, where the climate is generally mild, particularly in the Gulf of Aqaba and the Jordan Valley; the second period runs from mid-March to the end of May in central Jordan, particularly in Amman, Jarsh, and Madba; and the third period runs from mid-March to the end of May in the north where a sizable number of tourists, especially from Arab nations, come to take advantage of leisure travel and Jordan's temperate environment.

Social and Cultural Factor of Seasonality

Meanwhile, the term social and cultural factors of seasonality in tourism describes how societal and cultural habits, events, and preferences affect patterns of traveler arrivals and activity at a certain location. When and why people decide to go to a certain place are greatly influenced by these considerations. In the same development, Lim and McAleer (2001), agree with Abd Al-Karim (2002), Jang (2004), and Koc & Al-Tinay (2007), the most important institutional factors that affect seasonal tourism are labour laws, types of vacations and school holidays. The tourist season will be reduced to a few regulations if holidays are spread out over the course of the year. As a result, it is necessary to establish forms of international tourism related to vacations, such as tourism, sports, cultural tourism, museum visits, festival attendance, and tourist attractions.

The most important factors influencing the seasonality of tourism are the times when schools and businesses are closed (Rossello and Sanso, 2017). Butler (1994), contends that the traditional extended summer vacations for students at schools continue to be the most significant single barrier to lowering the impact of seasonality, because children typically have more time off during the summer, families with school-aged children are more likely to take a significant trip during the summer than during any other season. The intensity of the seasonal peaking of tourism activities is also affected by work holidays. This is especially true ever since paid holidays were first instituted and certain industrial sectors were shut down for a few weeks during the summer months (Murphy, 1985). At present, particularly during the age of mass tourism, taking a vacation was frequently dependent on a holiday break from school, industry, or the government (Bender, Schumacher, and Stein, 2005).

According to Mathieson & Wall (1982), and Duro (2016), they concur that there are two aspects to the tourist season: the peak season and the slow season. During the busiest months, problems for both locals and tourists worsen, which raises the number of tourists, which raises traffic and tourist-area congestion, raises the price of goods and services, and puts more strain on the infrastructure. Expanding services like security guards and medical facilities are therefore necessary. The animosity of the local populace toward tourism operations is a result of these problems.

According to Timothy (1998), during periods of low tourism, some communities make use of amenities and tourist facilities, preserving their cultural character. Additionally, Kushan and Abdullah (2001) assert that in order to reverse the negative effects of increased tourist traffic on a particular area, ecological and social recovery is required. This can be done using tactics like product diversification, price cuts, the promotion of substitute goods, and the promotion of events and festivals. Shukri (2014) and Rasdi et al. (2022) conducted an analysis of the social and cultural aspects of tourism activity in the

host community, in which he discussed the social and cultural effects of tourism and the nature of the relationship between the tourist and the host community, highlighting the most significant negative social and cultural influences of tourism, such as the growing demand for services and facilities, superstructure and infrastructure. Nevertheless, seasonality and tourism have a lot of positive effects, like the more cultural exchange between host and visitor communities, the learning of new languages, the preservation of cultural assets, and the rise of the “foreign marriage”.

The cultural effects of a destination's peak season are directly related to the volume of visitors it receives at that time of year. The changing seasons have cultural consequences for both the host community and the tourist (Koenig and Bischoff, 2005). The dramatic increases in population during the summer months have negative repercussions for locals because they put a strain on regular infrastructure and services (Murphy, 1985). These repercussions include, but are not limited to congestion, crowded streets, slower traffic, lack of parking, queues for services, higher prices for services, significant increases in the cost of community services, overcrowding at attraction sites, and pressure on the infrastructure.

Political Factor of Seasonality

The impact of laws, rules, and geopolitical events on patterns of traveler arrivals and activity in a specific location is known as the political component of seasonality in tourism. Depending on the political environment at the time, political issues can either stimulate or discourage travel, which can have a big impact on the tourist sector. According to Stemmman (2010), domestic and international tourism is significantly impacted by political instability, such as wars, riots, terrorism, and coups, as these events deteriorate tourist flows in any country and negatively affect bilateral relations, resulting in the imposition of travel restrictions. Saarinen (2003); Al-Omari, Ali, Mahmoud, and Jawabreh (2015), concur that the unstable political environment contributed to the emergence of tourist seasonality in the Arab world in general. The so-called Arab Spring upheavals and wars brought about a rise in corruption, economic stagnation, deplorable living conditions, and a tightening of political, economic, and media restrictions. Jordan's tourism industry has been particularly heavily hit, which has led to seasonality in travel. One of the biggest political challenges the Jordanian tourism industry faces is the fact that it is extremely vulnerable to the conflicts, wars, the spread of crime, and the complications related to Syrian refugees, according to Osama Al-Faouri's 2016 study on security and tourism stability in Jordan. Additionally, Stemmman (2010), agreed that wars and terrorism are significant domestic and international tourism adversaries, having a detrimental effect on international tourism in general, as wars between countries

destroy tourist flows not only within the fighting states but also in neighboring countries.

Economic Factor of Seasonality

The impact of economic factors, such as income levels, employment rates, and general economic stability, on patterns of visitor arrivals and activity at a specific destination is known as the economic factor of seasonality in tourism. When and how people decide to travel, as well as the kinds of places and activities they can afford, are heavily influenced by economic concerns. As argued by previous research, the enterprise-level manifestations of seasonality's economic effects relate mostly to problems during off-peak periods, specifically the loss of revenues due to the inefficient use of resources and facilities (Sutcliffe and Sinclair, 1980; Manning and Powers, 1984; Williams and Shaw, 1991). Baron (1975), suggested that seasonality creates "seasonal loss" in terms of cost. The loss of profit owing to inefficient use of resources is correlated with economic concerns.

Murphy (1985), asserts that businesses and communities require sufficient earnings from a few busy summer weeks to ensure their success throughout the year. Due to seasonal revenue fluctuations, business owners may be forced to seek credit or alternative sources of income. Changes in tourist demand may result in a lack of hotel rooms during the peak season, while tourism resources are always at danger of underutilization during the shoulder season. Particularly affected by seasonality are physical facilities with a higher proportion of fixed costs than other service providers (Chung, 2009). The management dilemma is whether to close during the off-season or remain open in order to generate adequate cash to cover fixed costs. Another significant issue with seasonality is low annual capital returns (Cooper et al., 2005). Due to low returns on capital, it is difficult to attract investors and lenders.

According to Dengjun Zhang and Jinghua Xie (2021), the costs of tourist services fluctuate with the seasons, which affects the seasonal concentration of tourism activities by increasing or decreasing, respectively. In other words, the economic effects are linked to issues with over- or under-utilization of tourism resources. They operate at or close to capacity during the peak season because to higher demand, however the rest of the season they are paused or run at reduced power. An increase in economic pressure is also connected with an increase in social endurance capacity, which results in a rise in issues in the local community as a result. Because of the increase in visitors during the busiest tourist season, there is more strain on the infrastructure and superstructure, which results in increased prices for everyone, both the guests and the host.

According to Dengjun Zhang; JinghuaXie (2021), tourism seasonality is a detrimental phenomenon, not just economically, as it causes overuse and increasing strain on tourist sites during peak tourism seasons, as well as a seasonal decrease. On the other hand, when the economic value of tourism is zero, it forces investors in the tourism sector to make significant efforts to compensate for anticipated financial losses by raising prices, which results in an increase in the cost of living in tourist areas, which affects the length of the tourist's stay and rate of material expenditure. Thus, the seasonality of tourism affects tourism demand. Because of the cyclical nature of the tourism industry, both the quality and quantity of workers are directly impacted by changes in demand (during the recession season). However, while service prices rise during the peak time, workers' pay rise during the busiest travel season and fall during the slowest, leading to so-called seasonal unemployment. Investment in tourism in the area is hampered by these factors. Event tourism, in particular MICE tourism, has been acknowledge to generate tourism demand to offset the effect of seasonality, which is explained below.

MICE Tourism

Meetings (M), Incentive Trips (I), Conferences (C), and Exhibitions (E) are the components that make up the term MICE (Hiller, 1995; Rogerson, 2005), which is fundamental to generate tourism demand and to overcome seasonality. MICE is a novel form of tourism that has emerged as a result of the rise in the number of conventions and exhibitions that have been held in conjunction with the expansion of the tourism business. According to Leong (2007), MICE tourism is a specific subset of the tourism business that focuses on a certain issue, subject matter, or agenda. Butler (2014) says that to attract a large number of visitors to a tourist place and prolong their stay, there must be attractions and facilities that will be provided, in turn such as providing events and facilities. MICE tourism involves hosting events such as conferences, meetings, and exhibitions, which can help attract tourists during the low season and increase the length of stay and spending of visitors. This type of tourism can also have positive spill over effects on other sectors, such as transportation, accommodation, and food and beverage (Tola & Gebremedihen, 2020). According to Al-Ananzeh *et al.* (2018), Jordan is a potential destination for MICE due to several factors, including its location in the Middle East between three continents: Africa, Asia, and Europe; its safety; and the fact that it offers a wide range of services and features in addition to its natural environment and beautiful scenery, as well as diverse tourist sites. The Jordanian capital city of Amman is a popular destination for MICE tourism.

RESEARCH METHODOLOGY

A quantitative research method was applied in this study by distributing a survey to 331 respondents from domestic and international tourists who visited Amman, stayed in a hotel at least one night, and participated in MICE activities. Using a non-probability sampling technique, data was analysed using Statistical Packages for Social Sciences (SPSS) version 24.0 and Smart PLS software. The research hypotheses of the study are as follows:

Research Hypotheses

- H1: There is a significant effect of natural seasonality on MICE tourism in Jordan.
 H2: There is a significant effect of social seasonality on MICE tourism in Jordan.
 H3: There is a significant effect of cultural seasonality on MICE tourism in Jordan.
 H4: There is a significant effect of political seasonality on MICE tourism in Jordan.
 H5: There is a significant effect of economic seasonality on MICE tourism in Jordan.

RESULT

The sample of the study consisted of 331 respondents, as depicted in Table 1 below. Regarding gender, 61% of respondents were male and the remaining were female. The most frequent age group was between 31-40 years (29.3%), followed by 21-30 years (28.7%). Meanwhile, married respondents constituted over half of the total respondents, and 42.3% of them were Jordanians.

Table 1: Demographic Profile of Respondents

Variable	Items	Frequency	Percent
Gender	Male	202	61.0
	Female	129	39.0
Age	Less than 20	33	10.0
	From 21 - 30	95	28.7
	From 31 - 40	97	29.3
	From 41 - 50	57	17.2
	From 51 - 60	34	10.3
	More than 60	15	4.5
Marital Status	Single	154	46.5
	Married	168	50.8
	Other	9	2.7
Nationality	Jordanian	140	42.3
	Other Countries	191	57.7

Hypothesis Testing Result of Variables

The relations of the hypotheses were examined using Structural Equation Modelling. As discussed in the literature, the different factors of seasonality are important predictors of MICE tourism in general. However, the findings in Table 2 show that only hypotheses H4 and H5 are supported. The p values of the effect of individual context and its dimension are less than 0.05.

Table 2: Results of Hypotheses

		Beta	T- Statistics	P Values
H1	Natural Seasonality> MICE Tourism	0.066	0.981	0.327
H2	Social Seasonality> MICE Tourism	0.104	1.397	0.163
H3	Cultural Seasonality> MICE Tourism	0.037	0.536	0.592
H4	Political Seasonality> MICE Tourism	0.181	2.329	0.020**
H5	Economic Seasonality> MICE Tourism	0.421	6.384	0.000***

Note: * Significant at level ≤ 0.05 . ** Significant at level ≤ 0.01

DISCUSSION OF RESULTS

The result based on hypothesis 1 shows the existence of an insignificant effect between natural seasonality and MICE tourism in Jordan. Indeed, the coefficient associated with the variable is statistically insignificant. Thus, the hypothesis that there is a significant effect between natural seasonality and MICE tourism in Jordan is not supported. The results of this study were consistent with Lee *et al.* (2008) and Baron (1975), in which they found that the business travelers are typically unaffected by the weather in their travels. They claim that the most important feature of MICE tourism, is the fact that it is not affected by climate circumstances, and this type of tourism is frequented by highly motivated business oriented travelers with longer stays in highly rated hotels. And in more detail, Ibrahim Bazazo (2020) argued Jordan has four distinct climates, each with its unique characteristics. The weather in Jordan is hot and dry during the summer, and the winters are mildly rainy. The weather in Jordan is an essential factor in attracting tourists. As a result, the country of Jordan is almost completely free of storms and heavy rain. Due to the favorable weather, tourist events, festivals, and celebrations can be held at any time of the year.

Meanwhile, the results based on hypotheses 2 and 3 present the existence of an insignificant effect between social and cultural seasonality and MICE tourism in Jordan. Indeed, the coefficient associated with the variable is statistically insignificant. Thus, the hypothesis that there is a significant effect

between social and cultural seasonality and MICE tourism in Jordan is not supported.

The finding agrees with Al-Ananzeah, (2012) who found that the social seasonality depends on school and university holidays, so there is no impact on MICE tourism, because MICE travellers are business people. On the other hand, Getz and Nilsson (2004) indicated the most important institutional factors that contribute to seasonality are the holiday season, summer breaks from schools, universities, and workplaces. Similarly, BarOn, (1975), asserted that institutional seasonality is also a reflection of the social norms and practices of a society. As a result, Hinch, Hickey & Jackson, (2001), agreed it is contingent on social factors and legislated holidays. Institutional seasonality is more complicated than natural seasonality because it is based on human behaviour and the choices that consumers make.

Al-Zboun (2018) used the Gini Coefficient to calculate the seasonality in Jordan. Due to Jordan's abundance of cultural tourism destinations that draw a range of tourists, the results indicate that Jordan is distinguished by having a low level of seasonality in its tourism industry. According to Al-Ananzeh, (2012), social and cultural factors were rated as the least significant factors on MICE tourism in Jordan.

In relation to hypothesis 4, the study indicates the existence of a significant effect between political seasonality and MICE tourism in Jordan. Indeed, the coefficient associated with the variable is statistically significant. Thus, the hypothesis that there is a significant effect between political seasonality and MICE tourism is supported. The results provide evidence of a significant relationship between political seasonality and MICE tourism in Jordan.

The result of this study was consistent with Al-Ananzeh, (2012) that argued the political atmosphere is stable in Jordan, and that Jordan is a safe destination to visit, besides the fact that Jordanians are highly welcoming to visitors. Jordan has managed to stay stable (politically), and therefore considered as a safe place for MICE tourism. Similarly, Schneider and Sonmez (1999) have contended that Jordan is perceived positively internationally as a safe, politically stable, with very welcoming citizens. Moreover, Rosenberg & Choufany's (2009), in their study regarding the Middle East, in which they discuss the situation in this part of the world, which is often referred to as a problematic and conflicted region; nevertheless, Jordan has kept its reputation as a unchanging, unproblematic (stable) place.

Finally, hypothesis 5 reveals the existence of a significant effect between economic seasonality and MICE tourism. Indeed, the coefficient associated with the variable is statistically significant. Thus, the hypothesis that there is a significant effect between economic seasonality and MICE tourism in Jordan is supported.

The results of this study were consistent with Connell, Page & Meyer (2015); Sainaghiet *al.*, (2019), who developed and identified the strategies regarding events and festivals, for their important role they play in attracting tourists, subsequently, having a vital economic impact on the hosting communities. Events, thus, are considered as one of the strategies that eliminate seasonality. Furthermore, Lau, Milne & Johnston, (2005); Rogerson, (2005), argued tourism industry can be beneficial internationally as well as locally. As for international level, MICE increases job demand in the facilities associated with MICE in hotels, convention centres. Moreover, MICE tourism increases foreign currency exchange, creates new investments, encourages networking and contact between business affiliated personnel, promote and facilitate access to new technologies, besides, people who participate in MICE are considered to be high-spending tourists. Locally, MICE tourism is a booster to small businesses, which encourage people within the hosting communities into initiating small business that caters for the needs of visitors, especially in the times outside the peak season.

Oppermann (1996) asserts that the MICE sector is one of the most thriving sectors of overall tourism, is least sensitive to price changes, and aids in reducing "peak-trough" seasonal tendencies. Therefore, MICE tourism has the potential to significantly contribute to shoulder and off-season demand. MICE has significant effects on the economy, according to Kim & Chon (2008). Firstly, MICE tourism participants and attendees come in large numbers of attendees; some conferences are attended by up to 500 participants. Secondly, people who attend MICE event stay longer in the hosting place in comparison to other types of tourism; most attendees of MICE event arrive at their destination few days before the launch of the event, and many others stay few days after the event is over to travel and explore the hosting country.

DISCUSSION AND CONCLUSION

Jordan has long been recognized as a prominent tourist destination, with a rich historical and cultural heritage that attracts visitors from around the world. The country has been keenly aware of the immense significance of tourism and has shown a growing interest in further developing its tourism industry in recent years by recognizing the potential economic and social benefits of tourism. Jordan has made efforts to attract more tourists and capitalize on the opportunities presented by the sector. This includes investment in tourism infrastructure, promotion of unique experiences, and fostering partnerships with international organizations to host conferences and exhibitions. The recognition of the importance of MICE tourism indicates a strategic approach to diversifying the tourism product offering and tapping into a lucrative market segment. The advancements in transportation and communication technologies have made it easier for Jordan to attract

business travelers, conference participants, and event attendees, leading to the growth and expansion of the MICE sector.

Policymakers and other stakeholders in the Jordanian tourism sector can take into considerations the findings of this research to make informed decisions that can positively impact the lives of individuals and companies operating in the industry. By understanding the identified factors and their influence on Jordan's tourism, there is a better chance of addressing the issue of tourism seasonality, thereby creating new jobs, fostering stability in employment, and promoting the growth of prosperous businesses. Research findings can lead to a more balanced distribution of tourists throughout the year, reducing the reliance on peak seasons and mitigating the associated challenges such as overcrowding and uneven revenue streams. This, in turn, can create a more sustainable tourism industry with improved job opportunities for locals and a stronger overall economy. Besides, tourism industry if sustainably managed, it would contribute significantly to any country's economy in terms of fiscal output (see Azinuddin et al., 2022a; 2022b; 2022c; Shehab et al., 2023).

The results of the study exhibited a significant and positive effect between two aspects of tourism seasonality (political and economic) and MICE tourism. However, there is no statistically significant effect between three aspects of tourism seasonality (natural, cultural, and social) and MICE tourism. According to the findings of this study, both official bodies and authorities (the government) and the private sector need to develop creative tactics and strategies to draw tourists, particularly MICE tourism because of its effect on boosting the number of tourists visiting the area. Moreover, the results of this research ought to motivate other scholars interested in this topic to do more research in order to extend the knowledge and cover more topics that were not discussed.

The recommendations derived from this research are targeted towards researchers and the Jordanian government with the aim of enhancing tourism and achieving the desired level set by the government. Understanding the patterns of tourism seasonality in various tourist destinations can significantly contribute to the growth of tourism. Therefore, it is advisable for the Jordanian government to promote longer stays and visits by tourists, which can be accomplished through the activation of MICE tourism and the expansion of diverse travel options and tourism programs. Considering the significant importance of tourism, it is recommended that similar studies be conducted in other regions of Jordan.

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COMMUNITY SATISFACTION TOWARDS POLITICAL REPRESENTATIVES: EXPLAINING THE ROLE OF GOOD GOVERNANCE PRACTICES

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Abstract

This study was to investigate the role of good governance on the community's satisfaction with the legislative institution, i.e., the state assemblyman. Good governance is often perceived as political stability for the effectiveness of administration. Good governance serves as the core element in administration, including political representation in Malaysia. In previous elections, the political representation trend shows a new pattern of citizens' inclination. Citizens had removed some of the under-performed representatives in the past elections due to dissatisfaction with the political representatives' performance. This study looked at how good governance impacted transparency, accountability, and responsiveness in relation to community satisfaction with administrative services performed by political representatives. This study used a survey through a purposive sampling technique (n-396). In order to prove hypotheses, the regression analysis technique was applied. Based on the results, the relationships among all independent and dependent variables are positive and significant, implying good governance plays a positive and significant role in affecting the level of satisfaction. Therefore, it is important for political representatives in Malaysia to strive for good governance in order to build trust and confidence among citizens and promote a healthy and functioning democracy.

Keywords: Political Representatives, Good Governance, Satisfaction, Malaysian Politics

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INTRODUCTION

The study aims to probe the link between good governance practices and the constituents' satisfaction among respondents residing on the East Coast of Malaysia. In marketing theory, there is a link between an employer's performance and customer satisfaction (Grigoroudis, 2013). If adopted in the field of political science, an employer's performance refers to the leader's governance while customer satisfaction is interpreted as the satisfaction of the voters. Customer satisfaction measures the level of feeling after receiving the service or gauging a product's performance. It is founded on the customer's expectations. In terms of measuring satisfaction with political leaders or representatives, the level of satisfaction will rise when their expectation is met. Accordingly, when a decrease in the quality of life was seen, such as high employment, yet the quality of human rights was low, the satisfaction towards their leader, i.e., the political representative, also declined.

Good governance among political representatives is crucial. Citizens expect that their elected officials will respect their human and democratic rights and represent their interests. They also expect that their representatives will act honourably and responsibly and see to it that the needs of the people are satisfied. Over several decades, good governance has attracted researchers' and public policy organizations' interest, particularly in how it affects economic prosperity and good governance (Knack & Keefer, 1995; Ngobo & Fouda, 2012). Good governance also "leads to a transparent environment for conducting public affairs, thus, the representative become a promoter of free market policies, justice, and the rule of law" (Ngobo & Fouda, 2012). Society can tell when their community is ruled under good governance. The purpose of government activity is to serve the public's interests and promote the welfare of society. Several studies (for example, Bochel & Bochel, 2010; Chema, 2010) concerned with the importance of good governance in political leadership at all levels of government- federal, state and local government in order to create prosperity for the people.

Based on past empirical studies, countries with higher incomes often come from excellent good governance when compared to countries that practice unsatisfactory governance. This is acceptable since governance ensures that political leadership is held accountable for its actions and guarantees that the whole population is included in the development efforts. Given this situation, good governance is viewed by many academics (Cheema 2010, Salminen and Ikola-Norrbacka 2010) as one of the best approaches to address public needs and advance the interests of the entire community. Consequently, this study's idea of good governance was chosen.

This study is an attempt to extend our understanding of good governance. It concentrates on the view of community upon the practices of good governance among political representatives in their constituents.

LITERATURE REVIEW

Good Governance

Good governance is important both locally and internationally in the management of public administration. Governance can be observed in how a public administration manages its policies, from its inception through action, with the involvement of the public and private sectors. According to Griffin (2010), governance operates at every level and responds to the collective problem of citizens in order to fulfill their needs in an effective way. Thus, good governance is a broad concept. There is a diverse concept of good governance. When looking at a good governance concept, it relies on its usage purpose. Good governance has not one size fits all formulation. For example, financial institutions prioritize economic reform, whereas political organizations focus on human rights (Wouters & Ryngaert, 2005). Studies on good governance have been carried out in public health (Devancey, 2016), finance (Omri, 2020), bureaucratic agency (Abdou, 2021), and environmental management (Alias et al., 2023; Leong et al., 2009). Asmawi *et al* (2015) explained that the concept of good governance is “as essential element of coastal management that can make a substantial contribution in managing coastal land uses in Malaysia”. This explanation displays the concept’s viability. Good governance is also seen in how administration manage the economy through its social resources and how they adopt certain policies for the country’s development (The World Bank, 2021) while curbing heinous practice like corruption. Also, good governance can be observed according to the situation by looking at the amicability among the citizens and between the citizens and their government agencies.

The World Bank also introduced the political concept of good governance. According to the World Bank (2021), good governance also refers to a governing system that is ideal for the management of the political, economic, and social development of the country. Good governance can be seen through the efficiency and effectiveness of the administration in managing their affair at all levels. In the political institution view, good governance demands a democratic practice that invites citizens and government bodies to participate in decision-making processes to guarantee human rights are protected and everyone is subjected to the rule of law. In the economic institution, good governance involves the creation of a conducive environment for sustainable economic growth and development, including the promotion of private sector development, investment and trade, as well as the efficient management of public resources and the reduction of corruption. In terms of social institutions, good governance requires the provision of basic services such as education, health care and social protection, as well as the promotion of gender equality, social inclusion and the protection of vulnerable groups. While recently, during the COVID-19 pandemic, the definition of good governance refers to the effectiveness of a country in

providing public goods to generate employment and growth during the current COVID-19 pandemic (The World Bank, 2021). Ideally, good governance has been described as the ability to formulate effective political, economic and social policies for the well-being of society. It is governance in achieving development and social justice.

Good governance is essential in politics to implement good policy decisions and produce favourable outcomes process (Farazmand, 2004). In addition, political representatives must be accessible and responsive to citizens in their constituency. Consequently, good governance of a constituency is vital because it is the centre of political participation and for the citizens to exercise their democratic rights. Based on Graham et al. (2003: 7), governance is defined as “the interactions among institutions, processes, and traditions that determine how power is exercised, how decisions are taken on issues of public and private concern, and how stakeholders have their say”. This definition reflects power, relationships, and accountability. It displays how authorities maintain order, maximize the public interests, and develop a relationship with the citizens and other stakeholders to pursue their objectives.

