

# Evaluation of the implementation of the motorcycle lane based on the riding experience

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## Evaluation of the implementation of the motorcycle lane based on the riding experience

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**Abstract.** Currently, two-wheeled vehicles or motorcycle dominate more than 80% of motorised vehicles in Indonesia. A large number of motorcycles result in complicated traffic operations and reduced levels of safety. Lanes separation is the best engineering solution to overcome this problem. Several cities in Indonesia have implemented special motorcycle lanes. The results of the study stated that this program was not successful. This paper tries to evaluate the application of motorcycle lanes in terms of the user's riding experience. The Sleman Outer Ring Road in Yogyakarta which has implemented a special motorcycle lane is the location of this study. Data collection was carried out through online questionnaire interviews. Respondents provide answers on a choice of four (4) scales, namely, strongly agree, agree, disagree, and strongly disagree. The method of analysis used for evaluating the use of a motorcycle lane is the descriptive statistical method and the chi-square test. Based on the experience of riding on an exclusive motorcycle lane, assessment of the special motorbike lane geometric and traffic flow is good.

### 1. Introduction

Motorcycles are the most desirable mode of transportation in developing countries, including Indonesia. The limited availability of mass public transport encourages people to look for alternative modes that can meet their needs. The choice of a motorcycle as a mode of transportation is due to its relatively high mobility and relatively affordable price. Data in 2017 in Indonesia, the number of motorcycles reached 113 million units, which is equivalent to 81.6% of the total number of motor vehicles in Indonesia.[1] The growth in the proportion of motorcycle in traffic flow in Indonesia increased from 25-45% in 1997 to 50-85% during 2011.[2]

Various harmful effects arise due to changes in the increase in the number of motorcycles. Among the decrease in space mean speed and accidents. In Indonesia, traffic accident growth of 11.64% per year is dominated by accidents involving motorcycles [3]. The best engineering solution to reduce the negative effect of increasing the volume of the motorcycle in traffic flow and saving motorcyclists from disasters is lane separation [3-5]. Some countries that have implemented special motorcycle lanes include Malaysia, Taiwan, etc. Neighboring Malaysia, which implemented this rule, succeeded in reducing the number of accidents involving motorcycles to 39% per year. [6]

Since 2006 motorcycle lane facilities have been implemented in several cities in Indonesia, including Jakarta, Sragen, Surabaya, Bandung, and Yogyakarta. Evaluation results show that motorcycle users have not optimally utilised the implementation of this facility.

The unsuccessful implementation of a special motorcycle lane in Indonesia attracted researchers to identify the characteristics of users of this facility. The purpose of this study was to determine the factors causing the failure of implementing a special motorcycle lane at the study location, explore the

desires and experience of motorcycle users on the geometric and traffic conditions on a special motorcycles lanes.

## 2. Literature review

### 2.1. Definition and sign of motorcycle lanes

According to Act number 22, the Year 2009 regarding traffic and transportation in Indonesia, "motorcycle is a two-wheeled motor vehicle with or without accessories or a three-wheeled vehicle without accessories" [7]. Ministry of transportation ordinance of the Republic of Indonesia number 34 the year 2014 regarding road signs defines that "Lane is a long part of the road with or without road signs which has enough width so that one vehicle can run, except motorcycle"[8]. Motorcycle lane sign is another sign which is marked by a picture of a white motorcycle that is placed on the left of traffic. A motorcycle lane sign is placed on the same lane of other vehicles.

In Malaysia, there are two types of motorcycle lanes; they are exclusive motorcycle lanes and inclusive motorcycle lanes [9]. Exclusive motorcycle lanes are constructed specially to separate motorcycle and other vehicles, which is separated by fence or median. Meanwhile, an inclusive motorcycle lane or shared lane [10] separates motorcycle with other vehicles, which is bordered by the road sign.

Applying inclusive motorcycle lane in Indonesia has been done on some highways in Jakarta, and applying exclusive motorcycle lane Darmo street in Surabaya; Lingkar Utara Road, Sleman, Yogyakarta; Bypass Sukarno-Hatta arterial street, Bandung.

The application of motorcycle lanes in Indonesia was carried out in Jakarta in December 2006. The lane is designed to the left of the traffic lane and must turn on the lights even during the day. This program did not last long, in mid-2007, most motorbikes passed in the middle lane, even some on the right lane [11]. Putranto et al. (2011) evaluated the rate of effectiveness and the rate of exclusiveness in the implementation of motorcycle lanes in Jakarta (3 locations) and Sragen (2 places). Each site with a different geometric design so that the operating characteristics are different. Statistical test results on the correlation between the rate of effectiveness and rate of exclusiveness with V/C show unclear patterns [2].

Jalan Raya Darmo, in the city of Surabaya, has implemented a particular motorbike lane since November 2011. Before and after the implementation of the specific lane, road performance was stable with Level of Service (LOS) C. This performance condition remained until 2014 [12].

