Jurnal Kejuruteraan 33(3) 2021: 753-762
https://doi.org/10.17576/jkukm-2021-33(3)-33

An Inventory of Measure for Urban Road Sustainability

Sharinatol Akmanida Jamaludin[a*], Samikhah Binti Muhammad[a] & Mohamad Razuhanafi Mat Yazid[b]

[a]*Civil Engineering Department, Polytechnic Ungku Omar (PUO), Perak, Malaysia*
[b] *Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia, Bangi, Malaysia*

**Corresponding author: sharinatol@celt.edu.my*

Received 27 November 2019, Received in revised form 05 March 2021
Accepted 13 April 2021, Available online 30 August 2021

ABSTRACT

Sustainable transportation policies aim to reduce the negative impact on society, the environment, and the economy in urban areas. Sustainable transportation is an indicator to achieve the sustainability of urban areas. However, an inventory system to measure the level of sustainability of a road has not yet been established. Therefore, the Sustainable Transportation Inventory System (STIS) was developed as an initial assessment of road sustainability in urban areas using the software. Through a literature review, ten criteria from social, environmental, and economic indicators were identified. Findings of these criteria are compiled into an inventory system using Microsoft Excel software. STIS consists of five worksheets namely metric criteria, social, environmental, economic, and score calculation. This inventory calculates the score and level of road sustainability of urban areas based on the guidelines that have been identified. Results from expert evaluation through Ipoh City Council (MBI), Public Works Department (PWD) and Town and Country Planning Department (JPBD) in Perak showed STIS with ten criteria approved for testing in selected urban areas. STIS improvements can be structured for use in other cities in Malaysia concerning relevant guidelines and are easily accessible using smartphones.

Keywords: Inventory system; road; sustainability; transportation

INTRODUCTION

Transportation frameworks are part of logistics planning at moving vehicles that are utilised to move individuals or things starting from one area to another area. It enables individuals to get the opportunity to choose either utilizing nearby public transport or personal vehicles (Abdelsalam et al. 2016). Yazid et al. (2017) and Williams (2017) stated that transportation and property are essential to the physical and financial growth of cities and urban communities anywhere in the world. Consequently, property and land prices will generally rise in the region with better transportation systems over time. Moreover, increasing land costs, rapid lodging and aspects of sustainability are important in urban areas by creating more sustainable roads as financial and population development needs to be improved.

Challenges and constraints towards creating a sustainable transportation system in Malaysia is the level of awareness of sustainable transport among people. This is because the misconception of the concept of sustainable understanding by road users can affect their interest in their awareness and knowledge of environmental conservation (Mei et al. 2016). Most of the roads in urban areas lack road facilities such as pedestrian and cycling routes that will encourage people to use motor vehicles and generate the traffic congestion problem. This overwhelming traffic situation will cause health problems where Chlorofluorocarbons (CFC) gas released by vehicles affected human health including asthma, eye contact, and others. In addition to affecting human health, this CFC gas also causes ozone diminution. Hence, authorities should take the initiative by conducting campaigns that can create awareness related to sustainable transportation. Also, the authorities should ensure that the planned guidelines follow the wishes of the road users to ensure they are motivated by sustainable transportation (Department of Town and Country Planning 2010). Besides, Zito & Salvo (2011) mentioned the other challenges towards sustainable

transportation is the agreement between local authorities and policymakers in making decisions (Chesneau et al. 2012; Williams 2017). Therefore, a new inventory system for measuring urban road sustainability needs to be built in order to facilitate the involved stakeholder.

OBSERVATION OF SUSTAINABLE TRANSPORTATION INDICATOR FOR URBAN ROAD

Hák et al. (2016) and Alam et al. (2017) discussed that there are many studies of sustainable transportation indicators being executed globally. Malaysia takes experienced rapidly environmental, economic, and social changes for many years toward sustainability issues. The Malaysian Urban Indicator network (MURNINet) and The Malaysian Quality of Life Index (MQLI) were developed to benefit at federal level, local authority and other stakeholders in city planning and implemented issues due to the social, environmental, and economic indicators (Department of Town and Country Planning 2010; Yazid et al. 2017).

SOCIAL INDICATOR

Department of Town and Country Planning (2010) and Reisi et al. (2017) remark the social indicator for sustainable transport including elements of safety and security among road users. The indicators related to this issue are the provision of safety components in crime avoidance, traffic calming measures, the separation between motorised traffic with cyclist, and pedestrian (Litman 2009; Iqbal et al. 2014).

