Research Article

Measuring Urban Walkability Index for the Town Centre of Petaling Jaya

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Abstract: *Walkability has been introduced as one of the newest elements in supporting green neighbourhood. Various studies have been conducted to identify the built environment factors that influences people's decision to walk. From these studies, scholars have developed walkability index to measure the walkability of a specific areas. However, most of this studies are conducted outside of Malaysia. Despite the numerous advantages of using walkability index to measure walkability of an area, the application of walkability index in Malaysia is limited and scarce. Therefore, this study attempts to develop the walkability index based on Malaysian context and test the feasibility of using this walkability index in Malaysia. The walkability index indicators were adjusted to suit the Malaysian local environment and used transportation network design, land use diversity and population density as the built environment indicators. The walkability index was tested in the urban areas of Petaling Jaya and were validated by the officers from the Transport Department of Petaling Jaya City Council. Results shown that the index is able to produce walkability results and depict areas with high and low walkability among the people. This study provided useful insights on how walkability index can assist planners and stakeholders in making informed decision in improving the built environment to promote walkability among the people.*

Keywords: Walkability Index; Urban Mobility; GIS.

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1. INTRODUCTION

Green neighbourhood is one of the initiatives taken by PLANMalaysia to reduce the nation's overall greenhouse gas emissions. This is in-line with the pledge taken by Malaysia during the United Nations Framework Convention on Climate Change (UNFCCC) Conference of Parties, Paris held in November 2015, to cut carbon emissions intensity by 45 per cent by 2030. Design elements of green neighbourhood consists of 10 elements and one of the elements is walkable streets (PLANMalaysia, 2017). For that reason, to increase the chances of having fewer carbon emissions from the implementation of green neighbourhood, it requires a well thought design of walkable streets in the built environment to promote walkability among the community.

Walking is one of the oldest mode of transportation used by people. It is considered as one of the best approaches to reduce carbon emissions. Walking creates less air pollution and thus reducing the carbon emissions that are warming the atmosphere. Various studies have been conducted by scholars to determine the relationship between built environment factors and the tendency of people to walk (Ewing & Cervero, 2010; Stockton, J. C. et al, 2016; Mavoa, S., 2018). Identifying this relationship is important in ensuring that the neighborhood design is ideal in promoting a walkable environment.

From previous studies, built environment is proven to have an influence on the individual's tendency to choose walking as their mode of transport (Larrañaga, A. M., & Cybis, H. B. B., 2014; Liu, J., Xiao, L., & Zhou, J., 2021). Thus, studies were conducted to find factors that encourage people to walk based on built environment factors. Most of the studies agreed that there are five main factors that may influence people to walk; transportation network design, land use diversity, population density, destination accessibility and distance to transit (Ewing & Cervero, 2010; Larrañaga, A. M., & Cybis, H. B. B., 2014). Studies to identify the relationship between built environment factors and the tendency of people to walk have been conducted mostly outside of Malaysia such as in Australia, India, United Kingdom and United States of America. The results from the studies have been used to derive the walkability index based on the built environment factors. However, there are limited studies on deriving the walkability index in Malaysia. The built environment and climate condition in Malaysia is likely to differ from the studies conducted in Australia and United States of America. Therefore, it is utmost importance that a local walkability index that is more suited to the Malaysian context is develop to assist town planners in measuring the walkability of a city.

2. METHOD & MATERIAL

This study developed a neighbourhood walkability index in Malaysia, using the urban areas in Petaling Jaya as a case study. The study investigated the factors of built environment to be used as the indicators in the walkability index and identifying an appropriate GIS data source for modelling the walkability index.

The walkability index for Petaling Jaya was developed and computed based on three indicators associated with walking behaviours; transportation network design (intersection density), land use diversity and distance to transit and Point of Interest. The three indicators were chosen based on the availability of data and the highest value of weighted average elasticities of walking. Based on the value of weighted average elasticities of walking, population density indicators were omitted from the computation of walkability index.

The walkability index was produced at neighbourhood scale using land use data, street data, transit data and POI data. The formula used to derive the walkability index are as follows:

$$(w/3) + (x/3) + (y/3)$$

w = ranking score for proximity to transit station and Point of Interest (POI)
x = ranking score to street intersection density
y = ranking score for Entropy Index

The w score was produced using a street level data and POI data. The x score was calculated using the street data while the y score for Entropy Index was computed using land use data based on the following formula

$$Entropy = -\left([\sum_{j=1}^{k} P^j \ln P^j]\right)\Big/_{\ln k}$$

P_j = percentage of each land use type j in the area
k = total number of land use types

2.1 Development of Walkability Index

This study used Geographic Information Systems (GIS) as the main tool for computing and deriving the walkability index for Petaling Jaya. GIS is used because of its capabilities in handling spatial data and the ability to conduct spatial analysis for walkability. ArcMap 10.8 are used as the main GIS software for the data processing and analysis of spatial data. All the data input was converted from TAB format to SHP format. The process of deriving the walkability index were done manually in the software using the ArcToolbox. However, a model builder was also created in this study to allow more automated process of the GIS workflows.

