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# PSYCHOLOGICAL EFFECTS OF GREEN SPACES ON WALKING ACCESSIBILITY

**Filzani Illia Ibrahim [1], Nur Alia Nadia[2], Chen Xingrui[3]**

[1,2.3] *School of Architecture, Building and Design,*
TAYLOR'S UNIVERSITY, MALAYSIA

## Abstract

In the face of accelerating global urbanization, urban walkability has garnered increasing attention as an essential component of urban sustainability and residents' quality of life. This study focuses on Malaysia, a rapidly urbanizing country, examining the effects of natural environments and greenery on residents' psychological perception of walking accessibility. Adopting a quantitative research methodology through survey analysis, our findings reveal that natural environments and greenery significantly enhance urban residents' psychological perceptions of walking environment quality, improving visual quality, thermal comfort, safety perceptions, and trip distance perceptions. Consequently, this promotes walking accessibility, highlighting the critical role of green spaces in urban planning and public health strategies. This study fills a critical gap in existing literature by quantitatively assessing the psychological effects of green spaces on walking accessibility within an urban Malaysian context. By highlighting the substantial influence of natural environments on enhancing walkability, our research offers valuable insights for urban planners and policymakers aiming to improve public health and urban sustainability through the strategic incorporation of greenery. This contribution is particularly relevant for rapidly urbanizing countries facing significant environmental and public health challenges.

***Keywords***: Greenery, Urban, Neighborhood, Walkability

[1] Lecturer at Taylor's University, FilzaniIllia.Ibrahim@taylors.edu.my

## INTRODUCTION

Walkability is essential for healthy, sustainable cities and resident well-being (Seifi et al., 2024). In recent years, the relationship between natural elements in urban environments and walking behavior has increasingly attracted researchers' attention. Studies have shown that a good walking environment can not only increase residents' walking frequency (Wu, Zhao, Wang, et al., 2021) but also affect path selection preferences (Kim et al., 2024), and improve the significance of greenery in promoting walking (Cooley et al., 2021).

In the exploration of urban walkability, the role of psychological perceptions is often overlooked. However, as urbanization accelerates, the psychological reactions of individuals to the quality of their living environment become increasingly significant. This study aims to fill this research gap by employing quantitative research methods and designing a questionnaire survey to meticulously explore how urban residents in Malaysia psychologically perceive their community environments, particularly how natural environments and greenery impact their psychological perceptions of walkability.

## LITERATURE REVIEW

### Positive impacts of greenery and the natural environment on walkability

Green spaces and natural environments play a crucial role in enhancing urban walkability, not merely for their ability to beautify the urban landscape but more importantly, for their direct impact on increasing residents' willingness to walk and enhancing the walking experience. This is particularly the case in countries with tropical climates like Malaysia, where appropriate greening measures can not only embellish the urban landscape but also effectively improve thermal comfort and enhance a sense of safety, thereby significantly improving the walkability of cities (Ki & Lee, 2021; Sun et al., 2021).

Studies indicate that green spaces and high-quality natural environments significantly enhance a city's visual appeal, attracting more people to walk and engage in outdoor activities. Research by Ki and Lee (2021) , utilizing Google Street View and deep learning technologies, demonstrates that the Green View Index (GVI) of neighborhood streets has a significant positive effect on walking duration, particularly among lower-income groups, suggesting that a high GVI can encourage walking behaviors. Furthermore, a street greening case study by Sun et al. (2021), optimized based on walk scores, significantly improved the walkability of urban areas.

In tropical countries like Malaysia, high temperatures and humidity are primary factors affecting pedestrian comfort. Increasing urban green coverage can effectively lower surface temperatures, thereby improving thermal comfort. A study by Gholami et al. (2022) on a 3D urban digital twin system developed in Imola, Italy, shows that a Green Pedestrian Network (GPN) can significantly assess and enhance pedestrian thermal comfort. Moreover, a review of urban

cooling strategies by Mohammad et al. (2021) highlights the importance of green infrastructure and design solutions in mitigating urban heat island effects and enhancing urban liveability.

