

## Road Users in Rural Areas Mobility: Impact from Fuel Price

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DOI: <https://doi.org/10.30880/rtcebe.2023.04.01.015>  
Received 06 January 2022; Accepted 15 January 2023; Available online 01 May 2023

**Abstract:** There has been a great deal of research that has shown that the mobility pattern of people is heavily influenced by their monthly incomes and wages. Fuel price increases have impacted the monthly budget of certain people, leading them to reduce their travel activities or change their modes of transport. Rural people have fewer options for transport modes than urban people, and most of them use their own vehicles for travel. Therefore, they may travel differently than urban people, especially if travel costs increase as a result of the rise in fuel prices. This study examines the changes in mobility patterns of rural people as a result of fuel price fluctuations. This study involved rural people living in Johor, Malaysia. The method of analysis was done by statistical analysis which included descriptive analysis and t-test. Based on the results of this study, the rising of fuel price did not give any significant changes (significance level, 0.05) towards the respondents' mobility pattern.

**Keywords:** Rural Areas, Mobility, Fuel Prices

### 1. Introduction

In this advanced world that is fully conquered with high technologies and various modes of transportation, there are still rural circles that most likely rely on land transportation such as car, motorcycle, bicycle and bus. This mode of transportation is significant among them to get easy access to their job places, schools, buying daily needs and other utilities. However, rural areas are commonly known to lack in mobility options [1]. In terms of public transportation, people in rural areas tend to avoid it because of limited travel distance and travel options unlike urban residents. Therefore, they are much dependent on private cars and motorbikes because those are the only option left for them to travel to another place easily.

However, there are still some of the rural people are incapable of relying on their own vehicles. The reason is these people found out that personal automobiles are readily expensive in commercials and their monthly earnings are not qualified enough for the vehicle's services and maintenance. In Malaysia, the rural poverty rate in 1970 was 58.7% which has toned down to 1.0% in 2016 [2]. Even though the average household income increased from RM200 in 1970 to RM4359 in rural areas, the

amounts are not that much when compared to urban areas. This is because most of the people in rural areas are highly dependent on their agricultural incomes per month which results in lower income in return [3]. In a nutshell, people in rural areas who have limitations may not be able to own any motorized vehicles.

The limitation of mobility choices in rural areas eventually gives a major impact on their quality of life. Their lives are not just in danger, but also will invade their monthly budget and income if they still eagerly want to own private vehicles. However, claimed by the Department of Statistics Malaysia (DOM) [4], the percentage change rate of monthly salaries and wages in rural areas was higher (6.0%) than the workers in urban areas (4.0%) as shown in Table 1. Although the change rate is higher, owning a private vehicle will consume fuel. In result, the variation price of fuel will be much more likely to disturb them. Rural people are best known to not have multiple choices in choosing public transport which will lead them to consume more fuel when using private vehicles.

**Table 1: Average monthly salaries and wages employees by strata [4]**

Strata	Average Salaries and wages (RM)					YoY (%)	CAGR (%)
	2015	2016	2017	2018	2019	2018-2019	2015-2019
Urban	2,638	2,812	3,038	3,274	3,405	4.0%	6.4%
Rural	1,831	1,916	2,040	2,083	2,208	6.0%	4.7%
Total	2,487	2,657	2,879	3,087	3,224	4.4%	6.5%

*\*\*YoY = Percentage refers to annual change rate*

*\*\*CAGR = Percentage refers to compounded annual growth rate*

In the meantime, rural people are known not to have the same facilities as in the urban areas. Their road network is not widened enough and some really lack in maintenance as in places such as Sabah and Sarawak. This is because heavy vehicles such as sport utility vehicles (SUVs) use the same roads as normal users who use private car, motorcycles and even pedestrians [5]. The visual of mud, gravel and potholes are typical road conditions can be seen in rural areas. Unlike in Johor, the roadways in the countryside have driven attention to the government. Johor Public Works, Rural and Regional Development Committee [6] claimed that there are plans to upgrade suitable rural roads into state roads in order to get road maintenance services associated under the Malaysian Road Records Information System (MARRIS).

