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The effect of rising prices of subsidized fuel on the use of private cars

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Abstract
The rising fuel prices on September 3, 2022, are expected to reduce the use of private cars and increase the use of public transport. This expectation has raised optimism among public transport operators and is expected to encourage them to invest more. However, there is no evidence to support the expectation. Therefore, it is essential to study the effect of the fuel price on the use of a particular transport mode, thus motivating this study. This paper aims to investigate the impact of the rising costs of subsidized fuel on private cars. A Likert-scale type of questionnaire was used to collect data. The data was analyzed descriptively, and then a conclusion was made based on the results. The study found that the daily commute of respondents changed after fuel prices increased. Distance, duration, and frequency of travel tend to be reduced and prioritized over primary activities. To reduce travel costs, the respondents who usually use cars are more likely to use motorcycles than public transport. The findings of this study disprove that an increase in fuel prices would increase the use of public transport. Why is public transport less favoured compared to motorcycles? It seems that the quality of service provided by public transport fails to satisfy the consumers' needs.

Keywords:
Likert-scale;
Pertalite;
Private car;
Subsidized fuel;

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INTRODUCTION

On September 3, 2022, at 14.30 WIB, the government officially increased the price of fuel oil, both subsidized and non-subsidized. In Indonesia, there are some types of fuel oil, such as Pertalite, Pertamax, Pertamax Turbo, Solar, Premium, Dexlite, and Dexlite Turbo. Pertalite and solar, from now on referred to as fuel, are subsidized fuel types and will be the focus of our study. The price of Pertalite was initially IDR 7,650 per liter and rose to IDR 10,000 per liter, while the cost of Solar rose from IDR 5,150 to IDR 6,800 per liter. Based on the records of the Ministry of Energy and Mineral Resources, Pertalite is the type of fuel most used by drivers, reaching 23 million kiloliters in 2021 or 79% more than other types of fuels such as Pertamax, Pertamax Turbo, and Premium, which are recorded at 21%. Rising fuel prices in Indonesia have increased travel costs using public or private vehicles.

It is essential to study the impact of the increase in travel costs on the use of private cars and people's lifestyles to recommend future policies. This study aims to identify the effect of rising fuel prices on the use of personal vehicles in Padang City and to offer some advice to the authorities. Fuel oil is a type of fuel obtained from refining crude oil. Crude oil from the earth's peritoneal was refined to produce oil products. Apart from fuel oil, various other products can be made from crude oil, from gas to products such as naphtha, Light Sulfur Waxy

Residue (LSWR), and asphalt. The use of fuel oil is increasing in line with Indonesia's economic growth; however, Indonesia's remaining reserves and supplies are decreasing over time.

Petroleum oil is divided into several types, namely:

a. Ron 88: a fuel product that has the lowest octane rating among other types. This fuel is more recommended for vehicles with low engine compression, namely 9:1. We can recognize this fuel with RON 88 as premium gasoline. In Indonesia, this type is no longer available.
b. Ron 90: This material has a price rate that is relatively affordable by the community. Not only that, the average vehicle is also suitable for this fuel octane. Usually known as Pertalite, this fuel is one of the fuels subsidized by the government.
c. Ron 92: usually intended for modern vehicles with a compression ratio of 10-11:1 or for vehicles using Electronic Fuel Injection (EFI) technology.
d. Ron 98: This type of fuel was first launched in Belgium. High-tech vehicle engines often use this type of fuel. The type of compression that matches this type of fuel has a ratio of 11-13:1. This fuel does not damage air quality or is environmentally friendly.

According to Litman [1], all transportation activities will affect economic, social, and environmental sustainability. Tamin [2] suggested three aspects of sustainable transportation: social, economic, and environmental. Socially, the vehicle should meet people's health, comfort, and convenience needs effectively and not change the social order. With that, transportation is expected to reduce air and noise pollution from transportation that disrupts the community and provides safety and comfort for the community. Economically, transport should provide cost-effective services and be financially affordable to support people's life activities. Environmentally, transportation should use endless resources, such as recycling materials, and produce no emissions.

