Assessing Micromobility Usage Trends and User Satisfaction Levels in Seksyen 14, Shah Alam, Selangor

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ABSTRACT

This study is to fill the research gap towards the advancement of micro mobility infrastructure as an important safety aspect. Micro mobility encompasses a broad spectrum of mobility options that are, in comparison to automobility, 'micro' in terms of energy demand, environmental effect, and use of road space. There is still a lack of research on micromobility users' needs. This study objective is to evaluate the micro mobility users' level of satisfaction towards the facilities and infrastructure aspects of micro mobility in the study area. The study area is Seksyen 14 i.e. the central business district of Shah Alam, Selangor. Descriptive analysis and cross tabulations of survey data from 161 users were obtained through a purposive sampling method. For the data analysis, the researchers used a Simple Multi-Attribute Rating Technique (SMART) to analyse the data. It is simple and allows for any form of weight attribute to each variable. The main findings revealed that the users are generally unsatisfied with the infrastructure, facilities and safety aspects of micro mobility. Users mostly use micro mobility for recreational purpose and less for work or other purpose. Remedial actions suggested including provision of a dedicated micro mobility lane or route and improved infrastructure. The findings are consistent with several studies of micro mobility in urban areas globally. The significance of this study adds to the current body of knowledge on micromobility users' perceptions related to safety and provision of infrastructure. This can benefit the municipalities future planning and design of more suitable infrastructure towards advancement of micromobility usage.

Keywords: Micro mobility Devices, Micro mobility Services, Sustainable Development, Micro mobility safety

INTRODUCTION

As cities become more densely populated, smart mobility is an effective solution to transportation issues in our cities and suburbs. Micro mobility users require quality and safe infrastructure for efficient accessibility and connectivity. Micro mobility devices (MMD) enable users to move from one building to another safely without being constrained by traffic or parking spaces. Efficient infrastructure would allow micro mobility users to travel easily around their cities, avoid traffic jams and park their devices in a safe and convenient place. Although many studies analyse micro-mobility from operations, management, and user perspectives, there is a lack of research on the safety aspects for pedestrians and users relating to the planning and infrastructure of bikeways. (Roslan, A., Zulkifli, N. S. M., Hamidun, 2023). Thus, this study is to fill the research gap towards the improvement and advancement of micro mobility infrastructure quality as an important safety aspect. The findings add towards recommended strategies of efficient and safe design of micro mobility in support of sustainable development goals especially SDG 11 (Sustainable Cities and Communities).

LITERATURE REVIEW

Since early 2018, the Malaysian government has received requests for approval from e-scooter start-ups or operators such as Neuron Mobility and Beam to offer this MMD experience to the Malaysian public via apps, capitalizing on the global uptrend of MMD mobility (Zulkipli, Z. H., 2022). Thousands of users are utilizing shared micro mobility options in cities across Europe, the US, and Asia. The growing popularity of micro

mobility has led to a surge in literature. Although many studies analyze micro-mobility from operations, management, and user perspectives, there is a lack of research on its new conflict and safety hazards for pedestrians and users, the majority of which relate to the planning and infrastructure of bikeways. (Roslan, A., Zulkiffli, N. S. M., Hamidun, 2023).

Micro mobility can help solve the urban congestion while addressing specific land use and environmental issues such as parking space shortages, carbon emissions, and noise pollution. In tourist destinations, micro mobility devices are flexible, low-cost mode of transportation for tourists and a means of avoiding traffic. Furthermore, micro mobility is being promoted to facilitate the transition from personal cars to personal lightweight micro mobility devices (MDs) which are more energy efficient, take up less space, and have no or little negative impact on the environment. These vehicles have an average inner-city trip range of less than 20 kilometres, which accounts for 70% of all daily trips in urban areas (Zulkipli, Z. H., Alias, N. K., Kak, D., Ariffin, 2022). Additionally, completing first and last mile distances promotes greater public transport usage.

Terminologies

The term micro mobility refers to a class of small, lightweight devices that operate at low speeds, typically less than 25 km/h (15 mph) and are either owned or rented by road users. Bicycles, electric scooters, electric skateboards, shared bicycles, and electric pedal-assisted bicycles are all examples of micro mobility devices. Meanwhile, according to the Road Transport Act 1987 (Act 333) Amendment of 2020 (Act A1618), micro mobility vehicle means any vehicle that is driven by an electric source, an internal combustion engine or human power or a combination of electrical sources, and has maximum speed 50 km/h.

