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Mobility Index Towards Heritage Tourism Area, Case Study: Borobudur, Prambanan, And Ratu Boko

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Cover Page Footnote

The study received funding through a joint program involving the University of Indonesia and the Ministry of Transportation's HR to support the implementation of the dual degree initiative.

MOBILITY INDEX TOWARDS HERITAGE TOURISM AREA CASE STUDY: BOROBUDUR, PRAMBANAN, AND RATU BOKO

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ABSTRACT

Mobility has become a crucial factor in transportation management, especially in the tourism sector. It is a key indicator of the performance of transportation infrastructure and people's response to it. To evaluate mobility in tourist areas, there is a need for tools to represent its value. In this study, the concept of an index as a measure of performance is applied, gathering information into a simpler and more mutually agreeable form. The cultural heritage sites of Borobudur, Prambanan, and Ratu Boko are chosen as an ideal study location due to their popularity internationally. Given the limitations of previous research on mobility indexes in tourist areas, the Sustainable Urban Mobility Index (I_SUM) framework is used to develop the variables. To avoid bias, this study utilizes expert opinion methods to assess necessary and unnecessary variables in achieving the index. Eight individuals with expertise and experience in transportation and tourism are selected as respondents. Furthermore, the expert evaluation results are processed using the Content Validity Index (CVI). The outcome is 26 variables that meet the validation test out of a total of 32 previous variables, which are divided into five domains, covering accessibility, social aspects, transportation infrastructure, traffic cycle, and transportation systems.

Keywords: *Content Validity Index; Heritage Tourism; Mobility Index*

INTRODUCTION

In recent years, the tourism industry has demonstrated substantial growth. In 2019, global tourist travel exceeded 12.3 billion, representing a 4.6% increase from the previous year. The total global tourism revenue amounted to US$5.8 trillion, equivalent to 6.7% of global GDP (World Tourism Economy Trends, 2020). Tourism has played a pivotal role in economic expansion by creating employment opportunities, enhancing infrastructure, and bolstering foreign exchange revenues for destinations (Li, Jin, & Shi, 2018). In Indonesia, the tourism sector has been a significant contributor to foreign exchange. In 2019, prior to the global health crisis, the Travel & Tourism sector, encompassing its direct, indirect, and induced impacts, represented 10.5% of total employment, amounting to 334 million jobs, and contributed 10.4% to the global GDP, equivalent to US$ 10.3 trillion. During this period, international visitor spending reached US$ 1.91 trillion (World Travel and Tourism Council, 2019). The National Strategic Tourism Area (KSPN) has emerged as a new brand in promoting Indonesian tourism. One of the tourist destinations included in the strategic area of national tourism is KSPN Borobudur, which comprises three temple tourist sites, including Borobudur, Prambanan, and Ratu Boko. The primary attraction of the area is the presence of the Borobudur Temple, recognized by UNESCO as one of the world heritage sites.

Mobility has become an essential aspect of tourism activities (Szivas et al., 2003; Liu et al., 2006). It plays a significant role in driving the growth of the tourism economy, with transportation infrastructure serving to maintain a smooth flow of tourists (Jun Liu et al., 2022). Mobility, in a broader sense, encompasses the ability to communicate spatially, mentally, socially, and professionally. Transport mobility specifically refers to the ability to move people within a space. The primary function of transport is to connect places and experiences for tourists. In some unique cases, transportation can also serve as part of the tourist experience itself, such as with the toboggan on the island of Madeira, the old antique buses in Malta, or antique trains (Lumsdon & Page, 2004).

Given the importance of the role of mobility in the tourism sector, it is necessary to determine an index that can be used to measure the mobility of a tourist area. Several previous studies have been conducted to determine the index of mobility in an Area. (I_SUM) Sustainable Urban Mobility Index has become the most frequently used method in measuring the mobility index in urban areas (Costa, Neto, & Bertolde, 2017). Due to the lack of research on the mobility index in the tourist area, I_MUS is used as a framework in this survey.