Green spaces and natural environments also significantly impact the enhancement of pedestrians' sense of safety. Using automated audits of Google Street View images, Koo et al. (2023) explored how micro-scale pedestrian streetscape features enhance macro-urban form accessibility and pedestrian safety perceptions, with results indicating that good micro-scale streetscape design significantly improves pedestrians' safety perceptions and willingness to walk. Research by Zuniga-Teran et al. (2019) examining the impact of urban walkability on the frequency of residents' use of green spaces found that enhancing neighbourhood walkability, especially through improving walking environments and increasing greenery, can encourage residents to use green spaces more frequently, thereby enhancing their sense of safety and health levels.

In summary, greening and natural environment play a key role in enhancing urban walkability. In countries with tropical climates such as Malaysia, greening becomes a key factor in enhancing walkability by improving visual appeal, thermal comfort and safety perception. Therefore, urban planning and design should give due consideration to the combined benefits of greening and natural environments in order to promote pedestrian-friendly cities.

## METHODOLOGY

In this study, a quantitative research approach was adopted to delve into the psychological perception impact of natural environments and greenery on the walkability of communities. Through systematic data collection and analysis, we aim to uncover the effects of natural environments and greenery on walking behaviours and attitudes among residents in Malaysian communities, as well as how these natural elements promote or hinder walkability within communities.

The primary reason for selecting a quantitative research method lies in its ability to provide a structured and objective pathway for quantifying and analysing the public's psychological perceptions of natural environments and greenery, and their impact on community walkability. By designing and conducting a questionnaire survey, we were able to gather substantial data to support our research hypothesis, while also numerically analysing participant feedback, thereby ensuring the reliability and universality of our findings.

Our study, through the form of a questionnaire survey, aimed to assess the public's views on the presence of natural environments and greenery in their communities and its impact on walking behaviour. This includes exploring the aesthetic perception of greenery, its influence on walking comfort, and the potential role of greenery in enhancing a sense of safety while walking. The questionnaire was designed to consider multiple dimensions related to walking, such as visual appeal, thermal comfort, sense of safety, and perception of walking

distance, in order to comprehensively understand how natural environments and greenery influence walking willingness and behaviour.

By quantitatively analysing the results of the questionnaire survey, we aimed to reveal the specific contributions of natural environments and greenery in promoting community walkability, as well as residents' psychological perceptions of this impact. This method allows us to quantify the impact of natural environments and greenery in a scientific manner, providing a solid foundation for evidence-based urban planning and design.

**Data Collection**

This study utilizes a questionnaire as the principal tool for data collection to evaluate the impact of natural environments and greenery on the psychological perception of walkability in Malaysian residential areas. The questionnaire design incorporates demographic information, perceived impacts of natural environments and greenery, as well as other relevant walkability attributes. Moreover, the development of the questionnaire is based on literature review and perceptual statements, using a five-point Likert scale to assess respondents' perceptions and attitudes. Table 1 displays the details of the questionnaire development.

**Table 1.** The details of the questionnaire development.

| Section | Description | Literature |
|---|---|---|
| Demographic Information | Contains six questions exploring the impact of gender, age, income, neighbourhood area, duration of residence, and lifestyle on respondents' perception and walking behaviour. | ------ |
| Perception of Natural Environment and Greenery | Aims to assess the perceived impact of the natural environment and greenery on community walkability, including visual appeal, thermal comfort, safety, and perception of walking distances. | (Niu et al., 2022; Yan et al., 2023; Yang et al., 2021; Zuniga-Teran et al., 2019) |
| Other Walkability Attributes | Provides a comprehensive evaluation of the correlation between greenery and community walkability, as well as other walkability attributes beyond greenery. | (Frank et al., 2022; Jin et al., 2022; Ki & Lee, 2021; Kim et al., 2020; Wu, Zhao, Li, et al., 2021; Yang et al., 2019) |