The term micro mobility is commonly used to describe travel solutions for short distances around cities, typically the first or last mile of a journey to or from another mode of transportation (bus, train, or car). To qualify for this category, a vehicle's gross weight cannot exceed 500 kilograms. The Society of Automotive Engineers (SAE), a standard developing organisation and professional association, defines powered micro mobility devices, having three common characteristics: fully or motor-assisted, low speed (below 20mph and small size weighing less than 45kg (Sandt L., 2019). Cities or other jurisdictions can set weight and width limits for various roadway facilities.

The provision of supportive infrastructure is an important consideration for a city when considering a shared micro mobility program. In this instance Malaysian Institute of Road and Safety Research (MIROS) of micro mobility in Malaysia (2023) defines infrastructure as:

• Bike lanes

• Active travel lanes

• Footpaths and

• Bridges (green and traditional)

Several authors have identified issues and challenges of the safety of micro mobility users. Avetisyan et al. (2022) found that micromobility challenges are related to geometry, and narrow lane widths pose greater risks to micro mobility users, increasing the likelihood of collisions with curbs, other cyclists, and conflicts with cars during overtaking maneuvers. Lanza (2022) identified that infrastructure's design and operation as the main challenge for users' safety on the lane provided. Sabbaghian et al (2022) further identifies the need for suitable geometry, pavement conditions, traffic patterns, and operational conditions as sub criteria that affect safety of micro mobility users (Refer to Figure 1). According to Lanza et al. (2022), micro mobility users follow the same traffic laws as automobile drivers and use the bicycle lane or street with the flow of traffic, never against it. However, micro mobility users are regarded suitable to travel on sidewalks yet must slow down and yield to pedestrians (City of Austin USA, 2019). In Europe, micromobility has recently become part of everyday life and is suitable for systematic trips and tourism purposes. In Italy, the municipalities tested micromobility and allowed the vehicles to circulate only in 30 km/h zones, cycling paths and pedestrian areas (Fazio et al 2021). In Malaysia,

the regulation and legislation surrounding micro mobility vehicles, especially e-scooters, currently involve a ban on certain models to prioritize road safety (MIROS 2023).