There are many variations of principles of good governance. The Economic and Social Commission for Asia and the Pacific (ESCAP) classified eight core characteristics of good governance, which include "participation, consensus-oriented, accountability, transparency, responsiveness, effectiveness and efficiency, equity and inclusiveness, and the rule of law". When all characteristics are practiced, it should be able to curb corruption, promote people's equality, and ensure that the at-risk groups are heard, fostering decision-making processes. According to Beshi Khan (2019), the most important characteristics of good governance are transparency, accountability, and responsiveness. These characteristics of good governance are reflected in political representatives. In this article, the list of fundamental good governance, according to Beshi Khan (2019), is as follows:

i) Transparency

The government is open and transparent in its decision-making process, and citizens have access to information about government activities.

ii) Accountability

All institutions that are involved in good governance are held accountable for their actions and decisions, and there are mechanisms in place to investigate and punish corruption and abuse of power.

iii) Responsiveness

The government responsive to the needs and concerns of citizens, and there are mechanisms in place to ensure their grievances are addressed.

Political Representative

Political representative is a general term that incorporates other terms such as legislature. Political representation is often seen as a relationship between the Members of Parliament (MPs) or State Assemblyman and the voters. As citizen representatives, political representatives are highly crucial in the setting and lobbying of any agenda to establish state laws. The MPs and State Assemblyman are elected to represent the people. Part of their work as representatives are carried out inside the Parliament, and part of it is to liaise directly with the citizens. To establish the people's perception of political representatives, it is imperative to discuss the roles of political representatives. According to Rosyidah *et al.* (2021), the political representative has two major roles, i.e., as a legislator and constituent services. The roles also can be transformed into the formal role of a legislator (Akirav O., 2020) and the informal role of servicing the people (Abdul Rashid, 2009; Aziz, 2012).

The primary role of the political representative is law-making. This is the main and most visible role of the MPs, especially in the age of technology where the media can carry not just words but also images in Parliament. Unfortunately, according to Rosyidah *et al.* (2021), the legislative function is one of the most challenging responsibilities that MPs are ill-equipped to carry. As a legislature, MPs should be knowledgeable about many things, including aiming to influence issues of local and regional relevance. They should be experts in drafting proposals and amendments. Parliament is the forum for the MPs to play their fundamental formal and official role as legislators. They make and draft proposals and amendments. The secondary role of the political representative is constituency services. MPs have come to devote major portions of their time to aiding their constituencies. According to Searing (1985), Westminster MPs are devoted primarily in terms of their constituency: they listen carefully to their constituencies' problems, sort out the problem of individual constituents, and also be an advocator for the constituency. They receive more complaints from their constituents, report an ever-increasing amount of constituency casework, and spend more time in their constituencies (Lusoli & Ward, 2004).

Good Governance in Malaysia

The Malaysian government has undergone a transformation from traditional public management to new public management over the past few decades. This transformation was mainly to improve the management of a state in order to serve people better. In new public management, the function of the government

function is to serve, not to rule the people. The Malaysian governance shifted towards market-oriented administration with a customer-centric approach that places a strong emphasis on meeting the needs and wants of customers through quality products and services and continuous product improvement. Efforts were made to increase efficiency in managing resources, increasing government effectiveness and practising accountability and responsiveness among all service providers. However, Siddiquee (2020) reported that these efforts bore no fruit, as little impact was observed based on a good governance perspective, particularly in the mode of governance. Siddiquee (2020) stated that the government has failed to make a fundamental change in the mode of governance given that the larger context in which the public sector operates has remained unaltered. There were also no attempts have been made simultaneously to reform the political and governmental of the country.

Yet, in previous elections, for instance, GE 2018 has signified a new voting pattern in Malaysia which affects the political representation in Malaysia. The citizens were more sceptical about the government. The sentiments mostly concentrate on the ineffectiveness of the government in managing the socioeconomics, in particular human well-being, as well as taxes and spending. One of the factors is that the political representations were tarnished with a bad reputation. Local and international political analysts and observers have attributed the swing in votes to public demands for a more open and accountable government. According to Nazri (2018), the swing in the voting pattern was due to the mismanagement and corruption of the political leaders.

Citizens Satisfaction

Citizens' satisfaction in this article refers to their satisfaction with their representatives and the administration. The Political representative or State Assemblyman is of big importance to the community. They are elected by the citizens, thus, are also accountable to them. The citizens firmly believed that political representatives must follow the best interest of the citizens (Griffith, 2010). How will the good governance of the political representative influence the citizens' satisfaction? The concept of satisfaction refers to a feeling of pleasure or contentment that comes from fulfilling a need or desire. Satisfaction also occurs when expectation meets or exceeds the performance, and then there is satisfaction. Otherwise, if performance does not meet the expectation, there will be dissatisfaction. This is similar to management theory. According to Kotler and Keller (2012), dissatisfaction is when a person feels unhappy after the experience of a product as it has not met the expected results. In correspondence, political science shows that citizens are disappointed if their elected political representative does not perform or is not in accordance with good governance.

When citizens receive the services they need in a timely and efficient manner, they are more likely to feel that their government is responsive and effective. This also includes the accessibility and approachability of the government. These practices ensure that the citizen's voices and concerns are heard and addressed. This can contribute to a sense of trust and confidence in their representatives and can lead to increase engagement and participation in the community.

However, it is important to note that different citizens may have different needs and expectations, and it can be challenging to provide services that are universally satisfied (Aberbach & Rockman, 2000). Governments that are able to adapt to changing needs and preferences and that prioritize ongoing communication and engagement with their stakeholders are more likely to be successful in meeting the needs of their citizens.

The Effect of Good Governance on Citizens' Satisfaction

Good governance enhances democratic practices that lead to people's contentment (Christmann, 2018), fortifying lives and happiness (Ibrahim et al., 2023; Helliwell et al., 2014), and has positively impacted community satisfaction (Beshi & Kaur, 2020). Good governance brings satisfaction and encourages public trust in the government (Bouckaert & Walle, 2003). Not only does it increase happiness levels, but it also lessens happiness disparities among the populace (Ott, 2011).

When there is a mismatch between the citizen's expectations and government institutions' performances, the citizen might lean to judge public employees as inept, profligate, corrupt, and dishonest. The public sector possesses the power, abilities and resources to steer society in its favor. The perception among the citizen of their public sector performance can influence the institution's ability, goodness, and integrity dimensions of trustworthiness of government institution (Porumbescu, 2013). As a result, improving public opinion of government services is considered as a means of re-establishing popular confidence in the institution of government, and it can be challenging for government to meet all of these expectations and needs in a consistent and equitable way. Figure 1 shows the research model base on the discussion of the study.

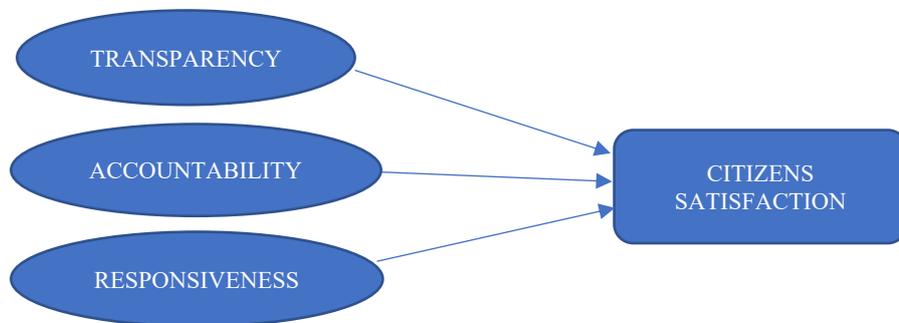


Figure 1: Research model base on the discussion of the study

The hypotheses which based on the research model are as the following:

Hypothesis 1 (H1). Transparency among political representatives has a positive and significant impact on citizens' satisfaction.

Hypothesis 2 (H2). Accountability among political representatives has positive and significant impacts on citizens' satisfaction.

Hypothesis 3 (H3). Responsiveness among political representatives has a positive and significant impact on citizens' satisfaction.

RESEARCH METHODOLOGY

The study design adopts quantitative methods. It is explanatory and investigates the relationship between variables. The study population was 450 respondents, based on Krejcie and Morgan's (1970) sample size formulation, which was sufficient for a population of registered voters in Kuala Terengganu- 103, 611 (SPR). The questionnaire was randomly distributed in four different legislative state assemblies in Kuala Terengganu.

The population that has been chosen for the current study is the voters in Kuala Terengganu; Terengganu is located on the East Coast of Malaysia. The population was determined based on purposive sampling. Kuala Terengganu is suitable for this case study based on the wavering election records. In the four series of elections in Kuala Terengganu in 1999, 2004, 2008, and 2013, the results were inconsistent. The political party-United Malay National Organization (UMNO) is no longer dominant in Terengganu. Both parties, UMNO and Parti Islam SeMalaysia (PAS)– the opposition, shared equal odds to clinch the election. Therefore, the population of registered voters in Kuala Terengganu is an interesting and suitable case study- to test and validate the dimensions of good governance of political representatives.

The respondents were allowed to ask any questions so as to avoid any confusion during the actual data collection. The data collection was conducted

for two months, from November to December 2019. The permission to collect data was obtained from the Village Community Management Council (MPKK). The enumerators approached the participants to participate voluntarily in the study. Participants were instructed to complete the questionnaire and were provided with a specific reference code number to ensure the participants' anonymity.

The participants involved 247 males (54.9%) and 203 females (45.1%), mostly aged between 18-29 years old (40.9%), followed by 30-49 years old (32.4%), and 26.7% were 50 years and above. Around 53.8% of the participants had a bachelor's degree, 28% had secondary school qualifications, 11.6% had a certificate, 4.4% had primary school qualifications, and 2.2% had not attended school. Additionally, most of the participants were Malay (93.6%), followed by Chinese (6.2%) and Indian (0.2%). Most of the participants were self-employed (35.3%), followed by participants who were working in the private sector (22.4%), the government sector (20.7%), students (17.1%), and those who were unemployed (4.4%).

A pilot study was undertaken to test the reliability and validity of the instrument by analyzing the responses. For pilot study, 120 participants were chosen. After collecting the pilot data, a basic statistical analysis was made using SPSS version 22. After adjustment was made, the final field survey data collection was carried out on November 1st 2019. Four hundred and twenty questionnaires were passed to the sample respondents, and the 120 participants from the pilot test were excluded. From the 420 questionnaires, 411 questionnaires were sent back, a response rate of 90.5% of the original sample. However, after inspection, 15 responses were forced to be thrown out due to unengaged responses (respondents selected the same options on all the Likert scale items), and some respondents did not complete the questionnaires.

Therefore, additional data analysis was performed using the remaining 396 surveys. The ultimate useable response rate for this study was 81.1% as a result. The independent and dependent variables' dimensions and indicators are displayed in Table 1. Accordingly, perceptions of accountability and transparency had each been put to the test using four questions, while perceptions of responsiveness were put to the test using five questions. Five questions were used to examine the dependent variable, which is the general public's happiness with their political representation. A 5-point Likert scale, from strongly disagree to strongly agree, was used to gauge the respondents' level of agreement.

Profile Respondent	N	Percentage (%)
Gender		
Male	208	52.5
FemalePerempuan	188	47.5
Age		
18 - 29	113	28.5
30 -49	134	33.8
50 and above	149	37.6
Ethnic		
Malay	376	94.9
Chinese	19	4.8
Indian	1	0.3
Education Level		
Not schooling	22	5.6
Primary School	49	12.4
High School (Lower)	36	9.1
High School (Upper)	141	35.6
Technical Certificate	28	7.1
Degree	120	30.3
Job		
Government	45	11.4
Private	65	16.4
Student	35	8.8
Unemployed	67	16.9
Self-Working	184	46.5
Income		
Below than RM2,500	251	63.4
RM2,501 - RM3,169	46	11.6
RM3,170 - RM3,969	41	10.4
RM3,970 - RM4,849	25	6.3
RM4,850 - RM5,879	14	6.5
RM5,880 - RM7,099	12	6.0
RM7,110 - RM8,699	3	0.8
RM8,700 - RM10,959	3	0.8
RM10,961 - RM15,039	0	0.0
RM15,040 and above	1	0.3
Political Party Membership		
Yes	81	20.5
No	315	79.5

Research Instrument

This study adapted a questionnaire by Salmien and Norrbacka (2010) on “Trust, good governance and unethical action in Finnish public administration”. The questionnaire has three parts: parts A, B and C. Part A was dedicated to compiling the respondent's demographics, including the level of education, age, and income. For part B, the questionnaire examines the principles of good governance, founded on the three aspects of transparency, accountability, and responsiveness. This part consists of 12 items according to a five-point Likert Scale- ‘1’ is used

for strongly disagree while ‘5’ is for strongly agree. Part C addresses the satisfaction towards the political representatives. Part C contains four 4 items that use a five-point Likert Scale – ‘1’ is used for strongly disagree while ‘5’ is for strongly agree. Confirmatory factor analysis was performed to finalized the suitable indicators for good governance and the constituents’ satisfaction. The wording of the survey was also kept simple for the people to answer.

Confirmatory Factor Analysis

A Confirmatory Factor Analysis (CFA) was conducted to measure the factorial validity of good governance principles and community satisfaction. The CFA results of factor loadings are shown in Table 1. Based on the CFA values, all criteria for adequacy of fit were met. Factor loadings indicated the strength of the relationship factors with their respective constructs. Factor loadings maximum value is 1, and in this study, the highest factor loading value in this model is 0.97, while the lowest value is 0.54. Through analyzing the item loadings and reliability, the construct validity in this study was established.

Table 1: Reliability Analysis

Variables	Items	α	M	SD
Transparency	4	0.94	3.83	0.80
Accountability	4	0.92	4.02	0.65
Responsiveness	4	0.97	4.5	0.54
Satisfaction	4	0.95	3.79	0.68

RESULT

Good Governance of Political Representative

This study proceeded to run multiple regression analyses to address the voters’ perception of good governance practices. The multiple regression analysis tested the predictors of citizens’ satisfaction with good governance - transparency, accountability, and responsiveness. The result of multiple regression demonstrated a significant relationship between transparency, accountability, and responsiveness in the citizens’ satisfaction towards their assemblyman.

Table 2: Multiple regression analysis

	<i>Unstandardized Coefficients</i>		<i>T</i>	<i>Sig.</i>
	<i>B</i>	<i>Std. Error</i>		
(Constant)	3.712	.067	55.558	.000
Perceived Transparency	1.291	.303	-4.262	.000***
Perceived Accountability	1.410	.324	-4.345	.004***
Perceived Responsiveness	1.059	.258	-4.106	.000***

Notes: Dependent Variable: Community Satisfaction

* Significant at the level of 0.10

** Significant at the level of 0.05

*** Significant at the level of 0.01

Based on the result, hypothesis H1 is accepted, meaning that transparency among the political representatives has a positive and significant impact on community satisfaction. This shows that the citizens in Kuala Terengganu believe that their representative is transparent in terms of the information that has been provided to them. The representative was also able to openly share information, especially on the work or project that had been done. Citizens are also able to obtain information from the representatives as the sources of information- specifically, on government action, especially on how decisions are being made, the budget of the projects, and the impact of the project. Their constituents were also satisfied with the information about the project that had been done. The representative also informed them regarding the financial allocation of the project. Although a few studies reported that Malaysia has low transparency, this study proved otherwise. The impact of transparency on citizens' satisfaction is significant, i.e., a regression coefficient $\beta = 1.29$.

Second, the result shows that hypothesis H2 is accepted, which means that accountability has a positive and significant impact on the citizens' satisfaction. This result shows that the citizens in Kuala Terengganu believe that their political representative has been accountable to them and accepted his or her responsibility as a political representative. In particular, their representative was more responsible in terms of the development of the constituency. Their representative also utilized the development budget well; the development project also had a positive impact on the people, and their representative also managed the development budget in the proper way. This result also proves that the representative has made a significant reform giving a meaningful impact on citizens' satisfaction. Compared to other variables, accountability is the highest, with a regression coefficient of $\beta = 1.41$

Third, the result shows that H3 is accepted. This shows that responsiveness among the political representatives has a positive impact on the citizens' satisfaction significantly. The citizens believed that their representative was responsive to their complaints, was very kind and readily available. They also believed that their representative gave equal treatment to all the voters in the constituent. In fact, their representative also accepted the ideas of the voters before making any decision. Although all variables of good governance - transparency, accountability and responsiveness are significant and positively impact citizen satisfaction, responsiveness scored the lowest score when linked with constituent satisfaction. The regression coefficient score ($\beta = 1.059$) was significantly lower than the remaining factors. This also shows that the representative's response towards their community is still low. It is imperative to formulate better method of response in the future. For example, the representative may create a feedback loop so that the citizen is able to provide input and also respond to the input by integrating it into action.

CONCLUSION

The finding of this study provided data on the satisfaction of the constituents towards their political representatives regarding the practices of good governance. Good governance among political representatives is essential for building trust and confidence in government institutions, promoting democracy, and ensuring that public resources are used effectively and efficiently to benefit society as a whole. The study shows that the satisfaction of constituents towards their political representative's good governance is good. However, improvement is still needed. Based on the principles of good governance, responsiveness is the aspect that needs significant attention from the political representatives. To address low satisfaction levels among citizens towards their representatives, it is important for representatives to listen to and respond to the concerns and needs of their constituents. The representatives also should be transparent and accountable in their actions and decision-making processes and work to build trust and confidence among citizens. This can be achieved through effective communication, engagement with the community, and a commitment to good governance and ethical behaviour.

At the same time, it is also important for citizens to actively participate in the political process, engage with their representatives, and also make sure the political representative accountable for their actions. This can help to ensure that the needs and interests of citizens are effectively represented and that government institutions are functioning in the best interests of the public. Mutual understanding is also needed between the constituents and their political representative; sometimes, constituents are unrealistic in terms of expectations, i.e., what the political representative can do for them. Therefore, the

representative should educate the constituents on the role of a representative for effective community engagement.

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DISCLOSURE STATEMENT

In accordance with international publication guidelines and our duty to uphold research ethics, we declare that we have no conflicts of interest.

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A COMPARATIVE STUDY ON THE ROLE OF URBAN SQUARES' PATH IN SHAPING THE CITY IMAGE OF PAST AND PRESENT ADMINISTRATIVE CAPITALS IN MALAYSIA

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Abstract

The 'Dataran' or urban square has been suffering an identity loss as a result from rapid urbanization despite its significance in shaping the city image. The concept of "city image," often referred to as a city's reputation or perception. Even though numerous studies had address different contribution of an urban square, there is only limited information that addresses its role in shaping city image, especially in relation to administrative capital in Malaysia. This paper is vital as it intends to provide emphasis to the actual role of the urban square once again. This study aims to examine the role of urban squares' path in shaping the city image through observable analysis on past and present administrative capitals in Malaysia; Dataran Merdeka, Kuala Lumpur and Dataran Putra, Putrajaya. The observable analysis will draw attention to two subject matters of paths; Clarity of Access Linkages and Directional Quality. Comparison will be made and the urban square that shows a stronger role in shaping the city image will be determined. Conclusively, it is found out that the urban square with higher clarity in the access linkages and strong directional quality are prone to show stronger role in shaping the city image. Based on the observable analysis, Dataran Putra shows a stronger role in shaping a city image as almost 100% of its' paths shows clarity in its' access linkages and form a strong directional quality due to its radial alignment.

Keywords: City Image, Urban Square, Path, Legibility, Administrative Capital

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INTRODUCTION

The 'Dataran' or urban square is a term used to describe an open space found inside Malaysia since the early 18th century during the British Colonial (Lai and Ang, 2018). During their colonial period, the administrative building becomes one of the focus of Malaysia's town planning development (Mohidin, 2015). This is the time when urban squares started to form a close relationship with the administrative buildings as these urban features are often present in the urban planning of such cities. This inseparable bond between urban square and the administrative building shows a strong sense of place which one way or another contributes to shaping the city image of such city (Razali et al., 2019). Besides administrative buildings, urban squares are often surrounded by circulation pathways (Wessel et al., 2018). Lynch (1960) disclosed that paths are one of the major urban elements as it is one of the first elements to be designed during city development. Paio et al. (2016) also stated that the surrounding paths often dictate the formation of an urban square. All these further strengthen the role of the path as a physical urban element that is closely related to urban square.

As one of the characterizing traits which dictate the formation of the urban square, it is undeniable that paths share a similar role as the urban square which is to shape the city image. But yet, few studies highlighted that the present urban square suffers from identity loss as a result of district division (Sennett, 2017). The physical transformation of the urban square as a result of rapid urbanization also affects this public realm negatively (Zakariya and Harun, 2018). On the other hand, past researches such as Gehl, J (2013) and Vadiati et al. (2011) had to address the different contribution of the urban square to the surrounding community in term of social cohesion and environmental sustainability but there is only limited research that addresses the role of the urban square in shaping the city image, especially concerning the urban paths inside the context of Malaysia. Hence, this research intends to overcome this gap by examining the legibility of paths for the selected urban square in shaping the image of past and present administrative capitals in Malaysia. Furthermore, this study intends to emphasize the role of urban square paths in shaping city image once again.

LITERATURE REVIEW

Administrative Capital

An administrative capital, also known as an administrative center or government capital, is a specific city or location within a country that serves as the primary center for governmental and administrative functions (Rossman, 2018; Turner and Turner, 2011; Mosser, 2010). This is distinct from the term "capital city," which may also encompass other functions like culture, economics, and historical significance. An administrative capital is primarily focused on housing government institutions and facilitating the operation of the government

(Rossman, 2018). It is therefore acting as the heart of a country and plays a significant role in shaping city image. Administrative capitals are essential for the effective functioning of a country's government and the execution of public policies. They facilitate communication and coordination among government agencies, lawmakers, and other stakeholders involved in governance. Administrative capitals are often chosen strategically for reasons such as political stability, geographical location, and historical significance (Rossman, 2018). Some examples of administrative capitals are Canberra in Australia, Washington D.C in USA, Jakarta in Indonesia and so many more rapidly growing old and new administrative capitals.

Roles of Urban Square

Based on Alves (2017), an urban square is defined as any space located within an urban area, in which its defining elements are seen from within and where the feeling of being is more acutely emphasized than in any other urban area. Public space such as urban square plays an essential role in the city to catalyze the humanization of its inhabitants (Bibri et al., 2017). Throughout history, different events such as festival celebrations or entertainment-related activities had seen taking place in the urban square (Zakariya et al., 2014). Kim (2017) also mentioned that cities are formed through the composition of voids and masses and the ratio of voids and masses will determine the structure of the city. Hence, the urban square also plays a significant role concerning the context of void and mass composition of a city due to its quality of openness.

Besides the physical role, the urban square also benefits the ecological quality of the urban environment by improving the surrounding air quality and lessen the water surface runoff (Massaro et al., 2021). Jin et al. (2020) also mentioned that the presence of urban squares helps to reduce the noise level of the surrounding. In addition, this urban feature is also a place where groups or individuals learn to respect and tolerate others (Vis, 2018). All these contexts of social cohesion and interaction display the local identity which will then reflect and shape the image of the city (Yavuz et al., 2020). Furthermore, the urban square also manifests a symbolic meaning of coexistence that further emphasizes the placemaking identity of the surrounding (Moro et al., 2020).

Throughout every country, urban square plays an essential role in catalyzing the humanization of inhabitants inside a city (Gehl, J, 2011). The role of urban square ranges from physical, ecological, contribute to social cohesion, placemaking, and the local identity. Thus, there is a strong relationship between the presence of an urban square and the surrounding urban contexts where the urban square also shows a role in shaping the city image.

Urban Square in Malaysia

Although the urban square was introduced and implemented by the British in the early 18th century, the creation of the urban square was originated in Calcutta, India (Lai and Ang, 2018). The creation of 'maidan' or an urban square in Calcutta, India resulted from a town planning experiment initiated by the British Empire while they were adapting to the pre-existing spaces in India (Nayan et al., 2019). After the creation of 'maidan', this urban feature was subsequently adopted by the British Empire as a hybrid planning device that formalized as an instrument for cities' planning (Razali et al., 2019).

Coming back to the context of the Malay Peninsula, the first urban square that was introduced was named Fort Cornwallis which was located in Penang Island (Shamsuddin et al., 2018). After the implementation of this urban feature in Malaya, the term 'maidan' was then changed to 'Dataran' to adapt to the context of Malaya (Lai and Ang, 2018). Following the introduction of Fort Cornwallis in Malaysia, few other urban squares such as the Padang Kota Lama in Penang, Dataran Merdeka in Kuala Lumpur, Dataran Putra in Putrajaya, and a few others were subsequently being introduced into the context of Malaysia. As a result of its openness, the urban square in Malaya plays an essential role in providing visual emphasis to the surrounding administrative building (Zakariya and Harun, 2018).

City Image and Legibility

Like a piece of architecture, the city is a construction in space, but one of vast scale, a thing perceived only in the course of long periods (Lynch, 1984). A city is not only an object that is perceived by people of diverse character, but it is an outcome of many designers and planners who are continuously modifying the structural framework based on their reason. Thus, the strong link between the city's memory, image, experience by its inhabitants and those physical characteristics of such a city results in the formation of city image (Lynch, 1960). In many ways, the visual quality or the image of a city is often defined by the mental image held by each citizen (Lak et al., 2019). The term "Legibility" of city image is the apparent clarity of the cityscape (Moulay et al., 2017). Legibility refers to the quality or state of being clear, readable, or easily understood (Moulay et al., 2017). If a physical object or element is legible, it could be easily seen as a recognizable symbol or a pattern. Thus, a legible city would be one whose physical elements are easily noticeable. Colding et al. (2020) also emphasized that there is a change in the pattern of urban public spaces where prominent architects and urban planners have been arguing that the quality of public spaces has much to do with the image that they convey. This statement further emphasized the importance of 'legibility'.

In short, Lynch (1960) emphasized that people should first attain a clear mental mapping of their surrounding urban environment where they will then be able to navigate, operate and act upon the environment. In conjunction with the idea of mental maps, Lynch (1960) proposed 5 elements that are contained inside these mental maps, namely: 1) Paths, 2) Edges, 3) Districts, 4) Nodes and 5) Landmarks. As the formation of the urban square is strongly dependent on the surrounding paths, this research study on urban square's legibility will only be focusing on the elements of paths.



