TALKS 4.0

E-Proceeding

OF

T.A.L.K.S 4.0

The Acclaimed Landscape Of Knowledge Sharing

ORGANISED BY

Landscape Architecture Program,
College of Built Environment
Universiti Teknologi MARA Selangor Branch
Puncak Alam Campus

CO-ORGANISED BY

Landscape Architecture Program,
Department of Built Environment Studies and Technology
College of Built Environment
Universiti Teknologi MARA Perak Branch
Seri Iskandar Campus

05 February 2025
Semester October 2024 - February2025

PUBLISHED

31 March 2025

e ISBN 978-967-2776-49-9

Unit Penerbitan UiTM Perak
(online)

Cover Design : Zawanie Fatini Mohd Jamzury

ORGANISING COMMITTEE

Chairman : Assoc. Prof. Ts. Dr. Siti Rasidah Md Sakip

MAIN SECRETARIAT

Project Leader:Muhammad Zulfikry Jaafar Sidek
Editorial Team:Nur Sazliana Pitderi
Nazmi Najiha Azmi
Nur salwani Mohd Rosle
Marketing and Promotion: Qamarina Izzati NikHim
Jihan Tsara Mohd Fadzly
Nurul Husna Abd Rahim
Design & Promotion Team: Zawanie Fatini Mohd Jamzury
Nur Raudhatul Athirah Nor Fauzi
Siti Syazana Sapuan
Certificate:Nur Adlin Saipudin
Atiqah Balqis Redzuan Teoh
Technical Support Team:Muhammad Luqman Hakim Sharuddin
Muhammad Nazmy Ashary Mohd Nazry

E-PROCEEDING EDITORS

Assoc. Prof. Ts. Dr. Siti Rasidah Md Sakip

LIST OF REVIEWER

Assoc. Prof. Ts. Dr Norhafizah Abdul Rahman
LAr. Ca. Dr Helmi Hamzah
IDr. Dr Nadiyanti Mat Nayan
LAr. Dr Norizan Mt Akhir
LAr. Dr Zulkefle Hj Ayob
Ts. Dr Izham Ghani
Dr Atikah Fukaihah Amir
Dr Huzeima Mohd Hussain
Dr Nor Izana Mohd Shobri
Dr Suriati Ahmad
Dr Wan Nor Anira Hj Wan Ali @ Yaacob
LAr. Ahmad Zamil Zakaria
LAr. Azran Mansor
LAr. Atikah Raihanah Amir
LAr. Ruwaidah Borhan
Mdm. Norasikin Hassan
Miss Siti Syamimi Omar

THE INFLUENCE OF PAVEMENT DESIGN FOR USERS' COMFORT AT ELMINA LAKESIDE MALL, SHAH ALAM TOWARDS PEDESTRIAN SAFETY

Nurin Balqis Zulkifli Shaibatul[1] & Islamiah Bt Che Man[2]*
***Corresponding**
[1,2]Studies of Landscape Architecture, College of Built Environment, Universiti Teknologi Mara Cawangan Selangor, Puncak Alam Malaysia

Published: 31 March 2025

ABSTRACT

This study addresses the critical issue of pedestrian comfort and safety in pavement design at Elmina Lakeside Mall. The aim is to evaluate how pavement patterns influence user experiences. Objectives include assessing user perceptions and identifying areas for improvement. A survey was conducted with 50 respondents to gather insights. Findings reveal that well-designed pavements enhance emotional responses and encourage longer visits. It therefore underscores that aesthetic improvement and integration of natural elements within pavement design will go a long way in making the ambience more hospitable, which is one of the sustainable urban development goals.

Keyword: *Influence, Pavement Design, Users' Comfort, Elmina Lake Side*

INTRODUCTION

Pedestrian infrastructure is a very important aspect of urban design, especially in high-traffic areas such as shopping malls. This study will focus on how pavement design, particularly pavement pattern affects pedestrian safety and comfort at Elmina Lakeside Mall. Pavement patterns have functional and aesthetic values guide movement, reduce congestion, and enhance spatial clarity. As Georgiev and Staedler (2020) have shown, good patterns can enhance usability and create more pedestrian-friendly

environments. Poorly designed or inconsistent patterns can disrupt pedestrian flow and compromise safety.