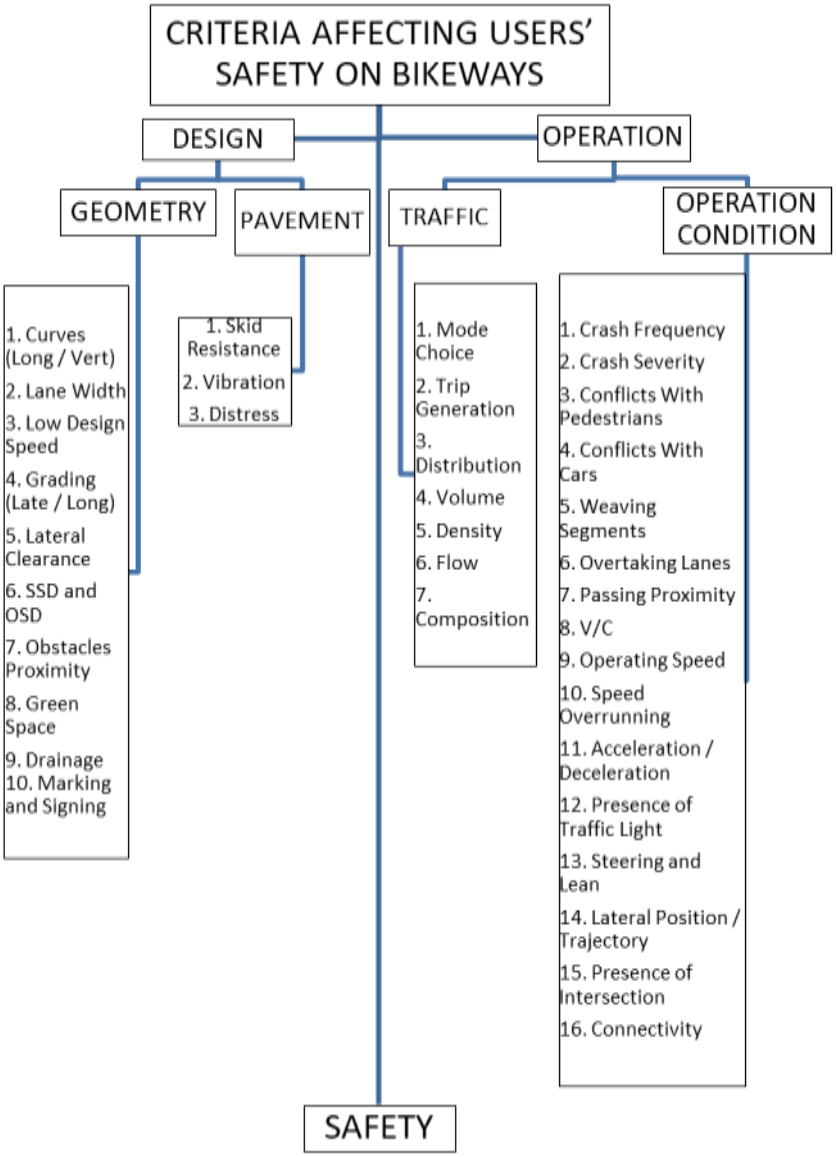

Figure 1: Factors Categorization of Factors Influencing Micro mobility – Safe Infrastructure

Source: Hossein Sabbaghian, A Safe Infrastructure for Micro mobility: The Current State of Knowledge. Sustainability, (2023)

Exceptions exist for specific areas under local councils, where operators can obtain permission to run their services, provided they adhere to guidelines set by the Ministry of Transport (MOT) (MIROS 2023). In terms of the configuration of a bike lane, this requires thorough consideration of existing traffic levels and behaviours, adequate safety buffers to protect bicyclists and other MDs from parked and moving vehicles, (Sabbaghian 2023). Under the Kuala Lumpur City Hall (DBKL) pilot project Sandbox Strategy, the challenges faced in operational of e-scooters in Kuala Lumpur are incomplete bike lanes, incomplete footpath infrastructure. However, DBKL plans to meet these challenges with the right strategies and more research with MIROS, PLANMalaysia, Urbanice and Ministry of Transport by 2030 (MIROS 2023).

Route categories, existing route modifications, gradients, vehicle access and exit (ingress and egress), and detours at public transportation stops are all important considerations (PLANMalaysia 2023). Micro mobility routes are divided into two categories, which are off- carriageway and on-carriageway. The off-carriageway road can be provided as a separate path or as a shared use path with pedestrians. The road category be specified as either a special route or a road used by motor vehicles. The minimum width of the special off-carriageway MMD

path is 2.0 meters (Figure 2). Paths must be separated by footpaths using physical separators such as landscaping, barrier rails, road bollards (bollard) or curb (curb). Set micro mobility vehicle speed limit is 25 km/. The off-carriageway or the shared use path between micro mobility vehicles and pedestrians must be at least 3.0 meters wide.

In the context of user behavior i.e. questionable practices of unsafe riding or poor or haphazard parking behaviour, (Sandpval et al. 2021) posit that this can result in potential injury to the users thus locating dedicated parking spaces for MMD is necessary. Avetisyan et al (2022) found that there is a weakness in addressing micromobility issues systematically which requires an integrated approach of vehicle, infrastructure design and social aspects especially in urban areas. For planners the issue of overseeing and enforcing policies that encourage and monitor usage of all modern automobiles is proving to be challenging (Olabi et al. 2023). Some MMD that require prepayment before usage or pricing through e payment can pose to be expensive for some while some users may take some time to learn how to use these gadgets (Olabi et al. 2023).