ENVIRONMENT INDICATOR

The environmental indicator is the value planning of physical elements and transportation intention, which are providing and supporting the presence of a healthy environment for road users and the surrounding (Department of Town and Country Planning 2010; Mei et al. 2017). Masoud et al. (2015) in their study allusion street connectivity, describes a street design that affects the overall neighbourhood layout and determines the densities that can be accommodated within a given layout design. Non-motorised transport facilities indicator refers to the length of sidewalks and cycleways in the neighbourhood. Typical walking distances range between 400 m-1 000 m (PAM 2009).

ECONOMIC INDICATOR

The sustainable transportation guidelines and policies expand all of the inventive methods that have been engaging for years and grows to integrate with new components. The determination of these matters incorporated the agency and citywide (Department of Town and Country Planning 2010; Ibrahim et al. 2015).

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POLICY AND GUIDELINES FOR SUSTAINABLE TRANSPORTATION

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I-THRIVE SYSTEM

An excel-based tool that helps engineers assessing the sustainability benefits of developments (Chesneau et al. 2012; Kang 2015). Masoud et al. (2015) mentioned the i-THRIVE was established based on the Healthy Development Index (HDI) tool developed by the Peel region and Dutch SRS principles. The theoretical foundations of both parts have been relied heavily on with modifications by expert researchers for use to progress this i-THRIVE Tool.

MURNINETS POLICIES

The Federal Department of Town and Country Planning Peninsular Malaysia, Ministry of Housing, and Local Government Malaysia (Department of Town and Country Planning 2010) developed Malaysia Urban-Rural Indicators Network for Sustainable Development or also

known as MURNInets. The MURNInets 2.0 framework that consists of five strategies, six dimensions, 20 themes, and 39 indicators is based on the Sustainable Development Strategy, which is based on Vision 2020 policy, New Economic Model (NEM), 11th Malaysia Plan (2016-2020), Third Physical Plan Country (3rd PPC), and National Municipal Policy 2 (NMP 2).

PUBLIC WORK DEPARTMENT (PWD)

The specific geometric design from PWD is a guide on choosing the proper speed limit for all streets should be an important reference for street experts, particularly those at the area foundation level. It gives the data and standard system essential for experts to lead suitable investigation and settle on exact choices concerning the setting of speed constraints in their preview. In any case, the use of the system and procedure should be connected with adaptability and practical insight to represent the wide variety of the street, condition, and traffic conditions (Zakaria & Sufian 2009).

FEDERAL DEPARTMENT OF TOWN AND COUNTRY PLANNING PENINSULAR MALAYSIA (PLANMALAYSIA)

The idea of building up an urban street arranged a chain of command including order and the board of streets inside an urban system as indicated by the capacities that they serve. The order and the board of the existing urban street framework as a progression of streets are conceptualized (Department of Town and Country Planning 2010; Masoud et al. 2015; Yigitcanlar et al. 2015).

DEVELOPMENT OF SUSTAINABLE TRANSPORTATION INVENTORY SYSTEM (STIS)

Researchers have gone through several phases to complete this research by obtaining information in identifying and listing the suitable sustainable transportation indicator from MURNInets and other guidelines and develop STIS using Microsoft Excel.

STUDY LOCATION

Ipoh city is the largest town in Perak located in the middle of Kinta District as shown in Figure 1. This city is rich with heritage buildings and an ecosystem that should be sustained. This city's population is approximately 2 510 300 people according to the Department of Statistics (2020). The STIS has been tested at the selected road in Ipoh town area as a pilot study such as Jalan Panglima Bukit Gantang Wahab, Jalan Sultan Idris Shah, Jalan Sultan Iskandar Shah, and Jalan Sultan Yusoff. This area was chosen as its nonexistence of road facilities for pedestrian routes and cycling and also heavy traffic congestion problem during peak hours. Also, Jalan Panglima Bukit Gantang Wahab approached the Railway Station Ipoh and this city was surrounded by historical buildings that attracts visitors from other locations too.

FIGURE 1. Location of Ipoh Town

METHODOLOGY

Figure 2 shows the methodology flowchart that consists of the work process conducted for this research. It starts with gathering input to recognise the problem statement and then form the precise objective for this study and expand the interest scope of the study for this research. Additional data from field studies around the town of Ipoh was also done.

In the literature review, a suitable indicator for road sustainability inventory has been identified and listed according to sustainable indicators from various guidelines, policy and regulations applied for transportation in the Malaysian context that consists of the social, environmental, and economic.

