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Towards Sustainable Mobility: Willingness to shift to public transport in Peninsular Malaysia

Akmalia Shabadin[1], Hawa Mohamed Jamil[1], Mohd Shafie Nemmang[1], Siti Zaharah Ishak[1,2*]
**Corresponding Author*

[1] Malaysian Institute of Road Safety Research (MIROS), 43000 Kajang, Selangor, Malaysia
[2] School of Civil Engineering, College of Engineering, Universiti Teknologi MARA, Shah Alam 40450, Selangor, Malaysia

akmalia@miros.gov.my, hawajamil@miros.gov.my, mohdshafie@miros.gov.my, sitizaharah@miros.gov.my
Tel: +6012-6711044

Abstract
Urban traffic congestion in Malaysia leads to longer travel times, higher emissions, and economic losses. Despite policies promoting public transport, usage remains low. This study examines commuters' willingness to transition to public transport in Peninsular Malaysia using a mixed-methods approach, combining questionnaires and interviews. Findings reveal a generally low willingness to shift from private vehicles, influenced by demographic factors such as gender, age, occupation, and region. Understanding these patterns is essential for policymakers to design effective strategies that promote sustainable mobility and reduce reliance on private vehicles.

Keywords: Private Vehicle; Public Transport; Unwillingness to Shift; Willingness to Shift.

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1.0 Introduction

Traffic congestion in urban areas remains a critical challenge for urban planning and environmental sustainability, contributing to prolonged travel times, deteriorating air quality, and substantial economic losses. Congestion as a systems outcome shaped by the interaction of road capacity, traffic operations, land-use patterns, and travel behaviour (International Transport Forum, 2021; Tikoudis et al., 2024). While the most direct trigger is often demand exceeding available road capacity, congestion typically emerges from multiple reinforcing factors, including network constraints, travel demand concentration, and behavioural responses to changing conditions (Pi et al., 2021). Empirical evidence also shows that congestion causes and impacts vary across contexts. A study in Bangladesh reported that heavy reliance on private vehicles, constrained road space, and inefficient public transport (PT) are among the key contributors to congestion and associated socio-economic impacts (Fattah et al., 2022). In the United States, urban-scale factors such as development patterns, community structure, and socioeconomic characteristics have been shown to influence congestion dynamics and their mitigating effects, highlighting that congestion cannot be solved by road capacity measures alone (Rahman et al., 2021).

A central structural driver underlying congestion is the continued growth in private vehicle ownership and use. Global evidence demonstrates increasing car dependency across metropolitan regions, with implications for urban mobility efficiency, environmental sustainability, and public health (Saeidizand et al., 2022). Policy synthesis similarly highlights that household travel choices and car dependence are strongly shaped by accessibility to viable alternatives, especially the availability and quality of PT (Tikoudis et al., 2024).

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These findings suggest that congestion management is increasingly inseparable from efforts to reduce car dependency and make non-car travel feasible, attractive, and reliable (International Transport Forum, 2021).

In response, cities worldwide have adopted multifaceted strategies to reduce reliance on private vehicles and increase PT uptake. These strategies are commonly framed as combining "pull" measures (making PT more attractive) with "push" measures (discouraging car use through pricing and regulation) (Lindsey et al., 2023; Tikoudis et al., 2024). Recent literature consistently shows that improving PT service quality, particularly reliability, comfort, safety, convenience, and overall user experience, plays a critical role in shaping satisfaction and behavioural outcomes (Deborah, 2025; Sogbe et al., 2025). Complementary incentive-based measures, such as financial incentives, can strengthen short- and long-term intentions to commute using PT (Zeiske et al., 2021), and changes in PT usage are also associated with travel satisfaction outcomes (Abou-Zeid & Fujii, 2016). Conversely, push approaches such as taxes and pricing mechanisms can shift travel behaviour by changing the relative cost of private car use; however, their adoption is strongly influenced by public acceptability and distributional equity considerations (Afrianti et al., 2024; Lindsey et al., 2023). In addition to economic levers, "soft pull" approaches such as communication and behavioural campaigns have been shown to influence PT uptake by shaping perceptions, motivation, and habitual behaviour (Zarabi et al., 2024).

