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Analysis of Traffic Performance in Arif Rahman Hakim Road Depok City, Indonesia

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ABSTRACT

In an effort to overcome congestion on roads, it is necessary to carry out traffic engineering, one of which is by changing the traffic lane from two directions to one direction. One of them is on Jalan Arif Rahman Hakim, Depok city, which is a two-way (4/2D) road that experiences congestion during rush hours, and to overcome congestion, traffic flow is changed to one direction (2/1), where at two-way system and one-way system have an effect on traffic performance. Data retrieval through questionnaires with data collection tools using google form, all data results were analyzed using multiple linear regression using IBM SPSS version 22. From data analysis, it was found that the factors that affect traffic performance in a two-way system are vehicle situations, obstacles on the other hand, the road situation has a negative effect on traffic performance, where on the one-level service line (C) and on the two-level service line (C). In the one-way system, the vehicle situation, side barriers have a negative effect and the road situation has a positive influence on traffic performance where in the first lane of service level (C), and in the second lane of service level (B). While the most dominant factors influencing traffic performance in a two-way system are side barriers and road situation, in a one-way system are side barriers

Keywords: Congestion, Traffic engineering, Two-way system, One-way system, Traffic performance

INTRODUCTION

Depok City as a fairly large city has characteristics that are no different from other cities in terms of city traffic. Traffic movements in the city of Depok are quite busy and even tend to be congested at certain hours, when people go to work and when people come home from work. In addition, there is an imbalance between the development of urban road space and the number of vehicles (motorcycles and cars) that pass, as well as the movement of public transportation in the city.

Jalan Arif Rahman Hakim is one of the main roads in Depok City which stretches between Jalan Nusantara on the west side and Jalan Margonda Raya on the east side. Jalan Arif Rahman Hakim has a total road length of 1,146 meters. Is a road that connects Jalan Margonda Raya to Jl. Nusantara Raya and Jalan Raya Sawangan, which are heavy traffic with a (4/2D) road type (4 lanes 2 divided directions). The problem of congestion also occurs on Jalan Arif Rahman Hakim, Depok City, because Jalan Dewi Sartika is implemented a one-way system which causes traffic on Jalan Arif Rahman Hakim to spike during working hours. The phenomenon of traffic engineering on the Jl. Arif Rahman Hakim Depok city which is a separate 4 lane 2 lane (4/2D) road which is the main road connecting Jl. Margonda Raya - Jl. Nusantara Raya - Jl. Beji in the environment of shops/offices and places of business, makes the roads congested, where the road

capacity does not accommodate the large volume of passing vehicles. The existence of side obstacles that are quite large due to the lack of parking facilities so that vehicles park on sidewalks and on the side of the road as well as city transportation waiting to pick up and drop off passengers in any place causing congestion.

Based on the road conditions mentioned above, the Depok City Government in this case the Transportation Service (Dishub) has imposed a change in the traffic system on Jalan Arif Rahman Hakim from a Two-Way System (4/2D) to a One-Way System (2/1) from east to west or from the intersection of Jalan Margonda Raya to the intersection of Jalan Nusantara Raya which starts at 15.00-22.00 wib which is applied every day, which is expected to be a solution in balancing the rate of traffic movement and improving traffic performance on Jl. Arif Rahman Hakim. Jalan Arif Rahman Hakim two-way system and one-way system can be seen in Figure 1 and Figure 2.

One of the roads experiencing traffic jams in the city of Depok is Jl. Arif Rahman Hakim which is a two-lane road (4/2D). To overcome congestion, road sections are changed from a Two-Way System (4/2D) to a One-Way System (2/1) from east to west or from the intersection of Jalan Margonda Raya to Jalan Nusantara Raya intersection starting at 15.00-22.00 WIB which is enforced every day, which is expected to be a solution to overcome congestion and improve traffic performance.

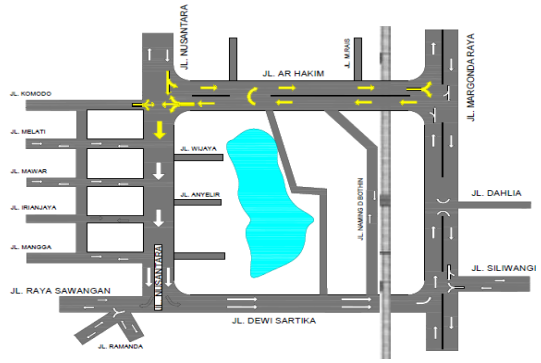

Figure 1. Two Way System Jl. Arif Rahman Hakim, Depok city

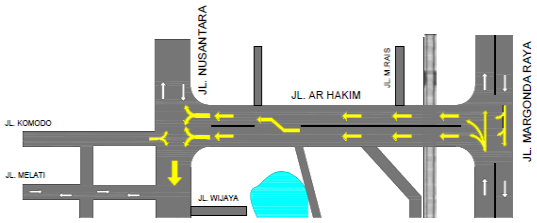

Figure 2. One Way System Jl. Arif Rahman Hakim, Depok city

With the implementation of changing lanes from two directions to one direction at certain hours, an analysis of the factors that affect traffic performance is carried out, namely the vehicle situation, side barriers and road situations in two-way systems and one-way systems. The purpose of this study is to 1) Knowing and analyzing how much influence the vehicle situation, side barriers and road situations in a two-way system have on traffic performance, 2) Knowing and analyzing how much influence the vehicle situation, side barriers and road situations have on the one-way system. direction on traffic performance, 3) Knowing and analyzing vehicle situations, side barriers, vehicle situations that have the most dominant influence on traffic performance.