The decision to use a transportation mode is expected to be influenced by factors of road user characteristics, for example, the ownership of private vehicles, ownership of driver's licenses, economic income, and the necessity of using modes to work or the need to take children to school [2]. The selection of transportation modes can be grouped into two categories, namely:

1) Transportation service users and trip makers
   a) A captive group is a group of people who are forced to use public transportation because they do not have private vehicles. These are the lower middle classes of society.
   b) The choice group is people with easy access to private vehicles who can use public transportation or personal vehicles.
2) Transportation service based on how to use the services:
   a) A private vehicle (private transportation) is a mode of transportation devoted to private people who can use it anywhere, anytime, and anywhere they want or cannot use it.
   b) Public transportation is a mode of transportation provided for the common interest of many people, receives joint services, has the same direction and destination, and complies with existing route regulations [3][4].

Few studies have been conducted to investigate the impact of the increasing price of fuel, such as the economic impact [5], impact on the capital market [6][7], policy [8], and the impact on grocery prices [9]. However, the studies did not evaluate the impact of increasing fuel prices on lifestyle and other aspects investigated in this study.

The issue of fuel prices occurred not only in Indonesia but also in various countries in the world. In kinds of literature, some studies have been conducted related to fuel prices, such as [10] that investigate the effects of fuel prices on the stock market during COVID-19, the implication of the fuel price to economics agents [11][12], the impact of fuel price changes to road traffic collisions [13], fossil-fuel subsidy reform [14], evidence from China about gasoline

prices and new automobiles [15]. The impact of fossil fuel prices on economic growth, environment sustainability, employment policy, healthcare expenditure, urban development, retailer businesses, and renewable fuel standard compliance cost save also been studied [16, 17, 18, 19, 20, 21, 22, 23]. Some studies investigated and explored the impact of fuel prices on inventory policies, electricity markets, spatial interactions, welfare impacts, fuel markets and inflations [24, 25, 26, 27, 28, 29, 30]. However, the impacts of fuel prices on lifestyles and travel behaviors have not been widely studied. Therefore, the findings of our study would contribute significantly to the science and knowledge.

METHOD

Data was collected by distributing questionnaires in various places such as residential areas, shopping centers, offices, and campuses. The Likert Scale was chosen to measure respondents' views or perceptions. Some of samples was determined using the Slovin Formula, which suggested 155 respondents. The questionnaire form has been tested to confirm the questions were valid. The data was analyzed using descriptive statistics and quadrant analysis.

RESULTS AND DISCUSSION

Characteristics of Respondents

The characteristics of respondents shown in Table 1 include gender, age, occupation, and income, providing a general picture of respondents. As shown in Table 1, 60% of respondents are men. In terms of respondents' occupation, about half of respondents are self-employed, and 27% are civil servants. The income of respondents is mostly between IDR 5,000,000 and IDR 7,500,000 (about 32%), 22% between IDR 7,500,000 and IDR 10,000,000 and 23% less than IDR 5,000,000. However, in terms of age, the age of respondents was spread between 19- to 59-year-old. These characteristics of respondents will influence the results of the study.

Travel and vehicle ownership information

Motorcycle vehicle ownership

Figure 1 shows that of the 155 respondents, as much as 42.6% have two motorcycles, 37.4% have one motorcycle, and about 10% have no motorcycles. This data confirmed that 90% of households have at least one motorcycle.

Table 1. Characteristics of Respondents

Characteristics	Category	Freq.	Percentage
Gender	Man	93	60%
	Woman	62	40%
Age	20 – 29 y.o	30	19.4%
	30 – 39 y.o	26	16.8%
	40 – 49 y.o	40	25.8%
	50 – 59 y.o	45	29.0%
	> 60 y.o	14	9.0%
Occupation	Self-Employed	76	49.0%
	Civil Servant	42	27.1%
	Teacher	17	11.0%
	Health worker	5	3.2%
	Retired	15	9.7%
Income	< IDR 5,000,000	37	23.9%
	IDR 5,000.000 – IDR 7,500,000	51	32.9%
	IDR 7,500.000 – IDR 10,000,000	34	21.9%
	IDR 10,000,000 – IDR 12,500,000	12	7.7%
	> IDR12,500,000	21	13.5%