Figure 1: The Element of a City
Source: Lynch (1960)

Paths of Urban Square

Based on Javadi (2016), the form of the urban square could be categorized into 4 types, namely: 1) The Closed Square, 2) The Dominate Square, 3) The Amorphous Squares and 4) The Street Plaza. Even though urban square could be defined into a few types, Paio et al. (2016) mentioned that all types of urban square share a similar characterizing trait that depends on 'The Global Properties' The global properties of an urban square refer to the overarching characteristics and qualities that define a square within an urban context (Paio et al., 2106). These properties encompass the square's role, significance, and impact on the surrounding city and its inhabitants. Global properties help distinguish one square from another and contribute to its unique identity within the urban fabric. It is also used to create reference between the urban square and the surrounding access or circulation pathways whether it is vehicular routes or pedestrian pathways (Wessel et al., 2018)

As one of the first urban elements to be designed during the initial city planning development, the path is considered the most significant element in urban design (Carmona, 2021; Jacobs and Appleyard, 2015; Lynch, 1960). Whether in international or local urban settings, urban squares are often surrounded by circulation pathways; either pedestrian pathways or vehicular routes where all these access linkages further emphasize the continuity and clarity of paths (Wessel et al., 2018). Access linkages in the context of an urban square refer to the connections and pathways that facilitate accessibility and movement within the square and its surrounding areas (Camona, 2021; R.Siti, 2019). These

linkages are designed to provide pedestrians with convenient and safe routes to access the square, move around it, and connect to adjacent streets, buildings, public transportation, and other key destinations. Access linkages play a crucial role in enhancing the functionality and usability of urban squares (R. Siti, 2019).

Besides continuously identifiable, the elements of paths may have directional quality (Lynch, 1960). The directional quality of a certain urban feature could also be a result of the alignment of access linkages where a certain feature could be the focal or termination point of the access linkages (Perovic and Folic, 2012; Wessel et al., 2018). This directional value will then lead to the perception of destination and origin points (Lynch, 1960). Thus, lacking identity in a major path will result in confusion between one path with another, leading to difficulty in reading the entire city image. The directional quality of paths at an urban square refers to how well the paths and walkways within the square guide pedestrians and provide a clear sense of direction or orientation (Carmona, 2021; Jacobs and Appleyard, 2015). This aspect of urban design focuses on ensuring that people can easily navigate the square, understand where they are, and find their way to desired destinations within or beyond the square. The directional quality of paths is an important consideration in urban planning and design to enhance pedestrian safety, convenience, and overall user experience (Carmona, 2021; Jacobs and Appleyard, 2015).

In short, both clarity of access linkages and directional quality of paths will contribute to a clearer mental map of the observer which will then contribute to a stronger visual clarity of city image.

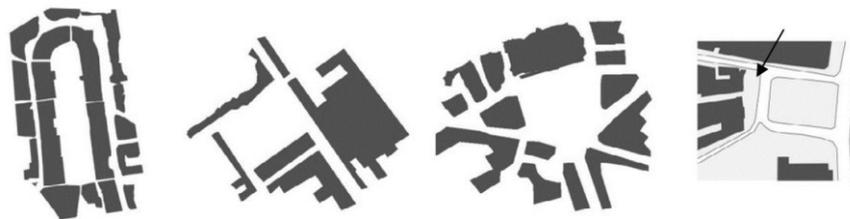


Figure 2: Different Forms of Urban Squares
Source: Javadi (2016)

RESEARCH METHODOLOGY

This qualitative research will be utilizing the case studies method as the method of data collection; in which two (2) urban squares, namely Dataran Merdeka and Dataran Putra from both past and present administrative cities in Malaysia were selected as case studies. The two dataran are chosen as they are located in a capital city have or currently serving as the administrative capital in Malaysia.

The data will be obtained from observing the main vehicular passage, pedestrian linkages and public vehicular access from site plans of the two administrative cities through the method of object mapping where this technique helps to remove non-related elements inside a particular image and provide the viewer with a quick overview of the subject of research analysis (Downes et al., 2015). To provide clarity and emphasize the different objects inside the site planning images, different elements inside the site planning will be shown through different images; Emphasizing only one object inside each image (Marosi, 2016). Even though each object mapping will only be indicating one element at a time, the site boundary of the selected case studies will always be shown in red inside every image to provide clarity between the relationship of the selected case studies and each surrounding element. The approach of the observation will be based on the subject matter of 'paths' as outlined by Lynch (1960).

As this research takes on an interpretive approach to research, the researcher will play the role of a complete observer as no interaction will be carried out with any insider to examine the legibility of the city image. Wibowo et al. (2015) stated that the maximum distance of travel for pedestrians inside a tropical climate such as Singapore is a total of 600m. However, a different point of view was reviewed by Azmi et al. (2012), where they mentioned that the maximum walkable distance inside another tropical city like Malaysia is only 400m. This statement was further supported by Leh et al. (2017) where they also mentioned that 400m is a safe travel distance inside Malaysia. With all these, the scope of observation and qualitative analysis for urban legibility will only be examined within a distance of 500m radius from both case studies as this distance represent the average comfortable travel distance inside a city of tropical climate.

The research analysis will then compare these two case studies in a table format with regards to the two subject matters of paths: Access Linkages and Directional Quality (as shown in Table 1). Lastly, the urban square that shows a stronger role in shaping the city image will then be determined.

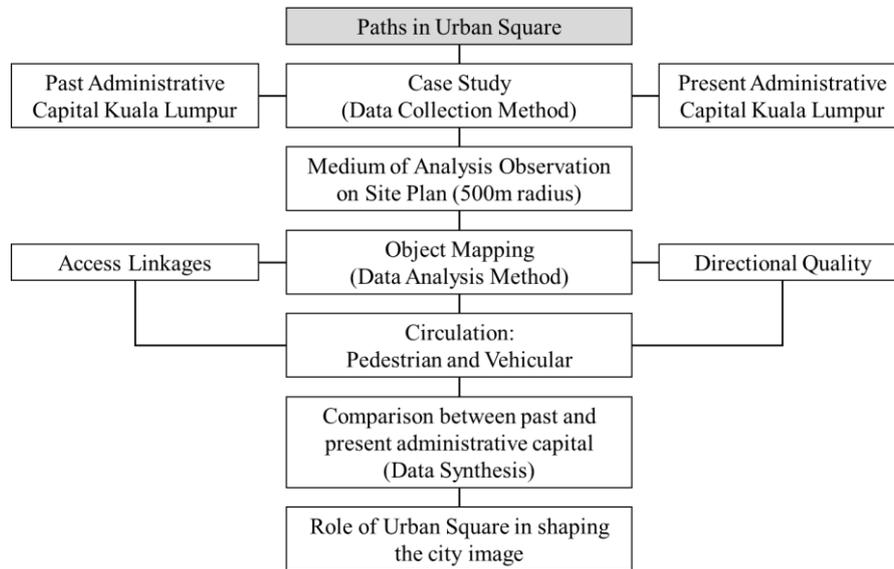


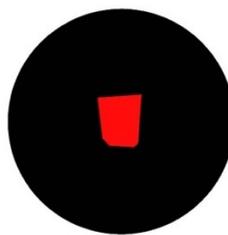
Figure 3: The research methodology framework

Table 1: Component of Object Mapping

PHYSICAL ELEMENT OF URBAN SQUARE	SUBJECT MATTERS	OBSERVABLE ELEMENTS
Paths	Access Linkages	Access Linkages around Urban Square <ul style="list-style-type: none"> • Main Vehicular Passage • Pedestrian Linkages
	Directional Quality	



A: The Radius of Study



B: The Boundary of Case Study



C: The Highlighted Element

Figure 4: Example of Object Mapping as Method of Analysis

Source: Authors (2021)

ANALYSIS AND DISCUSSION

Dataran Merdeka

Having witnessed the rise of the Malaysian flag during Independence Day, Dataran Merdeka is among the earliest public square introduced during the British Empire. Formally known as the Padang Club, this urban feature is situated inside the heart of an old government administrative district known as Kuala Lumpur alongside the National Police Department headquarters and the Gombak River (Zakariya & Harun, 2018).

For almost 140 years, Dataran Merdeka has witnessed many transformations and events (Lai and Ang, 2018). Besides diminishing in area of the open field, one of the major changes of Dataran Merdeka took place in the mid-1980s where this huge open space was completely dug up to further accommodate an underground parking area and a commercial plaza known as Plaza Dataran Merdeka (Zulkefle et al., 2012).

Despite all those physical transformations, Dataran Merdeka is still consistently the strongest element found inside this cityscape, a vast open space inside the heart of the busy district - Kuala Lumpur, the formal administrative capital of Malaysia (Nayan et al., 2019). It is undeniable that the stories of Dataran Merdeka contribute significantly to both the historical formation and social-cultural development of the formal administrative capital of Kuala Lumpur. Figure 5A shows the area of study for this selected case study within a radius of 500m as specified in the previous section.

Dataran Putra

Initiated by the 4th Prime Minister Tun Dr. Mahathir Mohamad, Malaysia embarked on an aspiring 'refashioning' of the nation known as Wawasan 2020 (Vision 2020) to achieve the goal of becoming a 'developed country' by then (Rossman, 2018). In conjunction with that, Putrajaya, the new federal administrative capital was formed and replaced the congested Kuala Lumpur as the administrative capital. One of the major urban features found in this administrative capital is an urban square known as Dataran Putra.

Dataran Putra contributes significantly to the overall master planning proposal for the new administrative capital of Putrajaya, as it is positioned in the termination point of this major boulevard of this city, the Putrajaya Boulevard (Ngesan et al., 2015, Moser, 2020). Hence, providing emphasis on the surrounding administrative building and architecture as a result of the openness of this urban feature (Kim, 2017). In addition, Dataran Putra also contributes greatly towards the social and communal values of the surrounding local community where recreational activities such as picnics, jogging, cycling, and skating were often carried out here (Ujang et al., 2015).

As a whole, Dataran Putra plays a significant role not just as the termination point of the major axis of Putrajaya, the Putrajaya Boulevard, but also as an urban feature that shows placemaking identity to the local. It is certain that the existence of this urban square also contributes greatly to forming the city image of this new administrative capital of Malaysia. Similar to that of the previous case study, Figure 5B shows the area of study for this selected case study within a radius of 500m.

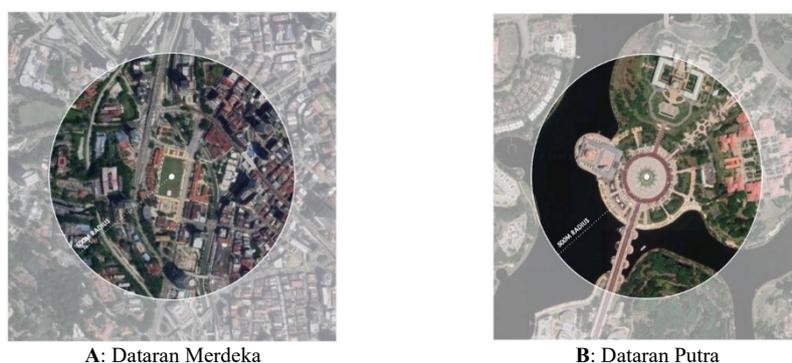


Figure 5: 500m Radius around both case Studies
Source: Authors (2021)

In general, the comparison between Dataran Merdeka and Dataran Putra is shown in the table below, where physical elements such as geographical location, urban form, and surrounding paths are specified.

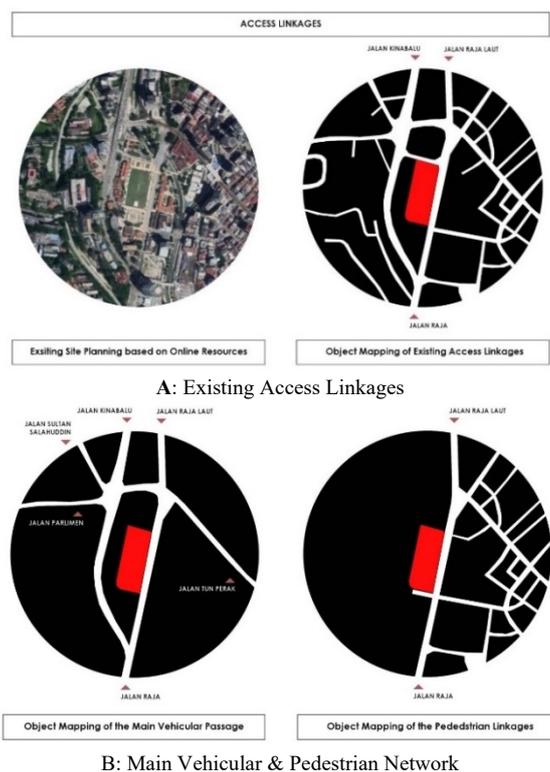
Table 2: General Comparison between Dataran Merdeka & Dataran Putra

ELEMENTS OF URBAN SQUARE	CASE STUDIES	
	DATARAN MERDEKA	DATARAN PUTRA
Photography		
Location	Kuala Lumpur	
User / Observer	(Past Administrative Capital of Malaysia)	
Form	(Present Administrative Capital of Malaysia)	
Surrounding Paths	Tourist / Foreign Traveller	Local Residence

Access Linkages

Based on what was observed from the site planning of Dataran Merdeka (as shown in Figure 6A), we can deduce that the site planning of this area is not referring to any major axis on-site, hence resulting in a diverse network of paths scattered all over the urban area. The reason behind the formation of this scattered capital might have resulted from the unplanned morphological transformation from a previous local village into an administrative capital after the arrival of the British Colony. On the other hand, based on Figure 6B, even though a few major roads with wider width could easily be observed from the site planning, those access linkages do not show any emphasis or focus towards any other urban feature inside the surrounding context, hence resulting in a weaker visual clarity inside the mental image of the traveling observers. In short, all the access linkages inside this area were not dictated by any major planning axis on-site, hence resulting in an unplanned capital with a diverse network of access linkages scattered all over the urban context.

Access Linkages in Dataran Merdeka



B: Main Vehicular & Pedestrian Network
Figure 6: 500m Radius around both case Studies
Source: Authors (2021)

Access Linkages in Dataran Putra

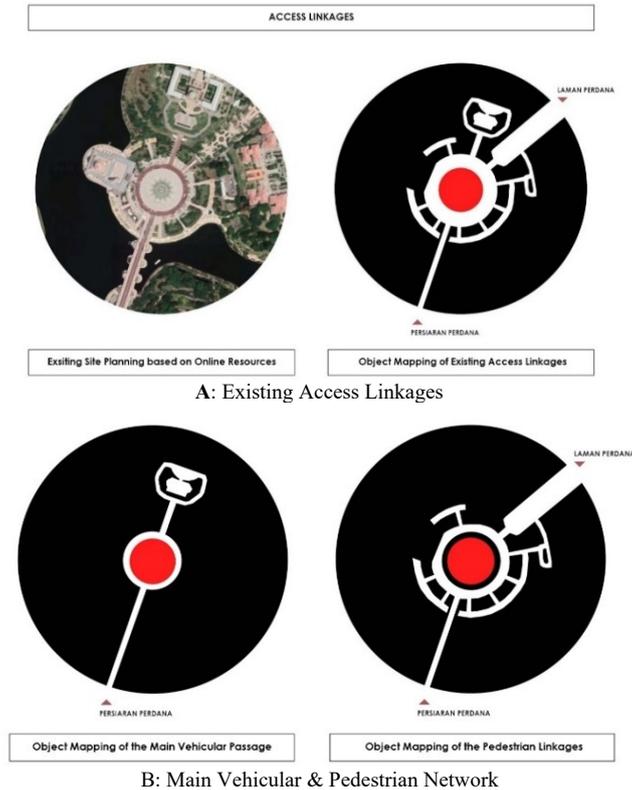


Figure 7: Overview of Access Linkages of Dataran Putra through Object Mapping
Source: Authors (2021)

Dataran Putra is an open space located in Precinct 1 of Putrajaya Malaysia (Rossman, 2018). Based on what was observed from the site planning of Dataran Putra in Figure 7A, it is apparent that the site planning of this area follows a major axis and the Dataran Putra plays a prominent role as the catalyst or binder for the surrounding site planning.

As a whole, the master plan for this 'Utopian City' divides the city into 2 main zone or areas, namely: 1) the Core Zone and 2) the Periphery Zone. Dataran Putra plays a prominent role inside the core zone where this urban feature acts as an open space that provides emphasis towards the surrounding feature, a catalyst for the city planning of Putrajaya's Core Zone (as shown in Figure 7B)

In summary, as a significant binder for the master planning of Putrajaya's Core Zone, Dataran Putra explicit a strong role as an important element of the city that shaped the city image of Putrajaya. All the access linkages

around this urban feature follows a focal point (the Dataran Putra) as the main planning axis which dictate the other paths' placement and position.

Discussion on Access Linkages

Based on what was observed, Dataran Merdeka shows a lack of clarity for its access linkages as all the access linkages inside this area was not dictated by any major planning axis on-site, hence resulting in an unplanned capital with a diverse network of access linkages scattered all over the urban context. As mentioned previously, the reason behind the formation of this scattered capital might have resulted from the unplanned morphological transformation from a previous local village into an administrative capital after the arrival of the British Colony (Zakariya & Harun, 2018).

In many ways, the visual quality or the image of a city is often defined by the mental image held by each citizen (Lynch, 1960). If a physical object or element is legible, it could be easily seen as a recognizable symbol or a related pattern (Lak et al., 2019). A similar theory applies to the physical elements of paths, where these unorganized access linkages found around Dataran Merdeka are portrayed as a non-legible urban element which one way or another weaken the travelers' apparent clarity to this specific urban area. Hence, visual clarity could not be seen inside the mental mapping of the observers as they pass through the surrounding access linkages because of those unorganized access linkages.

On the contrary, as the newly built and structured administrative capital of Malaysia, Dataran Putra shows a better clarity in its access linkages compared to that of the Dataran Merdeka. The contrast between the site planning of both urban features can be seen clearly as Dataran Putra follows a circular focal point as the main planning axis which further defines and dictate the other paths' positioning and planning. All these alignments and well-planned access linkages will then provide a stronger 'imageability' inside the mental mapping of the observers, thus allowing them to travel through the surrounding with ease and clarity. Moreover, a clear environmental image will also provide the inhabitant with a significant sense of emotional security (Colding et al., 2020). This statement further proves that the paths along Dataran Putra play a stronger role in shaping the city image compared to that of Dataran Merdeka.

Table 3: A Comparative Analysis for Access Linkages

SUBJECT MATTERS	PHYSICAL	OBSERVABLE ANALYSIS	
		DATARAN MERDEKA	DATARAN PUTRA
Clarity of Access Linkage	 A: Dataran Merdeka	<ul style="list-style-type: none"> • As the previous administrative capital which underwent major morphological transformation from way before the country's independence • Shows a lack of clarity of paths as there are a diverse network of paths scattered throughout the area as a result from the unplanned morphological transformation 	<ul style="list-style-type: none"> • As the current administrative capital that was newly built and structured without any influence from the previous morphological transformation • Shows a stronger clarity of paths as all paths follow a radial site planning axis where Dataran Putra act as the binder for the overall site planning
	 B: Dataran Putra	<ul style="list-style-type: none"> • A strong visual clarity or 'imageability' could not be formed inside the mental mapping of the observers due to such unplanned access linkages 	<ul style="list-style-type: none"> • A stronger 'imageability' could be formed by the observer as they pass through the radial site planning axis

Directional Quality

Based on what was observed from Figure 8, we can deduce that the perimeter access linkages of Dataran Merdeka are all aligning with the perimeter boundary of the urban square with an exception of one main road on site – Jalan Kinabalu. The reason behind the morphological transformation of the surrounding urban context that resulted in the current disconnection between Jalan Kinabalu (previously Jalan Raja at 2007) might be caused by the development of the Royal Selangor Club located on the west of Dataran Merdeka (Rossman, 2018).

Even though all those paths were positioned at the perimeter of Dataran Merdeka, there is no strong physical connection or directional quality between both the urban square and surrounding street as the urban square is not conceived

as either a focal or termination point. Hence, the mental mapping of observers will no longer perceive the Dataran Merdeka as a place of significance but rather a place in the city where the community passes by every day.

Conclusively, although there is a presence of path's alignment surrounding the perimeter of Dataran Merdeka, this urban square does not play a significant role in providing a clear mental mapping inside the mind of observers as clarity cannot be seen in term of directional quality of paths, hence confusing 'imageability' of paths in term of directional quality.

Directional Quality in Dataran Merdeka

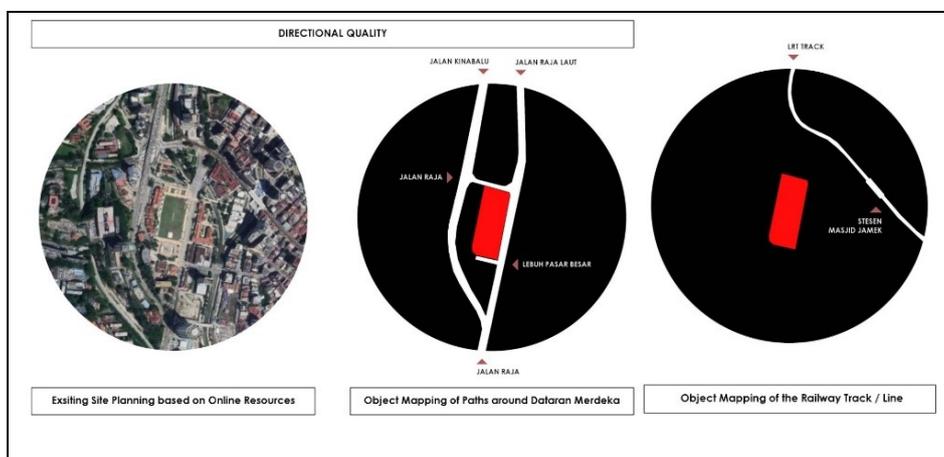


Figure 8: Overview of Perimeter Access Linkages of Dataran Merdeka through Object Mapping

Source: Authors (2021)

Directional Quality in Dataran Putra

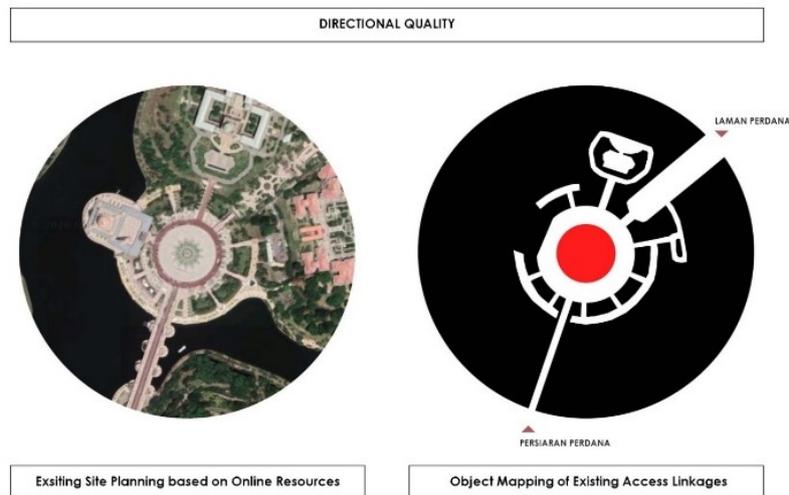


Figure 9: Overview of Perimeter Access Linkages of Dataran Putra through Object Mapping

Source: Authors (2021)

As the main termination point of Putrajaya Boulevard, the site planning, and the alignment of paths inside the Dataran Putra were also planned carefully per a specific focal point or site axis. This resulted in a strong radial site planning strategy where Dataran Putra acts as the focal point of this termination zone. All these further define and give clarity towards the paths' alignment and directional quality inside this area. All this will then contribute to a clearer mental image inside the observers' minds as they travel through this urban feature.

In summary, the surrounding access linkages around Dataran Putra show a strong directional quality as this urban feature was positioned in the termination point of the major axis of Putrajaya, the Putrajaya Boulevard. The alignment of all the access linkages here follows a central radial axis where the Dataran Putra acts as the binder for the overall site planning. All these alignments of paths inside Dataran Putra help strengthen the role of this urban square in shaping the city image of Putrajaya as clarity could be from inside the mental mapping of the observers, hence resulting in the clarity of 'imageability' of paths in term of directional quality.

Discussion on Directional Quality

Glancing through the surrounding context of Dataran Merdeka, even though most of the surrounding perimeter access linkages are aligned with the perimeter of Dataran Merdeka (except Jalan Kinabalu), no strong directional quality could be

seen between those access linkages with the Dataran Merdeka as the urban square was positioned at the perimeter of those paths and was only perceived as a place where the community pass by every day.

Lynch (1960) mentioned that travelers tend to imagine a paths' origin and termination point which allow them to know where they are heading and coming from. Colding et al. (2020) also disclosed that having a strong visual clarity in the paths' origin and a destination point will tend to lead to a stronger identity of that paths, giving a sense of bearing towards the observers' whenever they crossed them. All these further prove the lack of strong directional quality in the perimeter access linkages of paths along Dataran Merdeka as all of those paths do not show an origin or termination point.

On the contrary, the surrounding access linkages around Dataran Putra show a stronger visual clarity in all the paths' alignment as this urban feature was positioned in the termination point of the major axis of Putrajaya, the Putrajaya Boulevard. In addition, all the surrounding access linkages were also dictated by the presence of that urban feature and hence strengthening further the role of Dataran Putra in shaping its city image. This statement was supported by Lak et al. (2019) where he mentioned that an end-from-end differentiation could be formed by elements that may be visible near the end of a path, which further defined the termination point. On the other hand, Moulay et al. (2017) also added that having a strong directional quality as a result of origin and termination point will then give a sense of scale towards the travelers, which one way or another allow the observer to have a stronger mental mapping of the urban surrounding as a result of the visual clarity.