*Source: Author*

To ensure the breadth of data collection and the accessibility of the questionnaire, this study distributed the survey both online and offline. Online

questionnaires were mainly disseminated through community or neighbourhood Facebook groups, a method that aids in the rapid and widespread gathering of data, while also reducing geographic limitations. For offline respondents, the research team provided a live link to the same online Google form and offered on-site query responses in the questionnaire, a hybrid approach intended to maximize the coverage of the survey and ensure participation from a diverse group of individuals. Additionally, the research team directly informed the public about the purpose and importance of the study through live interactions at community events, not only increasing the willingness of respondents to participate but also helping to enhance the accuracy and reliability of the data.

Despite certain academic research ethics potentially limiting data collection via social media, this study opted to distribute online questionnaires through community or neighbourhood Facebook groups based on the following considerations: Firstly, this approach allows the research to quickly and broadly reach the target audience(Arrigo et al., 2021), especially considering the growing use of social media among residents of Malaysian communities; secondly, data collection via social media can effectively reduce geographical constraints(Opara et al., 2023), ensuring wide participation from residents of different areas.

**Data Analysis Method**

In this research, a comprehensive analysis was conducted on the data collected to uncover how natural environments and greenery affect the psychological perception of walkability among residents of Malaysian communities. The analysis followed rigorous statistical procedures to ensure the reliability and universality of the research outcomes.

Initially, descriptive statistical analysis was employed to outline the respondents' reactions to various items on the questionnaire, including calculations of frequency, mean values, and standard deviations. This step provided us with a preliminary understanding of the overall perception of natural environments and greenery within the community as viewed by the respondents.

Subsequently, the data underwent analysis for arithmetic means and standard deviations to evaluate the central tendency and dispersion of the psychological perception of walkability in various dimensions influenced by natural environments and greenery. Moreover, correlational and regression analyses were utilized to investigate the statistical relationships between the natural environments and greenery and the psychological perception of walkability, as well as to ascertain the level of support for the research hypotheses. All statistical tests were conducted at a 95% confidence level with a significance level set at $p < 0.05$, to ensure the statistical significance of the research findings.

To gain an in-depth understanding of the open-ended responses provided by the respondents in the questionnaire, content analysis was also

adopted in this study. This method involved categorizing and summarizing respondents' comments, summaries, and suggestions. This qualitative analytical component provided us with additional insights, aiding in the understanding of the deeper motivations and viewpoints underlying the quantitative data.

## RESULTS

### Data Analysis

The study begins with a careful descriptive analysis based on the 167 total number of respondents' demographics, socioeconomic status, and lifestyle, aiming to understand how these contextual factors may influence their perceptions of the research topic.

**Table 2:** Gender and Age Group Cross-analysis.

| Age Group / Gender | Male (45%) | Female (55%) |
|---|---|---|
| **0-25 years (53%)** | 24% | 29% |
| **26-45 years (28%)** | 12% | 16% |
| **46-55 years (19%)** | 9% | 10% |

*Source: Author*

**Table 3:** Income and Occupation Cross-analysis.

| Income / Occupation | Students (49%) | Professionals (25%) | Others (26%) |
|---|---|---|---|
| No Income (41%) | 20% | 12% | 9% |
| Below RM2000 (18%) | 9% | 6% | 3% |
| RM2001-RM4000 (18%) | 9% | 5% | 4% |
| RM4001-RM6000 (9%) | 4% | 3% | 2% |
| RM6001-RM8000 (7%) | 3% | 2% | 2% |
| Above RM8001 (7%) | 4% | 2% | 1% |

*Source: Author*

**Table 4:** Lifestyle and Age Group Cross-analysis.

| Lifestyle / Age Group | 0-25 years (53%) | 26-45 years (28%) | 46-55 years (19%) |
|---|---|---|---|
| Very Active (5%) | 2% | 2% | 1% |
| Moderately Active (36%) | 19% | 10% | 7% |
| Lightly Active (54%) | 28% | 15% | 11% |
| Sedentary (5%) | 3% | 1% | 1% |