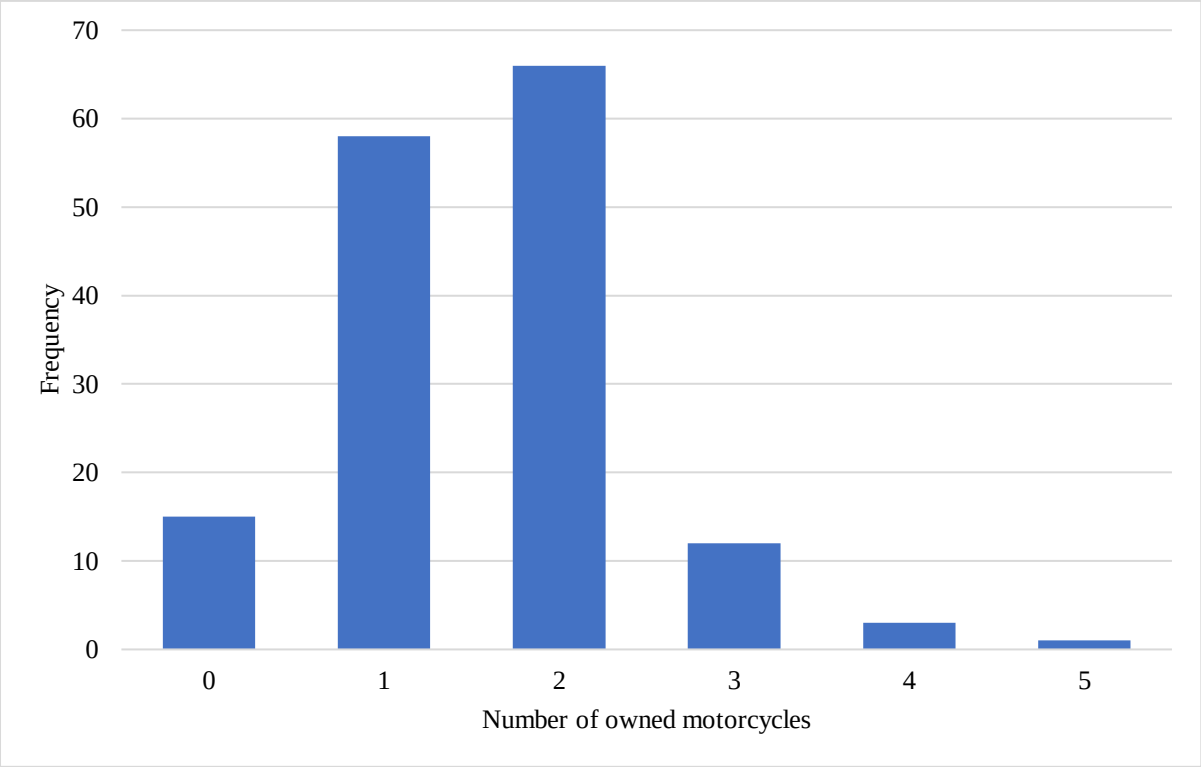

Figure 1. Respondents' distribution by motorcycle ownership

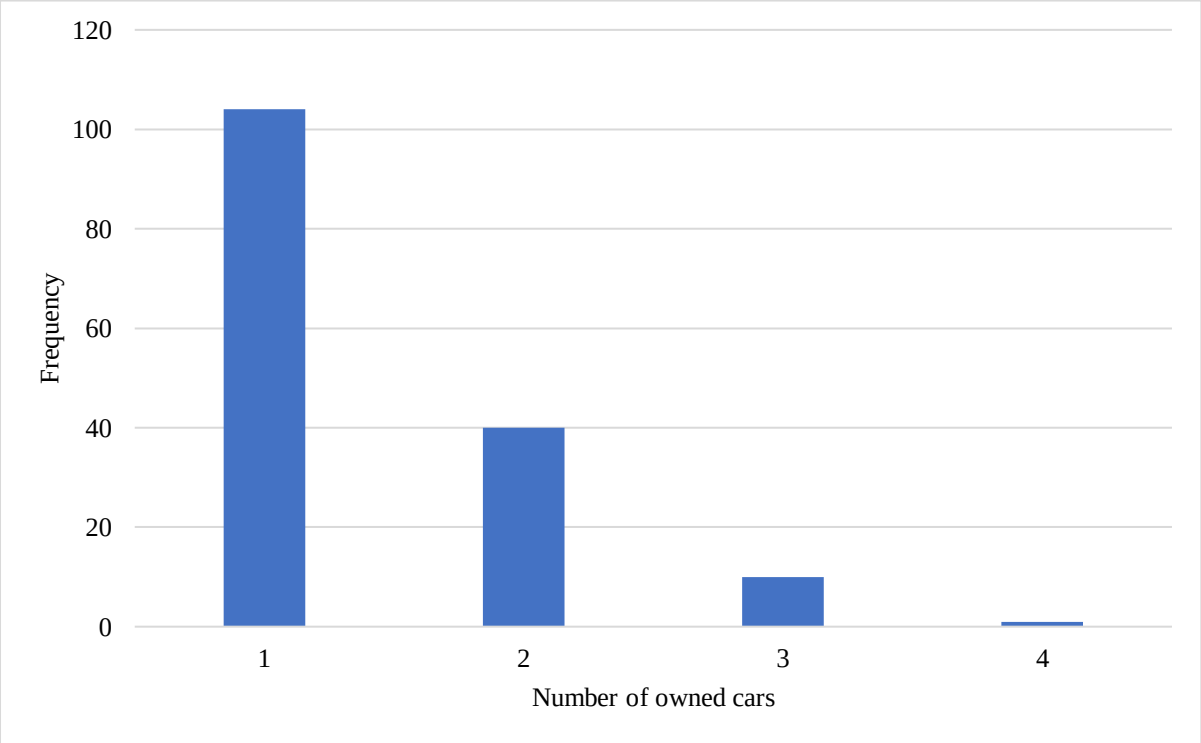

Figure 2. Distribution of respondents by car ownership

Figure 2 shows car ownership by the household of respondents. Most families have one car (about 67%), and about a quarter of respondents own two vehicles. There is no household with no cars recorded as a respondent because the survey focused on respondents with at least one car. It is common in a family to have motorcycles beside car(s) [31][32].

Number of trips per day before and after fuel price increase

This study showed that before the fuel price increase, the number of respondents who made the trip more than twice a day was about 84%. This percentage was reduced after the fuel price increase. Only 33% of respondents traveled more than three daily trips after the fuel price increase. Therefore, it can be concluded that people tend to reduce the number of trips after the fuel price increases. Number of trips made is shown in Figure 3.

Trip duration per day before and after fuel price hike

Data shows that 24.5% of respondents have a travel time of 20 minutes – 30 minutes, followed by 21.3% with a travel time of 30 – 40 Minutes, as shown in Figure 4. Before the fuel price increase, about 78% of respondents had traveled for more than 20 minutes. After the fuel price hike, the number was reduced to 66%. Thus, it can be concluded that the increasing fuel price has reduced respondents' travel duration per day.