As a conclusive remark, Dataran Putra shows a stronger role in shaping the city image through its alignment of the path which resulted in a stronger directional quality as this urban square plays a significant role as it is positioned in the termination point of the major axis of Putrajaya – The Putrajaya Boulevard. In addition to that, the alignment of paths for Dataran Putra was not only an alignment following the perimeter of the urban square but contribute to a major planning axis of the whole city of Putrajaya.

Table 4: A Comparative Analysis for Directional Quality

SUBJECT MATTERS	PHYSICAL	OBSERVABLE ANALYSIS	
		DATARAN MERDEKA	DATARAN PUTRA
Directional Quality	 A: Dataran Merdeka	<ul style="list-style-type: none"> • Most access linkages except Jalan Kinabalu area aligned to the perimeter of Dataran Merdeka • No strong physical relationship could be form between the alignment of paths and the positioning of the urban square 	<ul style="list-style-type: none"> • All the access linkages follow the radial site planning axis of Dataran Putra • This urban square plays a significant role as the main termination point for the major axis of Putrajaya – the Putrajaya Boulevard
	 B: Dataran Putra	<ul style="list-style-type: none"> • Dataran Merdeka was not perceived as a place of significant but rather as a place in the city where the community pass by as a result from such paths' alignment 	<ul style="list-style-type: none"> • Hence, strengthening further the significant of Dataran Putra in shaping the city image of Putrajaya

CONCLUSION

Conclusively, it is found out that the urban square with higher clarity in the access linkages and strong directional quality are prone to show stronger role in shaping the city image. As compared to Dataran Merdeka, we can deduce that Dataran Putra shows a stronger role in shaping the city image of the present administrative capital of Malaysia, Putrajaya. Looking through the site planning of Dataran Putra, a stronger ‘imageability’ could be form inside the mental mapping of the observer through its radial alignment and the strategic location of this urban feature as the termination point of the major axis of Putrajaya, the Putrajaya Boulevard resulted in a stronger clarity of access linkages and directional quality. Furthermore, this research study intends to reinstate the importance of urban square as a place of significant inside a city by allowing more residence to acknowledge the role of urban square in shaping city image.

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POVERTY ERADICATION PROJECT IN SABAH, MALAYSIA: NEW INITIATIVE, NEW CHALLENGES?

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Abstract

Since independence, the Malaysian government has invested billions of ringgits in the fight against poverty. Despite the national decrease in the percentage of the population living in poverty, the state of Sabah has had the highest poverty rate in Malaysia since 1997. Why has the poverty alleviation programme been less effective in reducing this social phenomenon among the poor communities in Sabah? To address this question, this paper discusses the issues and challenges confronting stakeholders involved in the poverty eradication programme in Sabah. The paper focuses on the implementation of the People's Income Initiative (PII) Phase 1 project in two communities: Penimbawan Village, Tuaran, and Bongkol Village, Pitas. This qualitative study reveals those participants, implementing agencies, and other stakeholders face issues and challenges when implementing poverty eradication projects. Furthermore, the issues faced by the poverty eradication project participants were found to include their own attitudes towards the project, such as a lack of focus on or interest in the project; the existence of a subsidy mentality; and the lack of clarity regarding the project's goals. However, the implementing agency was discovered to encounter issues with market support. The difficulties currently faced by these three parties could affect how long the PII Project can successfully eradicate poverty in both localities.

Keywords: Poverty; Hardcore Poor, Poverty Eradication Project; the People's Income Initiative; Sustainability

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INTRODUCTION

Reducing the incidence of poverty has become the aim of most countries, and this issue has been raised as an important agenda in national development plans. The commitment to the goal of eradicating poverty, especially extreme poverty, was translated to the global level when the United Nations listed it as the first item in the Sustainable Development Goals (SDG) as a problem to be eradicated by 2030. In Malaysia, poverty eradication efforts are not new; in fact, they formed part of the national agenda included in the Malaysia Plan. For example, the First Malaysia Plan (1966-1970) stated that the government would continue all efforts to reduce poverty by providing the poor with facilities and opportunities. In line with that, many programmes were introduced to reduce this damaging social phenomenon. The introduction of the New Economic Policy (1970-1990) demonstrated the commitment of the Malaysian government to addressing the issue of poverty in Malaysia. Because of this policy, the percentage of those living in poverty dropped considerably, falling from 49.3% in 1970 to 12.4% in 1992, two years after the NEP ended (Department of Statistics Malaysia, 2023). Since the government aimed to continue to achieve balanced development by eliminating extreme poverty and reducing relative poverty between the country's ethnic groups, the National Development Policy (1991-2000) was introduced after the NEP. The National Vision Policy (2001-2020) was the framework for Malaysia's programme to reduce poverty, which was to run until 2020 (Wan Nor Azriyati et al., 2011). The People's Income Initiative (PII) was recently launched with two main goals: (i) to raise the income of B40 and extremely poor families and (ii) to resolve every day financial issues through government-sponsored initiatives (Ministry of Economy, 2023) among ethnic groups.

Malaysia's success in reducing poverty demonstrates the benefits of the introduction of various programmes to combat poverty. When compared to 2016, the incidence of absolute poverty decreased from 7.6% to 5.6% in the year 2019 (12th Malaysia Plan, 2021–2025). The success of the government's nationwide development programmes correlates with the reduction of the poverty rate (Mohd Khairi, Chamhuri & Rospidah, 2018; Sharifah Rohayah & Khoo, 2016; Zulkarnain & Isahaque, 2013; Wan Nor Azriyati et al., 2011; Mohamed Zaini, 2010; Ishak & H. Osman-Rani, 1996). Despite this, the COVID-19 pandemic caused Malaysia's incidence of absolute poverty to rise once more to 8.4% in 2020 (12th Malaysia Plan, 2021–2025), according to the Department of Statistics Malaysia. However, the government's contribution to effective poverty reduction programmes should not be discounted (Sharifah Rohayah & Khoo, 2016). Government aid projects to reduce poverty can generally take top-down, bottom-up, or partnership approaches. Each method used to carry out a development project has particular advantages and disadvantages that can influence or guarantee the success of a newly introduced project.

The limited participation of poor communities in development can stymie efforts to lift them out of poverty. In contrast to the top-down approach to development, bottom-up and partnership approaches are seen to provide long-term benefits and foster active community involvement in poverty eradication projects (Asnarulkhadi, 2010; Haris & Abd Hadi, 2012; Haris, 2015). As a result, efforts to reduce poverty are the responsibility of not only the government but also the poor. The extent to which participants and implementing agencies can ensure the success of government-initiated poverty eradication projects has been questioned. Therefore, this study focuses on the issues and challenges encountered by participants and development agencies during the implementation of the People's Income Initiative-Eradication of the Hardcore Poor Project, Malaysia's most recent project of this type.

POVERTY ERADICATION PROJECTS IN MALAYSIA: HIGHLIGHTS OF PREVIOUS RESEARCH

Poverty is a social phenomenon that continues to capture the interest of academics, politicians, and the general public at both the global and local levels. Due to five significant events that occurred in Malaysia, this subject has once again become popular and openly discussed in the media as well as among academic researchers at local universities. First, a report was released by Professor Philip Alston, a special rapporteur for the UN, following his August 2019 visit to Kuala Lumpur, Selangor, Kelantan, Sarawak, and Sabah. His findings revealed that the incidence of poverty in Malaysia was higher than had been reported in the government's official statistics. According to Alston, inaccurate poverty rate data had led governments to implement policies that were not specifically intended to end the poverty of particular groups (United Nations, 2020). Second, an assessment was conducted of the 2019 Poverty Line Income (PLI). The national PLI in 2019 was RM2,208 (12th Malaysia Plan, 2021–2025), according to the PLI methodology. Third, the COVID-19 pandemic hit worldwide at the end of 2019, and Malaysia introduced movement control orders. Malaysians were undoubtedly impacted by this pandemic (Fathullah, 2021), whether they lived in urban or rural areas. As a result, the poverty rate increased by nearly 3% in one year, rising to 8.4% in 2020 from 5.6% in 2019 (Department of Statistics Malaysia, 2020). The fourth event was Malaysia's response and actions regarding the achievement of the Sustainable Development Goals (SDG). Malaysia must demonstrate its commitment to fighting hardcore poverty and achieve the elimination of extreme poverty by 2030. Finally, an event no less important was the introduction of the Multidimensional Poverty Index (MPI) in 2016, which aimed to measure poverty from a more inclusive perspective.

The implications of these five events not only invite academic-political-economic debate but also, more significantly, have caused changes in the government's approach to and actions against poverty. A holistic, comprehensive,

and inclusive poverty alleviation programme has come to be regarded as essential. Generally, poverty eradication projects in Malaysia can be divided into six main categories (Refer to Table 1). This category demonstrates that in Malaysia, such projects are not only ecocentric (focused on economic development) but also homocentric (human development-oriented) as they emphasise the formation of independent and informed communities (Asnarulkhadi, 2010). An important transition for this type of development is the inclusion of the target group in the planning, implementation, and decision-making processes. As a result, participation and community involvement in poverty alleviation projects including in agriculture (Siti Murni Wee & Kuppusamy, 2018) can increase incomes among the poor while also improving their skills and knowledge. The programmes listed in Table 1 are carried out by various federal and state agencies.

Table 1: Categories of Poverty Eradication Programmes in Malaysia

Name of Poverty Eradication Programme	
1.	Programme for the Provision of Basic Facilities, Social Infrastructure and Social Services
2.	Productivity Improvement Programme
3.	Land Reform Programme
4.	Income Increase Programme (in the Form of Financial Assistance)
5.	Special Programme for the Poorest People - Development Programme for the Poorest People
6.	Special Programme for the Poorest People - People's Welfare Development Scheme

Source: Modified from Asnarulkhadi, 2010

Studies of Malaysia's programme to eradicate poverty have revealed a variety of findings regarding the programme's accomplishments, problems, and difficulties. According to Zakiyah and Norzalinda (2021), the Launch Grant (LG) of RM2,700 provided by the Department of Social Welfare (JKM) was less effective in removing single mothers and disabled people from the hardcore poor. Their study found that even after participating in the LG programme, 84.0% of the respondents still had an income of RM1,000 or less. Financial issues (51.4%) and a lack of working capital (56.0%) were the two main issues experienced by the respondents either before or after joining the LG programme, according to the study. These problems were related to the absence of follow-up entrepreneurship programmes or LG participant monitoring.

The importance of a positive attitude in determining the success of a poverty eradication project was evident in the study by Azlina et al. (2019) of Orang Asli participants in the Income Enhancement Project (PPP) in Perak. This study showed that a positive attitude among respondents had the effect of increasing their income after their participation in the PPP. In fact, 48.2% of the

respondents admitted their income had risen since they had started to follow their respective projects. An important point from the same study (Azlina et al., 2019) was the existence of active projects lasting over two years (20.9%), with some active even for four years (20.9%). This demonstrates that a project can experience durability and sustainability if the participants have a positive attitude because this influences their active involvement in the project, which in turn raises the standard of living among both participants and households.

Participants' knowledge about a poverty alleviation project is a factor of active participation and an important determinant of the project's success. According to Kwok and Haris (2014), knowledge is directly related to the level of involvement. These researchers asserted that if local community members are unaware of a poverty eradication programme, they are unlikely to participate in making it a success. Despite that, the same study (Kwok & Haris, 2014) revealed the lack of a relationship between knowledge of the SPKR project and the level of respondents' participation in the study location.

Participation in projects aimed at reducing poverty requires ongoing effort from both participants and poor communities. According to a study by Jalihah, Diana, and Rohana (2021), a marsh clam farming project in Kopunadan Village, Kudat, Sabah enjoyed active participation as soon as the programme was launched. Each project implementation process involves participant participation and allows participants the freedom to become involved in project planning and decision-making. Participants were given sufficient project information so that they could prepare to address any project constraints. The study discovered that participants built and strengthened networks with the project stakeholders to ensure the project's sustainability.

A gap analysis study conducted by Nor Aini and Doris (2012) on single mothers in Peninsular Malaysia discovered four major issues related to projects in which this group was involved. First, project forms were incompatible with the participants' ages. Second, the short duration of the programmes made it difficult to deliver information effectively. Third, non-attendance at organised programmes was due to participants' lack of social support to manage the care of their small or chronically ill children. Finally, participants were uninterested in participating in the programmes due to a lack of knowledge about the programmes that had been introduced. The previous studies discussed in this paper clearly demonstrate the importance of participants' involvement in any project introduced to them. Participant involvement is more meaningful and effective when they understand a project in which they are involved. Thus, each participant's commitment and caring attitude must be fostered so that they can be better prepared to face challenges, as well as maintain and develop the potential of the project in which they participate.

RESEARCH METHODOLOGY

The qualitative method was used in this study. Data was gathered through interviews and field observations. Interviews were conducted with two field officers and an eKasih officer, all of whom were directly involved with the PII-HEP project, using a structured interview framework. Each interview lasted between 30 and 40 minutes. The interview data was then manually transcribed and analysed to enable an in-depth interpretation of the data as well as an exploration and search for meaning (Othman, 2009). Because the interviews were conducted in a structured manner, the main themes of the conversations were identified in advance; these included (i) the role of agencies in implementing poverty eradication projects; (ii) the challenge of implementing a project; and (iii) experience with previous poverty alleviation projects. Recognising that sources from documents can support, add evidence to, and confirm information obtained through interviews and observations, documents were also employed as data. A review was carried out of documents such as written reports prepared by field officers, poverty statistics in Sabah from the Tuaran eKasih Unit, and the Malaysia Plan. In this study, the PII-HPE poverty eradication project was discussed in reference to the issues and challenges faced by two localities - Penimbawan Village, Tuaran and Bongkol Village, Pitas - from the perspective of the implementing agency. These two areas were chosen because the PII-HPE project participants in these areas had been working on the project for over five (5) months at the time the study was conducted. Additionally, these two study areas were among the first places in Sabah to receive this project, which aimed to increase incomes.

FINDINGS AND DISCUSSION

The discussion of the study's findings is divided into two main sections. The first discusses poverty and the history of the PII-HPE project in Sabah, Malaysia. Then, the second focuses on the issues and challenges linked to PII-HPE in this state, with particular emphasis on two locations: Penimbawan Village, Tuaran, and Bongkol Village, Pitas.

POVERTY AND THE BACKGROUND OF THE PII-HPE PROJECT IN SABAH, MALAYSIA

Poverty is a serious issue in Sabah, especially given that this state had the highest absolute poverty rate in Malaysia in 2019 and 2020. As shown in Figure 1, the incidence of absolute poverty in Sabah increased from 19.5% in 2019 to 25.3% in 2020. According to records, Sabah has had the highest incidence of absolute poverty in Malaysia since 1997 (Department of Statistics Malaysia, 2023). Meanwhile, eight of the ten poorest Malaysian districts in 2019 were in Sabah, with an average poverty line income of RM2,537 (12th Malaysia Plan, 2021-2025). Many poverty eradication projects have been implemented in Sabah, but

the question remains why poverty remains prevalent in the state. According to Ragayah (2002), this high poverty rate is due to several factors, including a lack of infrastructure, the presence of foreigners, and the difficulty of accessing the geographical interior.

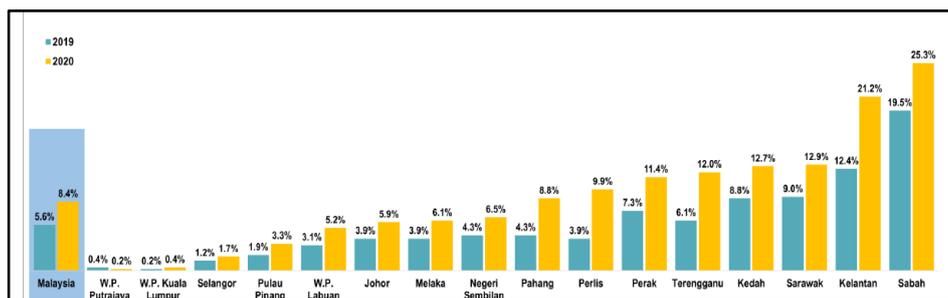


Figure 1: Absolute Poverty Incidence by State in Malaysia, 2019 & 2020
 Source: Department of Statistics Malaysia, 2020

The data also shows that the number of poor and hardcore poor heads of households in Sabah has increased in recent years. In 2019, for example, a total of 16,938 heads of households were listed as hardcore poor, while 21,373 heads of poor households were recorded in the eKasih system (Implementation Coordination Unit, 2019). However, as shown in Table 2, this number had increased by more than 100% by 2023, bringing the total number of heads of poor households to 48,277. The number of heads of hardcore poor households also increased, rising to 23,260 in the same year. The eKasih officer explained the increase in this number as follows:

To get help, people now apply and fill in eKasih form. Everyone is rushing to complete eKasih. Even we discovered cases of falsified information. Following COVID-19, the government intends to provide assistance in the form of cash money. Many people are applying. There may not be many if there is no COVID-19.

As a result, the increase in the number of both poor and hardcore poor heads of households in this state appears to be related to the perception that eKasih registration entitles people to government assistance, including financial assistance. Table 2 shows the number of poor and hardcore poor heads of households by district in Sabah. Over 1,000 people were recorded as hardcore poor heads in 11 districts. As recorded in Table 2, the Pitas district had the most hardcore poor with 1,761 (7.6%) such heads of households, followed by Kudat with 1,735 (7.5%). Both these districts are in the northern region of Sabah.

Kalabakan, on the other hand, had the fewest hardcore poor, with only 70 heads of households.

Table 2: Total of Poor and Hardcore Poor Heads of Households by District in Sabah, 2023 (Until 31 May, 2023)

Number	District	Poor	Hardcore Poor	Total
1	Beaufort	2,111	793	2,904
2	Beluran	1,710	1,114	2,824
3	Kalabakan	379	70	449
4	Keningau	2,445	1,478	3,923
5	Kinabatangan	1,258	487	1,745
6	Kota Belud	3,194	1,322	4,516
7	Kota Kinabalu	2,408	811	3,219
8.	Kota Marudu	2,972	1,309	4,281
9.	Kuala Penyu	790	368	1,158
10.	Kudat	2,727	1,735	4,462
11.	Kunak	759	324	1,083
12.	Lahad Datu	1,569	935	2,504
13.	Nabawan	1,955	776	2,731
14.	Papar	1,893	676	2,569
15.	Penampang	635	254	889
16.	Pitas	2,725	1,761	4,486
17.	Putatan	396	95	491
18.	Ranau	2,101	1,345	3,446
19.	Sandakan	2,622	1,361	3,983
20.	Semporna	2,490	1,543	4,033
21.	Sipitang	767	221	988
22.	Tambunan	1,027	349	1,376
23.	Tawau	2,900	995	3,895
24.	Telupid	501	268	769
25.	Tenom	1,772	1,118	2,890
26.	Tongod	1,332	661	1,993
27.	Tuaran	2,839	1,091	3,930
Total		48,277	23,260	71,537

Source: eKasih, Implementation Coordination Unit, 2023

The People's Income Initiative (PII) project began on December 6, 2021, with an announcement by the ninth Malaysian Prime Minister, and was then known as the *Keluarga* Malaysia Hardcore Poverty Eradication Programme (BMTKM). This programme was renamed as the Eradicate Hardcore Poverty Programme (EHPP) on December 20, 2022. To ensure the improvements were then made to the existing programme, the name was changed again on February 24, 2023, to the People's Income Initiative (PII). This was due to a change in the Malaysian government between 2021 and 2022. Despite this, the government has

continued to fund the poverty-aid programme. Under the PII, four main initiatives to eradicate poverty and increase income were introduced: the Agricultural Entrepreneur Initiative (INTAN), the Food Entrepreneur Initiative (INSAN), the Service Operator Initiative (IKHSAN), and the Eradicate Hardcore Poor (EHP) Project. According to the tenth Malaysian Prime Minister, this initiative was implemented to empower the poorest to increase their income in a sustainable manner.

The eradication project, which is being led by the Ministry of Economy as coordinator and facilitator, is the first to include public universities as strategic partners. There are various parties have collaborated in the PII project, including ministries and implementing agencies, the private sector, government-linked companies (GLCs), civil society organisations (CSOs), and community-based organisations (CBOs). This strategic collaboration aims to ensure the long-term viability of the implementation of the PII by taking into account the target group's exit policies after the project's initial two-year period. The appointment of field officers in each locality/district is another intriguing strategy. Their presence is anticipated to benefit the official monitoring and sustainability of projects aimed at reducing poverty. The direct involvement of public universities in the IIP-PII-HPE project at the grassroots level is also important in ensuring that the responsibility of poverty eradication is shared by all parties, including academics. Their role as strategic partners shows academic contributions begin at the early phase of a project rather than being limited to researchers assessing a completed project.

In general, this project employs a new approach to eradicating poverty that is whole-of-nation, bottom-up (local problem, local solution), and targeted, rather than one-size-fits-all, through integrated action at the federal, state, and district levels. This new approach, introduced through the implementation of PII-HPE, is critical because each state and district in Malaysia is at a different level of development (Ishak & H. Osman-Rani, 1996). In Sabah, a total of ten localities were identified as potential participants in the PII-HPE pilot project, with priority given to districts listed as Malaysia's poorest (12th Malaysia Plan, 2021-2025). Table 3 shows that six of these pilot PII-HPE localities are villages in Sabah's poorest districts: Pitas, Tongod, Beluran, Kota Belud, Nabawan, and Kota Marudu. In total, 322 hardcore poor heads of households are involved in the pilot project in Sabah. Of the total hardcore poor heads of households involved in this pilot project, 39 (12.1%) were from Bongkol Village, while 23 (7.1%) were from Penimbawan Village.

PII-HPE participants from Penimbawan Village, Tuaran, are involved in three types of projects, while those in Bongkol Village, Pitas are involved in and eight projects. However, for the purposes of this study, three projects in Bongkol Village are highlighted: the Goods Delivery Service Project (nine

participants), the Vegetable Sales Project (three participants), and the Standard Chicken Sales Project (six participants).

Table 3: Number of PII-HPE Pilot Project Participants by Localities in Sabah (Phase 1)

Localities	Name of District	Number of Participants (%)
1. Kg. Bongkol	Pitas	39 (12.1%)
2. Kg. Pinangah	Tongod	42 (13.0%)
3. Kg. Sembirai	Kota Belud	36 (11.2%)
4. Kg. Tetabuan	Beluran	19 (5.9%)
5. Kg. Lima	Nabawan	38 (11.8%)
6. Kg. Tandek	Kota Marudu	22 (6.8%)
7. Kg. Kaingaran	Ranau	35 (10.9%)
8. Kg. Pelakat	Sipitang	24 (7.5%)
9. Kg. Binsulok	Membakut	44 (13.7%)
10. Kg. Penimbawan	Tuaran	23 (7.1%)
TOTAL		322 (100.0%)

Source: iBox System, 2022

However, the discussion of Penimbawan Village emphasises the Fishing Equipment Project (13 participants). These PII-HPE projects are one-off schemes. Since the project participants are the hardcore poor heads of households, the overall poverty eradication project provides all project participants with a complete package, including a physical business site, capital, equipment, and training/courses related to the project.

PII-HPE ISSUES AND CHALLENGES IN SABAH: A PRELIMINARY ASSESSMENT

According to the findings of this study, the issues and challenges related to the implementation of PII-HPE in Sabah occur at multiple levels and involve participants and stakeholders. A study of the PII-HPE participants in the two localities revealed two distinct groups of participants, based on their commitment to the project. Some had actively carried out the PII-HPE project immediately after it was distributed, whereas passive participants had postponed its implementation.

Fostering a Poverty Culture

Cultural factors have long been believed to play a significant role in amplifying the negative aspects of the lives of the poor. Lewis (2010) argued that the nature, behaviour, and practices of the poor include giving up, being indifferent, and surrendering to fate, causing them to remain in poverty (Lewis, 2010). Although understanding poverty from a cultural perspective has been criticised on a global

scale, the issue of poverty remains closely related to culture in Malaysia (Asnarulkhadi, 2010; Chamhuri, 2004). According to research in the two localities mentioned in the current study, some participants had yet to begin their respective projects, despite the equipment having been handed to them nearly a month before. One participant was even yet to remove the outboard engine from its packaging, as discovered during a mapping project in Penimbawan Village. When asked why he had not been out to sea, the participant cited the uncertain weather, even though other participants were already using the same fishing equipment a day after it was handed to them. A key determining factor in the success of a poverty alleviation project is the attitude and commitment of the participants. Procrastination and/or refusal to start a project without reasonable cause should be avoided. A poverty of attitude is evident (Asnarulkhadi, 2010), which necessitates a positive attitude shift (Chamhuri, 2004).

Prioritise and Focus on Existing Jobs

Since the projects differ in comparison to the prevalent economic activities performed by the participants, the latter tend to prioritise their respective main occupations. This was identified among the Goods Delivery Service Project participants in Bongkol Village, all of whom used PII-HPE motorcycles to perform jobs linked to tapping rubber and palm oil. As a result, no income was recorded for the participating project. According to a field officer informant:

Yes, it [using the motorbikes] has an impact on income from the PII-HPE project, but they earn income from their existing job. Some, like the Goods Delivery Service Project participants, are employed as rubber tappers and labourers in palm oil estates. These participants do not have time for the PII-HPE Project. Most of the participants have jobs other than the PII-HPE Project, so they are unable to focus solely on PII-HPE.

Nonetheless, the usage of motorcycles facilitated participants' travel to their primary work. This was because before participating in the PII-HPE Project, some did not have their own automobile and had to ride in vehicles belonging to other villagers. Even though this behaviour does not comply with the PII-HPE goals, this initiative adds value in terms of participant property ownership and transportation to the workplace.