*Source: Author*

Through descriptive statistics, we found that community members come from extremely diverse backgrounds, and this diversity may have an impact on their perception of the natural environment and greenery and its influence on walking behaviour. Subsequently, the questionnaire data analysis showed that a good natural environment and greenery can significantly enhance the visual appeal of a community, improve residents' mood, and provide necessary shade,

which work together to enhance comfort and safety while walking, thus promoting residents' willingness and behaviour to walk in their community.

**Table 5:** Respondents' Ratings of Perceived Community Walkability Dimensions.

| Perception Dimension | Average Score | Standard Deviation | Interpretation |
|---|---|---|---|
| Visual Attractiveness | 4.71 | 3.853 | Strongly Agree |
| Mood Improvement | 4.49 | 4.035 | Strongly Agree |
| Shade Provision | 4.39 | 3.843 | Strongly Agree |
| Comfort and Safety | 4.37 | 3.920 | Strongly Agree |
| Reduction of Traffic Noise | 4.07 | 3.651 | Agree |

*Source: Author*

By evaluating and analysing the perceptual dimensions of visual attractiveness, mood improvement, shade provision, comfort, and security, we found that the visual attractiveness of the community was significantly enhanced through the beautification of the natural environment and greenery, while the green environment positively affected residents on a psychological level by providing a pleasant walking atmosphere. The shade provided by greenery and trees became a key factor in enhancing walking comfort in hot weather, while the presence of natural elements also provided psychological security for residents by reducing traffic noise and providing natural barriers.

As for community walkability, from the data collected, we found that respondents' walking behaviour was influenced by a variety of factors, including the natural environment and green status in the community. Walking behaviour not only includes the frequency and duration of walking, but also involves the preference of choosing walking paths, interactions during walking, and the main motivation for walking.

**Table 6:** Influence of Community Environment on Walking Behavior.

| Behavioural Dimension | Average Score | Standard Deviation | Interpretation |
|---|---|---|---|
| Walking Frequency | 4.06 | 3.694 | Frequent |
| Path Selection Preference | 3.67 | 3.773 | Diverse |
| Attractiveness of Natural Environment | 3.86 | 3.943 | Significant |
| Greenery's Role in Promoting Walking | 3.62 | 4.035 | Significant |

*Source: Author*

The analysis showed that the respondents generally believed that the natural environment and greenery of the community had a positive impact on their walking behavior. Among them, respondents who walked more frequently

tended to choose paths with beautiful environments and sufficient green coverage for their daily walks. This finding underscores the important role of the natural environment and greenery in encouraging walking behaviour in the community, especially in terms of increasing residents' interest and satisfaction in walking.

Through statistical analyses exploring how natural environments and greenery are associated with community walkability, we found that the variables of weather factors, proximity, comfort/infrastructure, and greenery/shade had a significant positive impact on enhancing community walkability. The results of these analyses further confirm the positive role of natural environments and greenery in shaping residents' walking behaviours and perceptions, emphasizing the need to incorporate natural elements in future urban planning and community design.

**Table 7.** Impact of Natural Environment and Greenery on Community Walkability.

| Variable Name | Average Score | Standard Deviation | Evaluation |
|---|---|---|---|
| Weather Factors | 3.889 | 3.536 | Significant |
| Proximity | 3.625 | 3.308 | Significant |
| Comfort/Infrastructure | 3.625 | 3.240 | Significant |
| Greenery/Shade | 3.542 | 3.180 | Significant |
| Natural Environment and Greenery | 3.514 | 3.162 | Significant |
| Attractiveness of Location/Scenery | 3.472 | 3.109 | Significant |
| Connectivity/Accessibility | 3.458 | 3.122 | Significant |
| Safety Factors | 2.139 | 2.466 | Lower |

*Source: Author*

Taken together, this study reveals the significant impacts of the natural environment and greening on enhancing community walkability through systematic quantitative analysis. Also, this study emphasizes the importance of considering the needs of different populations and adopting diverse strategies in community planning and design to promote healthy lifestyles and sustainable community development.