Next, the Sustainable Transportation Inventory System (STIS) is developed using Microsoft Excel with multiple

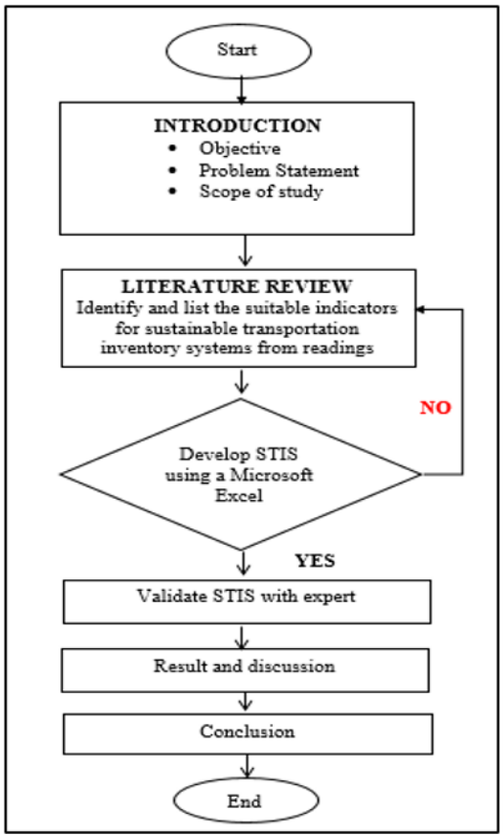


FIGURE 2. Methodology Process

sheets that contain the social, environmental, economic, and indicator calculation selected road. If the process is accomplished, the system will be validated by experts in the transportation field. If not, then the process will be a review on a problem basis.

Moreover, the results from the expertise has been discussed and the conclusion of this research was determined at the end of the analysis.

EXPERIMENT DESIGN AND PROCEDURE

IDENTIFY AND LIST THE SUSTAINABLE TRANSPORTATION INVENTORY FROM MURNI NET AND GUIDELINES

The Malaysia Urban Indicator network (MURNI Net) is a computer network designed to assess the sustainability levels of Malaysia cities and towns based on selected performance-indicators developed by the Federal Department of Town and Country Planning Peninsular Malaysia (Department of Town and Country Planning 2010). It is envisaged that the use of MURNInets will benefit all levels of the government at federal level, MURNInets contributes towards achieving sustainable urban development objectives of the Malaysian government. At state level, it helps the state to identify cities and towns with low sustainability levels. This is important so that they can enhance their services to the public. For the local authorities, from which the majority of MURNInets indicators is generated, they can use the indicators to identify issues associated with urban quality and public services, hence providing opportunities to rectify these issues and improve service levels to the public (Yazid et al. 2017).

DEVELOPING STIS USING MICROSOFT EXCEL

Sustainable Transportation Inventory System is the quantifiable measures and score systems for each criterion. The metric sheet shows the quantifiable measures that are referring to several guidelines such as PWD, PLANMalaysia, and MURNInets. The new tool, which was developed using Microsoft Excel, has five sheets involving Metrics, Social, Environment, Economic, and Calculation. The first sheet shows the quantifiable measures and their score systems for each criterion as shown in Figure 3. The second, third, and fourth sheet which is social, environmental, economic indicator evaluation provides the score behind each criterion, step by step through each metric, and some

Sustainable Transportation Inventory System (STIS)

INDICATOR	CRITERIA	METRIC
ENVIRONMENT	**Land Use Mix** Guidelines by National Housing Department (JPN) and JPBD Peninsular Malaysia	**Part a: Heterogeneity of LU mix** • ≥ 5 % of total community land is outdoor public space • Community provides ≥ 4 new services to an existing neighbourhood (within a 1 km radius of the community centre) • There is a mix of 3 housing types, 6 different services, a public school, and a park ≥ 0.4/ha within 800m of the community centre **Part b: Heterogeneity of Building mix** • ≥ 60 % of commercial buildings include a ground floor pedestrian use along ≥ 60 % of their street façades • 100 % of mixed-use buildings include ground floor retail, live/work spaces, or residential dwellings along ≥ 60 % of their street façade • ≥ 50 % of multifamily residential buildings have a pedestrian use on the ground floor **Part c: Mixed commercial types** • As above and the community includes ≥ 3 housing types, with none making up less than 20 % of the total residential units • Height Buildings for shops, shophouses and office outlets: Town center <5 floors / Rural <4 storey • Back Bore: minimum 9 meters for loading purposes. • Walkway: Minimum size is 2.5 meters for rural trade area and 3 meters for commercial area of the city. • Building Type: Terrace building and each row can not exceed 16 storey shops.
	Street connectivity Guidelines by Geometric Design of Roads	1)The street connectivity criteria promote healthier communities by making walking/cycling more convenient that driving 2) Route directness is used to compare the connectivity of communities' Active Transport (AT) network compared to vehicular network 3) The route directness is defined as the ratio between the actual distances on a street network and the desired distances (straight-line distance) 4) Ideally, the AT to vehicle route directness ratio should be less than one (the lowest the route directness value, the better the connectivity
	Aesthetics and Human	Tree placement and characteristics