Lower Participant Commitment in the PII-HPE Project

Seriousness, commitment, and interest are essential components for overcoming the problems that arise when working on a project. Previous research has shown that these three characteristics can help participants to avoid a project's difficulties. Furthermore, the three factors assist participants in exploring new

options to ensure the survival of the project in which they are involved. However, an interview with one informant revealed that most participants in the Goods Delivery Service initiative were less dedicated and less interested in putting the initiative into action. According to the informant:

We prepared a schedule for Goods Delivery Service participants, at least once a week if they are extremely busy. However, they found the schedule difficult to follow... [and] they do not collaborate.

The Uses of Project Equipment for the New Income-Generating

The usage of project equipment to generate new income was discovered in the first phase of the PII-HPE projects. This study found that equipment misuse occurred among the participants of the Fishing Equipment Project in Penimbawan Village, Tuaran. Boats and engines for the PII-HPE project had been utilised for water transportation that earned up to RM300 per day. The field officer revealed that transporting passengers by boat was carried out when the participants did not go out to sea. This was confirmed through income reports submitted to field officers which showed that within a week, participants went fishing as well as boatmen for water transportation ('grab water') around Penimbawan village to Serusup Jetty. Despite that, rumours also revealed that some participants had sold project equipment, but the validity of this information cannot yet be confirmed.

ISSUES AND CHALLENGES OF IMPLEMENTING AGENCIES

This study discovered three issues and challenges faced by the implementing agencies in regard to the PII-HPE project in the two localities.

Field Officers

An important approach in the newly introduced IIP Project is the appointment of field officers, who help to coordinate and monitor the project, as well as conduct engagement sessions in designated localities. In other words, the field officer is the point of liaison between the District Office-Ministry of Economy-IIP participants. They are also knowledgeable about every aspect of the IIP project in a specific locality/district. Although the PII-HPE projects are still in the early stages of implementation, this study discovered that participants were less obedient to the orders given by field officers. For example, some participants had not commenced the project despite being asked to do so by a field officer. The presence of field officers is projected to result in significant changes in project monitoring and the achievement of the goal of eliminating hardcore poverty. Field officers, on the other hand, are typically fresh graduates with minimal work experience. One field officer described the situation as follows:

Sometimes it's hard because we are young, so they [the project participants] do not listen and follow our instruction

During the mapping hardcore poor process, the researchers discovered that the field officers have varying levels of expertise and ability. The majority of them are dedicated and sincere in their work. However, on average, they lack the ability to approach participants and address issues that occur at the local level. As a result, training is needed to improve the skills of field officers and thus establish a group of trained personnel.

Insufficient Supply of Sale Goods

One duty of the agency partners in the PII-HPE projects is to supply products for sale by participants. Aside from selling materials, agencies also assist in offering advice, guidance, and assisting the marketing of products generated by participants. The Rural Development Cooperative (KPD) is a state partner agency for the Standard Chicken Sales Project in Bongkol Village, Pitas. This agency sells chicken at a lower price to participants so they can profit from selling the chicken. However, this study revealed that participants were faced with an intermittent supply of chicken from this state partner agency, which prompted the latter to obtain chicken stock from other sources. One field officer described the problem as follows:

The Rural Development Cooperative chicken supply is inconsistent. As a result, participants acquire stock from other sources and are forced to sell at a premium. When the partner agency restocks, participants sell cheaply. Customers can be confused for a long time because prices alter in an instant.

Since the chicken supply is purchased at a higher price, this affects the profit received by the participants. A field officer explained the difficulties in profiting from the agency's limited chicken stock:

If supplies are obtained from KPD, the participant sells at RM27 per kilogram, making an RM5 profit. Taking stock from other places is expensive; yet, it is often lucrative for participants to take it for only RM1 per kilogram.

Sustainability of Projects without Agency Monitoring

The ability of poverty eradication project participants to sustain their project without the supervision of implementing agencies has been questioned. This study demonstrates that PII-HPE projects participants in both Penimbawan Village and Bongkol Village started to focus less and limit their involvement in their respective projects. Concerns about project sustainability have emerged as

major challenges in all forms of development programmes, including poverty reduction initiatives. The capability of development projects to survive and move forward independently is frequently questioned in development studies. One argument is that the community or participants could not continue a post-monitoring project due to a lack of financial resources to procure supplies and independently market their goods/products. Participants' motivation and dedication also fluctuate, which can cause them to lose focus and interest in the project. As a result, a project might come to a halt and fail.

CONCLUSION

The heads of hardcore poor households involved in the PII-HPE projects consist of those who inherited a poor lifestyle from their respective families. Therefore, lifting this group out of the poverty trap requires a comprehensive approach that must include developing and improving their capacity as project participants. Hard work, determination, devotion, and competitiveness must be nourished and cultured from the early stage of any project. All these positive behaviours can produce individuals who value government aid, which can impact the increase in their household incomes and lift them out of hardcore poverty. It is believed that, based on this study, the presence of field officers specifically designated to oversee and administer IIP initiatives can benefit PII-HPE project participants by guiding, supervising, and ultimately increasing their involvement. The implementation stage of a project to eradicate poverty is just as vital as the other stages. At this point, active participation and monitoring of participants are essential to ensure the success of the project.

Moreover, the implementing agency must address the issues and challenges encountered by participants, field officers, and agency partners from the start of all PII-HPE projects in Sabah. This is critical to ensuring that concerns that could stymie a project's success and sustainability are addressed from the outset. If participants' attitudes and commitment are not wisely and properly dealt with, the government's investment in poverty eradication projects, particularly among Malaysia's hardcore poor, may be unsuccessful. A monitoring team comprised of field officers also needs ongoing training to function effectively in the field and engage constructively with hardcore poor communities. Poverty eradication efforts are the responsibility of all parties, not just the impoverished.

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TRANSIT ORIENTED DEVELOPMENT (TOD) FOR EARLY-BUILT RAIL-BASED TRANSIT STATIONS: POSSIBLE OR PLAUSIBLE?

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Abstract

Transit Oriented Development (TOD) embraces many principles, and is believed to be beneficial in tackling the issues of urban transportation. Some of the main dilemmas are urban accessibility, traffic congestion, and the efficacy of the public transportation system. In Malaysia, the TOD concept was introduced in 2005, much later after Calthorpe embarked on the idea. Rail-based public transport emerged much earlier in Malaysia to meet the demands for public transportation. To date, it is still debatable whether these transit stations deliver on the principles of TOD. Hence, to determine that, this study examined two transit stations that were developed way before the TOD concept was executed in the country. The aim was to evaluate the core areas of Subang Jaya Commuter Station and Tun Sambanthan Monorail Station, based on their components and features, in relation to TOD principles, and to examine the possibility of these early-built transit stations in becoming an ideal TOD. The study evaluated the land use components using the Case Study Method, together with the existence of several principles, namely “connectivity”, “facilities”, “safety” and “comfort”. Results indicated that both transit stations reflect some of the TOD measures, but these are not comprehensive throughout the 400m radius of the core areas. The stations have potential, but require a systematic approach to achieve TOD ideals since both areas are saturated with development, and making changes to land use may not be straightforward.

Keywords: Transit Oriented Development (TOD), Rail-Based, Transit Station, Land Use, Public Transportation

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BACKGROUND

Accessibility has become one of the many urban issues in developing countries including Malaysia. Among those issues are the perpetual traffic congestion, and weak public transport systems (Tsumita et al., 2023). Tsumita et al. (2023) also mentioned that Transit Oriented Development (TOD) is important alongside rail corridors in order to achieve equitable rail transit accessibility to all areas. They also believe that the efficiency of the transport system relies on not only the system itself, but also mixed land use. Additionally, TOD plays an important role in solving the issue of urban sprawl, which often affects the municipal budget, environment, transportation, and housing (Mathur & Gatdula, 2023). However, the question of how effective TOD is in Malaysia is raised especially since it is considered a new effort.

The basis of TOD is its direct connection to a transit station within one-half of a mile (Mathur & Gatdula, 2023), hence encouraging walking and cycling, and discouraging the use of private vehicles. Nevertheless, implementing TOD requires improvements in transit ridership, carbon emissions, and traffic congestion. Thus, to reduce the need for private vehicles, there is much need for the integration of the public transport system and land use (Yen, Feng & Lee, 2023). Even though TOD is claimed to be an effective tool for sustainable development, obtaining funding may be a challenge.

TOD and Land Use

TOD is believed to be a planning approach that incorporates land use with public transportation, which considers the development surrounding the stations (Yen, Feng & Lee, 2023). It was claimed that, when it was introduced in the 90s, land use, density, and walkability were the three (3) key strategies in the TOD design. In addition, Boarnet and Crane (2001) mentioned that TOD's paramount transportation objective is coordinating land use policies to facilitate transit stations.

When TOD was introduced, the idea was to pay greater attention to sustainable community development surrounding the transit stations. TOD therefore combines various forms of development, including housing, commercial or retail, offices, recreational areas, and public facilities (Chen et al., 2023). Additionally, Abdullah et al. (2022) agreed that land use planning is imperative when designing a TOD as it will influence the performance of the TOD. The land use arrangement of a TOD affects people's movement patterns, and by walking, it ensures that a variety of activities are also accessible. Scholars suggest that the essential principles of TOD consider the elements of connectivity, walkability, safety, distance, mixed-use, comfort, density, transit, cycling, compactness, active activities, and facilities (Mathur & Gatdula, 2023; Transit Oriented Development Institute, 2021; The World Bank Group, 2021;

Alter, 2020; Institute of Transportation and Development Policy, 2013; Reconnecting America Organization, 2008).

The aim of this paper was therefore to investigate the existing components and features of transit stations in Malaysia that were developed before the TOD concept was introduced, and to examine the possibility of these areas becoming an ideal TOD. To achieve this, several indicators were identified for investigation as described in the methodology section below.

METHODOLOGY

This study aimed to examine the transit stations in the country that were built before the TOD concept was introduced for TOD criteria and indicators. The purpose was to evaluate whether the transit stations reflect and possess the elements of an ideal TOD. Hence, to create a functional TOD, it is suggested that the peripheral areas around the transit stations be considered for any future new area development or revitalisation. In Malaysia, the application of TOD was first mentioned in 2005 in the Malaysia National Physical Plan, and later encouraged again in the National Physical Plan 2010 (Azmi et al., 2021; Ministry of Urban Wellbeing, Housing and Local Government Malaysia, 2016).

The study employed a Multiple Case Study design with two (2) transit stations in the Klang Valley, i.e., Tun Sambanthan Monorail Station, and Subang Jaya Commuter Station. The reason for having two (2) different transit stations was to examine the similarities and differences of rail-based TOD, and to capture the distinct features of each of these stations that were established long before the idea of TOD was put forth in Malaysia.

Subang Jaya's spatial arrangement started in 1974 when Sime UEP Properties Berhad transformed the rubber plantations into a new township. However, the railway connecting Kuala Lumpur to Klang had already been built in 1886. The Subang Jaya Commuter Station itself was opened in 1995. Meanwhile, the urban surroundings of the Tun Sambanthan Monorail Station (including Brickfields) had emerged during the colonial era when the British brought in the Indians to build the railways. The Tun Sambanthan Monorail Station began operations in 2003. Through conventional planning, the area eventually became developed though the concept of TOD was not implemented as it had not yet been introduced then. The Subang Jaya Commuter Station, and Tun Sambanthan Monorail Station were therefore designed to meet the current demands at the time, especially public transportation.

In conducting the investigation, aside from the specifications, criteria, and standards outlined by other scholars, the study referred to the essential TOD guideline by the Malaysian Department of Town and Country Planning (2018) since it addresses the local context, urban settings, and requirements. The main indicator in this study was the boundary of the study area. The approach was to

conduct a detailed investigation at the sites by assessing the land-use components within a 200-metre, and 400-metre radius from the transit stations.

According to the Department of Town and Country Planning (2018), a 400-metre span from the transit station is considered the core area of a TOD, or classified as the *Transit Influence Zone*, whereby it has an impact on the surrounding areas. The 400m zone is also identified as a high-intensity territory, and should therefore be the centre of economic, administrative, employment, residential, and cultural activities (Figure 1). Demarcating this perimeter was necessary to evaluate the facilities closest to the transit stations.

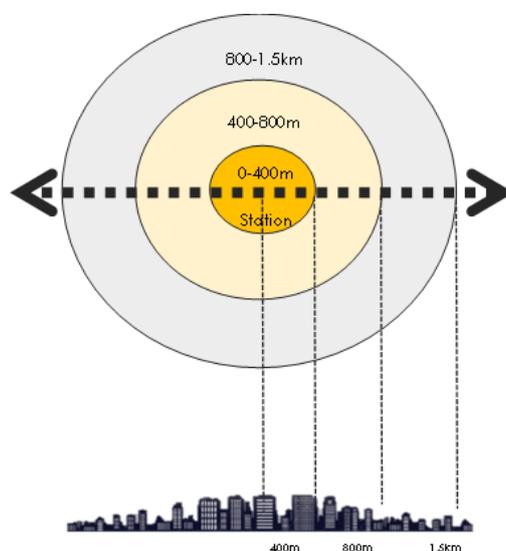


Figure 1: The radius of the study area covers the 400-metre territory from the transit station classified as the “Transit Influence Zone”
Source: Department of Town and Country Planning (2018)

The guideline also suggested the provision of feeder bus services equipped with the supporting facilities. In this manner, several indicators involving the type of land use, in accordance with the guideline, were applied for assessment, including residential areas in proximity, commercial buildings, and public facilities. According to scholars, there are many principles and criteria for an ideal TOD (Figure 2). However, for this study, in order to evaluate the functionality of the transit station facilities, only four principles were selected, namely “*connectivity*”, “*facilities*”, “*safety*”, and “*comfort*” since transit stations are deemed ideal if the elements meet these specific needs of users. These four (4) principles were chosen because they influence human emotions, senses, and

satisfaction. Subsequently, these principles were then itemised according to indicators (attributes).

The inspection limit of this site investigation was a radius of 400 metres from the transit stations, which constitutes the Transit Influence Zone as referred to in the local TOD Guideline. The analysis of these sites was divided into two (2) parts. The first part targeted the composition of the land use within the 400-metre boundary. This included evaluating the supporting facilities and amenities in the vicinity of the stations. The second part evaluates the extent of their compliance to and weaknesses in the TOD (in terms of the existence of indicators) as put forward by the Department of Town and Country Planning (2018). For this study, the existence of these elements within the radius of 100m, 200m, 300m, and 400m was investigated. By doing so, the outcome of this study would convey the potential of both transit stations in achieving ideal TOD practice. For each transit station, the site investigations involved observation and inspection of the existence of the four (4) principles within the 400-metre radius.

Connectivity	Walkability	Safety	Distance
Mixed-use	Comfort	Density	Transit
Cycling	Compact	Active	Facilities

Figure 2: The TOD principles selected for the study – Connectivity, Facilities, Safety, and Comfort

Source: Mathur and Gatdula (2023), Transit Oriented Development Institute (2021), The World Bank Group (2021), Alter (2020), Institute of Transportation and Development Policy (2013), and Reconnecting America Organization (2008)

FINDINGS AND DISCUSSION

Existing Composition of Land Use Surrounding the Transit Stations

With reference to the TOD Guideline by the Department of Town and Country Planning Malaysia (2018), the study revealed several similarities and differences between the Subang Jaya and Tun Sambanthan transit stations. Since the spatial arrangements for both areas were made before the transit stations were built, it is no surprise that development was focused on housing and commercial.

For both stations, residential areas were one of the land use components. However, Subang Jaya only has medium and high-cost houses, while Tun Sambanthan only has low-cost houses (Table 1). This does not indicate an ideal TOD concept since TOD should promote inclusivity, whereby for example, in Subang Jaya, even though there are apartments, clusters, and terraced houses, there should be more variety in the types of housing available in the core areas.

Apart from residential areas, both the transit stations cater to a variety of business activities. However, both stations do not have food and beverage shops, and Tun Sambanthan does not have a shopping centre close to the station, but has more commercial areas with retail, and professional and private services. In reference to the TOD guideline too, one of its principles is having a variety of commercial activities that provide more options for the people, and it seems that Tun Sambanthan meets this requirement to a certain extent. Nevertheless, further investigations could be made on the supporting facilities surrounding both these core areas in terms of the compactness of the design and implementation. The following discussion determines whether the two stations match the ideal.

Figures 3 and 4 below demonstrate the land use composition within 400 metres of both transit stations. From the site observation, it was found that Subang Jaya only has a recreational area beyond the 200m range whereas Tun Sambanthan has public facilities nearby, and a recreational area and public space at the 200m and 400m range respectively. The Subang Jaya Commuter Station is surrounded by residential areas, and commercial and recreational areas throughout the 400-metre radius with 40% of the total land use taken up by commercial buildings. Meanwhile, the Tun Sambanthan Monorail Station has more public facilities instead of housing and commercial. Nonetheless, both stations do not have administrative institutions, but have core areas taken up mostly by commercial establishments in Subang Jaya, or public facilities in Tun Sambanthan. In this sense, it cannot be concluded that both stations portray a good mix of activities since only certain activities are concentrated within the core areas.

Table 1: Land-Use Components

LAND USE COMPONENTS		Subang Jaya Commuter Station		Tun Sambanthan Monorail Station	
		200m radius	400m radius	200m radius	400m radius
Housing	Bungalow	X	X	X	X
	Cluster	X	/	X	X
	Terrace	/	/	X	X
	Low-cost apartment	X	/	X	/
Category of Housing	Low-cost	X	X	X	/
	Medium-cost	X	/	X	X
	High-cost	X	/	X	X
Commercial	Retail	X	/	/	/
	Private services	/	X	/	/
	Professional services	/	X	/	/
	Food & beverages	X	X	X	X
	Shopping centre	X	/	X	X

LAND USE COMPONENTS		Subang Jaya Commuter Station		Tun Sambanthan Monorail Station	
		200m radius	400m radius	200m radius	400m radius
Administrative Institutions		X	X	X	X
Public Facilities	Education	X	X	/	/
	Health	X	X	X	X
	Safety / Emergency	X	X	X	X
	Religious	X	X	X	/
	Community hall	X	X	X	X
	Recreation	X	/	/	X
Public space		X	X	/	X

Note: / Exists X Non-Existence



Figure 3: Subang Jaya Commuter Station
Source: PLAN Malaysia (2016)

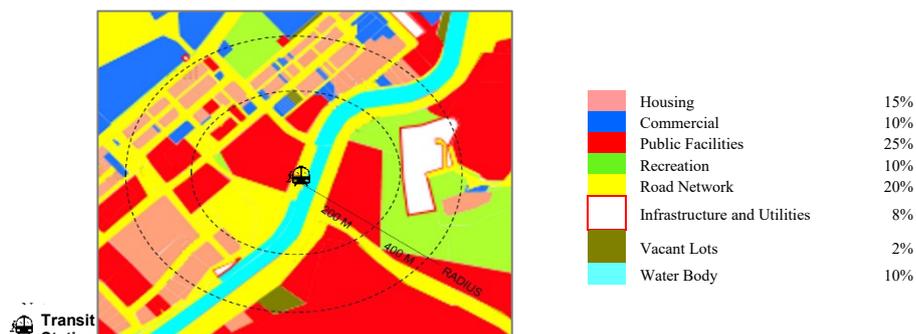


Figure 4: Tun Sambanthan Monorail Station
Source: PLAN Malaysia (2016)

Facilities for Pedestrians

The investigation included an assessment of the facilities for pedestrians at both stations. The existence of store sidewalks, walkway zones, special pedestrian walkways, covered paths, walkways, pedestrian bridges, and subways was evaluated (Table 2). Results showed that, within the radius of 300m, Subang Jaya transit station has more pedestrian facilities, but these become fewer after the 300m boundary. On the other hand, Tun Sambanthan has more variety of pedestrian facilities and paths closer to the station (within the 200m territory). For both stations, subways for pedestrians are not provided throughout the whole 400m span. Nevertheless, overall, pedestrian walkway zones are considerably adequate (Figures 5 and 6).

Besides paths for pedestrians, the results confirmed that there is also a lack of facilities for cyclists. In fact, Subang Jaya transit station does not cater well to cyclists, whereby bicycle lanes, and supportive facilities for cyclists are not provided within the 400m area. Meanwhile, Tun Sambanthan transit station only has bicycle lanes within the 300m range of the station (Table 2). In relation to the principles of TOD highlighted in Figure 2 earlier, these pedestrian paths and bicycle lanes are part of the four (4) principles, i.e., walkability, connectivity, facilities, and cycling. However, the two transit stations are observed to be far from achieving those principles. In order to embrace the TOD principles, the Subang Jaya Commuter Station, and its core area require improvement for pedestrians and cyclists. Tun Sambanthan, on the other hand, should concentrate on improving related facilities for cyclists since it already has on-road bicycle lanes with pedestrian paths side-by-side within its core area.

Table 2: Facilities for Pedestrians

FACILITIES FOR PEDESTRIANS	Subang Jaya Commuter Station				Tun Sambanthan Monorail Station			
	Metre Radius							
	100m	200m	300m	400m	100m	200m	300m	400m
Types of Pedestrian Paths								
Store pedestrian sidewalks	X	X	X	X	X	X	X	/
Walkway zones	/	/	/	/	/	/	/	/
Special pedestrian walkways (outside malls)	X	X	X	X	/	/	X	X
Covered pedestrian paths	/	X	X	X	/	/	/	/
Walkways	/	/	/	X	/	/	/	X
Pedestrian bridges	/	/	/	X	/	/	X	X
Subways for pedestrians	X	X	X	X	X	X	X	X
Existence of Indicators	4/7	3/7	3/7	1/7	5/7	5/7	3/7	3/7
Types of Bicycle Lanes								
Off-road bicycle lanes	X	X	X	XX	X X	X X X	X X	X X
Pedestrian paths and bicycle lanes (side by side)	X	X	X	X	/	/	/	X
Separated bicycle lanes	X	X	X	X	X	X	X	X
Controlled pathways (striped)	X	X	X	X	X	X	X	X
On-road bicycle lanes	X	X	X	X	/	/	/	X

FACILITIES FOR PEDESTRIANS	Subang Jaya Commuter Station				Tun Sambanthan Monorail Station			
	Metre Radius							
	100m	200m	300m	400m	100m	200m	300m	400m
Shared pathways	X	X	X	X	X	X	X	X
Existence of Indicators	0/6	0/6	0/6	0/6	2/6	2/6	2/6	0/6

Note: / Exists Non-Existent



Figure 5: Subang Jaya Commuter Station offers more pedestrian facilities within the 100m to 400m radius



Figure 6: Tun Sambanthan Monorail Station has fewer facilities for pedestrians compared to Subang Jaya Commuter Station

Conforming to the Principles of Connectivity, Facilities, Safety, and Comfort

Apart from the composition of land use, and the provision of facilities for pedestrians and cyclists, the appraisal also included analysing other principles, which are “connectivity”, “facilities”, “safety”, and “comfort”. As described earlier in the methodology section, there are many principles for an ideal TOD that have been quoted by scholars. However, for this study, only several principles were adopted for evaluation. This is acknowledged as a limitation of the study that is due to the limited capacity of the researchers, and the intended purpose of the study.

Table 3 below conveys the results of the assessment. For each principle, specific indicators were referred to for the evaluation. For “connectivity” and “facilities”, the indicators measured were the continuity of pedestrian paths, accessibility, and facilities for connectivity. Results revealed that, for both stations, the pedestrian paths have good connectivity, and easy accessibility. Also, both transit stations have a bus stop at each range of distance (100m to 400m radius). However, Subang Jaya has additional issues because it does not have any bicycle lanes or ramps, or parking spaces for cyclists. Tun Sambanthan, on the other hand, has bicycle lanes, but does not provide parking space for bikes. Moreover, the cycling lanes within Tun Sambanthan’s core area only cover the 300m span (also stated in Table 2 earlier).