LITERATURE REVIEW

Congestion is caused by high population density, growth of motorized vehicles and unsupportive infrastructure, as well as the growth of online transportation and delivery services that are increasing. (Afrin & Yodo, 2020)

To reduce congestion, alternative handling is using the concept of Transport Demand Management (TDM) which can result in trip reduction, alternative work scheduling (alternative working scheduling) and vehicle restrictions (auto restriction), (Widyaningsih, 2013). The one-way system

is a change in the pattern of traffic movement from two directions to one direction which is expected to increase road capacity and smooth traffic (Wikibuku, 2017). Congestion is a condition where the traffic flow that passes on the road under review exceeds the planned capacity of the road which results in the free speed of the road being close to 0 km/hour, causing queues to occur. (PU, 1997). Congestion is a condition where there is a buildup of vehicles on the road due to the large number of vehicles and cannot be balanced by traffic facilities and infrastructure. (Bergkamp, 2011). The number of private vehicles that pass on the road and the behavior of public transport drivers waiting to pick up/drop off passengers at any place on the roadside and the presence of pedestrians crossing create queues of vehicles and result in congestion. (Mardia & Widyaningsih, 2019). The performance of the road segment is the ability of the road segment to serve the needs of traffic flow in accordance with its function which can be measured and compared with the standard level of road service. The value of the road service level is used as a parameter of road performance, (Suwardi, 2010). Performance is a quantitative measure of the operational conditions of traffic facilities, (PU, 1997). Performance of urban roads is influenced by (i) Traffic Volume, (ii) Speed, (iii) Density, (iv) Side drag, (v) Degree of saturation, (vi) Travel speed. (PU, 1997). (i) Traffic volume is the number of vehicles passing on the road in a certain time unit, (Sukirman, 1994), (ii) Speed is the movement/speed of the vehicle from one place to another by taking into account the distance and travel time in km/hour, (Hobbs & D., 1995), (iii) Density is a traffic condition which is influenced by the volume and speed of vehicles on the length of the road for a certain time. (Hendarto & dkk, 2001), 2001). (iv) Side barriers are conditions that can affect the smooth flow of traffic caused, among others, by people walking and crossing, stopping vehicles, vehicles entering and leaving the side of the road, road bodies used as parking lots which result in slowing down of vehicles and congestion, (PU, 1997), (v) Degree of saturation is the ratio of current to road capacity. And is used to determine and determine traffic conditions on a road segment. From the value of the degree of saturation, it can be known whether the road segment will have capacity or not. The degree of saturation is classified into 3 categories of the value of the degree of saturation, namely: 1) High capacity Level if the DS value is above 0.85, 2) Medium Capacity Level if the DS value is between 0.7 to 0.85, 3) Low- Capacity level if the DS value is obtained below 0.7, (PU, 1997), (vi) Travel speed is the average speed of light vehicles (LV) which is influenced by the length of the road and the average travel time on the road segment. (PU, 1997), Road capacity is the maximum traffic flow at a road location that can be maintained in hours under certain conditions. For two-lane two-lane roads, capacity is determined for two-way traffic. For multi-lane roads, traffic flows are separated per direction and capacity is determined per lane. Capacity is expressed in units of passenger cars (pcu). (Tamin & Z., 2000). Traffic flow is the flow or volume of traffic on a highway which is measured based on the number of vehicles that pass a certain point during a certain time interval. (Oglesby & Hicks, 1990). The type of road environment, side disturbances/obstacles and the size of the city are factors that can affect traffic performance. (Munawar, 2006). The level of service is generally used as a measure of the limiting effect due to an increase in traffic volume, which is indicated by the letter A which is the highest level of service to F which is the lowest level of service. (Peraturan Menteri Perhubungan Nomor, 2006).

In this study, there are factors that affect traffic performance consisting of six independent variables, namely the situation of a two-way system vehicle, a two-way system side obstacle, a two-way system road situation, a one-way system vehicle

situation, a one-way system side obstacle, one-way system road situation, and one dependent variable is traffic performance.
The independent variables were then adjusted for the dependent variables. The description of the variable relationship is shown in Figure 3. The proposed hypothesis based on **Figure 3** is shown in **Table 1.**

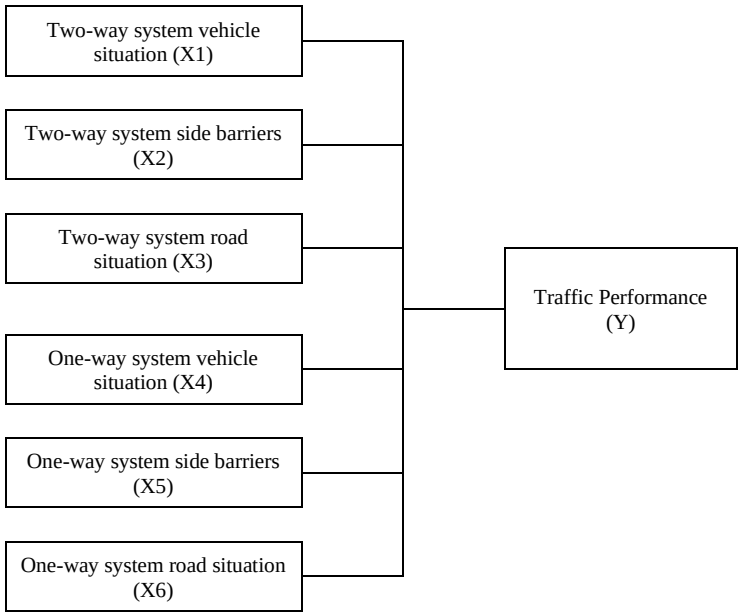

Figure 3. The effect of the situation of a two-way system vehicle, side barriers in a two-way system, road situations in a two-way system, a one-way system vehicle situation, side barriers in a one-way system and road situations in a one-way system on road traffic performance.