METHODS

The research framework utilizes the Urban Mobility Index (I-MUS) developed by Costa in 2008. This comprehensive framework comprises 9 domains, 37 sub-domains and, 87 variables shown in Table 1.

Table 1. Sustainable Urban Mobility Index (I_SUM) Framework

Domain	Sub-domain
Accessibility	Accessibility to transport systems
	Universal accessibility
	Physical barriers
	Legislation for users with special needs

Domain	Sub-domain
Environmental aspects	Control of environmental impacts
	Natural resources
Social aspects	Support to the citizens
	Social inclusion
	Education and active citizenship
	Public participation
	Quality of life
Political aspects	integration of political actions
	Acquisition and management of resources
	Urban mobility policy
Transport infrastructure	Provision and maintenance of transport infrastructure
	Distribution of transport infrastructure
Non-motorized modes	Bicycle transportation
	Pedestrians
	Trips reduction
Integrated planning	Managers training
	Central areas and historical sites
	Regional integration
	Planning process transparency
	Planning and control of land use
	Strategic and integrated planning
	Infrastructure and urban facilities planning
	Master Plan and urban legislation
Urban circulation traffic	Traffic accidents
	Traffic education program
	freedom of movements and circulation
	traffic operation and enforcement
	Private transport
Urban transport systems	transit availability and quality
	Diversity of transportation modes
	Transit regulations and enforcement
	Transit integration
	Fare policy

The adaptation of the framework to accommodate the variances in thematic areas between urban analysis and tourism took into consideration data availability, cost implications, the relevance of topics, and local conditions. Consequently, a set of 6 domains, 16 sub-domains, and 46 variables was established.

Table 2. Modified I_SUM Framework

Domain	Sub-domain	Variable
Accessibility	Accessibility to transport systems	Accessibility to transit
		Public transportation for users with special needs
		Transport expenses
	Universal accessibility	Street crossings adapted to users with special needs
		Parking spaces to users with special needs
		Accessibility to public buildings
Environmental aspects	Natural resources	Fuel consumption
		Use of clean energy and alternative fuels
Social aspects	Support to the citizens	Information available to the population
	Education and active citizenship	Education for sustainable development
	Public participation	Participation in decision-taking
Transport infrastructure	Provision and maintenance of transport infrastructure	Density of the street network
		Paved streets
		Maintenance expenditures in transport infrastructure
		Streets signaling
	Distribution of transport infrastructure	Transit lanes
Urban circulation traffic	Traffic accidents	Traffic accidents
		Accidents with pedestrians and cyclists

Domain	Sub-domain	Variable
		Accident prevention
	Traffic education program	Traffic education program
	Freedom of movements and circulation	Congestion
		Average traffic speed
	Traffic operation and enforcement	Violation of traffic rules
	Private transport	Motorization rate
		Vehicle occupation
Urban transport systems	Diversity of transportation modes	Diversity of transportation modes
		Public versus private transport
		Motorized versus non-motorized modes
	Transit integration	Intermodal terminals
		Transit integration
	Fare policy	Discounts and free rides
		Transit fares
		Public subsidies

To collect respondent data, a closed question method was used which was compiled from previous research. The authors prefer closed methods because it will help respondents to answer quickly, and also make it easier for researchers to carry out analysis of the entire collected results. Respondents simply answer the statement by choosing one of the alternative answers provided. Expert opinion method was used to discern accepted and rejected variables. Given the significance of this approach in minimizing error and bias, experts with substantial expertise and experience in transport and tourism were carefully chosen. The selection includes two experts from the Ministry of Transport, one from the Yogyakarta province's transport office, a representative from the transport office of Yogyakarta city, a transportation lecturer from Gajah Mada University, and three individuals from PT Taman Wisata Candi Borobudur, Prambanan and Ratu Boko. Each expert was asked to assess the validity of variables regarding the mobility index toward tourist areas. Assessments were conducted through face-to-face meetings as well as non-face-to-face or

online interactions. Following clear instructions, the author submitted the assessment form to each expert. The assessment outcomes were then analysed using the Content Validity Index.