For pedestrians, walking as a form of transportation must be a fully developed aspect in safety, accessibility, and comfort. Bad pavement conditions or narrow walkways increase danger, particularly in busy areas. Design-oriented pedestrian walkways, for example, as shown by Movahed, Azad, and Zakeri (2011), have made great contributions in urban settings making them inclusive while increasing walkability. This study aims to examine the pattern of paving that shapes pedestrians' experiences and can be recommended through design strategies in assisting the attainment of sustainable urban development goals.

LITERATURE REVIEW

Pavement design involves the patterns and materials arranged on walking paths for safety, comfort, and functionality. Pavement design thus includes patterns and materials that ensure comfort, safety, and functionality to users (Georgiev & Staedler, 2020).

Factors of Pedestrian Comfort and Safety in Pavement Design

Four key factors influence pedestrian comfort and safety in pavement design: (i) the natural environment in pavement design, (ii) cognitive perception of pavement aesthetics, (iii) emotional responses to pavement design, and (iv) behavioral intentions shaped by pavement design.

Natural Environment in Pavement Design

The integration of nature into pavement design, such as through nature-inspired patterns, vegetation, and eco-friendly materials, improves user comfort and psychological well-being while increasing ecological awareness and creating aesthetically pleasing urban spaces. Such has been reported by Söderlund & Newman (2015), Lee et al. (2010), and Ortegón-Cortázar & Royo-Vela (2017).

Cognitive Perception of Pavement Aesthetics

Pavement design impacts how users perceive safety. Visually appealing and well- structured pavements increase satisfaction in walking activity (El-

Adly & Eid, 2016; Park, 2016). Harmonious design elements contribute to a positive cognitive image, making pavements feel more dependable (Baker & Wakefield, 2012).

Emotional Responses to Pavement Design

Pavement textures, colour, and pedestrian-friendly designs create positive emotion, increasing satisfaction and perceived safety. The appealing and calming atmosphere promotes increased use of public spaces (Joye & Bolderdijk, 2014; Guéguen & Stefan, 2016).

Behavioural Intentions Shaped by Pavement Design

Pavements with greenery, connectivity, and aesthetic appeal encourage revisits and longer stays. These features enhance user experience, increase footfall, and promote customer loyalty in retail and recreational areas (Kim & Han, 2010; Wakefield & Baker, 1998).

METHODOLOGY

The Site Study Area

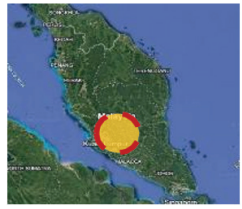

Figure 1. Key Plan
(Source: www.earth.google.com)

Figure 2. Location Plan
(Source: www.earth.google.com)

Figure 3. Site Plan
(Source: www.earth.google.com)

The Elmina Lakeside Mall located in Shah Alam, Selangor, Malaysia's Elmina City township. This mall forms the centerpiece of this mixed-use complex that marries sustainable urban planning with lifestyle facilities and occupies about 3 acres. It offers a unique blend of business and leisure areas, being close to Elmina Central Park and a serene lake.

Sime Darby Property envisioned Elmina City as a vibrant community that is sustainable, including its economy. With the Lakeside Mall sitting atop these residential areas, it allows one to shop, dine out, and engage in many other leisure activities. It really stands out for the residents and guests, with an emphasis on walkability and connectivity back to nature.

Research Design of the Study

The methods of data collection for this research are on-site direct observation and a questionnaire survey. The on-site observation conducts in a systemic manner with the intention of identifying tangible features in the physical and aesthetic design patterns of pavements at Elmina Lakeside Mall is responded to analyze implications for the comfort and safety of pedestrians. Meanwhile, the online survey questionnaire is also conducted to assess subjective perceptions, experiences, and feedback from users related to comfort and safety issues about pavement design. These methods are essential to ensure achieve the study's objectives.