Table 1. Hypothesis Path

Hypothesis			Path
X1	Two-way system vehicle situation		Traffic Performance
X2	Two-way system side barriers		Traffic Performance
X3	Two-way system road situation		Traffic Performance
X4	One-way system vehicle situation		Traffic Performance
X5	One-way system side barriers		Traffic Performance
X6	One-way system road situation		Traffic Performance

From Table 1 above, it can be seen the relationship of variables in this study (1) To find out how much influence the situation of a two-way system vehicle (X1) on traffic performance, (2) To find out how much influence the side barriers on the two-way system (X2) have on traffic performance, (3) To find out how much influence the road situation on the two-way system (X3) has on traffic performance, (4) To find out how much influence the one-way system vehicle situation (X4) has on traffic performance, (5) To find out how much influence the side barriers on the one-way system (X5) have on traffic performance, (6) To find out how much influence the road situation on the one-way system (X6) has on traffic performance, and To find out how much influence the situation of a two-way system vehicle (X1), side resistance in a two-way system (X2), road situation in a two-way system (X3), a one-way system vehicle situation (X4), side barriers on a two-way system (X4) the one-way system (X5) and the road situation in the one-way system (X6) are the most dominant on traffic performance

MATERIALS & METHODS

Method of collecting data

The method used in the data collection process was the distribution of closed

questionnaires using the google form application which was distributed to 100 respondents who were road users on Jl. Arif Rahman, Depok City Judge. Thus, the data used is primary data. The research variables are two-way vehicle situations (X1), two-way side barriers (X2), two-way road situations (X3), one-way vehicle situations (X4), one-way side barriers (X5), one-way road situations (X6) which are all independent variables. While the dependent variable is traffic performance (Y). The scale used for the measurement items is Likert with 5 levels of alternative answers. Level 1 is used for strongly disagree statements and level 5 for statements strongly agree. The reason for using a Likert scale is because it is more accurate in measuring self-regulated learning (SRL) than multiple choice, (Retnawati, 2015). These variables are described by operational concepts through dimensions and indicators.

Table 2. Two-way system vehicle situation variables (X1)

Dimensions	Indicator
Traffic flow	Traffic flow at the Ramanda-PLN intersection and the PLN Ramanda intersection
Traffic volume	Traffic volume of Ramanda-PLN and PLN - Ramanda intersections
Vehicle speed	Vehicle speed at the Ramanda-PLN and PLN - Ramanda intersections
Average speed of vehicle	The average speed of vehicles at the Ramanda-PLN and PLN - Ramanda intersections
Vehicle queue	Vehicle queues at the Ramanda-PLN intersection and PLN - Ramanda intersection

Table 3. Variable Side Barrier two-way system (X2)

Dimensions	Indicator
Parked vehicles	Side obstacles are caused by vehicles parked at the Ramanda-PLN intersection and PLN - Ramanda intersection
Slow moving vehicle	Side Barriers are caused by slow traffic on the Ramanda-PLN intersection and PLN - Ramanda intersection
Pedestrian	Side barriers are caused by pedestrians on the Ramanda-PLN intersection and PLN - Ramanda intersection
Parked public vehicles	Side barriers caused by parked public vehicles raising and lowering passengers on the Ramanda-PLN intersection and PLN - Ramanda intersection
Vehicles entering/exiting on the side of the road	Side obstacles are caused by vehicles entering/exiting on the side of the road at the Ramanda-PLN intersection and PLN - Ramanda intersection

Table 4. Two-way system road situation variables (X3)

Dimensions	Indicator
Degree of saturation	The degree of saturation of the Ramanda-PLN and PLN-Ramanda intersections
Service level	Level of service (speed, travel time, driving comfort, freedom of movement) At the Ramanda-PLN intersection and PLN - Ramanda intersection
road capacity	Capacity (maximum stable traffic flow that can be maintained) of vehicles on the Ramanda-PLN and PLN - Ramanda intersection roads
Traffic Direction Width	The width of the road for traffic flow on the Ramanda-PLN intersection and PLN - Ramanda intersection
Traffic Composition	Composition of Traffic on the Ramanda-PLN and PLN - Ramanda intersections

Table 5. Variables of one-way system vehicle situation (X4)

Dimensions	Indicator
Traffic flow	Traffic flow at the Ramanda-PLN intersection and the PLN Ramanda intersection
Traffic volume	Traffic volume of Ramanda-PLN and PLN - Ramanda intersections
Vehicle speed	Vehicle speed at the Ramanda-PLN and PLN - Ramanda intersections
Average speed of vehicle	The average speed of vehicles at the Ramanda-PLN and PLN - Ramanda intersections
Vehicle queue	Vehicle queues at the Ramanda-PLN intersection and PLN - Ramanda intersection

Table 6. Variable Side Barrier One-way system (X5)

Dimensions	Indicator
Parked vehicles	Side obstacles are caused by vehicles parked at the Ramanda-PLN intersection and PLN - Ramanda intersection
Slow moving vehicle	Side Barriers are caused by slow traffic on the Ramanda-PLN intersection and PLN - Ramanda intersection
Pedestrian	Side barriers are caused by pedestrians on the Ramanda-PLN intersection and PLN - Ramanda intersection
Parked public vehicles	Side barriers caused by parked public vehicles raising and lowering passengers on the Ramanda-PLN intersection and PLN - Ramanda intersection
Vehicles entering/exiting on the side of the road	Side obstacles are caused by vehicles entering/exiting on the side of the road at the Ramanda-PLN intersection and PLN - Ramanda intersection