The results of the pilot survey on the implementation of special lanes and the sharing of motorcycle lanes implemented in Thailand succeeded in reducing speed. The study recommends a special line width of 3-4 m for exclusive motorcycle lanes and 3 m for the shared lane. With the decline in speed, motorcyclist safety is further improved, and road performance can be maintained at the level of service B [10].

### 2.2. Likert Scale

The Likert scale is commonly used in survey research. It is often used to measure respondents' attitudes by asking the extent to which they agree or disagree with a particular question or statement. Likert scale is a bipolar scale method that measures both positive and negative responses to a statement. Four choice scales are also sometimes used for Likert scale questionnaires that force people to choose one pole because "neutral" choices are not available. A typical scale might be "strongly agree, agree, disagree, strongly disagree." On the surface, survey data using the Likert scale may seem easy to analyse, but there are important issues for a data analyst to consider [13]

When responding to a question on a Likert scale, respondents determine their level of agreement with a statement by choosing one of the available choices. Four scale options with formats such as:

- a. Positive Questions (+)
  - Score 1. Very (disagree / bad / less)
  - Score 2. No (agree /good) or less
  - Score 3. (Agree /Good/Like)
  - Score 4. Very (agree / good / like)
- b. Negative Questions (-)
  - Score 1. Very (agree / good / like)

- Score 2. (Agree / Good / Like)
- Score 3. No (agree / good /) or less
- Score 4. Very (disagree / bad / less)

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### 3. Methodology

#### 3.1. Questionnaire Design

Data collection was carried out through online questionnaire interviews. Questionnaire questions are designed into three (3) sections. The characteristic of the questions for the three parts of the questionnaire is closed questions. Open-ended questions are facilitated in section 2 regarding user desires for the geometric of motorcycle lanes. The question in part 1 is about the personal characteristics of the respondent (gender, age, last education, car ownership, vehicles that are used more often). Part 2 of this question is intended to determine or evaluate the riding experience on the geometric road of motorbikes lane. The question in section 3 to evaluate the journey of motorcycle users is viewed from the aspect of traffic flow.

There were 26 questions given, consisting of 25 closed questions and 1 open question. Open-ended questions related to improvements that must be made on a special motorcycle lane. In part 1, 7 questions related to the personal characteristics of the respondent and five questions related to the characteristics of the trip on a special motorcycle lane. Part 2, In part 2, 4 questions evaluate the geometric (width, length, signs, and markings) of a motorcycle lane. In part 3, 9 questions regarding evaluating the response experience in terms of traffic flow when using exclusive motorcycle lanes. Answers to questions are provided on a choice of four (4) scales, namely strongly agree, agree, disagree, and strongly disagree. Questionnaires are created in google docs forms. The survey can be accessed via the link: <https://intip.in/JalurSepedaMotor>.

#### 3.2. Data Collections and processing

The location of the study was conducted on the Sleman Outer Ring Road in Yogyakarta. The method of analysis used for evaluating the use of a motorcycle lane is the descriptive statistical method. The chi-square test is one approach for analysing the data in this way.

Evaluation of respondents' interpretations of riding experience on a motorcycle lane is the result of the value generated using the Index% formula.

$$\text{Index\%} = \frac{\text{Total Score}}{Y} \times 100 \quad (1)$$

$$I = 100 / \text{total Likert score} \quad (2)$$

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$$Y = \text{highest Likert score} \times \text{number of respondents}$$

$$I = \frac{\text{score}}{\text{interval}}$$

Criteria for interpretation of scores based on intervals:

Value 0% - 24.99% = strongly disagree

Value 25% - 49.99% = disagree

Value 50% - 74.99% = agree

Value 75% - 100% = strongly agree

### 4. Results and Discussion

The survey results collected 80 responses. The personal characteristics of respondents, as shown in Table 1, the respondent is dominated by the age of 17-30 years with occupation as a student. Even though car ownership of the respondent is 36%, the type of vehicle that is used more frequently is motorcycle by 87.5%. Only 4% of respondents ride without a license.

**Table 1.** Personal characteristics of the respondent.

Characteristics	Percentage (%)	
Gender	Male	55
	Female	45
Age	Age < 17	1.3
	17 ≤ age < 30	80
	30 ≤ age < 45	12.5
	45 ≤ age < 60	6.3
	Age ≥ 60	0
Last education	Primary school	0
	Junior high school	0
	Senior high school	31
	College	69
Occupation	employees	20
	Student	71
	Businessman	4
	housewife	0
Car ownership	others	5
	Owning	36
The type of vehicle that is more often used	Not owning	64
	Motorcycle	87.5
Driving license ownership	Car, sometimes motorcycle	12.5
	Yes	96
	No	4

Table 2 shows the respondents' experiences when riding at the motorcycle lane. From the total sample obtained, there are 60% of respondents using the motorcycle lane every day.