Importantly, recent studies emphasise that willingness to shift (WTS) to PT depends on the end-to-end journey, not only the main line-haul segment. First and last-mile (FLM) connectivity has been increasingly identified as a decisive barrier, especially for car users, because inconvenient or unsafe access to stations or stops can undermine perceived accessibility and discourage shifting (Sogbe, Susilawati & Pin, 2025). This aligns with recent synthesis evidence indicating that service quality and satisfaction alone may be insufficient if the access and transfer components of the journey remain weak (Sogbe et al., 2025).

In Malaysia, increasing dependence on private vehicles continues to contribute to persistent urban congestion, environmental pollution, and rising transport costs. Despite substantial investments and initiatives to improve PT systems and services, ridership remains comparatively low in many urban settings, suggesting a continuing mode-shift challenge. Malaysian evidence indicates that PT attractiveness is influenced by service quality and user perceptions. For example, service quality and satisfaction have been modelled as key predictors of reuse intention in Kuala Lumpur rail contexts (Ibrahim et al., 2023). More directly related to modal shift, research in the Kuala Lumpur conurbation shows that PT service quality is associated with switching intention and behavioural diffusion through word-of-mouth, reinforcing the importance of perceived performance and user experience in encouraging shifts from private vehicles (Hamzah et al., 2023).

Complementing this behavioural perspective, Malaysia-based network analyses also highlight the role of accessibility and efficiency of PT systems, looking for factors that shape whether PT is a practical alternative for daily trips (Hassan et al., 2025). Earlier Malaysian studies similarly report persistent challenges such as service reliability issues and structural barriers that limit the attractiveness of bus services in certain contexts (Borhan et al., 2019), while broader wellbeing and quality-of-life perspectives continue to position transport as a key determinant of lived urban experience (Othman & Hj. Ali, 2020).

Although prior literature demonstrates that PT service quality and satisfaction influence reuse and switching-related intentions (Hamzah et al., 2023; Ibrahim et al., 2023; Sogbe et al., 2025), FLM constraints can inhibit mode shift even when PT services exist ((Sogbe, Susilawati & Pin, 2025), and "push" measures may be effective but require careful attention to equity and acceptability (Lindsey et al., 2023), evidence remains limited on which road-user characteristics most strongly differentiate WTS from private vehicles to PT in Malaysia, particularly amid ongoing system improvements and persistent car reliance (Hassan et al., 2025; Tikoudis et al., 2024). This study aims to examine the willingness characteristics of road users in Malaysia to shift to PT. By identifying the key characteristics influencing willingness, the study provides actionable insights for designing targeted interventions such as service quality enhancements, improved FLM connectivity, and feasible policy packages to make PT a more attractive and viable option for sustainable urban mobility.

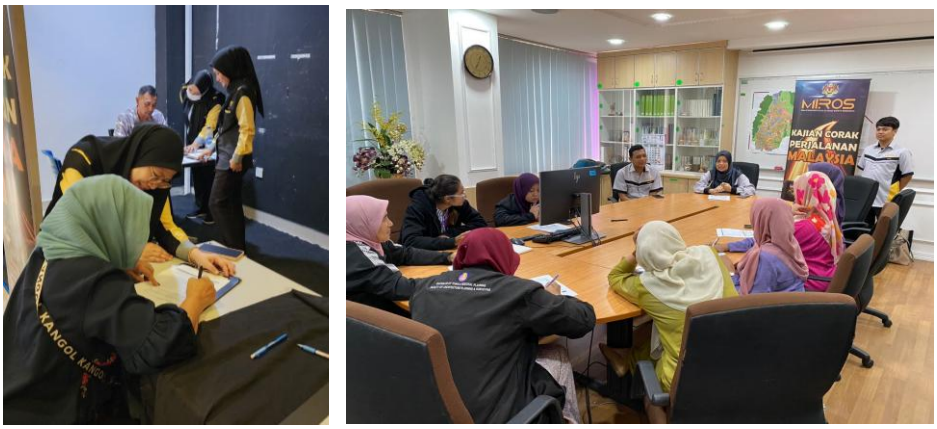
2.0 Methodology

This study employed a cross-sectional descriptive survey design to systematically measure road users' WTS to PT and to compare WTS patterns across demographic groups. A descriptive approach is appropriate when the aim is to profile and quantify perceptions/intentions at a single point in time, rather than establish causality (Creswell, 2009). The target population comprised road users in Malaysia, and a sample was drawn to represent this large population. The minimum sample size was set at 384, consistent with widely used large-population sample size estimation approaches such as 95% confidence level and ±5% margin of error (Ahmad & Halim, 2017). To improve robustness and account for incomplete submissions and enable subgroup comparisons, the study oversampled by approximately 30%, producing an expected total of about 512 respondents (Groves et al., 2009).