Apart from that, fuel is one of the main needs for people who own motorized vehicles. However, the fuel prices these days are determined by the global supply and demand [7]. This shows that users have to always be ready with the variation of the fuel price in the market. By referring to this, there are crucial consequences upon their monthly expenditures. Some have to spend more on fuel. Rural communities have no choices left as they still need to get their fuel filled. In any case, users have to find other mobility options in order to help them control their expenses on fuel. Therefore, the study of how fuel prices can influence the travel pattern of people living in rural areas is crucial to determine how it will affect their mobility. This study is aimed to analyze the mobility of people in rural areas towards the impact from fuel price.

## 2. Material and Method

In this study, information and data used was obtained from a series of questionnaire that is conducted in rural areas around Johor. The targeted respondents were working people who aged 20 and above and was according to the report of census data of 2010. The report stated that 25.6% of the working people live in rural areas [8]. By referring to Krejcie and Morgan table [9], only 383 respondents needed in this research. Hence, the questionnaires were distributed with the help on Google Form however only 204 were returned back to the researcher.

### 2.1 Research Instrument

There were three sections available in the questionnaire (Section A, Section B and Section C). Section A included respondents' demographic information such as gender, age, marital status, monthly salaries and etc. Meanwhile for Section B, details about mode of choice were asked that included driving

license and vehicle ownership, mode of transportation and frequency of most preferable mode for different purposes (to workplace, for leisure purpose and daily activities) [10]. Lastly, Section C were about how the variation of fuel prices would affect the travel pattern and mode of choice of the respondents [10].

## 2.2 Demographic information

From the questionnaire surveys, it is found that female respondents were more interested to take part in answering (69.6%). Referring to the survey, 49.0% were aged from 20 to 25 meanwhile 54.9% of them are married. In terms of household size, most of the respondents (55.9%) live in 4 to 6 people per house. The highest percentage of respondents' education level was by Bachelor's Degree. 52.9%. Apart from that, 37.7% works in the government sector and 23.0% has monthly salaries (RM) of 500 to 1000.

## 2.3 Analysis method

In this study, descriptive statistical analysis was done in order to analysis all sections from the questionnaire survey. In order to analyze the travel pattern before and after fuel price increases, t-test analysis was done to find out if there is any significant changes.

## 3. Results and Discussions

After the questionnaire survey was distributed for two months (October 2021 until December 2021), data sorting has been done in order to analyze the mobility pattern of the respondents before and after fuel price increases.

### 3.1 Driving License and Vehicle Ownership

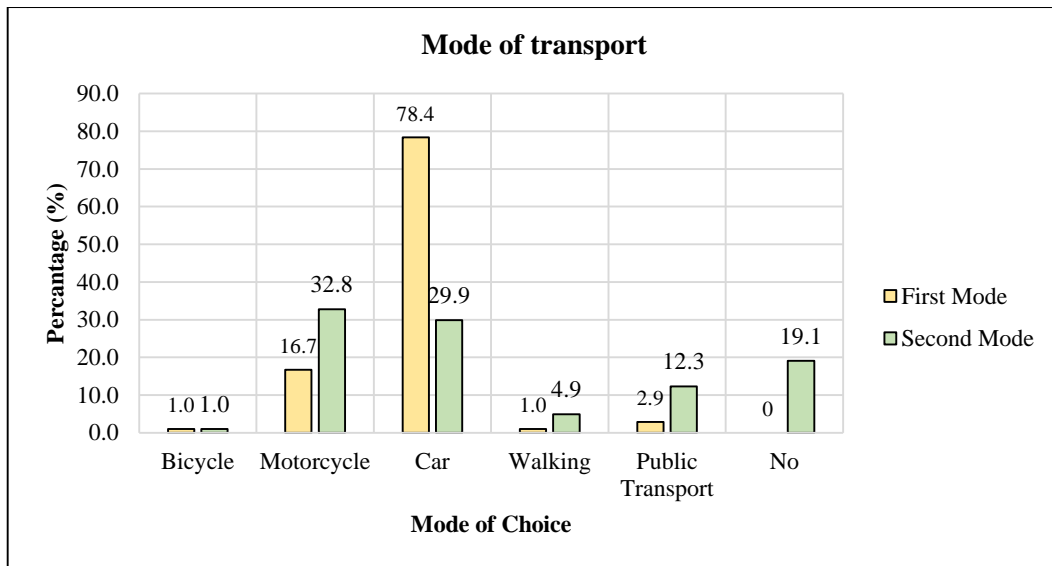
Table 2 shows the summary result of respondents' driving license and vehicle ownership. From the survey, 96.1% of them has driving license in which 43.6% own both B (motorcycle) and D (car) types of driving license. In the meantime, only 0.5% has GDL (goods driving license) type. For vehicle ownership, it can be concluded that most respondents (80.4%) have car (includes MPV, SUV and van) as their vehicle.