FIGURE 3. Metric Sheet

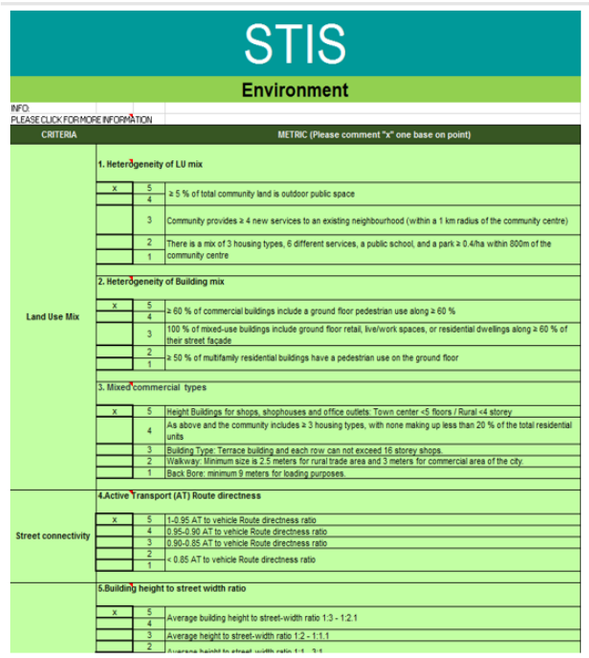
STIS

Social

INFO:
PLEASE CLICK FOR MORE INFORMATION

CRITERIA			METRIC (Please comment "x" one base on point)
Road network and sidewalk characteristics	**8. Traffic Calming**		
	x	5	4-6 traffic calming measures*/meter2
		4	7-10 traffic calming measures*/meter2
		3	11-13 traffic calming measures*/meter2
		2	14+ traffic calming measures*/meter2
		1	1 or more pedestrian-priority streets/meter2
	9. Speed Control / Pedestrian Priority		
	x	5	10-19 % of local roads are ≤ 15km/h with ped-priority
		4	
		3	20-29 % of local roads are ≤ 15km/h with ped-priority
		2	30-39 % of local roads are ≤ 15km/h with ped-priority
		1	≥ 40 % of local roads are ≤ 15km/h with ped-priority
	10.Sidewalks and buffer strips		
	x	5	Avg sidewalk width ≥ 2.5m on all mixed-use streets
		4	Buffer strips, curbside parking all roads > 30km/h
		3	
		2	Buffer strips with physical barriers all roads ≥ 50km/h
		1	
	11. Cycle friendly design		
	x	5	dedicated raised bike lanes, extension of SW
		4	bicycle-priority streets (cars must yield to cyclists; speed ≤ 30km/h)
		3	advance green lights for cyclists
		2	off-street pedestrian and cyclist shortcuts
		1	1 bicycle rack per ten car parking spots (includes on- and off-street spots)