Convenience sampling was used to enable efficient data collection under practical time and resource constraints. Respondents were recruited from public areas like shopping malls, recreational parks, and workplaces (government and private offices) to reach a broader mix of travellers and working individuals. Mall recruitment is widely used for efficient access to diverse respondents, although selection bias may occur, the use of multiple settings to broaden coverage (Bruwer, Haydam & Lin, 1996). A structured questionnaire was used, covering respondent background, primary vehicle information, and WTS. WTS was measured using a 1 (very unlikely) to 10 (very likely) numeric rating scale to capture finer gradations of behavioural intention, consistent with established intention measurement practices (Ajzen, 2002). Respondents also stated reasons for willingness or unwillingness and rated WTS under several hypothetical improvement scenarios to understand how these "pull" measures may influence intention, consistent with policy stated preference approaches.

Data were collected using a mixed-mode approach (face-to-face administration and online Microsoft Forms). Face-to-face collection allowed immediate clarification and improved completion quality, while online distribution supported broader geographic reach and accessibility. Mixed-mode surveys are commonly used to improve coverage and response rates, although potential mode effects should

be considered (Stadtmüller, Beuthner & Silber, 2021). In public locations, respondents were approached on-site as shown in Figure 1 (a); meanwhile, in offices, respondents received a briefing and could ask questions before completing the questionnaire as displayed in Figure 1 (b). Tokens of appreciation were provided to encourage participation and reduce item nonresponse. The findings should be interpreted with caution due to several limitations. The study employed convenience sampling and data collection in public areas and offices, which may limit representativeness across all road users and regions. In addition, the use of mixed survey modes (face-to-face and online) may also introduce response differences or social desirability bias, and the intervention scenarios were hypothetical, which could overestimate willingness under real-world constraints.



(a) (b)

Fig. 1. (a) Data collection among the public; (b) Briefing session in offices during data collection.

3.0 Results

3.1 Demographics Distribution

The demographic distribution of the 512 respondents reveals a balanced representation of genders, with 51% male and 49% female, as shown in Table 1. This distribution is similar to that of the Malaysian population by sex, with male netizens accounting for 52.5% of the total population (DOSM, 2020). The majority of respondents are aged between 31 and 40 years (38%), followed by those aged 41-50 years (29%) and 18-30 years (25%). Educationally, most respondents hold either a high school SPM (SPM, 29%) or a higher qualification such as STPM/Diploma (32%) or a bachelor's degree (32%). In terms of income, 45% earn between RM2,501 and RM5,500, while 37% earn less than RM2,500. Household sizes are mostly moderate, with 58% of households comprising 3 to 5 people. Vehicle ownership is also common, with 39% owning two vehicles and 24% owning three. Occupation-wise, a large proportion of respondents are government employees (66%), followed by those in the private sector (20%) and those self-employed (6%). Geographically, 37% reside in the central region, with smaller numbers living in the northern (21%), southern (23%), and eastern (19%) regions. Regarding transportation modes, 63% primarily drive cars, 28% use motorcycles, and 9% rely on MPVs, SUVs, or 4WDs.

3.2 Willingness to shift (WTS)

A WTS to PT refers to the readiness of individuals who currently use private vehicles to switch to public transportation for their travel needs, especially commuting to work. This willingness is based on the respondent's current situation and the current state of the transportation system. Table 1 presents the average score for WTS to PT, categorised by statistically significant demographic characteristics. The average WTS score is 2.67, indicating that, in general, people are not willing to shift, as this score is very low compared to the total possible score of 10.