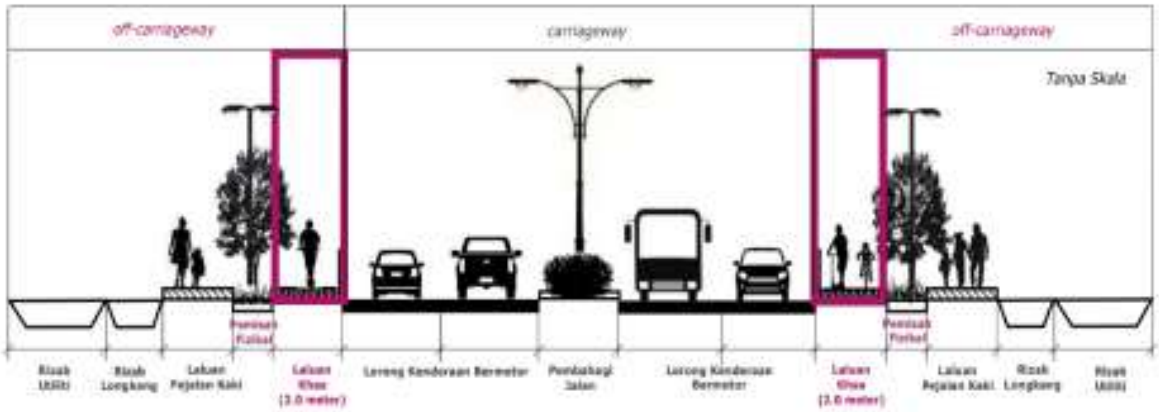

Figure 2: Example of a Typical Cross-Section of an Off-Carriageway Micromobility Vehicle. Source: Micromobility Vehicle Route Guidelines (Plan Malaysia, 2023)

RESEARCH METHODOLOGY

This study conducts quantitative research driven by the objective formulated. This study's primary data collected through a questionnaire survey of MMD users utilised the purposive sampling method. Data collection was conducted from March 2024 to June 2024.This sampling technique select sampling units (respondent) based on a certain criterion which is that the respondent are willing to answer the questions, familiar about micro mobility and use MMD at least once in the study area of Seksyen 14 Shah Alam. The background of study area of Seksyen 14, Shah Alam, which is the main administrative centre consist of state buildings such as the SUK Building, government buildings (Wisma MBSA) and significant recreational areas. In addition, Taman Cahaya is considered as an overflow of character to the Seksyen 14 City Centre area. It includes the pedestrian walkways that always being used by the pedestrians, micro mobility users and cyclists. Shah Alam with a population of nearly 700,000 is under the local authority of the Majlis Bandaraya Shah Alam (MBSA) has a strong policy framework to provide improved transport options (Shah Alam Towards Friendly Public Transport 2035) and significantly reduced carbon emissions (Low Carbon City Action Plan Shah Alam 2035). Micro mobility and shared e-scooters are important contributors to achieving the ambitions of these policies. Shah Alam hopes that by 2035, there will be an increase in public transport use from 10% to 30% and reduction of private vehicle use from 90% to 60%. A shared e-scooter pilot program was implemented between April 2021 and August 2022 and currently in operation in Seksyen 14 and Seksyen 7 Shah Alam. The pilot was generally viewed as a success, but issues associated with rider behaviour and poor parking need to be addressed (MIROS 2023).

In this study, the researchers collect data on site face to face in Seksyen 14 Shah Alam within a 3-month duration. The survey obtained 161 willing respondents to fill the questionnaire survey via google form and questionnaire. The data is stored in the drive and ensures a more efficient method of storage and retrieval. For the data analysis, the researchers used a Simple Multi-Attribute Rating Technique (SMART) to analyze the data. It is simple and allows for any form of weight attribute to each variable. Respondents were contacted at various spots along the

cycling track, recreation area, and micro mobility spots. Using SPSS software, the researchers in this study ran a descriptive analysis using chi square test to compare observed results with expected results. The purpose of this test is to determine if a difference between observed data and expected data is due to chance, or if it is due to a relationship between the variables (https://libguides.library.kent.edu/). However, we acknowledge that the use of purposive sampling and a relatively small sample size of 161 respondents may limit the generalizability of the findings beyond the study area.