Content validity index (CVI) is a method used to assess the extent to which an item of a tool represents the purpose of the tool, which is calculated based on two different levels such as the item level (I-CVI), and the overall scale level. (S-CVI). To calculate the content validity index (CVI), we need to use the following formula, which was proposed by Waltz and Basel.

$$\mathbf{CVI} = \frac{\text{Number of raters giving a rating of } '3' \text{ or } '4'}{\text{total number of raters}}$$

The process of choosing someone to evaluate and provide feedback on an evaluation tool, such as a questionnaire, typically depends on their expertise in the subject being studied. Table 1 outlines the suggested number of experts and its impact on the acceptable cut-off score of CVI.

Table 3. The number of experts and its implication on the acceptable cut-off score of CVI

Number of experts	Acceptable CVI values	Source of recommendation
Two	At least 0,80	Davis (1992)
Three to five	Should be 1	Polit & Beck (2006), Polit et al., (2007)
At least six	At least 0,83	Polit & Beck (2006), Polit et al., (2007)
Six to eight	At least 0,83	Lynn (1986)
At least nine	At least 0,78	Lynn (1986)

In 2007, Polit, Beck, and Owen introduced new aspects in the calculation of content validity indices, proposing a new method. They emphasized that the overall content validity evaluation (S-CVI) is a crucial step in enhancing the validity of the structure and improving measurement accuracy. They discussed two methods for obtaining scale content validity index values: S-CVI/Ave (averaging methods) and S-CVI/UA (universal agreement methods). The conservative nature of the averaging method (S-CVI/Ave) in computing S-CVI values renders it more reliable than the SCVI/UA method (Madadizadeh et al., 2023). Therefore, S-CVI/Ave will be employed in this survey, with its calculation determined by the following equation.

$$\mathbf{S-CVI/Ave} = \frac{\text{sum of I- CVI scores}}{\text{number of item}} \text{ or } \frac{\text{sum of proportion relevance rating}}{\text{sum of expert}}$$

The research was conducted in the Borobudur, Prambanan, and Ratu Boko Temple Area, which encompasses Yogyakarta Province and Magelang District in Central Java Province. These three temples are part of the National Strategic Tourism Area (KSPN) and have been identified as a priority area for development by the Indonesian government due to the high number of foreign and domestic tourists who visit them.

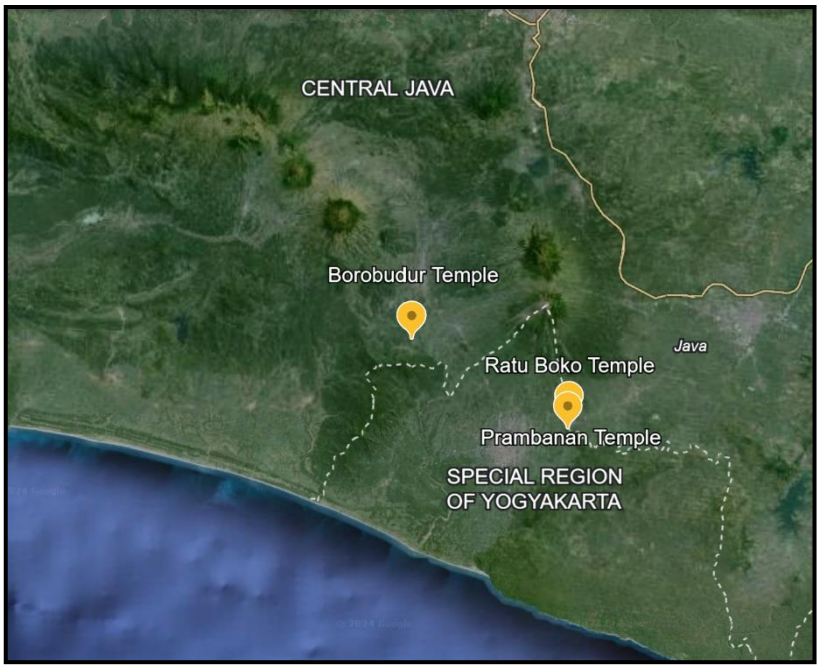

Figure 1. Study Location

RESULTS AND DISCUSSION

The initial phase of data analysis involves verifying the validity of the variable. Prior to computing the Content Validity Index (CVI), it is necessary to document the relevance rating as either 1 (indicating a relevance scale of 3 or 4) or 0 (representing a relevance scale of 1 or 2), as outlined in Table 4. Upon referencing Table 3, variables are identified for elimination. Variables with relevance values below 0.83 will be rejected, while those above 0.83 will be accepted.