Table 3: Existence of *Connectivity, Facilities, Safety, and Comfort* indicators

INDICATORS (EXISTENCE OF)	Subang Jaya Commuter Station				Tun Sambanthan Monorail Station			
	Radius (metre)							
	100	200	300	400	100	200	300	400
CONNECTIVITY AND FACILITIES								
<i>Indicators</i>								
Continuity of pedestrian paths	/	/	/	/	/	/	/	/
Easy access	/	/	/	/	/	/	/	/
Bus stops	/	/	/	/	/	/	/	/
Bicycle lanes/bicycle ramps	X	X	X	X	/	/	/	X
Parking areas (for bicycles)	X	X	X	X	X	X	X	X
Connecting/Overhead bridges	/	X	/	X	/	/	X	X
Total Indicators	4/6	3/6	4/6	3/6	5/6	5/6	4/6	3/6
SAFETY								
<i>Indicators</i>								
Pathways without obstacles	/	X	/	/	/	/	/	/
Signage	/	/	/	/	/	/	/	/
Warning signs	X	/	/	/	/	/	/	/
Pedestrian traffic lights	/	/	X	/	X	/	/	/
Striped tracks	/	/	/	/	/	/	/	/
Refuge islands/cut through the median	/	/	/	/	X	/	X	X
Bollards	/	/	/	/	/	X	X	X

INDICATORS (EXISTENCE OF)	Subang Jaya Commuter Station				Tun Sambanthan Monorail Station			
	Radius (metre)							
	100	200	300	400	100	200	300	400
Streetlights	/	/	/	/	/	/	/	/
Diverse pathways	/	/	/	/	/	/	/	/
Universal design	/	X	X	X	/	/	/	/
Dedicated lanes for cyclists	X	X	X	X	/	/	/	X
Total Indicators	9/10	9/10	9/10	9/10	8/10	9/10	8/10	8/10
COMFORT								
<i>Indicators</i>								
Covered pedestrian paths	/	/	/	X	/	/	X	X
Wide paths	/	/	/	/	/	/	/	/
Clean environment	/	/	/	/	/	/	/	/
Landscape	/	/	X	X	/	/	X	/
Waiting area at the focus point	/	/	/	/	/	/	/	/
Pocket parks/rejuvenate points	X	X	X	X	/	/	/	X
Seating	/	X	X	X	/	/	X	X
Art and information	/	/	X	X	/	/	X	X
User-friendly elements	/	X	X	X	/	X	/	/
Attractive design of facilities	X	X	X	X	X	/	X	/
Flat pathway surface	/	/	/	/	/	/	/	/
Total Indicators	9/11	7/11	5/11	4/11	10/11	10/11	6/11	6/11
Note: <input type="checkbox"/> Exists <input checked="" type="checkbox"/> Non-Existent								

In terms of the “safety” aspect, both stations feature almost all the indicators within the 400m boundary (Table 3). For both stations, signage, striped tracks, and streetlights are scattered throughout the core areas. Thus, generally, the safety aspect is not a striking issue for both although the only major change might probably be for Subang Jaya’s core area to focus on universal design. When analysing “comfort”, the results proved that comfort was lacking beyond the 300m distance from the stations because many elements (facilities) do not exist further from the stations, like seating, art and information, and covered pedestrian pathways (Table 3). This applies to both stations, but they differ in terms of the indicators. Subang Jaya Commuter Station revealed more non-existing indicators than Tun Sambanthan, with a lack of pocket parks, seating, user-friendly elements, and attractive design facilities. Despite that, the study cannot label Subang Jaya as an unpleasant place or space because the judgement very much relies on the users’ preference, which was not part of the scope of this study. Nevertheless, in general, it can be concluded that, based on the site observation, Tun Sambanthan Monorail Station’s core area offers more comfort compared to Subang Jaya Commuter Station.

The Potential of Early-Built Transit Stations to Become Ideal TOD

Subang Jaya Commuter Station and Tun Sambanthan Monorail Station, to some extent, depict the fundamental principles of a TOD. Both stations indicated the presence of many features of a Transit Oriented Development. However, until proven, both transit stations cannot be claimed as bearing the ideal concept of a TOD. Clearly, both stations were built to meet the demands for public transportation during those days, much earlier before the rise of the TOD concept in Malaysia. The railways were part of the transportation network built alongside other development. And when the railways were built, housing and commercial activities were part of the urban setting, which is why these land uses are evident in the areas surrounding the stations.

With regard to whether the transit stations function according to the TOD guideline, it is noted that some elements do correspond with TOD indicators. Results substantiated the existence of mixed-use activities at Tun Sambanthan and Subang Jaya, whereby the living environment is combined with the commercial and work environments. The provision of land use, and the connections between them and the transit stations were seen as prearranged and interactive although the development of these areas were not originally designed as a TOD. Even though the TOD concept came much later, both Tun Sambanthan and Subang Jaya stations had already developed their own urban form and profiles to meet the demands and requirements of the public, hence the provision of facilities and other elements that make up its urban composition. By coincidence, those urban structures and components mirrored the principles of a TOD. It cannot be denied that, based on the findings, the transit stations portrayed the image of TOD based on some of the elements (indicators studied), with mixed-use development that is equipped with facilities although there was insufficient attention on facilities for pedestrians and cyclists. Nevertheless, most importantly, both transit stations have the characteristics of connectivity and facilities, safety, and comfort.

Regarding the potential of the two transit stations to become ideal TOD areas, the study has explored the current conditions of the stations, and while they have their strengths, they still require improvements in certain aspects. Subang Jaya Commuter Station, for example, critically needs bicycle lanes and their supporting facilities as they are required safety measures for cyclists. Apart from that, the station also requires some changes to transform the current environment into one that is more comfortable for the users. For now, Tun Sambanthan Monorail Station beats Subang Jaya in terms of facilities for cyclists, and comfort. Both Subang Jaya Commuter Station and Tun Sambanthan Monorail Station can be upgraded, and transformed to become the ideal TOD. Currently, some of the key characteristics of TOD are visible. Both stations showed the essential features of density, compactness, activity, walkability, and others. In short, both stations

have the potential to be TOD, but require a systematic approach to achieve it since both areas are saturated with development, and making changes to the land use may not be straightforward. Alternatively, approaches like revitalisation and enhancement may stimulate the transformation of early stations to meet the requirements of the TOD concept.

CONCLUSION

This study has examined the TOD potential of transit stations that were built in the past before the concept was realised in Malaysia. The study evaluated the existence of certain TOD principles at the stations within a 400m boundary, which then saw the function and potential of those stations to become an ideal TOD. Subang Jaya Commuter Station and Tun Sambanthan Monorail Station were selected based on their backgrounds, which fit the purpose of the study.

Both stations underwent several appraisals. The investigation involved assessing the land use within the study perimeters, and the provision of facilities for pedestrians and cyclists. In terms of land use, both transit stations portrayed several characteristics of a TOD: mixed-use of the land, and the existence of residential areas, with a range of choices of housing costs even though not comprehensive, as well as walkability, density, connectivity, and facilities. However, none of the stations totally conformed to all indicators tested. Subang Jaya lacked facilities for cyclists. On the other hand, Tun Sambanthan had facilities for both pedestrians and cyclists, but had issues with comfort. Both transit stations may reflect several features of an ideal TOD, but require further enhancement or revitalisation to meet its standards. To sum up, the two early stations have the potential to be considered TOD, but need a rather robust approach to achieve it. Therefore, it is suggested that further studies focus on the users' preferences and demands, with detailed studies on the land use to incorporate other elements like bicycle lanes, or pedestrian paths for more connectivity and accessibility. Besides that, future studies can also include the role of authority in enforcing this transformation for the purpose of upgrading public transportation, and its environment.

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DEVELOPMENT OF CUMULATIVE RAINFALL THRESHOLD FOR LANDSLIDE OCCURRENCE IN PENINSULAR MALAYSIA

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Abstract

Significant issues related to landslides are exposed tremendously in Peninsular Malaysia which have an impact on human beings, animals as well as properties. Reported over twenty-eight significant landslides taking place between 1993 and 2011 which resulted in more than 100 deaths in total. Most of the landslides are the consequences of accumulation of water in underground soil which is connected to rainfall threshold. To establish an empirical Cumulative-Duration threshold through linear regression, analysis of 69 landslide incidents undertaken as well as rainfall data sourced from Public Works Department (PWD) and Department of Irrigation and Drainage (DID) were collected. A comprehensive assessment of all gathered parameters conducted to achieve the confidential purpose of this research which is to determine the threshold for cumulative rainfall event duration which can be utilized in early warning systems and planning for future safety measures. Thus, correlation between rainfall patterns and landslide events are observed. Cumulative rainfall threshold produced an equation $E = 9D^{0.3335}$ with identical range of event duration $1 < D < 2448$ h which acts as a critical line of landslide occurrences. Validation of threshold was revised using recent landslide cases to acquire new threshold values to represent current rainfall induced landslides. The threshold serves as an early warning mechanism and planning to protect lives and property.

Keywords: Landslide, Rainfall Threshold, Rainfall Cumulative-Duration Threshold, Early Warning System, Peninsular Malaysia

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INTRODUCTION

A landslide is a type of gravitational erosion involves downward movement of rocks, debris or soil due to gravity's force (Cruden and Varnes, 1996; Hungr et al., 2013; Gariano, S. L. and Guzzetti F., 2016). Landslides, whether natural or human-induced, are a global concern causing casualties, property damage, habitat destruction, and other destructive consequences (Akter, A. et al., 2019). Various factors including steep terrain, soil moisture, climate conditions, and human activities can trigger landslides with additional triggers like seismic activity, volcanic eruptions, and flooding. They are often linked to factors like precipitation which can exacerbate their impact and risk (Mohd Yassin, N. A. et al., 2023).

Nevertheless, majority of slope failures are primarily preceded by heavy rainfall and high moisture levels in the soil that existed (Ray, R.L. et al., 2018; Lazzari, M. et al., 2018; Ray, R.L. & Jacobs, J.M., 2007; L. Ray, R., & Lazzari, M., 2020). Presence of water in soil profiles is a crucial factor in triggering landslides and impacting stability of rock slopes. The way slope reacts to rainfall in terms of hydrological features influenced by multitude factors and levels of water in catchment basin (Karam, K., 2005; Sousa, R. L. et al., 2020). In addition, presence of cliff erosion during rainfall season obstructed water flow resulting in an elevated reservoir level and flash floods (Md Saad, M. H. et al, 2023). In Malaysia, landslides are primarily linked to periods of rainfall which conjunction with monsoonal rainfall patterns (Mukhlisin, M. et al., 2015). During monsoon season, tropical climate and substantial monthly rainfall may reach up to 700 mm around Peninsular Malaysia (Batumalai, P. et al., 2023). Consequently, collection of rainfall records for extended period enhance reliability of empirical rainfall thresholds (Sen Zhang et al., 2023). Threshold parameter represents a rainfall index determined by amalgamation of rainfall intensity and cumulative rainfall (Ligong, S. et al., 2022). Rainfall threshold produced beneficial value in predicting landslide occurrences as an early warning system to ensure safety of lives and property (Adele Young et al., 2021; Yuniawan, R. A. et al., 2022; Won Young Lee et al., 2021). Therefore, landslide early warning systems recommended to be established in Malaysia according to empirical relationship between precipitation and landslide occurrences through threshold development (Jamaludin, S. et al., 2011; Maturidi, A.M.A.M. et al., 2020; Ligong, S. et al., 2022).

Study Area

Peninsular Malaysia occupies southern portion of Malay Peninsula in Southeast Asia as shown in Figure 1. It is part of Sundaland, which encompasses Borneo, Java, Sumatra, and connecting shallow seas with several smaller islands (Sani Ado Kasim et al., 2020; van Bemmelen, R.W., 1949). Geographically, it is

situated between latitudes of 6° to 1° N and longitudes of 100° to 105° E. It shares a border with Thailand in North, while to the south and southwest which across Strait of Malacca, adjacent to Singapore and Indonesian island of Sumatra. Peninsular Malaysia experiences a tropical climate characterized by two distinct monsoon seasons and an average annual precipitation of approximately 100 inches. Humidity levels remain high throughout the year with average temperatures ranging from 72°F to 90°F while cooler temperatures in mountainous regions ranging from 55°F to 80°F. Terrain of Peninsular Malaysia is characterized by a series of eight mountain ranges that run longitudinally from west to east (Sani Ado Kasim et al., 2020; J.B. Scrivenor, 1931).



Figure 1: Location Map of Peninsular Malaysia
(Sani Ado Kasim et al., 2020; van Bemmelen, R.W., 1949)

Over past five years (2013-2017), this area received an average annual precipitation of 3,000 mm as reported by Malaysian Department of Drainage and Irrigation (DID, 2018). Specifically, Table 1 shown eastern coastal areas of Peninsular Malaysia such as Terengganu and Kelantan have higher annual rainfall figures ranging from 2,900 mm to 3,600 mm in 2017. In contrast, other regions on western coast of Peninsular Malaysia have recorded lower average yearly rainfall value between 1,700 mm to 2,100 mm. Higher amounts in eastern coast contributes to occurrence of shallow landslides throughout entire region (Maturidi, A.M.A.M. et al., 2021).

Table 1: Mean Annual Precipitation for 5 Years in Peninsular Malaysia (2013 – 2017)
(DID, 2018; Maturidi, A.M.A.M. et al., 2021)

State	Mean Annual Precipitation for 5 Years (2013 – 2017), (mm)
Perlis	< 1850
Kedah	< 2500
Pulau Pinang	< 2500
Kelantan	< 2900
Perak	< 2300
Terengganu	< 3600
Pahang	< 2100
Selangor	< 2200
Kuala Lumpur	< 2800
Negeri Sembilan	< 1750
Melaka	< 1600
Johor	< 2000

Other than that, geological characteristics of Peninsular region in Figure 2 are categorized into Western, Central, and Eastern belts which based on differences in stratigraphy, structure, and variations in geological as well as geophysical features (Sani Ado Kasim et al., 2020; Metcalfe, 2012). The NNW (north and northwest) structural trends within Peninsular are defined by an alignment of lithological formations, bedding orientations, and planes of folds. Despite being generally stable in tectonic terms and having remained above sea level during the Cenozoic era, there are still limited tectonic activity including fault movements, uplift, tilting, and some localized gentle subsidence in the area (Sani Ado Kasim et al., 2020; P.H., Stauffer et al., 1973; D.J. Gobbett et al., 1973].

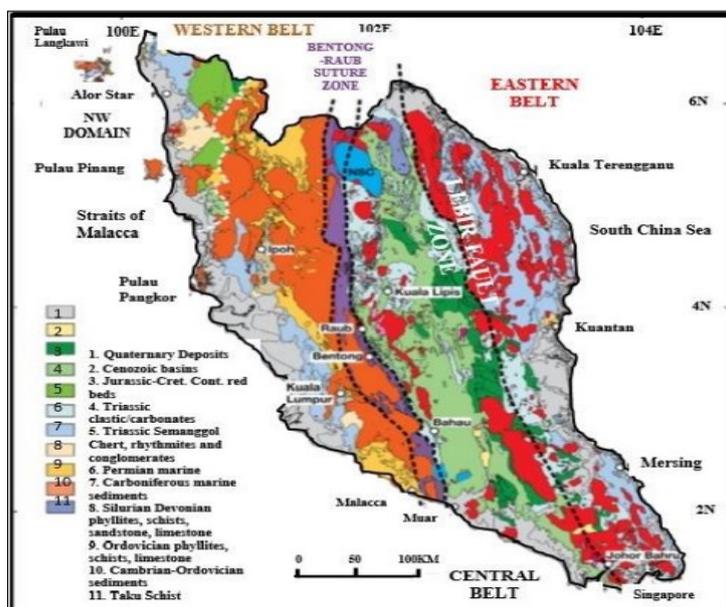


Figure 2: Geologic Map of Peninsular Malaysia (Metcalf, 2012)

Moreover, estimated approximately 90% of the granitic materials in the region were formed across all geological belts with various types of granites having distinct ages and processes of intrusive igneous activity. In contrast, other geological structures within the region were shaped through sedimentary and metamorphic processes which resulted in a diverse range of rock units including shale, sandstone, limestone, schist, and phyllite. However, coastal areas of Peninsular Malaysia in eastern and western regions are primarily characterized by quaternary or marine deposits. These deposits consist of continental soil types such as clay, sand, silt, peat and minor gravel components (Pour, Amin Beiranvand and Hashim, Mazlan; 2015).

RESEARCH METHODOLOGY

Methodology

Data collection will involve acquiring required information from relevant government agencies related to landslides which are Public Works Department (PWD) and Department of Irrigation and Drainage (DID). In order to calculate rainfall thresholds, it is imperative to utilise precipitation data sources. One such source is the Department of Irrigation and Drainage (DID), which serves primary precipitation data provider consisting of date, duration, and cumulative rainfall. Furthermore, rainfall data obtained from nearby rain gauge stations suggested to be located within five to twenty kilometres from location of landslides which

established a strong correlation between rainfall and landslides. Rainfall data prior to a landslide event considered as additional antecedent analysis obtained from Public Works Department (PWD). Detailed information about selected landslide cases including date, failure location, rain gauge ID, rainfall duration and cumulative rainfall are presented further in analysis of empirical cumulative-duration (E-D) threshold section. Specific analyses of rainfall events triggering landslides are conducted further using spreadsheet software or Microsoft Office Excel to extract relevant parameters for establishing E-D threshold.

ANALYSIS AND DISCUSSION

Essential rainfall parameters are cumulative rainfall and rainfall duration which obtained through analysis of rainfall events that interrelate with landslides. The primary objective of this study is to establish cumulative rainfall-duration (E-D) threshold which includes consistent rainfall duration data to generate scattered data points. Additionally, cumulative rainfall was extracted during time series analysis of rainfall data. This comprehensive analysis involved 69 cases of landslides happening around Peninsular Malaysia to develop (E-D) thresholds.

Analysis conducted with collection of hourly rainfall data from preceding days leading up to the landslide events, adhering to specified rainfall input requirements as illustrated in Figure 3. Rainfall event duration was measured from onset of rainfall until occurrence of shallow landslides. It was calculated after surpassing a non-rainfall gap (NRG) or inter-event period at least 24 consecutive hours without rainfall (Nikolopoulos et al., 2014; Rosi et al., 2016). However, this analysis considers factors such as soil pore water pressure influenced by infiltration and evaporation processes as potential triggers of shallow landslides. Additionally, NRG found to be highly sensitive to threshold, it determined event duration and subsequently impacts generated plots (Guzzetti et al., 2007). Cumulative rainfall event (E) and event duration (D) are obtained from analysis of rainfall patterns conducted act as overview of relationship between rainfall infiltration and landslide occurrences in Peninsular Malaysia.

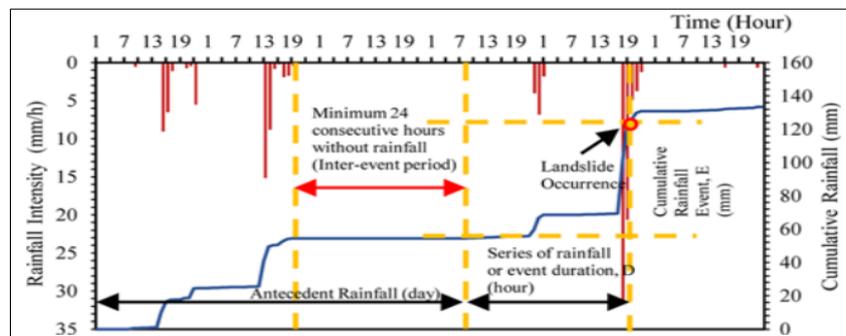


Figure 3: The Inputs to Derive Rainfall Parameters
 (Maturidi, A.M.A.M. et al., 2021)

Derived Rainfall Parameters

Peninsular Malaysia is characterized by variety of geological features where main composition consists of interbedded layers, minor intercalations and other elements which more comprehensible to be observed. Based on 69 selected landslide cases as illustrated in Figure 4, showed that 57% or 39 cases were associated with igneous rock types which particularly granite. Next, sedimentary rocks accounted 29% of total landslides with rock units like limestone, sandstone, and shale. Only 14% of landslides were metamorphic rock types such as phyllite, schist and slate. Consequently, frequent monitoring in areas with granitic rock formations is crucial due to heightened susceptibility towards landslides.

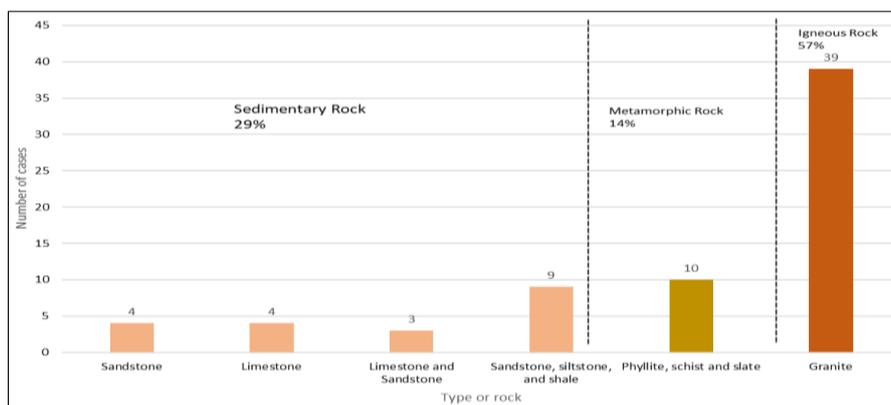


Figure 4: Classification for Geologic Rock Type for Selected Landslide Events in Peninsular Malaysia

Empirical Cumulative - Duration (E-D) Threshold

Scatter plots of data from parameters of 69 landslide cases have been applied to graphs and relationship between cumulative rainfall (E) and event duration (D) are obtained in Figure 6. Vertical axis represented Cumulative Rainfall (E) in millimeters, while horizontal axis represented Event Duration (D) in hours. Best-fit line is established and an equation represents correlation between Cumulative Rainfall (E) and Event Duration (D) using empirical methods is established. Coefficient from this general equation defined Cumulative Rainfall-Event Duration threshold. Furthermore, boundary line for threshold is drawn parallel to lowest plot indicating minimum E-D threshold as separation of stability zone and failure zone. Slope of curve, represents β value maintained as best-fitting line. Simultaneously, new values for α and D are obtained by projecting the drawn curve with respect to y-axis. Based on developed graphs, equations of (E-D) threshold can be expressed as follow:

$$E = 9D^{0.3335} \quad (1 < D < 2448)$$

Using the equation, $\alpha = 9$ and $\beta = 0.3335$ which serve as predictive factors of future landslides in the Peninsular Malaysia region based on historical landslide events. Range of rainfall duration capable of triggering landslides falls between 1 hour and 2448 hours as shown in Figure 5. Furthermore, Table 2 recorded cumulative rainfall amount leading to landslide triggering ranged from 45.5 mm to 1280.5 mm. In accordance with established thresholds parallel to the minimum point of cumulative rainfall, if the rainfall event lasts less than 10 hours, it would take 19.34 mm of cumulative rainfall to initiate a landslide. Conversely, if rainfall continues uninterrupted for over 100 hours, 42.35 mm of cumulative rainfall is sufficient to trigger landslides. These results are reasonable considering time required for water to penetrate soil layer sufficiently to induce slope failure varies depending on specific slope conditions. Empirical E-D threshold developed in Peninsular Malaysia can be effectively useful for specific authority in producing an early warning system. Thus, some efforts can be made to reduce impact of landslide occurrences at affected areas by initiating an emergency response plan.

Table 2: Derived Rainfall Parameters

	Date	Location of Slope Failure	Rg Station	Rainfall Duration, D (hr)	Cumulative Rainfall, E (mm)
1	23/11/1993	KM 25.5, Kuala Lumpur - Karak Highway	3217005 Gombak Damsite	80	64
2	17/10/1996	Kampung Baru, Gelang Patah, Johor	1534002 Pusat Kemajuan Per. At Pekan Nanas	28	184.3
3	15/5/1999	Jalan Wangsa 1, Bukit Antarabangsa, Selangor	3116003 I/Pejabat Jps Malaysia At W.Persekutuan.	131	151.5
4	24/2/2000	Kampung Sri Damai dekat Taman Kencana, Ampang	3117102 Taman Miharja At W. Persekutuan	50	112
5	20/11/2002	Taman Hillview, Hulu Klang, Selangor	3117070 Jps Ampang, Kuala Lumpur	92	203.8
6	5/11/2004	Jalan Tengah 6, Taman Sri Harmonis, Gombak, Selangor	3217002 Empangan Genting Klang	126	205
7	6/11/2006	Kuari Gunung Jerai, Gurun, Kedah	5704055 Kedah Peak	50	73.5
8	22/3/2007	Precinct 9, Putrajaya	2916001 Puncak Niaga	52	210
9	23/4/2008	Wangsa Height Condominium, Bukit Antarabangsa	3114113 Jln. Sg. Udang At Segambut	83	92
10	30/11/2008	Ulu Yam Perdana, Kuala Selangor, Selangor	3416029 Tmn. Desa Kelisa	34	130.7
11	6/12/2008	Taman Bukit Mewah, Bukit Antarabangsa	3114113 Jln. Sg. Udang At Segambut	38	87
12	19/9/2009	Wangsa Height Condominium, Bukit Antarabangsa	3114005 Km 10 Ulu Kelang At Uk Height	1	66
13	21/5/2011	Rumah Anak Yatim At Taqwa, Batu 14, Hulu Langat, Selangor	3118105 Balai Polis Batu 14	126	123.2
14	7/8/2011	Perkampungan Orang Asli Sungai Ruil, Brinchang	0180041rf Gunong Brinchang At Cameron Highlands Pahang	120	50
15	13/9/2013	Bukit Bendera	5302003 Kolam Takongan A.Itam	235	411.5
16	10/11/2013	Jalan Sultan Abu Bakar Brinchang, Cameron Hghland	4414040 Mardi C.Highland	107	126.9
17	10/11/2013	Jalan Sultan Abu Bakar Brinchang	0180041rf Gunong Brinchang At Cameron Highlands Pahang	144	114.5
18	7/1/2014	Lebuhraya Mahameru ke Jln Tun Razak	3117070 Pusat Penyelidikan At Jps Ampang	117	167.3
19	18/5/2014	Kampung Baru Road, Sungai Buloh	3010001 Taman Ehsan At Kg. Melayu Subang	3	66
20	5/6/2014	Taman Cheng Perdana, Cheng, Melaka	2221008 Pusat P'tani Sg. Udang	3	79.8
21	5/11/2014	Pekan Ringlelet, Lembah Bertam	4414037 Boh Bhg. Boh	7	74.9
22	6/11/2014	Sungai Kabok di Lembah Bertam	0550451rf Ldg. Boh (Bhg. Boh) At Pahang	1200	700

