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ASSESSMENT OF PEDESTRIAN ACCESS TO RAIL TRANSIT STATION BY SPATIAL WALKABILITY INDEX IN KUALA LUMPUR CITY CENTRE: A COMPREHENSIVE APPROACH USING ANALYTICAL NETWORK PROCESS AND GEOGRAPHICAL INFORMATION SCIENCE

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ABSTRACT

Walkability is one of the keys to achieve sustainable transportation in cities, as it supports a balance between environmental, social, and economic factors. Transit Oriented Development is a concept that promotes these effects. However, there are still gaps in research regarding the criteria selection and weighting methods to measure the walkability index. Additionally, there is a lack of clarity in how to define and measure walkability. This study aims to measure the Spatial Walkability Index of pedestrian access to rail transit stations in Kuala Lumpur City Centre, with three objectives: 1) to examine the set of criteria that can be used to measure walkability, 2) to determine the degree of importance of the walkability criteria, and 3) to develop the SWI for pedestrian access to rail transit stations. A set of criteria for SWI was determined through a literature review and analysis of national policies. Previous studies were reviewed to identify the most commonly used criteria to measure walkability. As a result, five (5) criteria were selected which are 1) Connectivity, 2) Land-use Mix, 3) Comfort, 4) Security, and 5) Safety, which align with national policies. Each of the criteria were represented by their ground parameters to be able to be used in geographic analysis. Then, their degree of importance of the criteria were then determined by using Analytical Network Process. The pairwise comparison method within Analytical Network Process was used to prioritize the weightage to be used as attributes in GIS software. The criterion with the highest weightage is Security (0.25), followed by Safety (0.22) which are not that different as both had always been the highest prioritized criteria in other studies too. For the ground parameters, Street Lights has the highest weightage (0.17), followed by Pedestrian Bridges (0.10). The weightage was then used in measuring Spatial Walkability Index of pedestrian access to rail transit stations by using GIS proximity analysis. This study includes both indoor and outdoor walking environment in the assessment as most of rail-transit stations in Kuala Lumpur has connection to a building, therefore people will need to walk both indoor and outdoor to access the services. As a result, the highest SWI for pedestrian access was obtained for Jalan Dato Onn near KTM Bank Negara with a value of 58.73. The highest SWI for existing rail transit stations was found at KTM Bank Negara with a value of 99.51. To ensure the model developed could be used, it was tested and validated. The inclusion of indoor walking environment was tested in KLCC LRT station where the station has direct access to the Suria KLCC. The test revealed that when indoor walking environment was not included in the assessment, the index became significantly lower (from a range of A to C, it became C to E). In addition, the presence of ground parameters was also tested to see how they play role in the measurement of walkability. The test revealed that, when the ground parameters were added to the road, the walkability of it increases. In conclusion, the combination of MCDA and GIS was proven to be possible to be used in measuring walkability by incorporating human's or experts' judgements in a geographic-based analysis. The model of framework for measuring the walkability index was translated into a GIS toolbox that was developed in ArcGIS. The tool is expected to be used by other researchers to assess walkability in their own study areas. This study also revealed the importance of the inclusion of indoor walking environment in enhancing the walkability assessment.

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CHAPTER ONE
INTRODUCTION

1.1 Background of Study

Walkability is considered as one of the keys to enhance sustainable transportation in a city (Bilyamin et al., 2017). The development of a sustainable city requires a walkable environment to promote or inhibit walking activities. Walkability is a part of built environment that aims to encourage people to walk by providing comfort and safety and connecting people with various destinations (Baobeid et al., 2021). It also describes how pedestrian-friendly the access is (Fonseca et al., 2022). Accessibility to rail-transit services is important to ensure its level of services from the first to last mile where accessing the station also included. Hence, walkability is important to encourage people to walk to rail transit stations to enhance sustainable transportation within the city. Besides, it also ensures the rail transit station can connect people with various services around the city. These days, many cities have considered enhancing the pedestrian path to rail transit stations to ensure a seamless walking experience for people to reach their destinations (Furlan et al., 2016; Kanthavel et al., 2021).

The Government of Malaysia is highly committed in integrating sustainable transportation as a connection tool to connect the people within the cities. The goal highlighted in the Kuala Lumpur Structure Plan 2040 emphasising the public transport system for all and make the public transport network the backbone to connect people in Kuala Lumpur city (DBKL, 2020). Each movement made by public transport begins and ends in walking mode. Therefore, the development of a pedestrian-friendly transport system had been included as one of the important agendas by the government. In addition, it provides various benefits in terms of health, environment, finance and community. It is suggested by the World Organization of Health (WHO) walking is a daily activity to encourage mental and physical health.

The focus of the Government for Kuala Lumpur city is to integrate the pedestrian-friendly network as access for people to the neighbourhood area, commercial and employment area and transit stations area (DBKL, 2020). Transit Oriented Development (TOD) is an example to implement in Kuala Lumpur city as it is the transport planning strategy to reduce traffic congestion within a city. TOD is proven to