Table 7. Variables of one-way system road situation (X6)

Dimensions	Indicator
Degree of saturation	The degree of saturation of the Ramanda-PLN and PLN-Ramanda intersections
Service level	Level of service (speed, travel time, driving comfort, freedom of movement) At the Ramanda-PLN intersection and PLN - Ramanda intersection
road capacity	Capacity (maximum stable traffic flow that can be maintained) of vehicles on the Ramanda-PLN and PLN - Ramanda intersection roads
Traffic Direction Width	The width of the road for traffic flow on the Ramanda-PLN intersection and PLN - Ramanda intersection
Traffic Composition	Composition of Traffic on the Ramanda-PLN and PLN - Ramanda intersections

Table 8. Dependent Variable Traffic performance (Y)

Dimensions	Indicator
Road safety management	One-way road safety management is the same as two-way
Vehicle safety	The speed of a one-way vehicle is equal to two-way
Degree of saturation	One-way degree of saturation equals two-way
Service Level	The level of service (speed, travel time, driving comfort, freedom of movement) in one direction is the same as in two directions
Environmental conditions in congested areas	Environmental conditions (parking, pedestrians, shoulder, median) one-way is better than two-way

Data processing

To obtain the information needed in this study, a quantitative approach was used to measure the level of influence of the variables based on Figure 3, measured based on Tables 2, 3, 4, 5, 6, 7, 8 in order to obtain a score which was then processed with statistical data.

Statistical Analysis

The distribution of questionnaires to 100 respondents with the aim of knowing how much influence the factors in the two-way system and one-way system have on traffic performance. The data was processed using SPSS v.22 and then reprocessed with multiple linear regression analysis. The stages of data testing are (i) validity and reliability test, (ii) classical assumption test consisting of normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test, (iii) multiple linear regression analysis with simultaneous F test and partial t test. From the results of the validity and reliability tests for all research instruments and variables, they must meet the requirements for entering the valid and reliable categories. The criteria for the results of this validity and reliability test are made as follows:

- If $r_{count} > r_{table}$, the result is a valid instrument.
- If $r_{count} < r_{table}$, the result is an invalid instrument.
- If the instrument is valid, it can be seen that the criteria for interpreting the correlation index (r) are as follows:

Table 9. Correlation Index

Correlation Index	Interpretation Criteria
0,800 – 1,000	Very high
0,600 – 0,799	High
0,400 – 0,599	High enough
0,200 – 0,399	Low
0,000 – 0,199	Very low

Reliability Test with Cronbach's Alpha Method. Calculations using the Cronbach's Alpha formula are accepted, if the calculation $r_{count} > r_{table}$ 5%.

RESULT

Existing Condition Jl. Arif Rahman Hakim

The level of service is calculated based on the basic capacity the degree of saturation is as follows:

1. Base Capacity:

Base capacity is calculated by the formula:

$C = Co \times FC_W \times FC_{SP} \times FC_{SF} \times FC_{CS}$

where:

- The basic capacity (Co) is determined based on the type of 4-lane road divided into a basic capacity of 1650 pcu/hour per lane.
- Traffic lane width adjustment factor (FC_W) for the 4-lane divided road type with an effective traffic lane width of 3.5 by 1.0

- Directional separation adjustment factor (FC_{SP}) of 1.0
- Capacity adjustment factor (FC_{SF}) on a curb road with a distance from the curb to the nearest side barrier as far as 1 meter with a 4-lane road type divided into 0.93.
- Capacity adjustment factor related to city size (FC_{CS}) with a total of 1.0-3.0 million inhabitants, obtained a city size adjustment factor of 1.0.

2. Degree of Saturation

The degree of saturation is calculated by the formula: DS = Qpcu / C

where:

- DS = Degree of saturation.
- C = Capacity (pcu/hour)
- Qpcu = Total current (pcu/hour).

Two Way System

Table 10. Two-way Traffic Volume (pcu/hour)

Roads	Traffic Direction	Traffic Volume *(pcu/hour)*
Jl. Arif Rahman Hakim	Lane 1: Ramanda Interchange - PLN	1458.31
	Lane 2 PLN - Simpang Ramanda	1311.59

Table 11. Bidirectional System Capacity

Traffic direction	Basic Capacity	Adjustment factor for capacity				Capacity
	Co *(pcu/hour)*	Lane Width *(FCw)*	Separation of Directions *(FCsp)*	Side Barriers (*FCsf)*	City Size (*FCcs)*	C *(pcu/hour)*
Lane 1: Ramanda Interchange - PLN	3300	1	1	0.93	1	3069
Lane 2: PLN - Ramanda Interchange	3300	1	1	0.93	1	3069

Table 12. Degree of Saturation of Two-Way System

Traffic direction	traffic flow	Capacity	Degree of Saturation
	Qtot *(pcu/hour)*	C *(pcu/hour)*	DS
Lane 1 Ramanda Intersection - PLN	1458.31	3069	0.48
Lane 2: PLN - Ramanda Interchange	1311.59	3069	0.43

One Way System

Table 13. Traffic Volume One Way Line 1 (pcu/hour)

No.	Time	Line 1			Amount	*pcu/hour*
		HV	LV	MC		
1	16.00 – 16.15	7.20	230	252.75	489.95	2015.55
2	16.15 – 16.30	4.80	265	264.25	534.05	
3	16.30 – 16.45	1.20	256	271.00	528.20	
4	16.45 – 17.00	3.60	240	219.75	463.35	

Table 14. Traffic Volume One Way Line 2 (pcu/hour)