	Date	Location of Slope Failure	Rg Station	Rainfall Duration, D (hr)	Cumulative Rainfall, E (mm)
23	18/11/2014	Genting Highlands	3317004 Genting Sempah	121	95.5
24	27/11/2014	Rumah Rakyat Kampung Panchor, Senawang (Lorong Mahsuri 1)	2719001 Setor Jps. Sikamat	155	256.2
25	30/11/2014	Jalan Dahllia 6, Taman Bunga Raya	0290321rf Sungai Putat At Batu Berendam Melaka	240	176
26	2/12/2014	Jalan Batu 4, Kuala Slim, Slim River	0190161rf Ldg. Trolak At Perak	288	262.5
27	19/12/2014	Jalan Kenyir - Aring (30 km from Jeneris Intersection)	5129040 Rumah Pam Paya Rapat	113	834.2
28	1/1/2015	Jalan Kampung Laut, Tumpat	0730561rf Kg. Kebakat	480	867
29	1/1/2015	Bandar Damai Perdana, Cheras	0231521rf Jam. Petaling At Jln. Klang Lama W.Persekutuan	288	223.5
30	6/1/2015	Jalan Raya Timur Barat Grik-Jeli FT004(Perak Kelantan)	0730441rf Kg. Jeli	576	1280.5
31	13/6/2015	Desa Jasmine, Nilai	0240061rf Ldg. Labu At Negeri Sembilan	312	1111.5
32	24/8/2015	Taman Cherry Park, Indera Mahkota, Kuantan	0570111rf Ranc. Pam Paya Pinang At Pahang	216	177
33	4/11/2015	Batu 15, Jalan Gombak - Bentong	0551701rf Genting Sempah At W.Persekutuan	264	259.5
34	7/11/2015	Kilometer 4.75, Jalan Kuala Kubu-Raub	3517022 Kampung Pertak	166	206.9
35	9/11/2015	Jalan Tapah-Ringlet	0180521rf S.K. S. Kijang Cndriang At Perak	408	346
36	11/11/2015	Kuala Lumpur - Karak Expressway, Pahang	3317004 Genting Sempah	35	66.6
37	13/11/2015	Route 68, SK Bukit Tinggi, Karak	0550341rf Kuala Marong At Bentong Pahang	312	201.5
38	16/11/2015	Jalan Raja Chulan	0230641rf I/Pejabat Jps Malaysia At W.Persekutuan	528	412
39	23/5/2016	Taman Mawar, Kuala Terla	0550991rf Ldg. Teh Sg. Palas At Cameron Highlands	1896	299
40	25/11/2016	Rumah Peranginan TNB Sharples, Tanah rata	0550361rf Ldg. Boh (Kwsn. Kilang) At Pahang	2568	150.5
41	10/12/2016	Hutan Matau Gelannggi 5 & 6, Jerantut, Pahang	3726073 Sg. Jerik	93	151.2
42	25/12/2016	Rumah Penginapan Tenaga Nasional Bhd (TNB) di Bungalow Sharpless, Tanah Rata	0550361rf Ldg. Boh (Kwsn. Kilang) At Pahang	288	102
43	25/12/2016	Kilometer 55, Jalan Ringlet -	0550461rf Ldg. Boh	240	99.5

Supiah Ali, Norhidayu Kasim, Afiq Aiman Saiful Anuar, Muhammad Imran Ruslan, Wan Nur Aifa Wan Azahar, Ahmad Bukhari Ramli
Development of Cumulative Rainfall Threshold for Landslide Occurrence in Peninsular Malaysia

	Date	Location of Slope Failure	Rg Station	Rainfall Duration, D (hr)	Cumulative Rainfall, E (mm)
		Tanah Rata	(Bhg. Selatan) At Pahang		
44	31/12/2016	Terowong KTM di Bukit Abu, Dabong	5320039 Ldg. Kuala Gris	28	201.6
45	22/1/2017	Jalan Aring 8 ke Kenyir	4726001 Gunung Gagau	122	268.1
46	27/1/2017	Batu 14, Lebu Raya Timur Barat, Jeli menghala ke Grik	5518035 Lubok Bungor	257	606.1
47	4/6/2017	Kampung Syukor, dungun terengganu	4730002 Kg. Surau At Kuala Jengai	99	122.9
48	21/9/2017	Jalan Tun Sardon - Bukit Baru Road, Paya Terubong, Pulau Pinang	5302002 Pintu A.Bagan	23	99.1
49	4/11/2017	Bendera Hill	5302001 T/Air Besar Sg. Pinang	15	151
50	4/11/2017	KM 392 (train route) antara Dabong dan Bukit Abu	5320039 Ldg. Kuala Gris	35	47.8
51	5/1/2018	Ladang Lada, Tanjung Bungah, Pulau Pinang	5402002 Kolam Bersih P.Pinang	55	216.7
52	3/2/2018	Jalan Sungai Koyan-Cameron Highlands	0551171rf Kuala Medang At Pahang	456	239
53	14/10/2018	Kilometer 78.8, Kampung 3, Terla	0550991rf Ldg. Teh Sg. Palas At Cameron Highlands	72	45.5
54	19/10/2018	Jalan Paya Terubong, Balik Pulau, Georgetown, Pulau Pinang	5402002 Kolam Bersih Pulau Pinang	87	78.9
55	23/10/2018	Jalan Bukit Lama from Bayan Lepas to Balik Pulau Georgetown	5302002 Pintu A.Bagan	18	95.7
56	24/10/2018	Batu 51, Jalan Kuala Kuala Terla, Kampung Raja, Cameron Highlands	4514032 Ldg Teh Sg. Palas	57	63.8
57	24/10/2018	Batu 51, Jalan Kuala Kuala Terla, Kampung Raja	0180041rf Gunong Brinchang At Cameron Highlands Pahang	1320	505.5
58	4/11/2018	Kampung Pelangai Hilir, Kuala Pilah	2722003 Sg.Kepis At Pej. Felcra Site 1	263	213
59	25/5/2019	Jalan Ulu Merah and Jalan Ringlet-Blue Valley, Cameron Highland ('19)	0550991rf Ldg. Teh Sg. Palas At Cameron Highlands	168	132.5
60	18/8/2021	Jalan Gunung Jerai (section 0.00 - 11.0)	0030071rf Sekolah Menengah Gurun At Kedah	144	107.5
61	30/10/2021	Jalan Baling-Pengkalan Hulu (Jalan Lama) (section 1.5)	0180411rf Dispensari Kroh At Perak	168	197.5
62	3/11/2021	Jalan Kg. Lahar/Kg. Teluk Sg. Durian (section 1.60 - 1.63)	0050141rf Pulai At Kedah	432	415.5
63	21/11/2021	Jalan Bentong - Gua Musang (section 16.00 - 16.1)	0550531rf Merapoh At Pahang	864	448
64	18/12/2021	Stesen Pemancar Gelombang Mikro Gunung Telapak Buruk, Seremban	0270261rf Kg. Bahru Pantai At Negeri Sembilan	432	262

	Date	Location of Slope Failure	Rg Station	Rainfall Duration, D (hr)	Cumulative Rainfall, E (mm)
65	18/12/2021	Jalan Genting Peras (section 41.8)	0550681rf Kg. Relai At Kg. Baharu Negeri Sembilan	72	141
66	26/12/2021	Kilometer 35.4 Jalan Tranum ke Bukit Fraser, Raub	0550221rf Jkr Jeruas At Pahang	336	345.5
67	26/2/2022	Jalan Dari Simpang Kuala Nal (Pasir Era ke Temangan - Sempadan Jajahan Kuala Krai / Machang) (section 4.2)	0730041rf Ldg. Kuala Nal	96	382.5
68	7/3/2022	Jalan Guchil/Batu Balai/Simpang Tiga Pahi (section 8.1)	0730121rf Sek. Men. Teknik Kuala Kerai	2448	507
69	12/3/2022	Jalan Pangsun, Kampung Lubok Kelubi, Hulu Langat	0240011rf Ldg. Dominion At Selangor	864	300

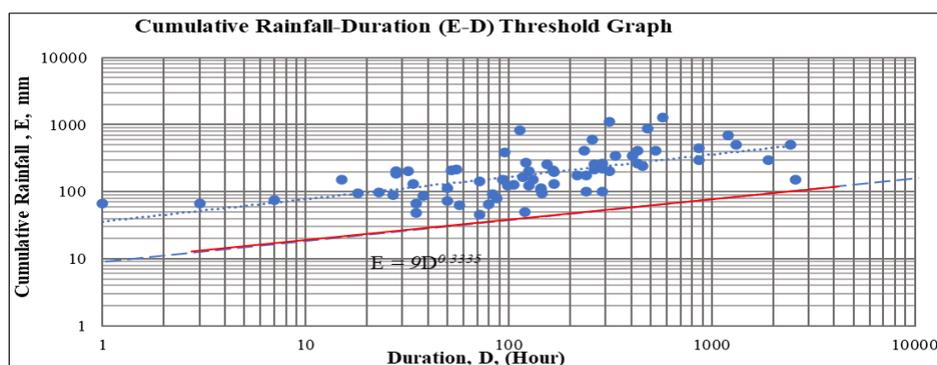


Figure 5: Empirical Cumulative Rainfall - Duration (E-D) Graph

Comparison with Selected I-D Threshold Worldwide

Various factors affect landslide occurrences triggered by rainfall. Climatic factors exert an influence on rainfall threshold across different locations based on numerous countries (Guzzetti et al., 2007). Gathered seven empirical E-D thresholds from various regions around the world which consist of global, regional or local as its geographical scope and connected into a single graph. Positioning of each threshold is typically by its threshold value and slope of curve. Figure 6 displays seven selected thresholds from diverse regions and localities with range of event duration between 1 to 100.

Based on Table 3, illustrated E-D threshold curve line of Present Study (2023) appears as shallowest slope in Figure 6. The slope indicates cumulative rainfall over time in 2023 having a huge amount led to landslide occurrences. In comparison to other global thresholds, Present Study (2023) threshold is notably higher. This discrepancy attributed based on Malaysia's monsoon season, which brings heavy rainfall annually leading to an increased quantity of water

accumulated in soil. Consequently, reduced strength of soil properties and initiate a soil movement. Additionally, power of D represented by the β value which varies across different locations. This value signifies slope of threshold line where a steeper curve, a higher β value. The Present Study (2023) categorised as region maintains a value of 0.3335 for (E-D) threshold while value proposed by Brunetti (2013) is 0.43 and 0.7 from He (2019) which exceeds 0.5 value of threshold. Based on local extent, Peruccacci (2012) having a threshold value of 0.38 and Vennari (2013) suggested value of 0.41. Innes (1983) with a value of 0.504 and Kanji (2003) proposed 0.4 are global levels. These illustrates different regions may exhibit distinct climatic conditions linked to causes of landslides.

Table 3: Selected Rainfall Thresholds

Authors	Area under study	Extent	The Proposed Threshold	Range (h)
(Innes, 1983)	World	Global	$E = 4.93D^{0.504}$	$0.1 < D < 100$
(Kanji, 2003)	World	Global	$E = 22.4D^{0.41}$	n.a
(Peruccacci, 2012)	Abruzzo, Marche, Umbria, Italy	Local	$E = 7.4D^{0.38}$	$1 < D < 1212$
(Brunetti, 2013)	Italy	Regional	$E = 7.85D^{0.43}$	$1 < D < 1080$
(Vennari, 2013)	Calabria, Italy	Local	$E = 5.8D^{0.41}$	$1 < D < 415$
(He, 2019)	China	Regional	$E = 0.53D^{0.7}$	$1 < D < 44$
(Present Study, 2023)	Peninsular Malaysia	Regional	$E = 9D^{0.3335}$	$1 < D < 2448$

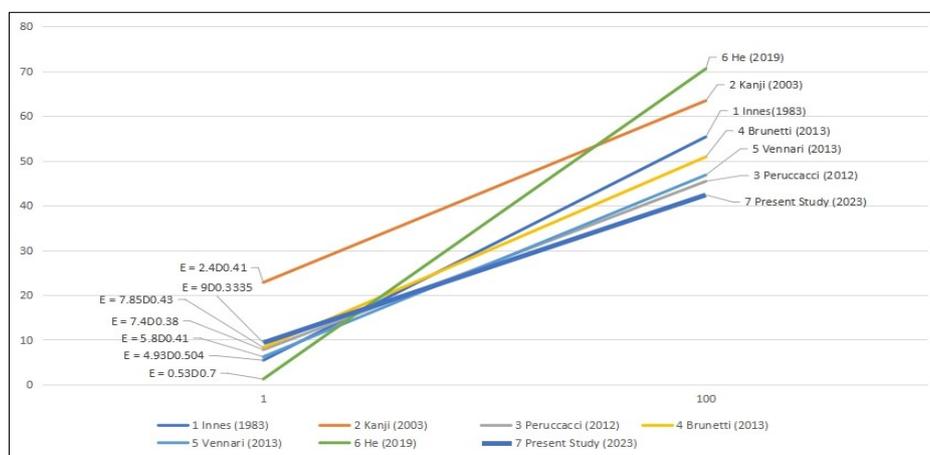


Figure 6: Threshold Comparison of Worldwide

Validating the Developed Cumulative Rainfall - Duration (E-D) Thresholds

Validation of threshold done through comparison with recent landslide-triggering rainfall events. Purpose of this threshold was to predict landslides in Peninsular Malaysia by determining the minimum cumulative rainfall required to trigger small-scale landslides. Table 4 shows ten recent landslide cases were selected between 2021 and 2023 where back analysis of rainfall was conducted to derive parameters including cumulative rainfall and event duration. These rainfall

parameters were compared to existing rainfall threshold and observations made on the position whether above or below threshold line. A plot considered a True Positive event when it exceeded the threshold indicating an accurate prediction. However, it categorized as False Negative event if landslide occurred below the threshold. Then, new threshold value is produced by lowering the curve align with lowest plot. This approach aimed to develop an accurate threshold for future prediction of shallow landslides.

Based on observations illustrated in Figure 7, all selected cases resulted in True Positive occurrences when using the (E-D) threshold. True positive phenomena strongly indicate accuracy of (E-D) threshold produced based on previous landslide cases in predicting incoming landslides. However, in real-time precipitation monitoring, two additional scenarios to be considered for E-D thresholds which are false positives and true negatives. False positive is false alarm where a landslide happened below the line of threshold while true negatives indicate no landslide occurrence but lies above the line (Valenzuela et al., 2019). Both false positives and false negatives are undesirable outcomes for E-D thresholds as consequently affect losses and casualties. If the threshold triggers a false alarm, authorities may face safety-related losses however if the threshold misses a landslide event or known as false positive, it could result in fatalities, injuries, and property damage. Nevertheless, crucial to emphasize any mitigation in experiencing effects of landslides which beyond human control. In enhancing effectiveness of landslide early warning system-based rainfall threshold, automatic rain gauges, total stations, inclinometers, and alarm devices must be installed especially in landslide-prone areas near highways, public facilities, and residential areas. Thus, well functioning systems making (E-D) threshold more reliable to be landslide prediction indicators as an early warning system.

Table 4: Rainfall Parameters for the Latest Event

	Location of slope failure	State	Rainfall Duration, D (hr)	Cumulative rainfall, E (mm)
1	Jalan Gunung Jerai (section 0.00 - 11.0)	Kedah	144	107.5
2	Jalan Baling-Pengkalan Hulu (Jalan Lama) (section 1.5)	Perak	168	197.5
3	Jalan Kg. Lahar/Kg. Teluk Sg. Durian (section 1.60 - 1.63)	Kedah	432	415.5
4	Jalan Bentong - Gua Musang (section 16.00 - 16.1)	Pahang	864	448
5	Stesen Pemancar Gelombang Mikro Gunung Telapak Buruk, Seremban	Negeri Sembilan	432	262
6	Jalan Genting Peras (section 41.8)	Negeri Sembilan	72	141
7	Kilometer 35.4 Jalan Trantum ke Bukit Fraser, Raub	Pahang	336	345.5
8	Jalan Dari Simpang Kuala Nal (Pasir Era ke Temangan - Sempadan Jajahan Kuala Krai / Machang) (section 4.2)	Kelantan	96	382.5

	Location of slope failure	State	Rainfall Duration, D (hr)	Cumulative rainfall, E (mm)
9	Jalan Guchil/Batu Balai/Simpang Tiga Pahi (section 8.1)	Kelantan	2448	507

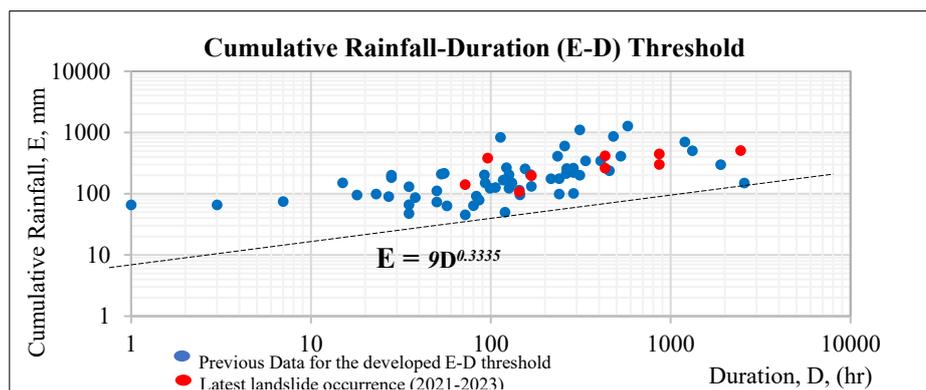


Figure 7: Validation of Recent Events on E-D Threshold

CONCLUSION

This study aimed to address landslide-related issues in Peninsular Malaysia by establishing empirical rainfall thresholds to enhance landslide forecasting. Analyses conducted using data obtained from PWD and DID where empirical thresholds established using precipitation data from 69 historical landslide events. In this study, rainfall durations fell within a range of $1 < D < 2448$ hours and proposed Cumulative Rainfall-Event Duration (E-D) threshold was $E = 9D^{0.3335}$ where the curve determined minimum cumulative rainfall required triggered shallow landslides. This threshold was found to be lower and more extensive than thresholds in other regions, primarily due to high precipitation levels in the humid tropical climate of Peninsular Malaysia. The study also validated the threshold using recent landslide events, aiming to improve accuracy and early prediction of landslides. The integration of these rainfall-induced landslide thresholds with advanced tools and devices help reduce the impact of landslides and facilitate emergency response planning in affected areas.

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FROM CRISIS TO RECOVERY: MALAYSIA'S POLICY RESPONSES TO COVID-19 AND ITS IMPLICATIONS

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Abstract

While Malaysia has taken drastic actions and initiatives to effectively address the COVID-19 pandemic issue, the country has also opted for a compliance strategy, particularly by imposing penalties for non-compliance with Malaysia's COVID-19 SOPs and the new norms. Following the government's extensive policy responses and initiatives to address the COVID-19 pandemic in Malaysia, quantitative research was conducted among 2,074 respondents across the country via online and face-to-face survey. According to the findings of this study, three new norms (face mask, hand sanitiser, and physical distancing) have a significant relationship with "preventing the spread of COVID-19." However, "washing hands with water and soap" has no effect on COVID-19 transmission ($p > 0.050$, $p = 0.138$). Notably, "practising physical distance" was discovered to be the most influential factor ($\beta = 0.112$, $p < 0.001$) in "preventing COVID-19 spread" ($p < 0.001$). In conclusion, all governments around the globe should prioritise voluntary compliance in the future by increasing self-awareness strategies with the goal of regulating their behaviours and engaging in self-improvement. Long-term self-awareness strategies will help the country and the world maintain positive behaviours for the sake of the entire human ecosystem.

Keywords: COVID-19, policy response, Malaysia

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INTRODUCTION

At the end of 2019, the world was taken aback by the emergence of the Corona Virus or 2019-nCoV, later recognised as COVID-19. This virus was categorised as a pandemic by the World Health Organization (WHO) on March 12, 2020. Originating in Wuhan, China, this outbreak was observed to have severe effects on human health, resembling the symptoms of Severe Acute Respiratory Syndrome Coronavirus (SARS). What is more concerning is the high rate of the transmission of this virus, which threatens everyone (especially individuals with high-risk conditions such as the elderly and those with comorbidities) and can potentially lead to fatalities. As of early May 2023, the worldwide reports on the COVID-19 cases that have been reported to the WHO are 765,222,932 confirmed cases, including 6,921,614 deaths (World Health Organization (WHO), 2023a).

In Malaysia, the history of the first COVID-19 case started with Chinese tourists from Singapore who entered Malaysia through a border crossing located in Johor in late January 2020. After the initial cases were reported, the Malaysian government had actively traced their close contacts to prevent the virus from spreading. One of the earliest announcements was made by the Ministry of Health, which advised and warned Malaysians against traveling to China unless it was necessary. Despite these efforts, there were still several reported cases every day. However, the nation was even more shocked when the first wave of the new rising cases of COVID-19 hit, with 190 cases reported in 24 hours on March 15, 2020. Attributed to the "Tabligh Gathering Cluster" at the Sri Petaling Mosque, this cluster had since then continued to spread and become more difficult to contain. To this day, it remains the largest cluster in Malaysia, with 3,375 confirmed cases (Harom, 2020). Following that, many other COVID-19 clusters have occurred in Malaysia, and the number of reported cases continue to rise drastically every day.

Policy Responses, Initiatives, and Actions Undertaken by the Government of Malaysia

The significant rise in cases subsequently prompted the Malaysian government to take decisive actions and initiatives, marking a turning point in their approach to managing the crisis. Among the measures taken by the Malaysian government are implementing the Movement Control Order (MCO) and enhancing the border control, conducting COVID-19 mass screening, establishing temporary hospital and quarantine centres, continually refining and updating the corresponding Standard Operating Procedures (SOPs), and implementing the New Norms Campaign.

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Movement Control Order (MCO)—The MCO has been considered the most significant step in containing the pandemic. The first MCO in Malaysia was announced to be implemented for only 14 days starting on March 18, 2020 until March 31, 2020 (Berita Harian, 2020). However, as the number of cases and death kept on increasing at that time, the implementation of the MCO was then extended time by time and followed by the implementation of several types of control orders to suit every crisis management in their particular situations (such as the risk of infections) which were the Conditional Movement Control Order (CMCO), Enhanced Movement Control Order (EMCO), and Recovery Movement Control Order (RMCO).

During the EMCO, a stricter lockdown was imposed on residents and visitors within the affected areas, prohibiting them to enter or leave during the order. All businesses, except for essential services, were closed, and the authorities were required to provide adequate food supplies for 14 days to ensure the people's sustenance. Besides, medical centres were set up in the affected areas to provide medical care for those who were sick or needed medical attention. Roadblocks were also put in place to control movements and prevent people from violating the order. Meanwhile, the RMCO was implemented in Malaysia as a gradual step towards normalcy. Under the RMCO, there was more flexibility in terms of movements and business operations, but strict measures on the Standard Operating Procedures (SOPs) were implemented to ensure compliance and reduce the transmission rate.

Standard operating procedures (SOPs)—The Malaysian government's role in developing and implementing SOPs to prevent the spread of COVID-19 has been commendable. Malaysia adopted the carefully designed SOPs based on the avoidance of 3Cs (Crowded places, Confined spaces, and Close conversation) and the practice of 3Ws (Washing hands, Wearing masks, and Warning against risks, symptoms, prevention, and treatment) during the enforcement of the four main legislations through the MCO, EMCO, CMCO, and RMCO till date, which have seen much success in reducing the number of COVID-19 cases in Malaysia (Ministry of Health, 2020). Comparative analysis with 15 other countries has demonstrated that the SOPs pertaining to cultivating new norms in Malaysia, such as the use of face masks, hand hygiene, hand sanitisation, and physical distancing, are nearly equivalent to those implemented in other countries (Ahmad et al., 2021). Malaysia seeks voluntary compliance from the public in the context of compliance with these SOPs. However, given the challenges of promoting voluntary compliance in a short period of time, punitive measures (such as increasing fines from RM1,000 to RM10,000) against individuals who did not follow the government's SOPs were required. This approach intended to

emphasise the necessity of following the SOPs not only to protect oneself, but also others such as family members, and indirectly, society as a whole.

Vaccination programme—The responsibility of seeking the vaccines to curb the transmission of COVID-19 has been entrusted to the Ministry of Science, Technology and Innovation (MOSTI) in close collaboration with the Ministry of Health (MoH), up until the implementation of the immunisation programme. As of May 2021, the government had allocated a sum of RM5 billion for the procurement of vaccines for 38.5 million of the country's population (Ibrahim, 2021). Realising the emergence of novel strains of COVID-19, the Malaysian government then promulgated the vaccination of additional dose and booster dose, with the main aim to enhance the immunity of individuals deemed to be at high risk, thereby exhibiting a commitment towards promoting public health and well-being. Thus far, the government has persistently advocated for heightened awareness among the public to prioritise the acquisition of additional and booster doses (Ministry of Health, 2022).

New Norms Campaign—The COVID-19 pandemic has had a significant impact on all segments of society, resulting in the introduction of unfamiliar terms and practices, including new norms, standard operating procedures (SOPs), food delivery, online learning, and online shopping (Mahjom et al., 2021). The implementation of these new norms is closely linked to the SOPs introduced by the government to curb the spread of COVID-19. The strict enforcement of the SOPs has been proven effective in reducing the number of cases during the first wave of the pandemic. Hence, to bring awareness and promote responsibility in adhering to the new norms among individuals, the Malaysian government launched the Cultivating New Norms Campaign on August 8, 2020, themed "*Bersama Hentikan Wabak COVID-19*" (Stop the COVID-19 Pandemic Together). The campaign aims to raise self-control awareness, encourage compliance with the SOPs, and promote the adoption of the new norms among Malaysians, using a "mind-conditioning" approach to instil practices that prevent the spread of COVID-19 (New Straits Times, 2020a).