Methods of Data Collection

Direct Site Observation

The checklist for the site observation is developed based on reviews from the literature. Such reviews emphasize the integration of natural environments, cognitive and emotional responses to pavement aesthetics, and behavioural influences of pavement design. The site observation schedule and elements as well techniques for site observation as shown in Table 2.

Table 2. Site Observation Schedule

Aspect	Details
Duration of Conducts	- 2 weeks - 25/11/2024 – 08/12/2024 - 10:00 AM – 10:00 PM
Rationale	The observations were conducted at these times and dates to capture any variations in pedestrian activity across the day for both weekday and weekend traffic flows.
Elements to be Observed	(a) Natural Environment in Pavement Design Observing areas with nature-like patterns, vegetation, and eco-friendly materials such as permeable paving and stone. Focused on landscaped zones near pathways, green buffers, and shaded areas.
	(b)Cognitive Perception of Pavement Aesthetics Observing areas with nature-like patterns, vegetation, and eco-friendly materials such as permeable paving and stone. Focused on landscaped zones near pathways, green buffers, and shaded areas.
	(c)Emotional Responses to Pavement Design Assessing textures, colours, and sensory- friendly materials, such as smooth finishes and calming tones. Focused on areas with benches, rest zones, and pathways designed for relaxation.
	(d)Behavioural Intentions Shaped by Pavement Design Monitoring pedestrian flow, interactions, and the seamlessness of transitions between spaces. Focused on entrances, plazas, and recreational zones to assess usability and movement patterns.

Source: Author

Questionnaire Survey

This study employed a questionnaire to collect data on the influence of pavement design on pedestrian comfort and safety at Elmina Lakeside Mall, Shah Alam. The questionnaire consisted of four factors, and the sample size was determined using Cochran's formula, a widely accepted method for estimating sample sizes.

Convenience Sampling

Using a 95% confidence level (Z-value of 1.96), an estimated population proportion of 0.5, and a margin of error of 5%, Cochran's formula calculated an initial sample size of approximately 384 respondents. For a finite population of 35,000, this was adjusted to about 380 respondents. It was noted that for a sample of 50 respondents, the margin of error would be around 13.9%.

Cochran's Formula

Cochran's formula, developed by Cochran (1977), is a standard method for estimating sample sizes, particularly in large or infinite populations. The formula is expressed as:

The formula is:

$$n0 = \frac{Z^2 \cdot p \cdot (1 - p)}{e^2}$$

Where:
n0: Sample size for an infinite population
Z: Z-value for the desired confidence level (1.96 for 95%)
p: Estimated proportion of the population with the desired attribute (0.5 if unknown)
e: Margin of error (0.05 for 5%)
Using the values from this study:
$Z = 1.96$
$p = 0.5$
$e = 0.05$
The calculation would be:

$$n0 = \frac{(1.96)^2 \cdot 0.5 \cdot (1 - 0.5)}{(0.05)^2}$$

$$= \frac{3.8416 \cdot 0.5 \cdot 0.5}{0.0025}$$

$$= \frac{0.9604}{0.0025}$$

$$= 384.16$$

Ahmed (2021) has pointed out the Cochran's formula in the survey or cross-sectional studies that this formula balances precision with efficiency. The adjustment for finite populations ensures that studies do not overshoot while retaining the accuracy of the results.

DATA ANALYSIS AND DISCUSSION

Data collection from observation at the site and sources of survey have been analyzed for factors that focus on comfort and safety, apart from general user experience. The site observation focused on pattern and design aspect flow of pedestrians. Descriptive statistics are applied to the Microsoft Form data for drawing out the trends. Besides, mapping analysis has shown the spatial dynamics, pointing out some important problem areas that could be improved. This is a multidimensional approach that integrates physical design interpretations with user experiences.