FIGURE 3. Metric Sheet



STIS

Environment

INFO:
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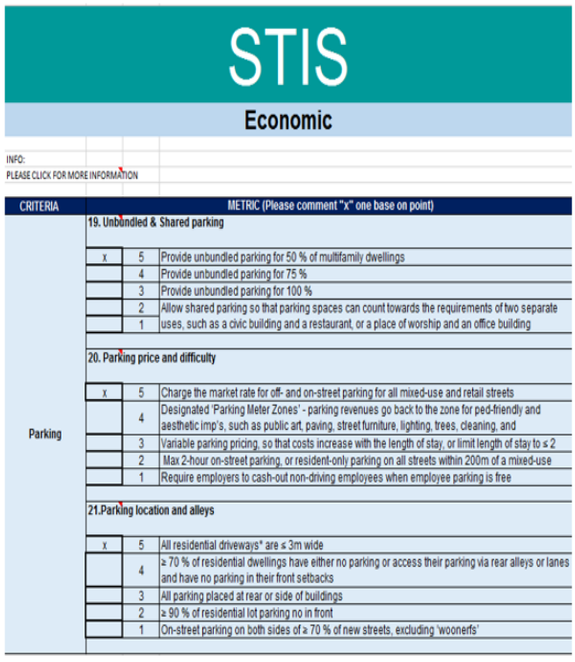
CRITERIA			METRIC (Please comment "x" one base on point)
Land Use Mix	1. Heterogeneity of LU mix		
	x	5	≥ 5 % of total community land is outdoor public space
		4	
		3	Community provides ≥ 4 new services to an existing neighbourhood (within a 1 km radius of the community centre)
		2	There is a mix of 3 housing types, 6 different services, a public school, and a park ≥ 0.4/ha within 800m of the community centre
		1	
	2. Heterogeneity of Building mix		
	x	5	≥ 60 % of commercial buildings include a ground floor pedestrian use along ≥ 60 %
		4	
		3	100 % of mixed-use buildings include ground floor retail, live/work spaces, or residential dwellings along ≥ 60 % of their street façade
		2	≥ 50 % of multifamily residential buildings have a pedestrian use on the ground floor
		1	
	3. Mixed commercial types		
	x	5	Height Buildings for shops, shophouses and office outlets: Town center <5 floors / Rural <4 storey
		4	As above and the community includes ≥ 3 housing types, with none making up less than 20 % of the total residential units
		3	Building Type: Terrace building and each row can not exceed 16 storey shops.
		2	Walkway: Minimum size is 2.5 meters for rural trade area and 3 meters for commercial area of the city.
		1	Back Bore: minimum 9 meters for loading purposes.
Street connectivity	4.Active Transport (AT) Route directness		
	x	5	1-0.95 AT to vehicle Route directness ratio
		4	0.95-0.90 AT to vehicle Route directness ratio
		3	0.90-0.85 AT to vehicle Route directness ratio
		2	
		1	< 0.85 AT to vehicle Route directness ratio
	5.Building height to street width ratio		
	x	5	Average building height to street-width ratio 1:3 - 1:2.1
		4	
		3	Average height to street-width ratio 1:2 - 1:1.1
		2	

FIGURE 5. Environment indicator sheet



STIS

Economic

INFO:
PLEASE CLICK FOR MORE INFORMATION

CRITERIA			METRIC (Please comment "x" one base on point)
Parking	19. Unbundled & Shared parking		
	x	5	Provide unbundled parking for 50 % of multifamily dwellings
		4	Provide unbundled parking for 75 %
		3	Provide unbundled parking for 100 %
		2	Allow shared parking so that parking spaces can count towards the requirements of two separate uses, such as a civic building and a restaurant, or a place of worship and an office building
		1	
	20. Parking price and difficulty		
	x	5	Charge the market rate for off- and on-street parking for all mixed-use and retail streets
		4	Designated 'Parking Meter Zones' - parking revenues go back to the zone for ped-friendly and aesthetic imp's, such as public art, paving, street furniture, lighting, trees, cleaning, and
		3	Variable parking pricing, so that costs increase with the length of stay, or limit length of stay to ≤ 2
		2	Max 2-hour on-street parking, or resident-only parking on all streets within 200m of a mixed-use
		1	Require employers to cash-out non-driving employees when employee parking is free
	21.Parking location and alleys		
	x	5	All residential driveways* are ≤ 3m wide
		4	≥ 70 % of residential dwellings have either no parking or access their parking via rear alleys or lanes and have no parking in their front setbacks
		3	All parking placed at rear or side of buildings
		2	≥ 90 % of residential lot parking no in front
		1	On-street parking on both sides of ≥ 70 % of new streets, excluding 'woonerfs'

FIGURE 6. Economic indicator sheet

important considerations to be taken when applying the tool as shown in Figure 4, Figure 5, and Figure 6.

The social indicator sheet shows the score elements for traffic calming, speed control / pedestrian priority, sidewalks and buffer strips, cycle friendly design, reducing motorists task demand, reducing cyclists task demand, functional classification, access management on collector roads, distinguishable design characteristics, design measures on-road facilities, and forgiving road design measures on collector and arterial roads.

ENVIRONMENT INDICATOR SHEET

The environment indicator sheet shows the score elements for heterogeneity of LU mix, heterogeneity of building mix, mixed commercial types, Active Transport (AT) route directness, building height to street width ratio, setbacks and street walls, and tree placement and characteristics. These indicators relate to the environmental issues raised by common roads in the urban area.

ECONOMIC INDICATOR SHEET

The economic indicator sheet shows the score elements for unbundled & shared parking, parking price and difficulty and parking location and alleys.