## FINDINGS

This research delves into how natural environments and greenery influence the perception and actual behaviours of walking within communities, revealing their pivotal role in enhancing community walkability. Through comprehensive analysis, we found that natural environments and greenery not only significantly contribute to beautifying communities, uplifting residents' moods, and enhancing the pleasure of walking but also act through various mechanisms to significantly elevate the walking experience of residents and the overall walk-friendliness of

the community. These results offer new perspectives for urban planning and environmental design, particularly on how to effectively employ greening strategies to enhance urban sustainability and the quality of life for residents.

The first key finding of this study is that natural environments and greenery significantly boost the visual appeal of communities, producing profound psychological impacts on residents. This finding resonates with the study by Budiani et al. (2022), which highlighted visual appeal as an important factor influencing urban residents' willingness to walk. Our analysis further indicates that greenery, by providing a comfortable and pleasant walking environment, not only beautifies communities but also enhances the psychological pleasure of walking, promoting residents' walking activities. This underscores the importance of integrating green elements in urban planning to create liveable and walk-friendly environments.

The provision of shade was another key finding that enhances walking comfort. Ample shading can significantly reduce the negative impact of high temperatures on residents' walking experiences, aligning with the findings of Labdaoui et al. (2021), who discovered that shading is an effective measure to improve thermal comfort and encourage outdoor activities. Moreover, the presence of natural elements increased residents' psychological sense of safety, further improving walkability through reducing traffic noise and providing natural barriers. These findings emphasize the role of natural environments and greenery in enhancing residents' comfort and sense of safety while walking, with important implications for urban planning and community design.

These findings not only enrich the theoretical framework of urban walkability but also provide an empirical basis for urban planning and public policy. They suggest that by better utilizing natural elements in urban design, cities can be more sustainable, the quality of life for residents can be improved, and the development of healthy communities can be promoted. Furthermore, this study highlights the key role of greening strategies in achieving these objectives, offering concrete guidance for urban planners and designers.

## DISCUSSION

### Significance and Interpretation of Research Findings

This study conducted a thorough investigation into how natural environments and greenery affect walkability perceptions and behaviors in Malaysian communities. It demonstrates that well-maintained green spaces not only improve the visual aesthetics of communities but also positively influence residents' psychological inclination to walk, by enhancing the comfort and safety of walking experiences. Such findings introduce a novel angle to urban planning and highlight the significance of greenery in advancing urban sustainability and improving life quality.

We've quantitatively explored the ways in which natural surroundings and greenery contribute to walkability perceptions, addressing not just aesthetic and comfort aspects but also safety and distance perceptions, thus broadening the understanding of greenery's role in promoting walkability.

The implications for urban planning are considerable, with our research underscoring the effectiveness of strategic green space design and maintenance in promoting walkability, thus supporting the integration of green infrastructure as a cornerstone for healthy and sustainable urban communities.

**Contributions to Empirical Research**

This study significantly extends the theoretical framework regarding the impact of natural environments and greenery on walkability, offering fresh insights into how these environmental elements shape people's walking behaviour and perceptions. By systematically assessing the specific role of natural environments and greenery in Malaysian communities, this research further reveals the nuanced mechanisms through which natural environments affect the psychological perception of walkability. In particular, this study underscores the mediating roles of visual appeal, psychological comfort, sense of safety, and the perception of walking distances in how natural environments enhance walkability, providing new dimensions of explanation for the complex interplay of natural environments on human behaviour.