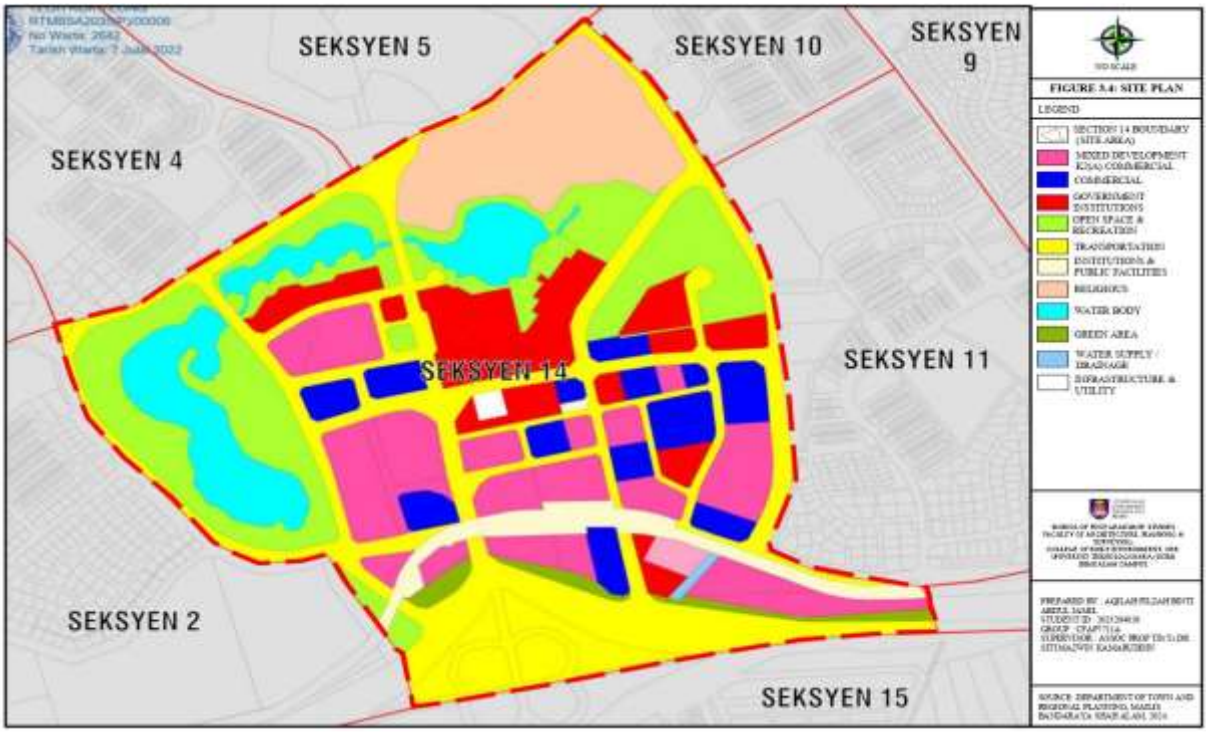

Figure 5: The Study Area

Section 1 – Analysis of Respondents' Profile

In all tests of significance, if $p < 0.05$, we can say that there is a statistically significant relationship between the two variables (https://statistics.laerd.com/spss-tutorials). Therefore, a chi square test is choice to help the researcher better understand and interpret the relationship between the two categorical variables or data identified. For this study the researchers conducted several chi square tests for several variables to analyse the relationship between respondents (users of MMD) with their age, gender, level of satisfaction (LoS) of safety aspects, LoS of facilities, LoS of location of MMD, incidence of crash, purpose of using MMD and overall quality of micro mobility services.

ANALYSIS AND DISCUSSION

The questionnaire was distributed in the survey at Seksyen 14, Shah Alam between March to June 2024. The survey's aim is to collect data and subsequently to analyse the respondents' views and level of satisfaction of aspects of micro mobility has three sections. The first section identifies the respondents' profile, the second section aims to gain the respondents frequency of using micro mobility, occurrence of conflicts with pedestrians and views on operational conditions e.g. roads, and safety aspects. The third section focus on the respondents' feedback on their feelings of satisfaction of facilities availability example parking for MMD, location of MMD available to users and overall quality of micro mobility.

Table 2 indicates the respondents for this study are 59% male and 41% females. Most of the respondents in this study are within the 30 years and below age group (70%) consistent with other studies on micro mobility users in Malaysia (Roslan et al. 2023). However, other studies conducted in European countries indicate slightly older age groups of MMD users (Esztergár-Kiss and Lizarraga, 2021; Rayaprolu & Venigalla 2020). Most of the respondents are locals from Shah Alam or Selangor while 16% are foreigners or tourists visiting Selangor.