Following the government's extensive policy responses and initiatives to address the COVID-19 pandemic in Malaysia, this paper aims to answer two main research objectives:

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1. To investigate the practice of new norms (wearing a face mask, washing hands with soap and water, using hand sanitiser, and practising physical distancing) that aid in the prevention of the spread of the COVID-19 virus
2. To identify the main new norm that aids in the prevention of the spread of the COVID-19 virus

LITERATURE REVIEW

Wearing Face Mask

In response to the spread of COVID-19 in 2019, the World Health Organisation (WHO) has encouraged society and all nations in the world to use face masks as a public health measure to prevent the spread of COVID-19. The spread of COVID-19 has been identified as being capable of transmitting through microdroplets in the air via respiratory, conversational, coughing, or sneezing transmission. The Malaysian government has also acted by advising and encouraging the public to wear face masks, especially in public areas, to prevent the spread and transmission of the COVID-19 outbreak that has hit the country. From August 2020 onwards, the government has made the wearing of face masks compulsory for all Malaysians; in fact, those who fail to follow the rules will be punished or imposed with a penalty up to RM1000.00 under the Prevention and Control of Infectious Diseases Act 1988 (Idris, 2020). However, in responding to the implementation of the policy or the standard operating procedures (SOPs) upon preventing the spreading of COVID-19, there have been many issues and challenges faced by society, particularly relating to the wearing of face masks (Ahmad et al., 2021).

Among the issues and challenges highlighted were those in terms of comfortability, affordability, quality, practices, availability, awareness, and disposing processes (Ahmad et al., 2021). The development of society's understanding and acceptance of wearing face masks during the COVID-19 pandemic requires time and efforts from the government and leaders at all levels of society. Nevertheless, to sustain the practices of wearing the face mask after the COVID-19 pandemic poses a different challenge in society, which requires self-awareness as a lesson learned due to the outbreak of COVID-19 in 2019.

Washing Hand with Water and Soap

For centuries, hand washing with water and soap has been an accepted method as well as one of the ways to maintain hygiene and indirectly prevent infectious diseases in the society. Due to the outbreak of COVID-19, the importance of hand hygiene has been heightened by the governments in all nations in the world (Tomori, 2020). Nevertheless, the practices of washing hand with water and soap also have its own issues and challenges. Among the issues and challenges are the

availability of water and soap in public area, the quality of soap provided in the public area, the effective ways of washing hand, the frequency of washing hand, and others that have been highlighted (Ahmad et al., 2021). The COVID-19 pandemic has increased the awareness of the society in developed and developing nations that this simple practice should become the norms as it will provide a lot of benefits not only during the pandemic of COVID-19. Overall, there is strong scientific evidence to support the importance of hand hygiene in preventing the spread of COVID-19 (Hamed et al., 2021; UNICEF, 2020). It is crucial to continue promoting and maintaining effective hand hygiene practices to reduce the transmission of COVID-19 and other infectious diseases. This can be considered as a long-term positive impact of the policy response from the government, which also can prevent other infectious diseases in the future.

Hand Sanitiser

To prevent COVID-19, the government has requested that everyone maintains cleanliness (Bernama, 2021a). Regular hand washing with soap and running water is the most efficient strategy to stop the transmission of COVID-19 (Bernama, 2021a; Singh et al., 2020). There are some of the factors that have contributed to these changes in traditional norms of washing hands in favour of hand sanitiser, including (1) no access to water and soap in public places (Singh et al., 2020); (2) less convenient locations for hand-washing facilities; (3) people's unclean behaviour; and (4) forgetfulness to frequently wash their hands even at home. Additionally, Booker et al. (2022) sparked academics' interest in further research on public health intervention and policy response in quantifying the usage rates of hand sanitiser. According to the authors, this will be beneficial in determining the best method to educate public policy on the value of hand sanitiser, which could increase public compliance. Sidharth et al. (2022) also raised a good point about how the epidemic has taught people a valuable lesson about keeping personal hygiene, which has long been disregarded. The usage of hand sanitisers is seen to be the next step in maintaining personal cleanliness and fending off future pandemic infections.

Physical Distancing

According to the World Health Organisation (WHO) (2023b), physical distancing refers to keeping a distance of at least 1 metre from each other and avoiding crowded places or groups. As a preventive approach, maintaining distance between people who do not reside in the same home is crucial, as claimed by Mokhtar et al. (2022). Many countries, like Malaysia, have imposed physical distance into effect, and the government has taken further steps to increase public adherence. For example, the floors of shops and organisations were required to

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be labelled with the 1-metre rule to guide customers when queuing. Additionally, seating arrangements were changed to maintain a 1-metre space between employees at work (The Star, 2020a). Besides, alerts were also clearly displayed inside trains and buses, and users were instructed to leave every other seat vacant as a form of physical distancing (The Star, 2020b). However, these new norms were only fully implemented during the COVID-19 pandemic to immediately halt the rising number of cases. Additionally, a lot of workplaces had to close, and employees were encouraged to work from home (WFH) (Abdullah et al., 2022).

The Model of Compliance

In reality, it is not feasible to ensure total public adherence to the COVID-19 SOPs. It is estimated that 10% to 15% of the general public still refuses to follow the established SOPs (Ahmad et al., 2021). In discussing compliance issues, there are several phases of individual behaviours that lead to compliance. This model emphasises four main phases, which can be used as a reference: (1) have decided not to comply, (2) do not want to comply, (3) try to comply but do not always succeed, and (4) willing to do the right thing (Australian Government, 2019). This Compliance Model anticipates that individuals and organisations are going to abide by the regulations. However, studies have shown that several factors can influence individuals' desire to adhere to the law, particularly their willingness and understanding of their roles (Gray et al., 2021). Individual beliefs, thoughts, and behaviours have also been identified to be among the factors contributing to one's attitudes towards compliance (Alharbi, 2019). Therefore, it is important for the government to take into account these factors when developing strategies to promote compliance. To increase people's adherence, enforcement is still required in certain circumstances, such as serious law violations (Government of Western Australia, 2014).

In Malaysia, various factors can affect people's compliance with the COVID-19 standard operating procedures (SOPs), such as nonchalance and lack of consideration, societal resistance, insufficient knowledge, and inadequate awareness of the importance of adhering to the SOPs. In the context of the COVID-19 SOPs compliance, Malaysia has targeted voluntary compliance from the public. In other words, voluntary compliance with the COVID-19 SOPs is seen as the best preventive measure to avoid the transmission of the COVID-19 virus. However, considering the challenges in promoting voluntary compliance within a short period, there is a need to implement penalties (from RM1,000 to RM10,000 fines) for actions that do not comply with the established COVID-19 standard operating procedures (SOPs). Other than imposing penalties, the

government is also encouraged to continuously provide reminders and support to motivate the public in navigating life with COVID-19.

Self-Awareness on Practising New Norms

One of the fundamental behaviours that reduce the risk of spreading COVID-19 is by having awareness related to COVID-19 and the community to comply with the Standard Operating Procedures (SOPs) formulated by the government. The battle against COVID-19 can be successful with the community's adherence to the control measures which is highly influenced by their attitude and self-awareness on the prevention of the COVID-19 (Hassan et al., 2021). High compliance to the COVID-19 infection prevention significantly provides insight into the effectiveness of the prevention measures of the outbreak. Furthermore, Chan et al. (2022) argued that individuals with higher knowledge of COVID-19 and self-awareness are more willing to obey public health recommendations for infection prevention.

Self-awareness involves the understanding of one's own health status and risk, as well as the potential consequence of one's actions towards others. Previously, the community has been indicated to be aware of the guidelines and recommendations to prevent the spread of COVID-19 such as getting vaccinated, practising good hygiene, obeying public health guidelines, and monitoring early symptoms (World Health Organisation, 2023c). It can be seen that some individuals who are self-aware still take their own proactive steps until today to protect themselves and others, even if those around them are no longer following the SOPs. For example, some individuals choose to wear face mask when they feel unwell despite they do not test positive for COVID-19. If one still chooses to wear face mask when not feeling well and practises physical distancing when not wearing a mask, they are actually protecting themselves and those around them (Chan et al., 2022). They perform that behaviour because they understand the positive outcomes of practising such behaviour.

RESEARCH METHODOLOGY

This paper presents the results of a quantitative approach using an online survey with 2,074 respondents across the country. The quantitative approach has the advantages of being objective, precise, and able to generalise the conclusion to a larger population; thus, the findings of this study will be able to draw statistical conclusions about the impact of government initiatives on the practice of the new norms by Malaysians as a mechanism to prevent the spread of the COVID-19 virus.

This study was conducted during the peak season of the COVID-19 pandemic. As a result, the only feasible method of data collection is through an

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online survey. Many researchers have previously criticised online survey techniques in terms of trustworthiness, non-bias response (Goldhill, 2018; SurveyMonkey, 2021), response quality (Clay, 2017), and many others. Nonetheless, during the COVID-19 pandemic, online surveys were widely accepted (Reis et al., 2022). This was most likely due to the fact that online survey was the only option available to collect data during Malaysia's restriction of movement control orders. In addition, as the internet technology has become more accessible and affordable, online surveys have proven to be a cost-effective and efficient method of gathering data from a large and diverse sample (Chen & Chen, 2021; Heerwegh & Loosveldt, 2021). Despite this, there was a good response rate from Malaysian society to this study, with a total of 2,074 respondents collected within a month (November 2020).

The instrument used in this study was thoroughly developed based on the feedback from experts as well as the study's primary stakeholder (NADMA, the co-funder of this project). This study's questions used both closed and open-ended questions, beginning with demographics, opinion on government initiatives to deal with the COVID-19 pandemic, preventive measures to be taken by all parties, the practice of the new norms (wearing masks, washing hands with water and soap, using hand sanitiser, and practising physical distancing), issues and challenges, and finally feedback on the Cultivating New Norms Campaign throughout the year.

FINDINGS AND ANALYSIS

Profile of Respondents

This study gathered 2,074 respondents to participate in the nationwide survey. More than two-thirds of respondents were female (66.1%), while the remaining were male (33.9%). Other than that, young adults between the ages of 18 and 30 exhibited a high interest in participating in the survey (62.0%), relative to other age groups. In term of race, Malay respondents participated in the survey at the maximum rate (83.9%), while the other ethnicities accounted for less than 7.5% of the total number of respondents. The analysis revealed that the majority of the respondents held tertiary degrees (84.4%), as opposed to those who attended secondary schools, primary schools, and other educational institutions (15.6%). The highest rank of respondents' income was between RM1,000 and RM4,000 (33.1%), followed by more than a quarter of respondents who claimed to have no income (29.2%).

Table 1: Profile of the Respondents (N=2,074)

Characteristic	Total	Percentage (%)
Gender		
Male	703	33.9
Female	1,371	66.1
Age		
15 – 17 years	16	0.8
18 – 30 years	1,286	62.0
31 – 40 years	458	22.1
41 – 50 years	202	9.7
51 – 59 years	103	5.0
60 years and above	9	0.4
Race		
Malay	1,740	83.9
Chinese	18	0.9
Indian	18	0.9
Bumiputera Sabah	151	7.3
Bumiputera Sarawak	123	5.9
Others	24	1.2
Education		
No formal education	2	0.1
UPSR or equivalent	3	0.1
PT3/PMR/SRP or equivalent	10	0.5
SPM/SPMV/SMA or equivalent	266	12.8
Certificate	38	1.8
Matriculation/Foundation/STPM/STAM or equivalent	101	4.9
Diploma	670	32.3
Bachelor's Degree	712	34.4
Master's Degree	226	10.9
Doctorate/PhD	39	1.9
Others (e.g., Religious School and others)	7	0.2
Monthly household income		
No income	606	29.2
Below RM1,000	114	5.5
RM1,000 - RM4,000	687	33.1
RM4,001 - RM10,000	517	24.9
RM10,001 - RM20,001	138	6.7
Above RM20,000	12	0.6

Linear Multiple Regression

As previously pointed out, the purpose of this study is to examine the association between a dependent variable (preventing the spread of COVID-19) and multiple independent variables (wearing a face mask, cleansing hands with water and detergent, using hand sanitiser, and practising physical distancing). To determine how the independent variables predict or explain variation in the dependent variable, a linear multiple regression analysis was conducted. In addition, the

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regression coefficients (also referred to as regression weights or beta coefficients) may evaluate the intensity and direction of the relationship between the independent and dependent variables. (Sarstedt & Mooi, 2014; Kang & Zhao, 2020). The linear multiple regression model used in this study was based on this formula:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \dots + \beta_n \cdot X_n + \varepsilon$$

Based on the Model Summary results, the R^2 value was 0.055 and the adjusted R^2 was 0.054, indicating that the model used in this study only fit 5.4 % of the data. The Durbin-Watson value of 1.933 (between 1.5 and 2.5) indicated that there was no significant autocorrelation in the residuals (Savin & White, 1977; Huitema & McKean, 2000).

Table 2: Linear Multiple Regression (Model Summary^b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	Df 1	Df2	Sig. F Change	Durbin Watson
1	.235 ^a	.055	.054	1.01934	.055	29.687	4	2023	.000	1.933

- a. Predictors (Constant), wearing face mask, washing hands with water and soap, using hand sanitiser, and practising physical distancing
- b. Dependent variable: preventing the infection and spreading of the COVID-19 virus

Subsequently, ANOVA results revealed that the entire model used in this study was significant ($p < 0.000$), indicating that there was a significant relationship between the independent variables and the dependent variable used in this study.

Table 3: Linear Multiple Regression (ANOVA^a)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	123.389	4	30.847	29.687	.000 ^b
	Residual	2102.027	2023	1.039		
	Total	2225.415	2027			

- a. Dependent variable: preventing the infection and spreading of the COVID-19 virus
- b. Predictors (Constant), wearing face mask, washing hands with water and soap, using hand sanitiser, and practising physical distancing

In addition, based on the linear multiple regression analysis, the Collinearity statistics revealed that the tolerance value for each construct was greater than 0.30 and the VIF value was less than 0.40, indicating that there was no multicollinearity in the study's findings. Other than that, the results demonstrated that three independent variables (face mask, hand sanitiser, and physical distancing) utilised in this study have a statistically significant relationship with the dependent variable (preventing the spread of COVID-19) ($p < 0.050$), with the exception of washing hands ($p > 0.050$, $p = 0.138$). Notably, "practising physical distance" was found to be the most influential factor ($\beta = 0.112$, $p < 0.001$) in "preventing the spread of COVID-19" ($p < 0.001$).

Table 4: Linear Multiple Regression (Coefficient^a)

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	1.879	.243		7.719	.000		
Face mask	.174	.062	.077	2.821	.005	.632	1.581
Washing hands	.057	.039	.040	1.483	.138	.651	1.535
Hand sanitiser	.091	.039	.065	2.365	.018	.624	1.603
Physical distancing	.197	.049	.112	3.995	.000	.589	1.697

DISCUSSION

Following an effective policy response, actions, initiatives, and a nationwide campaign, the findings of this study revealed that physical distance was found to be the most important new norm in preventing the spread of the COVID-19 virus, followed by wearing a face mask and using hand sanitiser. Nonetheless, only one new norm, "washing hands with water and soap," was found to have no significant effect on preventing the spread of the COVID-19 virus ($p > 0.05$).

Physical distancing—During the beginning of the COVID-19 pandemic, physical distancing was a new norm that posed the most difficulty, particularly among family members, at work, and when entering crowded and confined premises, places, or spaces (Ahmad et al., 2021). In order to prevent the spread of COVID-19, the World Health Organisation (WHO) has advised global societies to maintain a minimum distance of one metre between each other (World Health Organisation (WHO), 2023d). This reminder encourages all nations to reduce the distance between their citizens. However, as indicated earlier, the implementation of physical distancing in countries all over the world

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is different and in Malaysia for one, the government encouraged the public to maintain a one-metre distance (Bernama, 2020c). Meanwhile in Australia, the required distance is 1.5 metres (Department of Health and Aged Care, 2023; Australian Department of Health, 2020). Contrastingly in New Zealand, its government emphasises that its citizens should maintain a two-metre distance from one another (New Zealand Ministry of Health, 2020).

In Malaysia, limited space makes it difficult for service providers such as schools, restaurants, businesses, or public transportation to implement a physical separation of at least 1 metre. Physical separation is also perceived as a barrier to communication, particularly in the workplace and in restaurants. There are also issues where the federal government, state governments, and organisations have established different physical distancing SOPs, which can lead to public confusion (Shukri, 2021; New Straits Times, 2020b). Meanwhile, the issue of physical separation is being debated in places of worship, particularly during prayer in religious institutions such as mosques, temples, shrines, and churches, where the number of visitors must be limited at any given time (Ali, 2022; Tan et al., 2022).

Face mask—Since the country began requiring the use of face masks on August 1, 2020 (The Straits Times, 2020), the community has begun to take these regulations seriously. Although the cost of purchasing face masks is now considered reasonable, it remains a burden, particularly for low-income individuals. The purchase of face masks has now become a daily necessity, indirectly increasing the community's cost of living. For some people, using homemade face masks (fabric face masks and *purdah*) is more cost-effective. Face masks from these categories, however, are feared to be unsafe and unsanitary. The cleanliness of three-layer face masks is also widely debated especially when their use does not emphasise the aspects of hygiene (repeated use, sharing of face masks, and improper use that does not cover the mouth and nose) (Pereira-Ávila et al., 2020). Furthermore, the public must be aware of the proper way to dispose of face masks (Shammas et al., 2022). Improper disposal of used face masks in various locations can result in the spread of viruses and an increase in environmental pollution rates.

Aside from Malaysia, many countries and regions around the world have policies requiring the use of face masks as a preventative measure. However, the scopes, implementation, and enforcement of these policies vary. For example, there has been a shift in the enforcement of face mask policies. In New Zealand, the government has decided to increase the penalty for failing to comply with a COVID-19 requirement, which includes the public wearing a face mask. Previously, New Zealanders who did not don masks on public transit were subject

to a \$300 fine (Wade, 2020). However, due to rising the number of COVID-19 cases, the New Zealand government has increased the fine to \$4,000, or a maximum of \$12,000. (The Official Website of New Zealand Government, 2021). Similar circumstances occurred in Malaysia, where the government increased the fine for not wearing a face mask in public from RM1,000 to RM10,000 (Bernama, 2021b). Individuals who do not comply with face mask mandates may face fines or other penalties in some places.

Hand sanitiser—Other than face mask, the use of hand sanitisers, which was not initially understood or recognised by the Malaysian public, has now become the norm in order to prevent the spread of the COVID-19 pandemic (Ahmad et al., 2021). The cost of hand sanitisers has become a source of contention, particularly among low-income households, large families, and business owners. Furthermore, the issue of halal status and the alcohol content in hand sanitisers remain a point of contention for a small number of Muslim communities throughout the world, particularly when using hand sanitisers during prayer. Some countries, for instance Malaysia, Canada, United States and many others have implemented regulations to ensure that hand sanitisers meet certain safety and quality standards, and have warned against using homemade or unregulated hand sanitisers (Government of Canada, 2020).

Washing hands with water and soap—Many governments have launched public awareness campaigns to encourage people to wash their hands frequently, especially after using public transportation or touching potentially contaminated surfaces. People should also wash their hands for at least 20 seconds with soap and water, covering all surfaces of their hands, including under their nails and between their fingers (WHO, 2009). Despite the fact that handwashing with soap and water is a globally promoted hygiene practice, the findings of this study revealed that "washing hands with water and soap" did not help to prevent the spread of the COVID-19 virus. This is due to a number of impediments to a widespread adoption. One of the most significant challenges is the lack of handwashing facilities such as in schools, workplaces, and public places (farmers' markets, public markets, and night markets), where the majority of handwashing facilities are only available in nearby toilets (Ahmad, et al., 2021). Uncomfortable facilities, particularly in food establishments, include dirty handwashing facilities, the lack of soap or low-quality and modified soap, a lack of tissues or hand-drying equipment, and the lack of tissues or hand-drying equipment, making it difficult for people to wash their hands comfortably with soap and water. Even when the facilities (a sink, water, soap, tissue, or hand-drying equipment) are available, some people are still hesitant to wash their hands with

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soap and water. This is due to the lack of understanding about how much dirt and viruses are on a person's hands, even if they appear to be clean (Edmonds-Wilson et al., 2015; United Nations Children's Fund (UNICEF) & World Health Organization (WHO), 2021).

CONCLUSION

While Malaysia has taken numerous initiatives and actions to prevent the spread of COVID-19, particularly during the early stages of the disaster in early 2020, this study found that new Malaysian norms such as physical distance, wearing face masks, and using hand sanitiser have a significant influence in preventing the spread of the COVID-19 virus. However, washing hands with soap and water has no effect on the COVID-19 prevention. This was most likely due to the lack of facilities to wash hands and maintain cleanliness throughout the world during the early stages of the COVID-19 pandemic. Lack of cooperation and actions taken by providers to prepare appropriate sinks, an adequate water supply, and quality soap raise an important question to consider: how to encourage the public to wash their hands with water and soap in public places when the required facilities are not provided?

Further, the findings of this study demonstrated that the government's policy responses and compliance strategies encourage Malaysians to practise new norms as effective preventive measures to address the COVID-19 pandemic. In reality, it was difficult to achieve voluntary compliance among Malaysians during that time if the country were to only rely on rhetorical approaches such as raising awareness and educating society. It is estimated that 10% to 15% of the general public still refuses to follow established SOPs (Ahmad et al., 2021). As a result, without imposing compliance strategies, it is not possible to ensure total public adherence to the COVID-19 SOPs in a short period of time. The MCO, CMCO, EMCO, RMCO, and SOPs developed by the countries were among the government's actions to combat COVID-19; however, penalties imposed for non-compliance with the SOPs and new norms are among the strategies that have helped Malaysians prevent the spread of the COVID-19 virus. Other countries have used the same strategy to deal with this public health crisis. Among them are New Zealand, Korea, the United Arab Emirates, and many others.

While this study was conducted in 2020, it is argued that the practices of adopting new norms to prevent the spread of the COVID-19 virus has weakened in recent years. However, the fight against the COVID-19 pandemic continues as there is no guarantee that the world will be free of this type of public health problem in the future. In fact, people all over the world should view the COVID-19 pandemic as the most important lesson learned in order to be more vigilant, resilient, risk-taking, and capable of forecasting the future. To

accomplish this, the compliance strategy alone will not be effective for an extended period of time. All governments should emphasise voluntary compliance by increasing self-awareness strategies with the goal of regulating their behaviours and engaging in self-improvement. In other words, people adhere to the new norms because they understand the benefits of doing so. The long-term self-awareness strategy will assist the country and the world in maintaining positive behaviours for the wellbeing of the entire human ecosystem.

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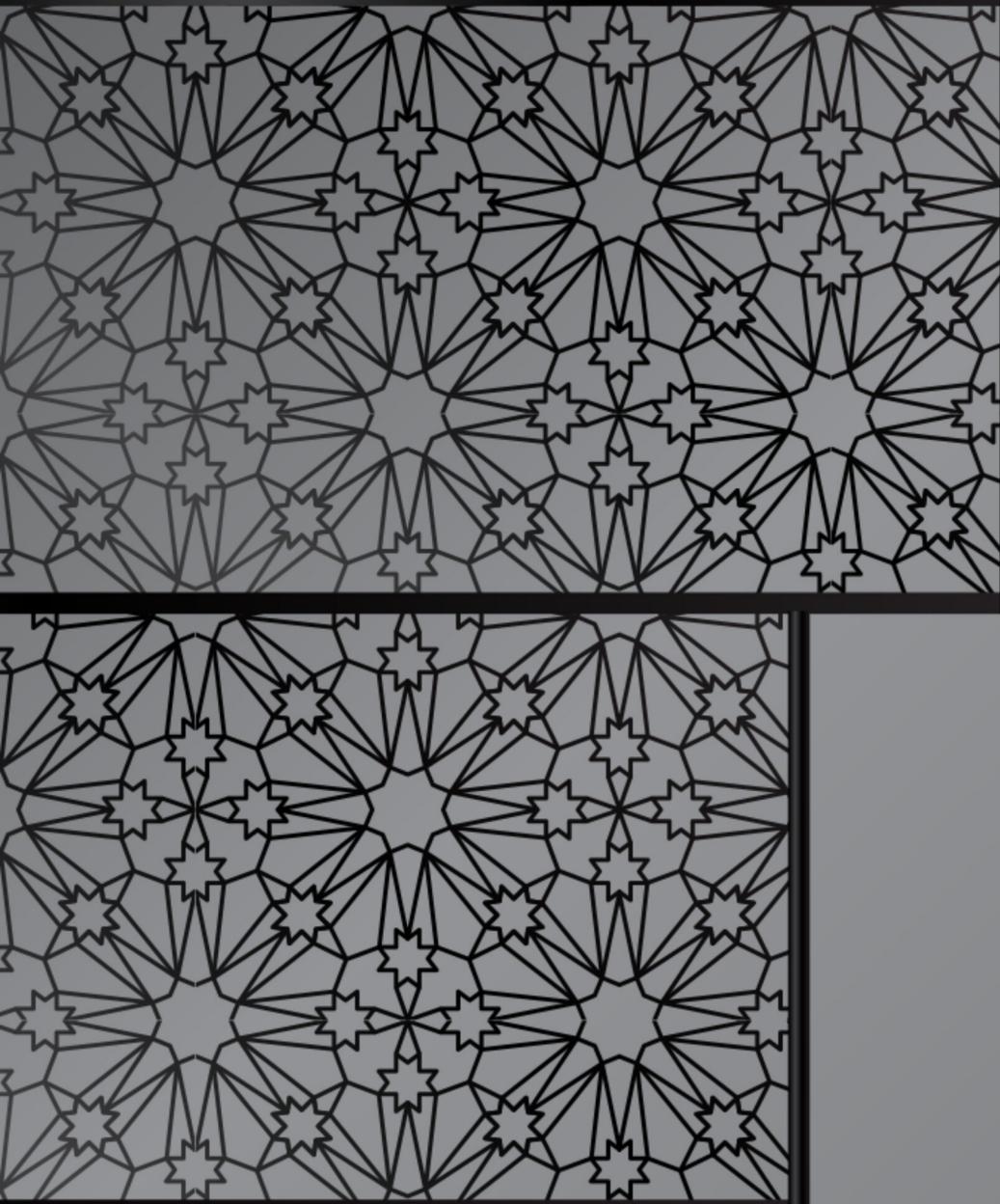
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