3. FINDINGS

Figure 1 shows the result of Walkability Index for Petaling Jaya based on the three (3) indicators. The high score indicates areas of high walkability areas in Petaling Jaya based on built environment factors while the low score of Walkability Index means that people are more incline to use motorized vehicles which resulted in less walking.

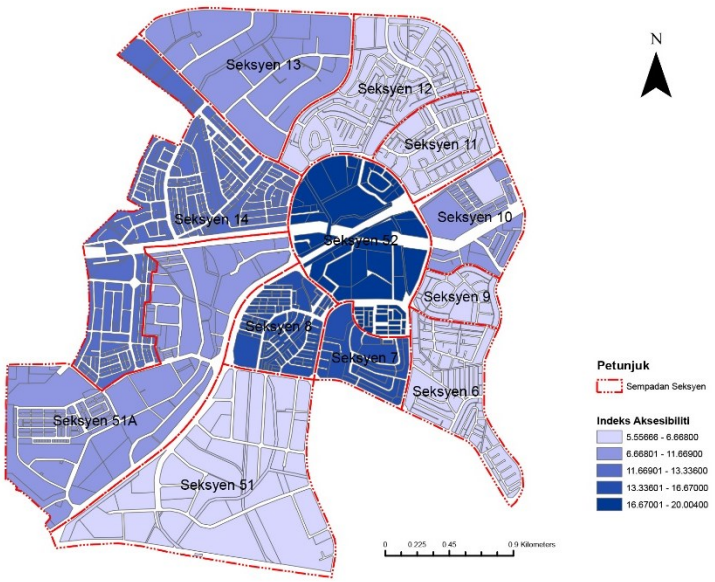

Figure 1: Results of Walkability Index for Section 5 – Secton 52, Petaling Jaya

Results from this study was validated by officers and technicians from the Transport Department, Petaling Jaya City Council. The index showed high reliability in depicting areas which may have high volume of pedestrian especially in the town centre of Section 52.

Based on this study, the index has the potential to be applied at City Council especially in assisting the City Council in determining areas with high or low volume of pedestrians. However, it should be highlighted that the accuracy of the Walkability Index is highly dependent on the accuracy of input data used in developing the index. Therefore, the acquisition of highly accurate spatial data is important to ensure the reliability of the index.

4. DISCUSSION

This study demonstrates the value of the walkability index as a powerful tool for urban planners and stakeholders to make informed decision regarding pedestrian infrastructure in the cities. It highlights how this walkability index enables a clear understanding of areas with both high and low walkability levels. This insight equips decision makers with a baseline data to develop targeted strategies and policies that can effectively enhance pedestrian infrastructure across cities. The adoption of a walkability index fundamentally shifts how cities approach pedestrian infrastructure. Instead of relying on time-consuming, subjective visual inspections, planners can now make data-informed decisions that enhance public space effectively and equitably.

This approach benefits public services by maximizing their impact and ensuring that investment goes into areas where it will have the most influence on walkability. Additionally, the walkability index can provide a framework for tracking improvements over time, offering measurable data on how adjustments to the built environment impact pedestrian activity.

In contrast, the walkability index allows planners to prioritize inspections and resources in areas with high walkability scores, as these are locations where the built environment is likely to support high pedestrian activity. This shift not only improves the efficiency of public services by concentrating efforts where they are most needed but also ensures that areas with high walkability scores receive the infrastructure enhancements they require. Urban planners and local authority can prioritize walkability in a way that aligns with broader goals like reducing traffic, improving public health, and enhancing quality of life for residents. Furthermore, the index serves as a reliable tool for evaluating current layouts and new proposals, helping planners assess and design environments that encourage walking.

5. CONCLUSION

The findings from this study showed that the Walkability Index is a highly valuable tool to assist planners and stakeholders in understanding areas with high level of walkability and low level of walkability. Having this valuable information will assist planners and stakeholders in formulating strategies and policies to improve the pedestrian infrastructure in the city. Previously, most of the decision to upgrade or improve the pedestrian infrastructure are based on visual inspections by the technicians. However, this approach is time consuming. By using Walkability Index, planners can focus a more thorough inspection at the areas with high score because it is deemed that this area has a high chance of people walking based on built environment factors. This approach will improve the efficiency of the public services and ensure that areas with high score will be provided with the proper infrastructure. This also will provide the planners with a proper tool to evaluate the existing and proposed new layout from the built environment factors that can encourage people to walk.

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