Table 1: Respondents' Profile

Frequency of Gender and Age			**Total**
Gender	Male	95	**161**
	Female	66	
Age Group	< 18 years old	31	**161**
	19 - 30 years old	82	
	31 - 40 years old	27	
	41 - 50 years old	15	
	> 51 years	6	
Origin	Local	68	**161**
	In the State of Selangor	77	
	Tourist	16	

In Table 2, most of the respondents are male, and this is consistent with other studies conducted on MMD (Roslan et. al. 2023; Rayaprolu and Venigalla, 2020). However, Parnell et.al (2023) has argued that there are mixed results on the gendered use of e-micro mobility to some extent which relates to incentives and barriers of e-micro mobility specifically. Accordingly, large-scale survey data has suggested that in European countries where cycling rates are high, for example, the Netherlands, Denmark, and Belgium, the number of female users of e-bikes seems to be equal to, or more than, male users (Parnel et al. 2023). The researchers conducted cross tabulation between variables of gender and usage of micro mobility and found that the chi square test (the asymptotic significance (p-value) was more than 0.05 (Table 3). Thus, this indicate there is no significant relationship between both variables as prescribed in many studies (https://www.ncbi.nlm.nih.gov/). In this case, there is no conclusive evidence that there is any association between gender and usage of micro mobility.

Table 3: Cross Tabulation of Gender and Usage of Micromobility

	Value	Asymptotic Significance (2-sided)
Pearson Chi-square	35.069	0.110
Number of Valid Cases	161	

Note: the chi square test (the asymptotic significance (p-value) was more than 0.05. Thus, this indicate there is no significant relationship between both variables

Section 2- Respondents' Views of Using MMD

Table 3 highlights that most of the respondents have at least used MMD once. However, most respondents rarely use (70.2%) while only 29.8% often and routinely use MMD. The MMD are mostly on rent (59%) while about a third (34%) own the MMD and the rest are borrowed devices. This is consistent with the current situation where MMD company, for example Beam is allowed by the local authority to rent out or set up their services as part of the National Regulatory Sandbox (NRS) for Micro mobility initiative (MIROS 2023). The table also highlights that most users (63.9%) use their devices with friends and family, which correspond to their purpose of recreation and relaxing (69.5%). Table 3 also indicates a cross tabulation using chi square as a test of both

variables revealing that there is a significant relationship between both variables with significance value of ($p<0.005$).

Table 4: Respondents' Views on Micro mobility Usage

Frequency Usage of Micromobility and Frequency Using Micromobility			**Total**
Usage of Micromobility	Owned	55	**161**
	Rent	95	
	Borrowed	11	
Frequency Using Micromobility	Often	32	**161**
	Routine	16	
	Rarely	78	
	Once A Month	19	
	Once A Year	16	
Frequency of Micromobility Usage and Micromobility Usage Purposes			**Total**
Usage of Micromobility	Alone	58	**161**
	Family	47	
	Friends	56	
Micromobility Usage Purposes	Recreation	66	**161**
	Worked	5	
	School	10	
	Shopping	3	
	Relaxing	46	
	Rent	2	
	Multi – Purposes	29	
	Value	Asymptotic Significance (2-sided)	
Pearson Chi-Square	513.294[a]	.000	
N of Valid Cases	161		

Note: Chi Square Test of Association between Frequency of Micromobility Usage and

Micromobiliity Usage Purposes

Table 5 below indicates that most users or respondents (70.8%) do not feel safe using micro mobility in the study area. However, a majority (72%) has not had a crash with pedestrians despite admitting that they (62.1%) have conflicts with the pedestrian and other road users. This finding is consistent with Lanza et al. (2022) study in urban areas where fatalities of pedestrians and cyclists in traffic crashes involving motor vehicles have increased due to a lack of separate cycle lanes and non-proper pedestrian pavement markings. It is also alarming to see that most users in this study area (67.1%) do not use a helmet while using the MMD, which is against the requirement set by the local authorities. The researchers also conducted cross tabulation between variables of frequency of usage with the purpose using micro mobility. This evaluate if there is any significant association between the two variables. The findings indicate that the most frequent usage of MMD is for recreation and relaxing purposes more for recreational purposes than other tasks. This finding is consistent with other studies on micro mobility in that MMD are used for a variety of purpose (Elmashhara 2022).