No.	Time	Line 2			Amount	*pcu/hour*
		HV	LV	MC		
1	16.00 – 16.15	1.20	70	136.25	207.45	892.80
2	16.15 – 16.30	2.40	91	137.25	230.65	
3	16.30 – 16.45	0.00	77	135.50	212.50	
4	16.45 – 17.00	1.20	90	151.00	242.20	

Table 15. One-way System Capacity

Traffic direction	Basic Capacity	Adjustment factor for capacity				Capacity
	Co *(pcu/hour)*	Lane Width *(FCw)*	Separation of Directions *(FCsp)*	Side Barriers (*FCsf)*	City Size *(FCcs)*	C *(pcu/hour)*
Lane 1: Ramanda Interchange - PLN	3300	1	1	0.93	1	3069
Lane 2: Ramanda Interchange - PLN	3300	1	1	0.93	1	3069

Table 16. Degree of Saturation of OneWay System

Traffic direction	Traffic flow	Capacity	Degree of Saturation
	Qtot *(pcu/hour)*	C *(pcu/hour)*	DS
Lane 1: Ramanda Interchange - PLN	2015.55	3069	0.66
Lane 2: Ramanda Interchange - PLN	892.80	3069	0.29

From the calculation of the basic capacity and degree of saturation in the two-way system and one-way system above to the road service level, it can be seen in the following table:

Table 17. Road Service Level

No.	System	Traffic Direction	Capacity Street *(pcu/ hour)*	Volume (*pcu/ hour)*	Degrees Saturation *(pcu/ hour)*	Level of Service *(LoS)*
1	Two-way direction	**Lane 1,** Ramanda Interchange - PLN	3069	1458.31	0.48	C
		Lane 2, PLN – Ramanda Interchange	3069	1311.59	0.43	C
2	One way direction	**Ljur 1**, Ramanda Interchange - PLN	3069	2015.55	0.66	C
		Lajur 2, Ramanda Interchange - PLN	3069	892.80	0.29	B

Characteristics of Respondents

Characteristics of 100 respondents using the road on Jl. Arif Rahman Hakim Depok city can be seen in the **Table 18**.

Table 18. Characteristics of Respondents

No	Respondent Data Overview	Number of Voter Respondents	Percentage
1	Using Vehicle		
	Car	62	62%
	Motorcycle	38	38%
	City transport	-	-
	Other Transportation	-	-
2	Residence		
	Depok City	82	82%
	Outside Depok	18	18%
3	Passing on Jl. Arif Rahman Hakim on the Two-Way System		
	Often (5 to 7 days a week)	60	60%
	Rarely (3 to 4 days during one week)	29	29%
	Very Rarely (1 to 2 days per week)	11	11%
4	Passing on Jl. Arif Rahman Hakim on One Way System		
	Often (5 to 7 days a week)	62	62%
	Rarely (3 to 4 days during one week)	27	27%
	Very Rarely (1 to 2 days per week)	11	11%

From the results of the respondent's analysis in **Table 18** above, it can be concluded that the respondents who pass are road users who really understand and feel the conditions on Jl. Arif Rahman Hakim, Depok city. And it is hoped that in filling out the questionnaire, it can provide answers with constant and uniform values.

Validity and Reliability Test Results

The validity test is needed to show the degree of accuracy between the data that actually occurs on the object and the data collected by researchers to find the validity of an item, (Sugiyono, 2016). Reliability test to determine the extent to which the measurement results using the same object will produce the same data (Sugiyono, 2017). Quantitative data from the questionnaire distribution was tested in stages, namely (i) validity and reliability tests, (ii) classical assumption test consisting of normality, heteroscedasticity, multicollinearity and autocorrelation tests,

and (ii) multiple linear regression with simultaneous F-test and partial t-test. From the tests carried out, it was found that all data obtained $r_{count} > r_{table}$ and Cronbach's alpha value > 0.6. This means that all data can be categorized as valid and reliable. The results of the validity and reliability tests are shown in the table below.

Table 19. Validity and Reliability Test Results of Research Instruments

No.	Variable		Validity Test Results	Reliability Test Results
1	X.1	Two Way Vehicle Situation	>0,1966	> 0,6
2	X.2.	Two Way Side Barriers	>0,1966	>0,6
3	X.3.	Two Way Street Situation	>0,1966	>0,6
4	X.4.	One Way Vehicle Situation	>0,1966	>0,6
5	X.5.	One Way Side Barriers	>0,1966	>0,6
6	X.6.	One Way Street Situation	>0,1966	>0,6
7	Y	Traffic Performance	>0,1966	>0,6

Information: N = 100 respondents, r_{table} = 0.1966 (sig 5%), Valid (rcount > r_{table}), Reliable (Cronbach alpha > 0.6).

Classic assumption test

Classical assumption test is done by:

Normality test aims to determine the distribution of data in the variables to be used in the study. Good and appropriate data used in research is data that has a normal distribution. The normality of the data can be seen using the Kolmogorov-Smirnov Normal test, (Sujarweni, 2015). Multicollinearity test to determine whether there are independent variables that have similarities between independent variables in a model. (Sujarweni, 2015). This heteroscedasticity test is to test whether in the regression model there is an inequality of variance from the residuals of one observation to another observation (Ghozali, 2013). The autocorrelation test aims to determine whether there is a correlation between the confounding error in period t and period t-1 (previous) in the linear regression model (Santoso, 2012).

a. The normality test used the Kolmogrov-Smirnov test where the Asymp results were
   obtained. Sig. (2-tailed) > 0.05 which means that the data is normally distributed,
b. The multicollinearity test was measured from the tolerance value and the VIF value,
c. Heteroscedasticity test using the Scatterplot test,
d. The autocorrelation test was carried out using the run test method.