Figure 4. Site Plan Highlighting Pedestrian Traffic, Natural Elements, and Safety Concerns

(Adapted from www.earth.google.com & Author)

Survey

Section A – Demographic Information

Table 3. Results of Demographic Profile

Description	Variable	Frequency	Percentage (%)
Gender	Male	26	52%
	Female	24	48%
Age Group	Under 18 years old	3	6%
	18-24 years old	10	20%
	25-34 years old	20	40%
	35-44 years old	6	12%
	45 years old and above	11	22%
Frequency of Visitors	Daily	4	8%
	A few times a week	6	12%
	Once a week	12	24%
	A few times a month	12	24%
	Rarely or only on special occasions	16	32%

Purpose	Shopping	11	22%
	Leisure/Recreation	17	34%
	Dining	15	30%
	Working	7	14%

Source: Author

These findings insinuate that the predominant age group of 25-34 years is likely to be more involved in the pedestrian experience while high percentages of leisure and dining purposes are indicative that respondents engage in casual and prolonged activities at the mall. A low percentage of daily visitors, 8%, and a high percentage of those visiting rarely, 32%, would imply that the pedestrian environment significantly influences visit frequency. Therefore, improving pavement design for comfort and safety may improve the satisfaction of pedestrians and increase the frequency of visits.

Section B – Natural Environment in Pavement Design

Table 4. Results of Descriptive Analysis of Natural Environment in Pavement Design

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
The pavements incorporate nature-inspired patterns and designs that enhance my comfort.	50	1	5	3.80	.857
The presence of vegetation and green elements along the pavements improves the walking experience.	50	3	5	4.42	.642
Eco-friendly pavement materials support sustainable development practice.	50	2	5	3.76	.771
The natural elements around the pavements make the area visually appealing and engaging.	50	2	5	4.20	.904
Valid N (listwise)	50				

Source: Author

Further analysis indicates that the presence of vegetation and green elements along pavements attained the highest mean score of 4.42, with a very low standard deviation of 0.642, indicating very strong consensus on these features being enhancement factors in walking. In a similar manner, aesthetic value of natural elements scored 4.20 in average, which underlines that aesthetics also play an important role in enhancing pedestrian comfort. Nature-inspired patterns and designs on the pavement showed an average score of 3.80, which is within the range of a fair level of agreement that these aspects add to user comfort. Conversely, eco-friendly pavement materials had the lowest average score of 3.76, indicating that while sustainability is valued, it is slightly less emphasized compared to aesthetic and functional aspects of pavement design. Overall, these findings highlight the necessity of integrating greenery and natural aesthetics into pavement design to enhance pedestrian comfort in urban environments.

Section C – Cognitive Perception of Pavement Aesthetics

Table 4. Results of Descriptive Analysis of Cognitive Perception of Pavement Aesthetics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
The design pavements is modern and aesthetically pleasing.	50	2	5	3.70	.863
The layout and organization of the pavements make the walkways user-friendly.	50	1	5	3.38	.967
The pavement design gives me a sense of safety while walking.	50	1	5	3.16	1.037
The overall visual appeal of the pavements encourages me to walk more comfortably.	50	2	5	3.42	1.071
Valid N (listwise)	50				

Source: Author

The analysis indicates that, overall, the pavement aesthetics and functionality are appreciated by the respondents. The statement on pavements being modern and aesthetically pleasing had the highest mean score at 3.70, showing strong appreciation for the visual appeal of the walkways. Overall visual appeal encouraging comfortable walking followed,

with a mean of 3.42, showing a moderate level of agreement about its importance for pedestrian comfort. However, the lay-out and organization of pavements, for improving user- friendliness scored an average of 3.38, showing a constant but relatively lower degree of consensus. Finally, safety about the design of the pavements recorded the lowest mean score of 3.16 and higher standard deviation of 1.037, indicating that different perceptions exist among the respondents regarding the presence of safety features. These findings suggest that while aesthetics is well-received, there is a need for improvements in organization and safety to enhance the overall pedestrian experience.