The WTS scores differed significantly across gender, age, occupation, and house region groups. In terms of gender differences, females show a slightly higher WTS, with a score of 2.98, compared to males, who scored 2.38. This suggests that women are generally more open to adopting PT than men. Concerning age, the WTS is highest among those aged 51 years and older (3.40) and 18-30 years (2.99). This suggests that older individuals and younger adults are more likely to use public transportation, possibly due to retirement, reduced mobility needs, or lower vehicle ownership among young adults. People aged 31-40 have the lowest willingness score of 2.33, followed by those aged 41-50 (2.64). This indicates that middle-aged individuals, who are likely more established in their careers and financially stable, may prefer private vehicles. A study conducted by Chong et al. (2022) also found that young people are willing to pay for PT, as most are students and older adults, who no longer drive or work, tend to use it more. Meanwhile, the middle generation prefers their own vehicles (Chong et al., 2022).

In terms of occupation, self-employed individuals and retirees have the highest WTS, with a score of 4.00. This is likely due to the flexibility of self-employed schedules, whereas retirees may have reduced daily travel needs and a reduced need for frequent vehicle use. Students, with an average score of 3.55, show a moderate to high level of WTS, likely influenced by their financial considerations. Unemployed individuals have a similar average score of 3.57, which may be linked to their available time and personal circumstances. Private sector employees (3.09) show moderate openness to shifting to PT, while government employees score lower (2.34), indicating a stronger preference for private vehicles among this group. Regionally, the central region shows the highest WTS (3.14), likely due to

better PT infrastructure and more congested urban areas. The southern region also exhibits moderate openness (2.90), while the eastern (2.19) and northern (2.07) regions display the lowest willingness, possibly due to limited access to public transportation options in these areas. On the other hand, the other groups, such as education level, income, household size, and number of vehicles, showed no significant differences in the scores.

Table 1. Demographic distribution of respondents and their WTS score

Demographic Type	%	Mean	Demographic Type	%	Mean
All	n=512	2.67	Income	Sig. value = 0.095	
Gender*	Sig. value = 0.019		No income	5%	3.32
Male	51%	2.38	Less than RM2,500	37%	2.89
Female	49%	2.98	RM2,501–RM5,500	45%	2.46
Age*	Sig. value = 0.021		More than RM5,500	13%	2.56
18-30 years	25%	2.99	Household size	Sig. value = 0.135	
31-40 years	38%	2.33	Less than 3	18%	3.11
41-50 years	29%	2.64	3 – 5 people	58%	2.68
> 51 years	8%	3.40	More than 5	24%	2.32
Education level	Sig. value = 0.058		Vehicle Number	Sig. value = 0.261	
SPM	29%	2.34	1	18%	2.63
STPM/Diploma	32%	2.75	2	39%	2.69
Bachelor degree	32%	2.86	3	24%	2.44
Master degree	7%	2.95	More than 3	19%	2.98
PhD	1%	1.00	House Region*	Sig. value = 0.015	
Occupation*	Sig. value = 0.002		Central	37%	3.14
Government staff	66%	2.34	Northen	21%	2.05
Private staff	20%	3.09	Southern	23%	2.90
Self-Employed	6%	4.03	Eastern	19%	2.19
Students	4%	3.55	Vehicle Use	Sig. value = 0.485	
Unemployed	3%	3.57	Motorcycle	28%	2.59
Retiree	1%	4.00	Car	63%	2.73
			MPV/SUV/4WD	9%	2.43

**Significantly different at 0.05*

3.3 Reason for unwillingness to shift

In the open-ended question, respondents were also asked to provide reasons for their chosen scores regarding their WTS to PT. To examine willingness characteristics, we first describe the factors associated with reluctance to shift to PT as shown in Table 2, followed by respondents' conditional WTS under targeted interventions in Table 3. Together, these results explain both why road users are unwilling and what conditions may increase willingness. The most significant factor, cited by 38.8% of respondents, is that they find their vehicle more comfortable. This indicates a strong preference for the personal convenience and comfort that private vehicles offer over PT. PT issues and problems were highlighted by 34.8% of respondents, suggesting dissatisfaction with the current PT system, which may include concerns about efficiency, reliability, cleanliness, safety, or overcrowding. This is a significant barrier to adoption. A study conducted by Kim Mee et al. (2022) suggests that Malaysians prioritise efficiency, encompassing factors such as travel time, convenience, and cost-effectiveness, whereas Filipinos value reliability, which includes consistent schedules, fewer breakdowns, and on-time performance.