INFORMATION BOX

This sheet also provides an information box about each criterion. The user should only click on the front of the question. The information box will pop out out by highlighting the meaning and information associated with the criteria

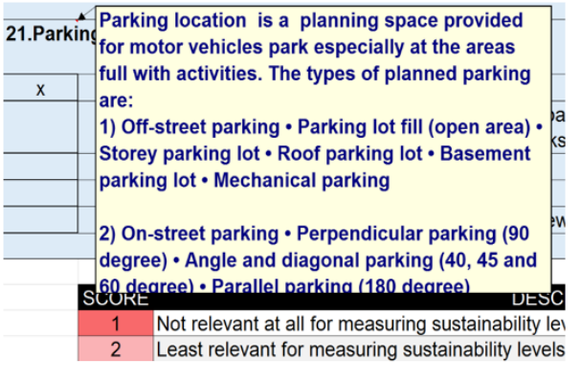


FIGURE 7. Information Annotation

SCORE OF INDICATORS

The calculation is based on the score and level of sustainability for each indicator (Yigitcanlar et al. 2015).

TABLE 1. Score of indicators

Score	Description
1	Not relevant at all for measuring sustainability levels
2	Least relevant for measuring sustainability levels
3	Moderately relevant for measuring urban sustainability levels
4	Relevant for measuring sustainability levels
5	Very relevant for measuring sustainability levels

LEVEL OF SUSTAINABILITY

The level of sustainability for transportation inventory in urban areas were presented in percentage with five-level too (Yigitcanlar et al. 2015).

TABLE 2. Level of sustainability

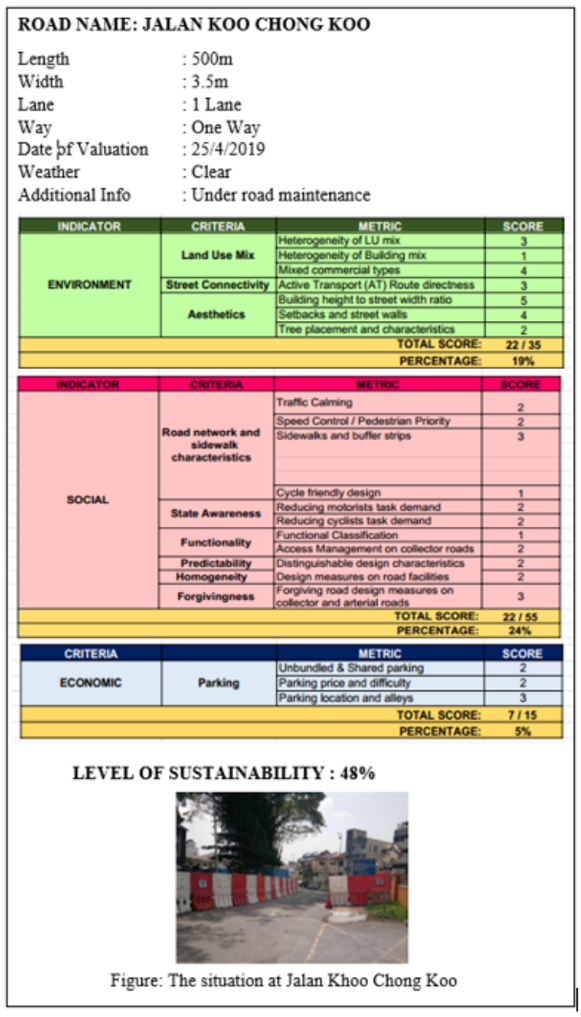
Percentage	Level Of Sustainability	Description
1-20%	Very Low	Least important contribution to the overall assessment score
21-40%	Low	Less important contribution to the overall assessment score
41-60%	Acceptable	Average important contribution to the overall assessment score
61-80%	Good	Important contribution to the overall assessment score
81-100%	Very Good	Extremely important contribution to the overall assessment score

RESULTS AND DISCUSSION

The STIS tool has been developed to benefit transport planners and the engineering community in sustainable inventory for urban roads. These effects can be addressed by using sustainable principles, which evaluate the social, environmental, and economic indicators. Hence, it is suggested that a combination of the frameworks will create a holistic approach and a balance will be provided between the need for a healthy, active lifestyle, and the safety of road users.

STIS OPERATION

The STIS Tool consists of 10 elements, including land use mix, street connectivity, road network and sidewalk characteristics, parking, aesthetics, functionality, predictability, homogeneity, forgivingness, and state awareness. The first six elements are the social indicator (Road network and sidewalk characteristics, state awareness, functionality, predictability, homogeneity, and forgivingness. The next three elements environment indicator (land use mix, street connectivity, aesthetics), while the last element is the economic indicator (parking). The result of the system is shown in Figure 8.