Table 5: Safety Aspect of Micro Mobility

Do you feel safe using micro mobility at Section 14, Shah Alam?	No	114	70.8
	Yes	47	29.2
	Total	161	100.0
Do you have any crash involvement while using the micro mobility?	No	116	72.0
	Yes	45	28.0
	Total	161	100.0
Do you use helmet while using the micro mobility?	No	108	67.1
	Yes	53	32.9
	Total	161	100.0
Do you have any conflicts with the pedestrian or the road users?	Yes	100	62.1
	No	61	37.9
	Total	161	100.0

Table 5 shows that the respondents in majority stated that they feel unsafe using micro mobility in the study area (70.8%) however, users as a majority did not involve in any crash while 28% did involve in crash with other road users including conflict with pedestrians or road users (61%). This aspect is critical for planners and policy makers to investigate the infrastructure further as almost half of the respondents (49%) were concerned with conflict of roads with pedestrian and the lack of dedicated lane for micro mobility lanes (Figure 2). A chi square test of association validated by the p-value<0.005 between the variables of Conflict with the Pedestrian and the

Position of lane showed that there is a significant association between both variables. This further implies that dedicated lanes specifically for micro mobility users is essential as mitigation to incidence of crash and consistent with other studies conducted (Ignacolo et al. 2022).

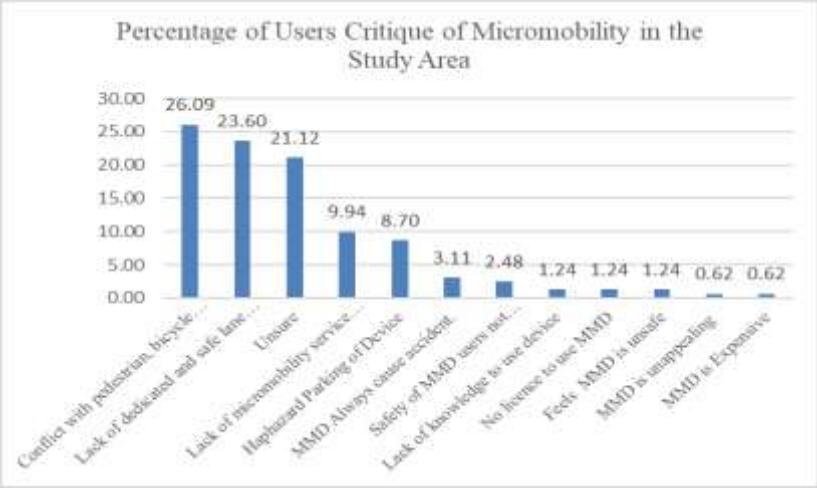

Figure 6: User Critique of Micro mobility in the Study Area

Section 3 – Level of Satisfaction of Micro mobility in the Study Area

Table 6 highlights most of the respondents' level of satisfaction of the location and availability of public transportation in the area as moderate to low (unsatisfied). Respondents reported that the facilities availability example location, availability of public transportation and parking in the area are moderately satisfactory.

Photo 1: Cycling activities are included as Micro mobility in the study area

of Seksyen 14 Shah Alam, Selangor

Source: https://ahpekbiker.blogspot.com/search?q=biking+shah+alam#google_vignette 2018

Table 6: Users' Level of Satisfaction (LoS) with Micromobility

	Level of Satisfaction (LoS)	**Frequency**	**Percent**	**Mean (Average Score)**
Suitability for the location of the micro mobility.	Very Good	1	0.6	2.45
	Good	10	6.2	
	Moderate	66	41.0	

	Unsatisfied	67	41.6	
	Very Unsatisfied	17	10.6	
	Total	161	100	
The availability of public transportation in the area	Good	15	9.3	2.44
	Moderate	82	50.9	
	Unsatisfied	54	33.5	
	Very Unsatisfied	10	6.2	
	Total	161	100	
Public facilities such as parking conditions	Very Good	1	.6	2.70
	Good	10	6.2	
	Moderate	102	63.4	
	Unsatisfied	39	24.2	
	Very Unsatisfied	9	5.6	
	Total	161	100.0	

Scale of LoS

1-Very unsatisfied

2-Unsatisfied

3-Moderate

4-Good; 5- Very Good

The findings of the level of satisfaction for location of micro mobility services, public transportation (which implies connectivity and accessibility) and facilities such as shared parking are moderate to unsatisfied. The average level of satisfaction is indicated in the final column. Respondents also suggest some measures or actions to be taken by the government (local authority) to revitalise micro mobility use and services. The suggestions are shown in Figure 7 below. The three highest score for remedial actions is for the authority to provide a dedicated micro mobility lane or route (42%), improved infrastructure (22.9%) which encompass provision of suitable space or parking area equipped with charging facilities for e-MMD (18%). The respondents also suggest that special license is issued for MMD users (6.3%) and separate or widening of pedestrian lanes (6.8%).