Section D – Emotional Impacts of Pavement Design

Table 4. Results of Descriptive Analysis of Emotional Impacts of Pavement Design

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Walking on the pavements makes me feel relaxed and at ease.	50	2	5	3.52	.762
Walking on the pavements makes me feel relaxed and at ease.	50	1	5	3.10	1.199
The pavement design evokes a sense of enthusiasm to explore the area.	50	1	5	3.44	1.053
The colours and materials used in the pavements enhance my mood during my visit.	50	1	5	3.38	1.048
Valid N (listwise)	50				

Source: Author

The analysis shows that the pavement design at Elmina Lakeside Mall has a positive effect on the emotional comfort and experiences of users. For instance, it was reported that walking on the pavements was relaxing and comfortable, as expressed in the mean score of 3.52 with a low standard deviation of 0.762, showing consistency in the responses. It also designed the space to create an eagerness for the desire to explore the area, which had a mean score of 3.44 with a standard deviation of 1.053, showing generally positive perceptions but with a moderate variation. However,

the smooth texture of the pavements received a lower mean score of 3.10 and a higher standard deviation of 1.199, indicating more varied opinions on its impact in terms of the walking experience. The colors and materials used in the pavements added to the users' moods during their visits, with a mean score of 3.38 and a standard deviation of 1.048. Generally, these findings indicate that though pavement design contributes to users' comfort and emotional well-being, there are variations in individual perceptions that could be addressed for further improvement.

Section E – Behavioural Intentions Influenced by Pavement Design

Table 5. Results of Descriptive Analysis of Behavioural Intentions Influenced by Pavement Design

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
I would revisit the mall due to the pedestrian-friendly pavement design.	50	2	5	3.36	.898
I would likely recommend this mall to others because of its comfortable walkways.	50	2	5	3.28	.809
The pavement design encourages me to spend more time exploring the area.	50	2	5	3.52	.909
The focus on pedestrian comfort and safety makes this mall stand out from others.	50	2	5	3.32	.999
Valid N (listwise)	50				

Source: Author

The descriptive analysis of responses from the survey about the behavioural intentions brought forth by pavement design at Elmina Lakeside Mall reflects positive notes within the user experience. The response to the willingness to revisit the mall because of its pedestrian-friendly pavement design had a mean score of 3.36, while recommending it to others in regard to its comfortable walkways scored a mean of 3.28. The pavement design to encourage users to stay longer was the highest ranked, with an average score of 3.52, while distinctive concern for pedestrian comfort and safety

scored an average of 3.32. Summing up all of the above, this means that notwithstanding variations in the individual perceptions of thoughtful pavement design, positive behavioral intentions to revisit, recommend, and stay longer in the mall are at variance.

Section F – User Suggestions Question

In open-ended questions related to the pavement design in Elmina Lakeside Mall, most respondents suggested areas that needed improvement, basing them on the four analysed factors. On the first question, comfort and safety, 46% or 23 of the respondents mentioned that this is achieved with an appealingly pedestrian- friendly pavement design, 20% or 10 suggested encouraging people to explore further because of well-thought-out design. Conversely, 10% (5 respondents)

pointed out the need for better focus on pedestrian comfort and safety features. Regarding the second question about specific elements to add or remove, 42% (21 respondents) again highlighted the need for improvements in pedestrian- friendly design, while 24% (12 respondents) suggested that features promoting exploration should be prioritized. 8% or 4 indicated an improved focus on pedestrian comfort and safety. Overall, these responses reflect a strong desire for enhancements that put the comfort and safety of pedestrians first, while also encouraging exploration within the mall environment.

CONCLUSION

In conclusion, this study identifies the importance of pavement design in ensuring the improvement of pedestrians' safety, comfort, and experience within Elmina Lakeside Mall. As a result, aesthetically pleasing and well-planned pavements that incorporate natural environments could elicit positive emotional reactions and behavioural responses among users. The improvements that could be recommended for pavement design are to make them more green, more attractive in terms of pavement patterns, and wide and safe to walk. The atmosphere is friendly and could encourage people to take their time or even recommend.