For 9.2% of respondents, the need to manage children or transport multiple children makes using PT impractical. Typically, parents with children must send them to various locations, such as schools or daycares, before heading to work, which makes it difficult for them to use PT. Furthermore, these demographic groups face unique challenges, such as handling strollers, childcare, or coordinating travel with a large family. A study on car ownership throughout the parenting journey and beyond found that the majority of parents reported that cars are a predominant part of their daily travel habits (Kent, 2025). 8.3% of respondents cited the long travel time associated with public transportation as a deterrent, indicating that it is perceived as slower compared to private vehicles. This is likely due to the waiting times, multiple stops, or indirect routes that PT can involve. A smaller percentage, 5.8%, resisted shifting due to the flexibility of using a private vehicle, which allows them to move more freely and spontaneously compared to the fixed schedules of PT.

Other reasons for resistance, though less significant, include inconvenience (1.5%), lack of infrastructure (0.6%), and minor concerns such as health issues, communication difficulties, and having no choice (0.3% each). These factors highlight that, while comfort and transport issues are the significant barriers, practical and situational factors also play a role in the decision to stay with private vehicle use.

Table 2. Reasons respondents resist shifting

Reasons	%
More comfortable with their own vehicle	38.8
PT issues and problems	34.8
Have to manage children and have many children	9.2
Long travel time	8.3
Flexibility (easy to move)	5.8
Inconvenient	1.5
No infrastructure provided	0.6
Health issue	0.3
Communication issue	0.3
No choice	0.3

3.4 Willingness to shift with the implementation of the interventions

Respondents were also asked to score their WTS if some interventions were introduced. Table 3 below shows the average score of WTS to PT based on various proposed interventions. The results show that respondents are most willing to shift to PT when interventions directly improve the convenience, accessibility, and affordability of PT services. With a mean of 6.76, provision of regular PT schedules garners a very high level of support. People appear to strongly favour regular, predictable PT schedules. Knowing that buses or trains will arrive on time helps build trust in the system and increases convenience, making PT a more reliable choice. A 20% reduction in PT fares also has strong support, with a mean score of 6.71. A decrease in PT fares would make it a more attractive option, especially for cost-conscious users. This suggests that fare affordability is a key factor in encouraging more people to use PT. A study conducted in Norway also found that ticket costs, distance to work, and parking availability all significantly influence people's decisions to use PT for their daily commute (Rasca & Saeed, 2022).

Another intervention that can influence the shift to PT is the provision of additional parking spaces at PT stations or stops (6.69). This suggests that some users may still rely on private vehicles to reach PT stations, and providing ample parking spaces could encourage a shift to PT. On the other hand, interventions such as increased fuel prices, parking fees, and toll price hikes received relatively lower scores, suggesting that these measures alone may not be sufficient to encourage a shift to PT. A study conducted in Poland also found that fuel prices are examples of economic issues that have a minimal impact on how people travel (Urbanek, 2021).

Table 3. Willingness to shift to PT based on various proposed interventions

Interventions	Average Score
Provision of regular PT schedules	6.76
Reduction of PT fares by 20%	6.71
Increase in parking spaces at PT stations or stops	6.69
Enhancement of PT support facilities for children and persons with disabilities	6.51
Reduction of travel time using PT by 20%	6.51
Reduction of waiting time for PT by 20%	6.49
Improvement in user safety, such as the separation of train cars	6.47
Increase in PT service frequency	6.18
Expansion and enhancement of PT infrastructure	5.94
Improvement of access: journey from home to PT station (first mile)	5.46
Improvement of access: journey from PT station to destination (last mile)	5.38
Implementation of congestion charges on high-traffic roads	5.13
Increase in toll prices by 20%	4.81
Increase in parking fees for vehicles in office areas by 20%	4.75
Increase in fuel prices by 20%	4.74

4.0 Discussion

The overall low WTS score confirms that most private-vehicle users are reluctant to shift to PT, and the significant differences by gender, age, occupation and region suggest that willingness is shaped by both socio-demographic characteristics and local PT conditions. Higher willingness among females, younger adults (18–30) and older adults (51+), as well as self-employed individuals and retirees, may reflect differences in travel needs, flexibility, and resource constraints, while the lower willingness among middle-aged groups and government staff may indicate stronger dependence on private vehicles for routine commuting. The strong barriers reported are comfort, dissatisfaction with PT service quality, long travel time and family logistics. This reinforces that mode choice is influenced not only by cost but also by service reliability, convenience and trip-chaining needs, consistent with the literature on car dependence among parents (Kent, 2025).