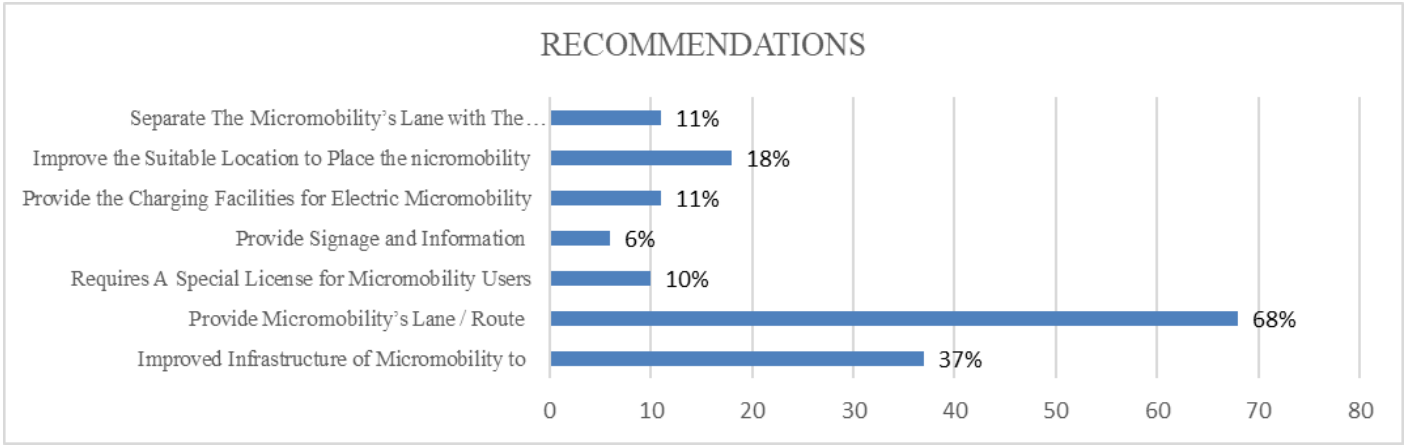

Figure 7: Recommendations for Revitalising Micro mobility in the Study Area

CONCLUSION

This study has identified major issues raised by micro mobility users. Most users or respondents do not feel satisfied with micro mobility service and infrastructure in the study area despite Shah Alam being a safe and modern urban area, committed towards low carbon initiatives and achieving sustainability by 2030. Users mostly use micro mobility for recreational purpose and less for work or other purpose. This may be due to the lack of suitable locations for dedicated micro mobility lanes, parking spaces with charging facilities for e-MMD as reported in the study. Incidence of crash and conflict with pedestrians and other vehicle road users point to the need for remedial actions necessary if micro mobility use is to expand and support the SDG agenda. Although clash with pedestrians and other vehicles incidence are limited to mostly recreational areas as indicated by most recreational users, safety issues must be given priority by the authorities in any location and circumstances. Recommendations by the respondents (highest being the provision of micromobility lane folled by improved infrastructure) are consistent with other micro mobility users from urban cities i.e in Europe and the US. The study supports continuous improvement and expansion of existing micro mobility infrastructure identified in the Malaysia Road Safety Plan (2022-2030). More suitable road markings and signages, which install clear, visible road markings and signage to designate micro mobility lanes, are necessary. In addition, the authorities could implement and gazette more designated specific zones as shared spaces where micro mobility, pedestrians, and vehicles can coexist. The local authority's current micro mobility initiatives coupled with scheduled monitoring and management for promoting micro mobility etiquette through workshops, social media, and community events with the public and residents while collaborating with suitable establishments is heading in the right direction towards the development of a flexible, affordable, fun, space-efficient, and emission-free mobility and accessible for everyone.

DISCLOSURE STATEMENT

This study was conducted independently without any financial or commercial support that could be perceived as a conflict of interest. The authors declare that there are no competing interests that could have influenced the research outcomes presented.

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