Table 20. Classical assumption test results

Classic assumption test	Results	Information
Normality test	Asymp. Sig. (2-tailed) = .200[c,d] > 0.05	Normal distribution
Multicollinearity Test	score tolerance > 0.1 and is at VIF value < 10	no symptoms multicollinearity
Heteroscedasticity Test	Scatterplot Test	There are no symptoms of Heteroscedasticity
Autocorrelation Test	Run test method	No symptoms of autocorrelation

Normality test

Graphically the normality test based on P-P Plot is presented in **Figure 4** as follows:

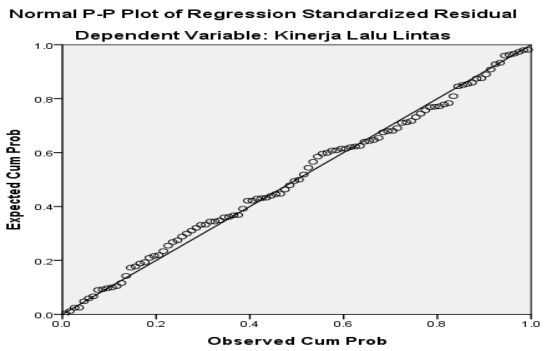

Figure 4. Normal distributed residual value

Heteroscedasticity Test

The heteroscedasticity test uses the Scatterplot test, which is shown in the image below:

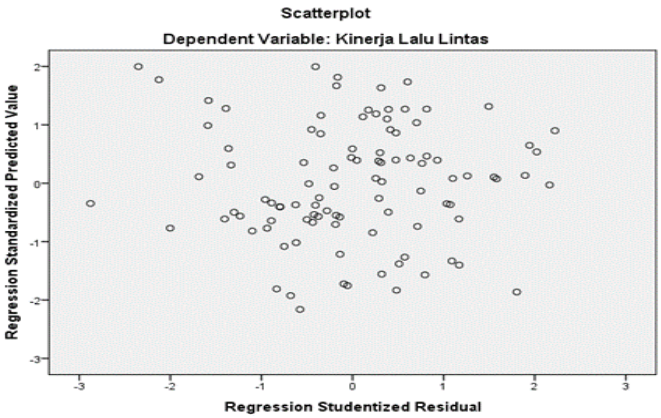

Figure 5. Heteroscedasticity Test Results Using Scatterplot

The picture above shows that there is no clear pattern of the existing points and the points are spread above and below the number 0 on the Y axis, which means that the data does not contain symptoms of heteroscedasticity. Then the two independent variables of the two-way system and the one-way system can be said to be free from the influence of heteroscedasticity.

Autocorrelation Test

Test using the run test method with the following results.

Table 21. Run Test

Runs Test	
	Unstandardized Residual
Test Value[a]	-.20259
Cases < Test Value	50
Cases >= Test Value	50
Total Cases	100
Number of Runs	43
Z	-1.608
Asymp. Sig. (2-tailed)	.108

a. Median

From the results of the run test, the Asymp number is obtained. Sig. (2-tailed) > 0.05 so it can be concluded that there is no autocorrelation between the existing data.

Multiple Linear Regression Test

Simultaneous F Test

The basis for decision making for the simultaneous F test is:

a. If the value of sig. <0.05 then the independent variable (X) partially affects the dependent variable (Y)
b. If $F_{count} > F_{table}$, where it is known that Ftable = (k; n-k) = (6; 100-6) = (6; 94) = 2,20.

Table 22. Simultaneous F Test Results

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3928.62	6	654.77	28.213	.000[b]
Residual	2158.37	93	23.208		
Total	6087.00	99			

a. Dependent Variable: Traffic Performance
b. Predictors: (Constant), Changes in Work Methods, Changes in Quality, Changes in Quantity, Changes in Work Programs, Changes in Design

From the table above, it can be seen that the significance value is 0.000, which is below 0.05 and the F_{count} = 28.213 > F_{table} 2.20. This means that all variables measured simultaneously or together have a significant effect on road traffic performance.

After the regression equation is found, the next step is to find the value of the determinant coefficient of R2. The determinant coefficient shows how big the variables are two-way vehicle situations (X_1), two-way side barriers (X_2), two-way road situations (X_3), one-way vehicle situations (X_4), one-way side barriers (X_5) and one-way road situations. (X_6) on traffic performance (Y) in the form of percent (%). Based on the SPSS output the value of the determinant coefficient is 0.645.

Table 23. Determinant coefficient

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.803[a]	.645	.623	4.818	1.510

a. Predictors: (Constant), One-way Road Situation, Two-way Vehicle Situation, One-way Side Barrier, Two-way Side Barrier, One-way Vehicle Situation, Two-way Road Situation
b. Dependent Variable: Traffic Performance

Partial t test

The basis for making partial t test decisions are:

a. If the value of sig. <0.05 then the independent variable (X) partially affects the dependent variable (Y).
b. If $t_{count} > t_{table}$, where it is known that $t_{table} = (\alpha/2; 6\text{-}k\text{-}1) = (0.05/2; 100\text{-}6\text{-}1) = (0.025; 93) = 1.98580$

Table 24. Partial t-test results

Model	t	Sig.
(Constant)	14.280	.000
Two-way Vehicle Situation X1	-.324	.747
Two-way Side Barriers X2	-5.742	.000
Two-way street situation X3	-2.632	.010
One-way Vehicle Situation X4	-.413	.681
One-way Side Barriers X5	-2.223	.029
One-way Street Situation X6	.666	.507

a. Dependent Variable: Traffic Performance

From the table above, it can be seen that partially, two-way side barriers (X_2), two-way road situations (X_3) and one-way barriers (X_5) have a significant effect on traffic performance. This is indicated by the value of two-way Side Barriers (X_2) t_{count} (-5.742) > t_{table} (-1.98580) and a significance value of 0.000 < 0.05, Two-way Road Situation (X_3) t_{count} (-2.632) > t_{table} (-1.98580) with a value of significance 0.01 < 0.05 and one-way Side Barrier (X_5) t_{count} (-2.223) > t_{table} (-1.98580) with a significance value of 0.029 <0.05.