Out of the 32 variables outlined in the framework, 6 have been identified as invalid: travel expenses (0.63), accessibility to public facilities (0.63), fuel consumption (0.63), use of reusable energy (0.75), public participation in policy formulation (0.75), and traffic violations (0.75). The S-CVI/Ave value is 0.88, calculated by dividing the sum of I-CVI score (28.25) by the total number of items (32 items).

Table 1. CVI and SVCI Analysis

	E.1	E.2	E.3	E.4	E.5	E.6	E.7	E.8	Expert in Agreement	I CVI
item										
Q1	1	1	1	0	1	1	1	1	7	0,88
Q2	1	1	1	0	1	1	1	1	7	0,88
Q3	1	0	1	0	1	1	1	0	5	0,63
Q4	1	1	1	0	1	1	1	1	7	0,88
Q5	1	1	1	0	1	1	1	1	7	0,88
Q6	0	1	0	1	1	1	1	0	5	0,63
Q7	1	0	1	0	1	1	1	0	5	0,63
Q8	1	1	1	0	1	1	1	0	6	0,75
Q9	1	1	1	1	1	1	1	1	8	1,00

Q10	1	1	1	1	1	1	1	0	7	0,88
Q11	1	1	1	1	1	0	0	0	5	0,63
Q12	1	1	1	0	1	1	1	1	7	0,88
Q13	1	1	1	0	1	1	1	1	7	0,88
Q14	1	1	1	0	1	1	1	1	7	0,88
Q15	1	1	1	0	1	1	1	1	7	0,88
Q16	1	1	1	1	1	1	1	1	8	1,00
Q17	1	1	1	1	1	1	1	1	8	1,00
Q18	1	1	1	1	1	1	1	1	8	1,00
Q19	1	1	1	1	1	1	1	1	8	1,00
Q20	1	1	1	1	1	1	1	0	7	0,88
Q21	1	1	1	1	1	1	1	1	8	1,00
Q22	1	1	1	1	1	1	1	1	8	1,00
Q23	1	0	1	1	1	1	1	0	6	0,75
Q24	1	1	1	1	1	1	1	0	7	0,88
Q25	1	1	1	0	1	1	1	0	6	0,75
Q26	1	1	1	1	1	1	1	1	8	1,00
Q27	1	1	1	1	1	1	1	1	8	1,00
Q28	1	0	1	1	1	1	1	1	7	0,88
Q29	1	1	1	1	1	1	1	1	8	1,00
Q30	1	1	1	1	1	1	1	1	8	1,00
Q31	1	1	1	1	1	1	1	1	8	1,00
Q32	1	1	1	1	1	1	1	1	8	1,00
									S-CVI/Ave	0,88

CONCLUSION

Based on the findings of the study, it can be inferred that the calculation of the mobility index towards the tourist area is reliant on an analysis of 26 variables categorized into 5 domains: Accessibility, Social Aspects, Transportation Infrastructure, Traffic Cycle, and Transportation System. However, not all variables within the I_MUS framework are applicable in computing the Mobility Index to the Tourist Area. Factors such as data availability, varying conditions, and other limitations necessitate the exclusion and adjustment of certain variables by the author to achieve an accurate index value.

This research has the potential to generate index values for each tourist area, providing valuable insights for governments, communities, and investors to assess the mobility dynamics within these areas. The systematic use of indicators will enable ongoing monitoring of current challenges and facilitate more targeted and effective initiatives to improve the tourist experience. Moreover, a broader application of these indicators will allow for comparative analyses across different tourism areas, identifying best practices and benchmarks that can guide enhancement efforts.

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