**Table 2: Driving license and vehicle ownership**

Driving License Ownership	Percentage (%)
Yes	96.1
No	3.9
Type of Driving License Ownership	Percentage (%)
B	11.3
D	40.7
B and D	43.6
GDL	0.5
No	3.9
Vehicle Ownership	Percentage (%)
Bicycle	0.5
Motorcycle	13.7
Car	80.4
No	5.4

### 3.2 Mode of Transport

Figure 1 shows the respondents' main and second mode of transportation. Through the survey, 78.4% had chosen car as their main mode. Meanwhile for the second mode, motorcycle showed the highest percentage (32.8%). Furthermore, for the first mode, there were no respondent who responded 'No' and this literally proved that everyone in rural areas has their preferable first mode.



**Figure 1: Mode of transportation by the respondents**

### 3.3 Fueling Information

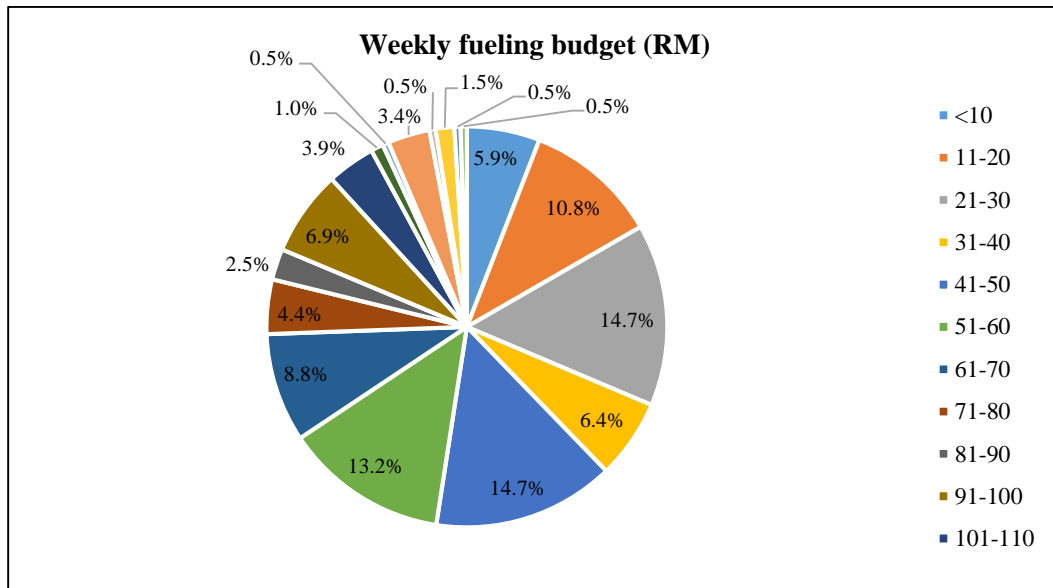
This section explained about the respondents’ fueling information as shown that includes type of fuel consumed and weekly frequency of fueling as shown in Table 3. From the table, more than half (92.6%) of the respondents prefer to use RON95 (Research Octane Number) than RON97 (7.4%) only. This is because RON95 is best known for having an affordable price with moderate performance when compared to RON97 [11]. In addition, 47.5% of respondents fuel their vehicles 2 to 3 times a week and 0.5% who fuel 5 to 6 times and everyday of the week. This is likely because they travel long distances and consume more fuel, or because they travel frequently.