The Most Influential Factors on Traffic Performance

Based on the results of the multiple linear regression analysis described in the previous sub-chapter, it can be simultaneously seen that: two-way vehicle situation (X_1), two-way side barriers (X_2), two-way road situation (X_3), one-way vehicle situation (X_4), one-way side barriers (X_5), and one-way road situations (X_6), have a positive influence on traffic performance on Jalan Arif Rahman Hakim, Depok city. This has been proven from the results of the F test which shows the value of F_{count} (28.213) > F_{table} (2.20). This means that all variables measured simultaneously or together have a significant influence on the occurrence of project disputes. From multiple linear regression analysis, the following equation is generated:

$$Y = 93.493 – 0.28X_1 – 0.577X_2 – 0.244X_3 – 0.043X_4 - 0.180X_5 + 0.060X_6$$

The factors possessed by the two-way vehicle situation (X_1), two-way side barriers (X_2), two-way road situations (X_3), one-way vehicle situations (X_4), one-way side barriers (X_5), and one-way road situations direction (X_6), together have a simultaneous positive effect on traffic performance. In a two-way system, all factors, namely the situation of two-way vehicles (X_1), two-way side barriers (X_2) and two-way road situations (X_3) have a negative influence on traffic performance. This means that: "If a two-way system is implemented, the vehicle situation, side barriers, and road situation will reduce traffic performance." In the one-way system the positive influence on traffic performance comes from the one-way road situation (X_6), and which has a negative influence on traffic performance in the one-way system, namely, the one-way vehicle situation (X_4), and one-way side barriers (X_5). This means that: "If a one-way system is applied, then the vehicle situation, side barriers, still affect the decline in traffic performance even though there has been a decrease from the two-way system and the influence of the one-way road situation (X_6) changes can improve traffic performance," The two-way vehicle situation (X_1), two-way road situation (X_3) and one-way vehicle situation (X_4) have a negative effect on traffic performance as shown in the

regression equation above. This means that "The greater the situation of the two-way system vehicle (X_1), as well as the one-way vehicle situation (X_4) which consists of dimensions (i) traffic flow, (ii) vehicle volume, (iii) vehicle speed, (iv) vehicle speed, and (iv) vehicle speed. average, (v) vehicle queues and vehicle situation in one direction consisting of dimensions (i) degree of saturation, (ii) service level, (iii) road capacity, (iv) road width, (v) vehicle type, and the situation of a two-way road system (X_3) consisting of dimensions (i) degree of saturation, (ii) level of service, (iii) road capacity, (iv) road width, (v) vehicle type has a negative influence on traffic performance" aggravating traffic performance According to research (Fricilia & Naufal Rudini, 2020), that the situation of two-way vehicles, the situation of two-way roads and the situation of one-way vehicles has an effect on reducing traffic performance. One-way road situation factors (X_6) consisting of dimensions (i) degree of saturation, (ii) service level, (iii) road capacity, (iv) road width, (v) vehicle type, this study found a positive influence on performance traffic, as has been revealed in research (Fricilia & Naufal Rudini, 2020), which states that the one-way system road situation has a good influence on traffic performance.

The Most Influential Factors On Traffic Performance

All factors have a positive and negative influence on traffic performance, but only two-way side barriers (X_2), two-way road situations (X_3), and one-way side barriers (X_5) have a significant influence on traffic performance. This is indicated by the significance value of the two-way side barrier factor (X_2) with dimensions with a significance value of 0.00 < 0.05 and a $t_{count} > t_{table}$ of -5.742 > -1.98580, a two-way road situation factor (X_3) with a significance value of 0.010 < 0.05 and a $t_{count} > t_{table}$ of -2,632 > -1,98580, and a one-way side resistance factor (X_5) with a significance value of 0.029 < 0.05 and a $t_{count} > t_{table}$ of -2.223 > - 1.98580.

From the factors that most influence the traffic performance above, it can be seen that:

1. Side barriers on roads when the two-way system is implemented are a factor that reduces traffic performance. Likewise when the one-way system is implemented, although there is an increase in the decrease in traffic performance.
2. When the one-way system is implemented, the road situation has improved, with a decrease in the degree of saturation so that when the one-way system is implemented, the road situation can improve traffic performance.
3. When a two-way system is implemented, traffic conditions are denser with decreasing traffic performance, and when a one-way system is implemented, traffic conditions are smoother and there is an increase in traffic performance.

DISCUSSION

The Existing Condition of Traffic on Jl. Arif Rahman Hakim, Depok city.

The existing condition of traffic on Jl. Arif Rahman Hakim Depok city in observing and calculating the capacity, degree of saturation and the value of road service level using the 1997 MKJI, it can be concluded that:

1. During the implementation of the two-way system, traffic conditions on lane one and lane two, where the capacity and degree of saturation on both lanes are high enough to affect traffic performance. Judging by the value of the level of service (C) for both lines.
2. At the time the one-way system was implemented, the traffic conditions in lane one where the capacity and the degree of saturation did not change the traffic performance, where the value of the service level (C). And in lane two, where the capacity and degree of

saturation have a better effect on traffic performance, the service level is (B).