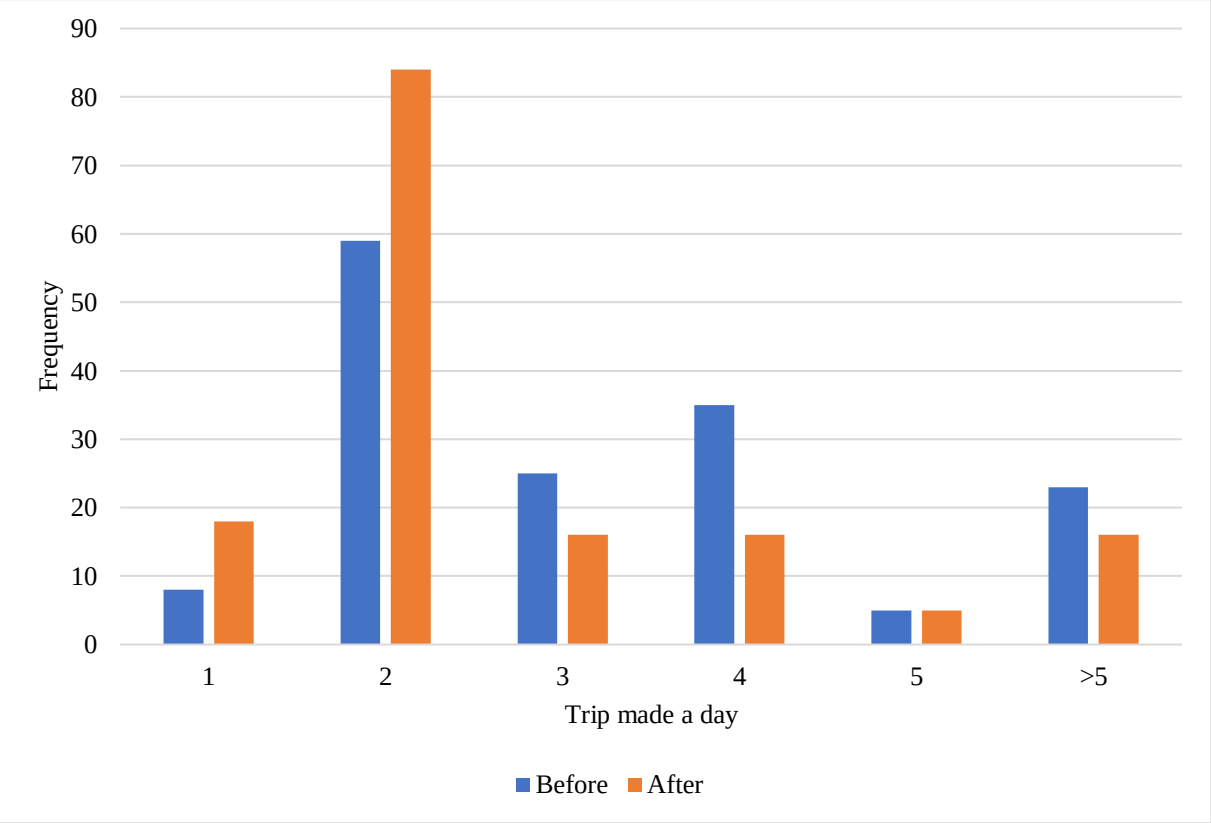

Figure 3. Number of trips made

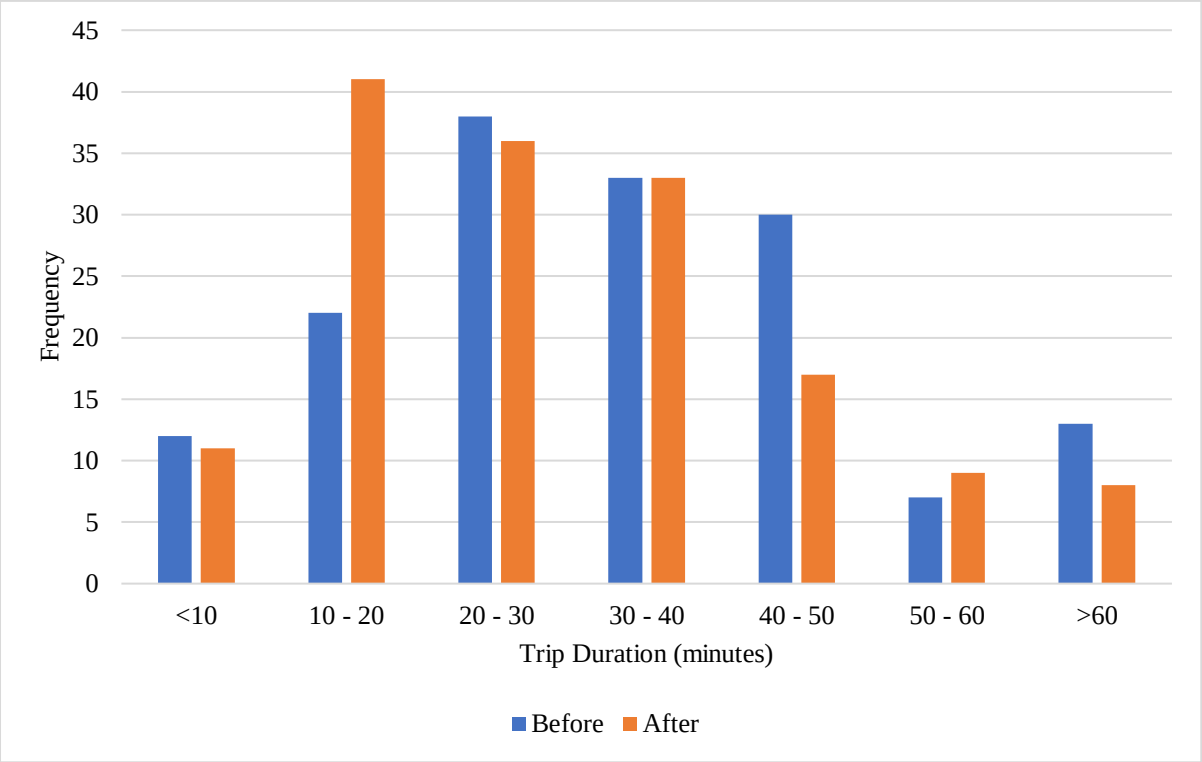

Figure 4. In-vehicle time before and after fuel price hike

Average monthly respondents' expenditure for fuel

Figure 5 shows that respondents' fuel expenditure is around IDR 400.000 to IDR 600.000. Before the fuel price hike, the percentage of respondent's expenditures higher than IDR 600.000 was about 32%. After the fuel price hike, the rate increased to 50%. The data confirmed that even though respondents reduced the Number of trips and travel duration, their expenditure for fuel was still higher than before the fuel price increased.

Respondents' Perception and Attitude

This section explains the perception and attitude of respondents to the statements given about the impact/results of the increase in fuel prices. The perception and attitude of respondents were assessed using a questionnaire where respondents were asked to express their agreement with the given statement. Table 2 shows the average score of respondents' agreement with the information based on a 4-point Likert scale.

Table 2 shows that most respondents confirmed that the increment in the fuel price has changed their travel. As shown in the interpretation column, after the fuel price increase, respondents tend to reduce their travel distance, use motorcycles more, postpone their trip, reduce shopping, reduce using private cars, become a hitchhiker, become less active outside, reduce using car air conditioning, avoid congested, trying to search for a part-time job after their full-time job.

Table 2. The average score of respondents' agreement with the statement

No.	Statements	Score Average	Interpretation
1	My daily commute changed after the fuel price hike	2.69	In general, respondents' daily commute changed after the increase in fuel prices
2	The distance I traveled after the fuel price hike was lower than before the fuel price hike	2.59	In general, respondents' mileage tends to be low after the increase in fuel prices
3	I use my motorbike more after the fuel price hike	2.80	I use my motorbike more after the fuel price hike
4	The increase in fuel prices made me postpone buying other necessities	2.65	In general, respondents postponed other needs after the increase in fuel prices
5	I reduced my shopping activities after the fuel price hike so that I could continue using my vehicle	2.65	In general, respondents tend to reduce their shopping activities after the increase in fuel prices to be able to use their vehicles