**Table 2.** Experiences in using motorcycle lanes

Experiences	Percentage(%)	
Riding at the motorcycle lane	yes	95
	no	5
Frequency riding at motorcycle lanes	frequently	60
	sometimes	26
Time riding at motorcycle lane	infrequently	14
	peak hour in the morning	26
	off-peak hour in the morning	19
	peak hour in the noon	10
	off peak hour in the noon	10
	peak hour in the afternoon	19
	off peak hour in the afternoon	0
	in the night	16
Time-frequency riding at motorcycle lane	everyday	47.5
	once a week	17.5
	every two weeks	5
	infrequently	30
Improvements that must be done on a motorcycles lane at this time	- Uneven pavement construction due to many utility holes and damaged	
	- need to be widened	
	- street lighting	
	- the car disturbs the motorcycle lanes	



The experience of the respondent riding on a motorcycle lane as shown in Figure 1. Most respondents (>50%) strongly agreed and agreed that the width of the motorcycle lane was sufficient to reach optimal speed, comfort, and safety. The same thing for the length of the motorcycle lane and the availability of signs and markers.

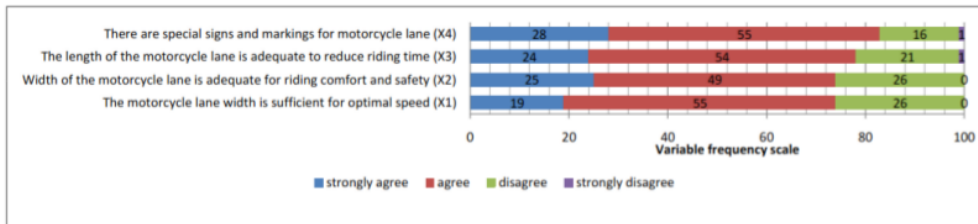


Figure 1. Respondent's experience riding on the geometry of a motorcycle lane.

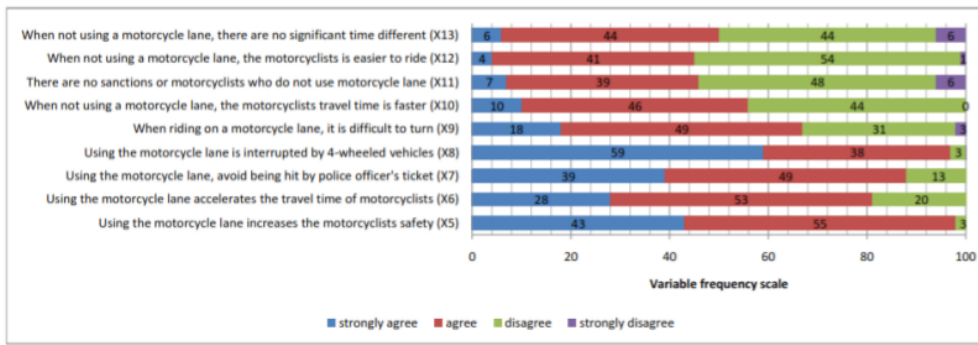


Figure 2. The respondent's riding experience on a motorcycle lane traffic flow.

Respondents' driving experience in terms of traffic flow parameters as shown in Figure 2. Questions X1-X9 are positive questions; the answers given are also positive. Respondents agree with the statement that using the motorcycle lane increases the safety/security of motorcyclists (X5), using a motorcycle lane accelerates the travel time of motorcycle riders (X6), using a motorcycle lane. You obey the rules and avoid being hit by a police officer's ticket (X7), When riding on a motorcycle lane, vehicles that are not allowed to pass through the motorcycle lane disturb the motorcyclists (X8). When riding on a motorcycle lane, it is difficult to turn (X9).

But on questions X10-X13, which are negative questions, only half the respondents expressed disagreement.

The results of determining the index% and its interpretation are recapitulated in Table 3. Questions 1-8 are positive questions, response X3-X4 strongly agrees, but response X1 and X2 agree. Questions 9-13 are negative, the response agrees. Questions 9-13 are negative; the answers agree. The hypothesis expects the results to disagree.

Table 3. Index% and interpretation.

Variable	Index%	Interpretation
X1	73.13	Agree
X2	74.70	Agree
X3	75.00	Strongly agree
X4	77.19	Strongly agree
X5	85.00	Strongly agree
X6	76.90	Strongly agree
X7	81.60	Strongly agree

X8	88.40	Strongly agree
X9	54.70	Agree
X10	58.40	agree
X11	63.13	agree
X12	63.13	agree
X13	62.50	agree

*Chi-square* statistical test results on the parameters of personal characteristics and variables X1-X13 are independent. Except, car ownership affects the X5 (using the motorcycle lane increases the safety/security of motorcyclists ) and X6 (using a motorcycle lane accelerates the travel time of motorcycle riders) responses. The type of vehicle that is used more frequently affects the X11 (when riding without using a motorcycle lane, there are no sanctions from the officers) response.

## 5. Conclusion

Based on the experience of riding on a motorcycle lane, users feel the benefits of this facility. Geometric conditions and traffic flow on the motorcycle lane are good, but the surface condition of the road pavement decreases the respondents' ratings. Car ownership affects the X5 (using the motorcycle lane increases the safety/security of motorcyclists ), and X6 (using a motorcycle lane accelerates the travel time of motorcycle riders) responses. The type of vehicle that is used more frequently affects the X11 (when riding without using a motorcycle lane, there are no sanctions from the officers) response.

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