Regression Equation

From the regression equation, $Y = 93.493 – 0.28X_1 – 0.577X_2 – 0.244X_3 – 0.043X_4 - 0.180X_5 + 0.060X_6$, it can be concluded:

1. The vehicle situation factor in a two-way system (X_1) consisting of dimensions (i) traffic flow, (ii) vehicle volume, (iii) vehicle speed, (iv) average speed, (v) vehicle queue, has negative influence on traffic performance. It means that "The bigger/increasing situation factor of the two-way system (X_1) vehicle on Jl. Arif Rahman Hakim, further aggravated traffic performance (Y). According to research by Maya Fricilia, et al (Fricilia & Naufal Rudini, 2020) that the situation of two-way vehicles has the effect of reducing traffic performance (Y).
2. Side resistance factor in a two-way system (X_2) consisting of dimensions (i) degree of saturation, (ii) level of service, (iii) pedestrians, (iv) public vehicles parked, (v) vehicles entering/exiting at side of the road, has a negative effect on traffic performance (Y). It means that "The bigger/increasing side resistance factor of the two-way system (X_2) on Jl. Arif Rahman Hakim, further aggravated traffic performance (Y).
3. Increasing road situation factors in a two-way system (X_3) consisting of dimensions (i) degree of saturation, (ii) service level, (iii) road capacity, (iv) road width, (v) vehicle type, has a negative influence on traffic performance (Y). It means that "The bigger/increasing situation factor of the two-way system road (X_3) on Jl. Arif Rahman Hakim, further aggravated traffic performance (Y). According to research by Maya Fricilia, et al (Fricilia & Naufal Rudini, 2020) that the two-way road situation has a negative influence on traffic performance.
4. The vehicle situation factor in a one-way system (X_4) consisting of dimensions (i) traffic flow, (ii) vehicle volume, (iii) vehicle speed, (iv) average speed, (v) vehicle queue, has negative effect on traffic performance (Y). It means that "The bigger/increasing situation factor of the two-way system (X1) vehicle on Jl. Arif Rahman Hakim, further aggravated traffic performance (Y). According to research by Maya Fricilia, et al (Fricilia & Naufal Rudini, 2020) that the situation of two-way vehicles has the effect of reducing traffic performance.
5. Side resistance factor in a two-way system (X_5) consisting of dimensions (i) degree of saturation, (ii) level of service, (iii) pedestrians, (iv) public vehicles parked, (v) vehicles entering/exiting at side of the road, has a negative effect on traffic performance (Y). It means that "The bigger/increasing side resistance factor for one-way system (X_5) on Jl. Arif Rahman Hakim, further aggravated traffic performance (Y).
6. The road situation factor in a one-way system (X_6) consisting of dimensions (i) degree of saturation, (ii) service level, (iii) road capacity, (iv) road width, (v) vehicle type, has a positive influence on traffic performance (Y). It means that "The greater/increasing factor of the situation of the one-way system road (X_6) on Jl. Arif Rahman Hakim, gave a good influence and improved traffic performance (Y). Supporting the research of Maya Fricilia, et al (Fricilia & Naufal Rudini, 2020), stated that the one-way system road situation has a good influence on traffic performance.

From the analysis of existing road conditions and the regression equation above, it shows that in a two-way system which is 4 lanes 2 lanes (4/2D) where the vehicle situation, side barriers and road conditions on both lanes cause congestion, traffic performance decreases. With the implementation of a one-way system of 2 lanes 1 lane (2/1), where in lane one the vehicle situation factor, side barriers and

road conditions, traffic conditions are still congested and reduce traffic performance, while in lane 2 the vehicle situation factor, side barriers and the road situation is better with increasing traffic performance.

Phenomenon on Jl. Arif Rahman Hakim, Depok City, with the implementation of traffic engineering from two directions to one direction, does not work optimally in overcoming congestion. In a one-way system, passing vehicles prefer lane 1 rather than lane 2, so that in lane 1 there is still congestion and reduce traffic performance. This is due to the lack of signposts and supporting facilities in the implementation of the one-way system.

CONCLUSION

From the results of the analysis and discussion that has been carried out, the following conclusions can be drawn:

1. In the Two-Way System, congestion occurs which affects the decline in traffic performance. The factors possessed by the Two-Way System have a negative influence on traffic performance, among others, the situation of two-way vehicles (X1), two-way side barriers (X2), two-way road situations (X3).

In the existing condition, the level of road service is as follows:

a. In lane one road service level type (C), where the traffic flow is stable, traffic conditions limit the speed and movement of vehicles.
b. In lane two, the road service level is type (C), where the traffic flow is stable, traffic conditions limit the speed and movement of vehicles.

2. The implementation of the One-Way System, congestion can be broken down and divided into two lanes, thereby reducing congestion and improving traffic performance. The factors possessed by the One-Way System affect traffic performance, among others, the situation of one-way vehicles (X4), one-way side barriers (X5), one-way road situations (X6). One-way vehicle situation factors (X4), one-way side barriers (X5) still have a negative effect but have had an effect on improving traffic performance and one-way road situations (X6) have a positive effect on traffic performance.

And in the existing condition, the level of road service is as follows:

a. In lane one, the road service level is type (C), where the traffic flow is stable, traffic conditions limit the speed and movement of vehicles.
b. In lane two, the road service level is type (B), where the traffic flow is stable and the speed is starting to be limited. There is an increase in the level of road service on lane two because fewer passing vehicles will turn to the right.

3. The most dominant factor influencing the two-way system on traffic performance is the side barriers of the two-way system and the road situation of the two-way system, and in the one-way system the most dominant factor affecting traffic performance is the side barriers of the one-way system.

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