ROAD NAME: JALAN KOO CHONG KOO

Length : 500m
Width : 3.5m
Lane : 1 Lane
Way : One Way
Date of Valuation : 25/4/2019
Weather : Clear
Additional Info : Under road maintenance

INDICATOR	CRITERIA	METRIC	SCORE
ENVIRONMENT	Land Use Mix	Heterogeneity of LU mix	3
		Heterogeneity of Building mix	1
		Mixed commercial types	4
	Street Connectivity	Active Transport (AT) Route directness	3
	Aesthetics	Building height to street width ratio	5
		Setbacks and street walls	4
		Tree placement and characteristics	2
		TOTAL SCORE:	22 / 35
		PERCENTAGE:	19%

INDICATOR	CRITERIA	METRIC	SCORE
SOCIAL	Road network and sidewalk characteristics	Traffic Calming	2
		Speed Control / Pedestrian Priority	2
		Sidewalks and buffer strips	3
		Cycle friendly design	1
	State Awareness	Reducing motorists task demand	2
		Reducing cyclists task demand	2
	Functionality	Functional Classification	1
		Access Management on collector roads	2
	Predictability	Distinguishable design characteristics	2
	Homogeneity	Design measures on road facilities	2
	Forgivingness	Forgiving road design measures on collector and arterial roads	3
		TOTAL SCORE:	22 / 55
		PERCENTAGE:	24%

CRITERIA		METRIC	SCORE
ECONOMIC	Parking	Unbundled & Shared parking	2
		Parking price and difficulty	2
		Parking location and alleys	3
		TOTAL SCORE:	7 / 15
		PERCENTAGE:	5%

LEVEL OF SUSTAINABILITY : 48%

Figure: The situation at Jalan Khoo Chong Koo

FIGURE 8. Information Annotation

EXPERT VALIDATION

As validation for the system, a questionnaire was distributed to the five experts from Majlis Bandaraya Ipoh (MBI), PWD, Department of Town and Country Planning Peninsular Malaysia (DTCP). After all the data and records are collected and analysed solutions to further promote sustainable transportation in the city of Ipoh, experts in the field of transportation to prove legality support the proposed solution. The ratings range on a five-point Likert scale (level of relevance) from '1= Strongly Disagree', '2= Disagree', '3= Neither', '4= Agree' and '5= Strongly Agree'.

GENDER VERSUS WORKING EXPERIENCE

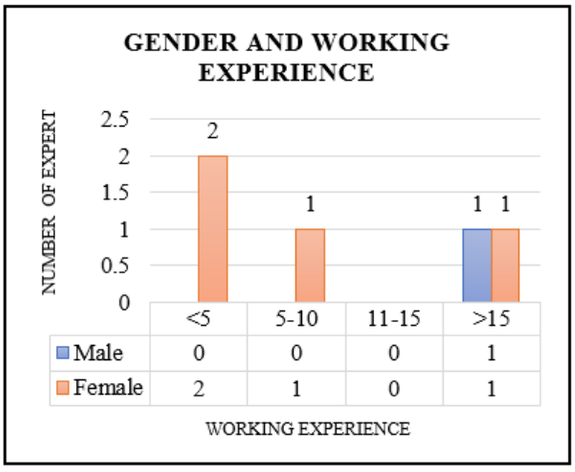


FIGURE 9. The number of experts by gender and working experience

Based on Figure 9, it is shown that the number of experts that have working experience between 16 to 25 years is two which consist of one male and one female. Besides that, only one female expert that has working experience between 5 to 10 years and 2 female experts that have working experience of less than 5 years. In conclusion, it can be said that the number of experts that have working experience between 16 to 25 years is more than the number of experts that have working experience between 5 to 10 years.

RATING SCALE FROM DTCP PERAK, PWD AND MBI EXPERTS

Figure 10 shows that two of the experts from DTCP Perak strongly agree this system is useful for engineers and planners at local development agencies. Besides that, the experts that strongly agree that this system is suitable to be used in urban areas, strongly agree that STIS overcome the issues regarding safety and health in urban areas. This system is able to facilitate the engineers and planners work because they only need to bring their tablet to survey site work. Then, it is also showing that the experts strongly agree that this system to be understandable by the users. It shows that this system is good enough for sustainable transportation inventory activities.