6	I reduced the use of private vehicles after the fuel price increase	2.17	In general, some of the respondents reduced the use of their vehicles after the increase in fuel prices
7	I use public transportation after the fuel price hike	1.87	In general, respondents tend to use their vehicles rather than using public transportation
8	I became hitchhiking a lot after the fuel price hike	2.23	In general, respondents became frequent hitchhikers after the increase in fuel prices
9	I became less active in hanging out with friends after the rise in fuel prices	2.51	In general, respondents became less likely to push it after the fuel price hike
10	I became less travelable after the increase in fuel prices	2.83	In general, respondents reduced their travel after the increase in fuel prices
11	I declined the cost of filling fuel after the rise in fuel prices	2.52	In general, respondents reduce the cost of filling their fuel after the increase in fuel prices
12	Due to the rise in fuel prices, I decreased the amount of my monthly savings	2.71	In general, after the increase in fuel, respondents reduce the amount of their savings
13	I declined activities outside the home after the rise in fuel prices	2.70	In general, after the increase in fuel prices, respondents became less active outside the home
14	I reduced the use of car air conditioners after the rise in fuel prices	2.65	In general, after the increase in fuel prices, respondents reduced the use of air conditioning in their cars, thereby saving fuel usage
15	I changed the way/technique of working	2.80	In general, respondents tend to change their driving methods/techniques after the increase in fuel prices
16	I avoid congested areas	3.26	I avoid congested areas
17	I avoid peak traffic hours	3.27	In general, after the increase in fuel prices, respondents avoid peak congestion hours
18	I replaced the vehicle with a fuel-efficient vehicle	2.51	In general, after the increase in fuel prices, respondents changed their vehicles to fuel-efficient vehicles
19	I am looking for additional income due to rising fuel prices so as not to reduce other needs	2.61	In general, after the increase in fuel prices, respondents are looking for additional income to meet other needs
20	I cut back on my consumptive and glamorous lifestyle	2.99	In general, after the increase in fuel prices, respondents changed their consumptive and glamorous lifestyles