However, the research is limited by its reliance on subjective

perceptions based on a very small sample size of 50 respondents, which cannot be representative of the diverse views of all the visitors to the malls. In the future, samples should be increased and longitudinal studies conducted that could establish long-term changes in pedestrian behaviour based on the adjustments made to the pavement design. After all, it is continuous assessment and improvement in pedestrian infrastructure that will meet sustainable urban development objectives.

ACKNOWLEDGEMENT

I am grateful for the invaluable insights from my supervisor, Dr. Shaibatul' Islamiah binti Che Man. I would like to express my appreciation to the respondents for their participation in the survey, which enriched my case study on Elmina Lakeside Mall. Additionally, I thank my friends and family for their support and encouragement throughout this research journey, as their contributions were crucial to the successful completion of this work.

REFERENCES

Gao, T., Lim, S., Wong, D. K. H., & Schroepfer, T. (2024). From walking to staying: The impact of spatial qualities on socio-spatial segregation in innovation districts. *Sustainable Cities and Society, 113*(7), 105688. https://doi.org/10.1016/j.scs.2024.105688.

Kim, S., Choi, J., & Kim, Y. (2011). Determining the sidewalk pavement width by using pedestrian discomfort levels and movement characteristics. *KSCE Journal of Civil Engineering, 15*(5), 883–889. https://doi.org/10.1007/s12205-011-1173-1.

Matsuura, T., & Yano, N. (2023). Behaviors of pedestrians on streets with roadside strips. *Transportation Research Interdisciplinary Perspectives, 19*(8), 100799. https://doi.org/10.1016/j.trip.2023.100799.

Nuzir, F. A., Dewancker, B. J., Jing, S., Nakashima, Y., Lebreton, K., & Rahardi, Y. (2014). A Study of the Visual Influence of Pavement Patterns on Pedestrian Walking Behaviour in the KSRP , Kitakyushu , Japan. *Proceedings of the 10th International Symposium on Architectural*

Interchanges in Asia, October, 1017–1024.

Bartlett, J. E., Kotrlik, J. W., & Higgins, C. C. (2001). *Organizational Research: Determining Appropriate Sample Size in Survey Research*.

Cochran, W. G. (1977). *Sampling Techniques* (3rd ed.). New York: John Wiley & Sons.

Ahmed, S. K. (2021). How to choose a sampling technique and determine sample size for research: A simplified guide for researchers. *Educational Research and Reviews, 16*(6), 235-245.

Amin, S., Kim, H., & Zhang, W. (2021). Pedestrian pathways and safety: A case study of urban mall environments. *Journal of Urban Design, 26*(4), 456-472.

Zhou, L., Yang, C., & Li, S. (2020). Enhancing pedestrian safety in urban spaces: Pavement design and management. *Sustainable Cities and Society,* 55, 102043.

Nguyen, T., & Van, P. (2019). The role of shaded pathways in urban pedestrian comfort. *Urban Forestry & Urban Greening,* 40, 23-31.

Kong, Y., Lin, C., & Lee, J. (2022). The impact of amenities on pedestrian satisfaction in urban public spaces. *Sustainability, 14*(3), 1937.

Chen, Z., Wang, H., & Liu, Y. (2021). Green infrastructure and emotional well-being: Evidence from urban park designs. *Environmental Research Letters, 16*(4), 045003.

Rahman, M., Karim, A., & Chowdhury, N. (2021). Optimizing pedestrian-friendly layouts in urban retail spaces. *International Journal of Urban Planning, 35*(7), 62-78.

PROCEEDING OF 4TH SEMINAR ON THE ACCLAIMED LANDSCAPE KNOWLEDGE SHARINGS

e ISBN 978-967-2776-49-9

9 789672 776499

Unit penerbitan UiTM Perak (online)