**Table 3: Fueling information**

Type of fuel consumed	Percentage (%)
RON95	92.6
RON97	7.4
Frequency of fueling (per week)	Percentage (%)
1x	40.7
2-3x	47.5
3-4x	7.8
4-5x	2.9
5-6x	0.5
7x	0.5

Figure 2 shows the weekly fueling budget (RM) filled in by the respondents. Based on the figure, 14.7% of the respondent spent their earnings on fuel as much as RM21 to RM30 and RM41 to RM50 respectively. There are also about 5.9% of them who spend less than RM10 on fuel. This might due to they prefer to use active transport such as walking, cycling or by public transport. It can be concluded that none of the respondents spent more RM251 weekly on fuel. The highest budget is by RM241 to RM250 which constitute 0.5% only

**Figure 2: The weekly fueling budget (RM) of the respondents**



**3.4 Respondents’ Mobility Mode of Choice Before Fuel Price Increases**

Table 4 shows the respondents’ mode of choice before fuel price increases. From the table, 85.7% of respondents stated that they travel using cars (includes MPV, SUV and van) to their workplace at least 1 day in a week. By motorcycle, 38.2% of them travel using it more than 1 day weekly. However, the study also found out that respondents travel to the workplace with other modes by only not more than 20% each.

The survey also indicates that for leisure purposes, cars are still leading by 88.2% of usage by the respondents. However, public transport shows the highest percentage by 87.7. respondents claimed that they are not using it at all in a week. This is because it is widely known that public transportation such as bus services does not cover all areas in Malaysia [12].

In terms of travelling for daily activities, rural people are most comfortable with cars (87.8%). Daily activities mentioned here was referred to marketing, going to mosque (for Muslim respondents), going to hospital etc.

**Table 4: Mobility mode of choice before fuel price increases**

Survey Question	No	1-2 days	3-4 days	5-6 days	7 days
<b>To workplace:</b>					
Percentage (%)					
Car	14.2	27.9	14.7	30.4	12.7
Motorcycle	61.8	19.6	8.8	5.4	4.4
Carpooling	84.3	8.8	3.9	2.0	1.0
Public transport	89.2	7.8	0	2.0	1.0
Bicycle	97.1	1.5	1.0	0	0.5
Walking	91.7	4.9	2.0	0.5	1.0
<b>For leisure:</b>					
Percentage (%)					
Car	11.4	53.4	21.1	3.4	10.3
Motorcycle	56.4	29.4	7.4	2.5	4.4
Carpooling	73.5	19.6	3.9	2.9	0
Public transport	87.7	7.8	3.4	0.5	0.5
Bicycle	87.3	6.9	3.9	1.5	0.5
Walking	80.4	11.8	5.9	1.5	0.5

**Table 4: Mobility mode of choice before fuel price increases (cont.)**

For daily activities:	Percentage (%)				
Car	12.3	45.6	24.0	5.9	12.3
Motorcycle	54.4	24.0	9.3	3.9	8.3
Carpooling	84.3	8.8	5.4	1.5	0
Public transport	93.6	3.9	2.0	0	7.0
Bicycle	94.6	3.4	2.0	0	0
Walking	85.8	8.8	2.9	1.5	1.0

### 3.4 Comparison of Respondents' Mobility Mode of Choice Before and After Fuel Price Increases

Table 5 shows the respondents' mode of choice after fuel price increases, while the t-test analysis result is shown in Table 6. The t-test is used in order to determine if there are significant changes in travel patterns among respondents based on fluctuations in fuel prices.

The respondents' frequency of traveling to and from work decreased as shown in Table 5. As in example, the frequency has reduced from 85.8% to 82.8% for respondents who used car to workplace. The reduction can also be seen in other modes except for carpooling and bicycle. This claimed that people preferred to do carpooling to travel to workplace. Based on the survey, all modes have reduced its frequency of using it in a week. Therefore, t-test was done in order to know if the changes are significant