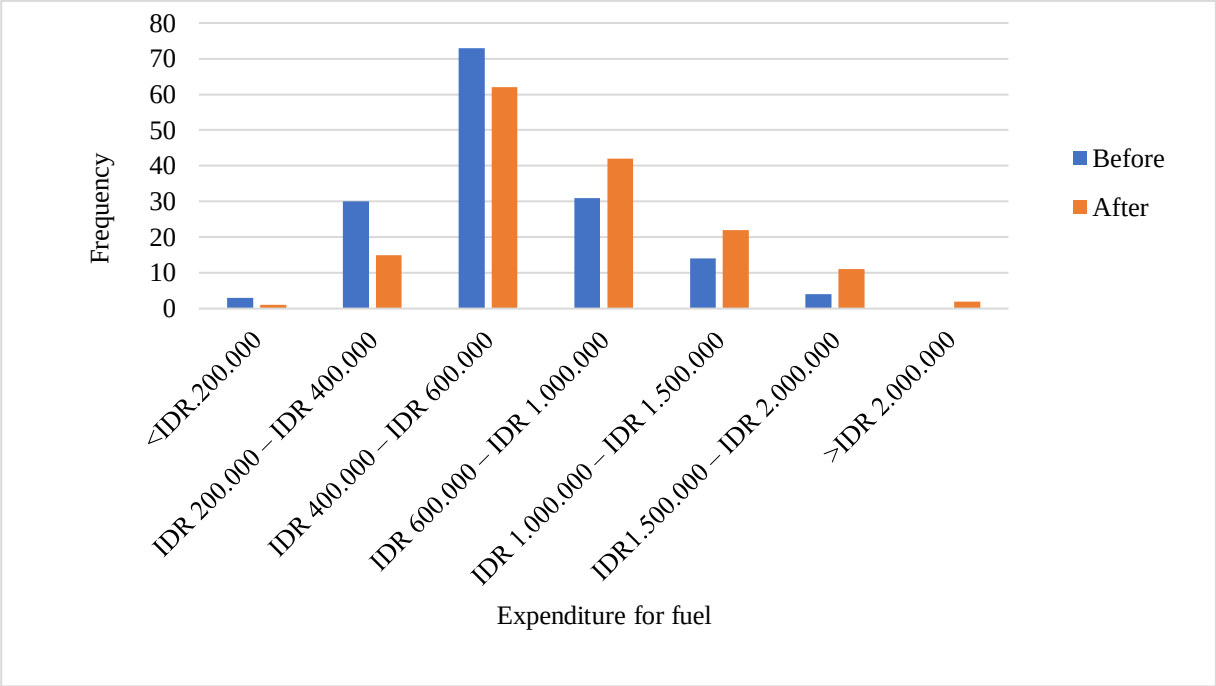

Figure 5. Frequency of the average monthly expenditure for fuel

CONCLUSION

From the results of the research conducted, the following conclusion can be drawn. First, of the 155 respondents in Padang City, after the increase in fuel prices, most respondents avoided areas and peak traffic hours to save fuel usage. Then, respondents continue using their private vehicles despite the increase in fuel prices. Public transportation has not been a solution for the people of Padang City to the problem of rising fuel prices. Finally, respondents tend to overcome the rising fuel prices by changing their four-wheeled private vehicles to motorcycles and reducing activities outside the home, such as traveling and hanging out with friends, to save on fuel expenses.

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