From a practical standpoint, the findings of this study provide valuable guidance for urban planners and community designers, emphasizing the importance of integrating natural environments and greenery into community planning and urban design. The results indicate that enhancing the quality and accessibility of natural environments can significantly boost community walk-friendliness, thereby fostering healthy lifestyles among residents and the sustainable development of communities. Specifically, we suggest that urban planning and community design should consider the following aspects:

Optimizing Greenery Layout: Prioritize the layout of green spaces in community planning to ensure an equitable and ample distribution of green spaces that are easily accessible to residents.

Enhancing Greenery Quality: Increase the diversity of plant species to not only beautify community environments but also to raise biodiversity, enhancing residents' interactive experiences with nature.

Designing Walk-Friendly Pathways: Plan comfortable and safe walking paths in conjunction with natural environments and greenery to encourage walking, especially between commercial and residential areas.

Implementing Green Infrastructure Projects: Promote green roofs, rain gardens, and other green infrastructure projects to improve the ecological functions of the city and the walking experience of residents.

In summary, this study not only theoretically enriches our understanding of the impact of natural environments and greenery on walkability but also provides an empirical foundation and concrete recommendations for urban planning and community design, indicating effective pathways for enhancing community walk-friendliness through the utilization of natural environments and greenery. These outcomes are expected to have a positive impact on promoting sustainable urban development, contributing to the creation of more liveable and healthier urban environments.

**Research Limitations and Suggestions for Future Studies**

This research utilized quantitative methods to analyse the impact of natural environments and greenery on the psychological perception of walkability among residents of Malaysian communities, revealing a significant positive role of natural spaces in promoting walkability. The study was limited by its sample size and regional scope, which may affect the generalizability of the results. Future studies should expand the sample and geographic scope and integrate objective measurement tools such as walkability audits and GIS to enhance the applicability and accuracy of the findings. Further research should also investigate the specific mechanisms by which natural environments and greenery impact walkability, providing guidance for urban planning across various cultural and geographical contexts.

**Implications for Policy Formulation**

This research provides clear evidence of the critical role natural environments and greenery play in promoting walkability in communities, offering new perspectives for urban planning and community development. Based on our findings, we recommend the following for policy formulation:

**Promote Green Infrastructure:** Prioritize green infrastructure in urban planning for sustainable community development, including parks, green streets, rain gardens, and green roofs, which enhance the environment and encourage walking.

**Develop Green Corridors:** Establish green corridors that connect residential, work, and recreational areas, considering walkability and environmental quality, ensuring pathways are comfortable and safe.

**Encourage Community Engagement:** Support community involvement in green projects through incentives, recognizing that participation can improve project success and foster a sense of environmental stewardship.

**Strengthen Cross-Sectoral Collaboration:** Encourage collaboration across sectors to integrate greenery in urban planning effectively, considering the multifaceted benefits for environmental conservation, economic development, and social well-being.

**Monitor and Evaluate:** Implement a system to monitor and assess the impact of green policies, especially on walkability and health, to guide policy optimization for long-term sustainability goals.

By implementing these policies, communities can enhance walkability and achieve broader benefits, including improved air quality and urban resilience, contributing to residents' physical and mental health. Integrating natural environments and greenery is essential for sustainable urban development.

## CONCLUSIONS

This study comprehensively investigates the role of natural environments and greenery in enhancing community walkability in Malaysia. Key findings from our robust quantitative methods and data analysis enrich theoretical and practical understandings in urban planning and public health.

The primary contribution of this study is the positive psychological impact of natural environments and greenery on the public's walking experience and willingness to walk. By enhancing community appeal and comfort, natural elements significantly encourage walking behaviors.

Policymakers and urban planners should consider these elements essential in improving walkability and sustainable development. Integrating high-quality natural environments and creating interconnected green corridors should be central to urban planning efforts.

In summary, this study offers empirical evidence and guidance for creating healthier and more sustainable living environments. We anticipate further research to explore the potential of natural environments in enhancing walkability, inspiring policy and practice innovations.

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