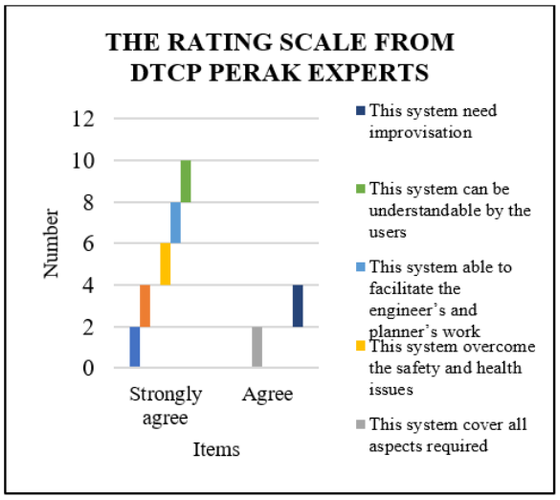


FIGURE 10. The rating scale from DTCP Perak experts

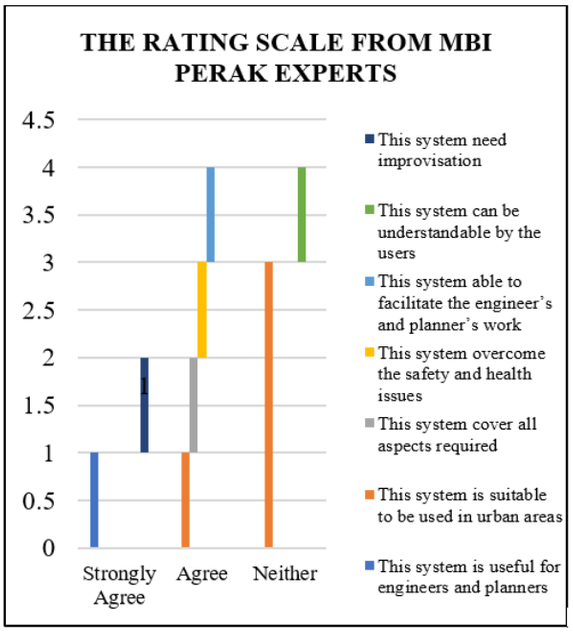


FIGURE 11. The rating scale from MBI Perak experts

Figure 11 shows that one expert agrees with this system is suitable for use in urban areas and covers all the

aspects required for Sustainable Transportation Indicator implementation. Besides that, one expert also agrees that this system can overcome the safety and health issues and able to facilitate the engineer's and planner's work and also strongly agree this system needs improvisation to achieve sustainable transportation development in urban areas. In conclusion, it can be said that the number of rating of strongly agree is greater than neither option but less than the number of rating of agree to answer this questionnaire.

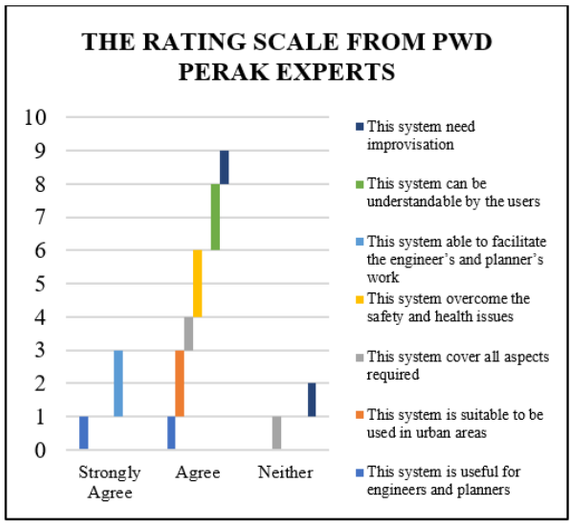


FIGURE 12. The rating scale from PWD experts

Based on Figure 12, it shows that two experts agree this system is suitable to be used in urban areas and only one expert agrees this system is useful for engineers and planners at local development agencies. Besides that, two experts agree this system overcomes the safety and health issues in urban areas because all of the information in this system is extracted from the trusted guidelines. While only one expert agrees that this system covers all the aspects required for Sustainable Transportation Inventory implementation in urban areas. Furthermore, only one expert agrees that this system needs improvisation but two experts rated agree that this system can be understandable by the users. For the neither option, only one expert thinks that the system covers all the aspects required for Sustainable Transportation Inventory implementation in urban areas and thinks this system needs improvisation.

In conclusion, it can be said that the number of rating of strongly agree is greater than rating of neither but less than the number of rating of agree to answer this questionnaire.

CONCLUSION

This system can overcome issues regarding the development of sustainable transportation for urban areas and this system can facilitate the engineer's and planner's work. The guidance and suggestions that were given by the experts were used to improvise the STIS to be more precise. This system could be upgraded to a mobile application and QR code scanner so that it will be more convenient for the transport planner and engineers to conduct their fieldwork. The STIS content will also be structured with the aid of MBI, PWD and DTCP, Perak experts in the Civil Engineering Department. The STIS will be useful in other areas besides Ipoh by referring to the guidelines that have been developed but it will require more time frame due to time using the conventional method.

ACKNOWLEDGEMENT

The authors would like to express gratitude to the Majlis Bandaraya Ipoh, Public Work Department and Department of Town and Country Planning Peninsular Malaysia, Perak state for their support in facilitating this research.

DECLARATION OF COMPETING INTEREST

None.

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