**Table 5: Mobility mode of choice after fuel price increases**

Survey Question	No	1-2 days	3-4 days	5-6 days	7 days
To workplace:	Percentage (%)				
Car	17.2	29.6	16.7	21.6	14.7
Motorcycle	62.3	16.2	9.3	3.9	8.3
Carpooling	77.0	13.7	5.4	2.9	1.0
Public transport	86.3	7.4	2.9	1.0	2.5
Bicycle	97.1	0.5	1.5	0.5	0.5
Walking	94.6	1.5	2.0	1.0	1.0
For leisure:	Percentage (%)				
Car	16.7	53.9	15.2	6.4	7.8
Motorcycle	58.8	22.1	10.8	2.5	5.9
Carpooling	78.9	14.2	4.9	0.5	1.5
Public transport	87.7	7.4	2.5	1.5	1.0
Bicycle	89.7	5.9	2.0	0.5	2.0
Walking	85.3	9.3	2.5	1.0	2.0
For daily activities:	Percentage (%)				
Car	15.2	54.9	15.2	5.4	9.3
Motorcycle	56.4	22.5	8.8	2.9	9.3
Carpooling	81.9	12.3	3.9	1.5	0.5
Public transport	91.2	5.9	2.0	1.0	0
Bicycle	91.2	3.9	3.4	1.0	0.5
Walking	84.8	9.3	2.5	1.5	2.0

t-Test analysis result is shown in Table 6. The majority of modes of transportation exceed the level of significance of 0.05, proving that although respondents claim they change their mode of transportation, the change is insignificant. On the other hand, the use of car and bicycle for daily activities shows the result of less than 0.05, which are 0.0274 and 0.0348 respectively. These results may indicate that respondents are more serious in reducing their daily trip activities than their work trip activities. This result may be influenced by rising fuel prices. In terms of bicycle, since it travels faster than by walking, respondents prefer to use it more.

**Table 6: One tailed t-test analysis result**

Survey Question	t-Stat	P(T≤t)	Significant
<b>Mode of transportation: To workplace</b>			
Car	0.9800	0.1638	No
Motorcycle	-0.7490	0.2271	No
Car pooling	-1.4365	0.0758	No
Public Transport	-1.1965	0.1161	No
Bicycle	-0.3757	0.3537	No
Walking	0.3516	0.3627	No
<b>Mode of transportation: For leisure</b>			
Car	1.1898	0.1174	No
Motorcycle	-0.5071	0.3062	No
Car pooling	0.6966	0.2432	No
Public Transport	-0.4105	0.3408	No
Bicycle	0.3029	0.3810	No
Walking	0.6967	0.2432	No
<b>Mode of transportation: For daily activities</b>			
Car	1.9262	0.0274	Yes
Motorcycle	0.1187	0.4528	No
Car pooling	-0.3908	0.3481	No
Public Transport	-0.6662	0.2524	No
Bicycle	-1.8194	0.0348	Yes
Walking	-0.4867	0.3134	No

### 3.5 Discussion

Based on the results obtained and data analysis done on the survey, as claimed by Fortunati [13], it was proved that mobility is categorized as the freedom of choices of the people to choose the most suitable mode for their journey and purposes. This can be seen in this research having that respondents had their own preferable first mode, second mode and based on different purposes.

Throughout this survey, it was found that only a few of the respondents choose to use non-motorized modes that include bicycle and walking. They mainly used it for the purpose of daily activities such as going to mosque. This is because as claimed by Pojani and Stead [14], a higher chance would be applied to use manpower mode when the distance travel is considered short. Hence, the previous research is still valid and acceptable.

In terms of transportation system, respondents were more interested in using private vehicles such as car and motorcycle. This is because rural areas are not having the same road network infrastructure as in the urban [15]. It is evidenced that the decision of using private vehicle is mainly due to the characteristic of the trip maker itself as stated by Ortuzar and Willumsen [16]. Since almost all of the respondents own driving license, the thought of shorten the time travel, pleasant journey and safety purposes are what the respondents prioritize the most.

## 4. Conclusion

Based on the research and analysis conducted, it is evident that rural people will not shift their mobility type regardless of the rising fuel prices. In a week, they will likely only slightly reduce personal vehicle usage. In terms of public transport, rural people are known for not having the same facilities as in the urban areas. Therefore, only a few of them will opt for it. Riding bicycle or by walking can act as a possible way in order to reduce the weekly budget on fuel. It is one of the best approaches to overcome this issue as it will also conserve the environment from various population and create a healthy lifestyle.

## Acknowledgement

This research was made possible by funding from research grant number ABC-XXXX provided by the Ministry of Higher Education, Malaysia. The authors would also like to thank the Faculty of Civil Engineering and Built Environment, Universiti Tun Hussein Onn Malaysia for its support.

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