The intervention results further show that respondents favour “pull” improvements that make PT more usable in daily life, particularly regular schedules, fare reductions and station parking, which align with evidence that fare levels, commuting distance and station access/parking influence PT use decisions (Rasca & Saeed, 2022). Conversely, the relatively low scores for fuel price, toll and parking fee increases suggest that “push” measures alone may not be sufficient to drive behavioural change, consistent with findings that fuel price changes may have limited influence on travel decisions (Urbanek, 2021). These patterns imply that mode-shift strategies should prioritise reliability, affordability, convenience and integrated first and last-mile connectivity rather than depending primarily on financial disincentives. In addition, the demographic and occupational differences indicate the value of segmented approaches in which early gains may be achieved among groups already showing higher willingness, such as younger adults, retirees, and self-employed, while middle-aged working adults may require greater improvements in travel time, comfort and seamless access to stations to consider shifting. The regional differences further highlight the need to reduce infrastructure and service disparities outside the central region, where limited PT availability likely constrains mode shift regardless of intent. Overall, the findings suggest that effective mode shift requires an integrated sustainable mobility approach combining service quality upgrades, family-friendly and accessibility features, improved station access/parking, and targeted strategies that reflect different user needs across regions and demographic groups.

5.0 Conclusion and Recommendation

This study aims to understand the characteristics of road users' WTS in Malaysia. In conclusion, the results suggest a generally low WTS from private vehicles to public transportation. This reluctance is influenced by a variety of demographic factors, including gender, age, occupation, and region, with females, younger adults, older individuals, self-employed people, and retirees showing higher

willingness to adopt PT. Regional differences also emerged, with the central region exhibiting the highest willingness, likely due to better PT infrastructure. Key barriers to shifting include comfort and convenience, as well as dissatisfaction with the current PT system, which many respondents find inefficient or unreliable. Other reasons for resistance include managing children or family logistics, long travel times, and the flexibility offered by private vehicles.

However, the WTS increases significantly when interventions are introduced to improve the accessibility, affordability, and convenience of PT. High levels of support were shown for interventions such as providing regular PT schedules, reducing fares and increasing parking spaces at stations. These findings underscore the importance of enhancing the practical aspects of PT, such as reliability and affordability, in encouraging a shift from private vehicles. Conversely, measures like fuel price increases, toll hikes, and higher parking fees received less support, suggesting that financial disincentives alone may not be enough to drive significant behavioural change.

Several recommendations can be suggested to encourage a shift towards public transportation. Expanding and enhancing public transit infrastructure, especially in regions outside the Klang Valley, is recommended to improve accessibility for those currently reliant on private vehicles. Improving route convenience, frequency, and real-time tracking would increase the appeal of PT for time-sensitive users. Enhanced safety, cleanliness, and comfort would help meet the standards expected by middle-aged and higher-income individuals. Finally, public awareness campaigns highlighting the cost, environmental, and congestion-reduction benefits of PT could shift perceptions and reduce the current preference for private vehicles.

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Paper Contribution to Related Field of Study

This paper contributes to the field of sustainable urban mobility and transport behaviour by providing empirical insights into commuters' willingness to transition from private vehicles to PT in Peninsular Malaysia. Unlike prior studies that primarily focus on infrastructure or service provision, this research integrates demographic, socio-economic, and behavioural factors to understand mode-shift decisions comprehensively. By linking these factors to willingness to adopt public transportation, the study informs policymakers, urban planners, and transport authorities on designing targeted interventions and strategies to promote sustainable mobility. Additionally, this research contributes to the limited literature on Malaysian urban travel behaviour, providing a locally contextualised understanding that can guide future transport policy, planning, and behavioural change initiatives.

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