

ROAD PERFORMANCE ANALYSIS WITH MEDIAN AND WITHOUT MEDIAN ON THE ROAD OF A.YANI SATUI

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ABSTRACT

The road that is located in the City of Satui is a road that connects cities that are large in the South Kalimantan, the road is often used by mining trucks. From these conditions, there will be a high movement of people, goods, and services. For this reason, it is necessary to conduct a review to determine the performance of the road.

The location in this study is on A.Yani Street, City of Satui, South Kalimantan. On this road, there is a part of the road that has a median and does not have a median. Data collected from the results of traffic surveys are primary data which includes geometric data, traffic volume data, and traffic speed data. Secondary data which includes an overview of the study area. The data obtained are then grouped according to the composition of the vehicle. Then the data is made into hourly traffic data to get volume, speed, and density. The data obtained was analyzed to obtain capacity, the appropriate relationship model, and performance changes between roads.

The results of data analysis on A.Yani Street, City of Satui are the maximum volumes obtained on the road with a median of 468,75 amp/hour while those on the road without the median are 421,51 amp/hour. The maximum density obtained on the road with a median of 133,67 SMP/km while on the road without a median of 55,86 SMP/km. The maximum speed obtained on the road without the median is 129,2 km/hour while the road with the median maximum speed is 60,87 km/hour. The corresponding equation for A.Yani Street, the City of Satui on the road with the median is the *Underwood* model, $y = 61,161e^{-0,048x}$ with the R-value of 0,90675 while the road without the median is the *Greenberg* model, $y = -20,41\ln(x) + 82,208$ with an R-value of 0,90161.

Keyword: Road performance analysis, traffic characteristic

1. Preliminary

Roads are a very important means of transportation because by road one area can be connected to the other area. To ensure that the road can provide services as expected, efforts will always be made to improve them. With the increasing number of vehicles, this led to the increasing number of traffic with limited road capability.

Traffic jams are not something that has only recently been experienced in big cities, especially in Indonesia. This is because of the increasing desire of the community to use private motorized vehicles to fulfill their life activities without seeing far the impact. With the ever-increasing number of road users, especially at certain hours so as to demand an increase in the quality and quantity of a road, for that is the need for research on the capacity of the existing road so it can be evaluated and analyzed to anticipate the number of vehicles and population growth.

A. Yani Street, in the City of Satui, is the main road that connects the cities in South Kalimantan such as Banjarmasin, Martapura, and Pelaihari with the cities of the eastern part of South Kalimantan, on this road there are some roads that use the median and some do not use the median. The road is also often traversed by mining trucks because there are several coal mining locations near Satui City. From this condition, will occur from the movement of people, goods and services that are high in A. Yani Street, Satui. Thus causing heavy traffic activities and resulting in many traffic problems such as congestion and collisions.

Based on the conditions above, for this reason, a review is needed to determine the performance of the road section. So that it can compare the performance of roads using the median and not using the median, and it can be seen whether the median on the road is very influential on performance on the road or not.

2. The Research Methods

The location of this research is A.Yani Street, Satui, South Kalimantan. On this road, there is a road that has a median and a road that does not have a median.

Data collection is the first step after the preparation stage in the process of conducting research, from here a series of problem-solving can be determined. As for some data in data collection in this study are primary data and secondary data.

1. Primary data is obtained from the results of direct observation at the research location, while the primary data in this study are as follows:
 - 1) Geometric data includes profile data on the research location road. This data collection is to identify the characteristics of road infrastructure, considering that the data obtained can affect the capacity of the road.

- 2) Traffic volume data, This data collection is intended to determine the level of traffic density on the road section based on the type of vehicle in a certain time unit carried out by observation and recording at the research location.
 - 3) Traffic Speed data, This data collection is intended to measure travel time and average moving time required by a vehicle to cross the road.
2. Secondary data, its nature provides a general description of the research area, such as location maps, geographical data, population, and other information related to the completeness of this study.

Research Design

1. Identification variables

The variables used in this study are the flow and composition of traffic, capacity, the degree of saturation, and geometric conditions of the road.

2. Survey

In this study, a traffic survey was conducted. The survey is conducted by surveying traffic on the road without the median and the road with the median on A. Yani Street, Satui. The survey will be conducted on an active working day with a survey period of 1 day or within 12 hours on the same day. To simplify the survey, tools are needed as follows:

1. *Traffic counter* to calculate the number of vehicles based on the type of vehicle.
2. *Rollmeter* to retrieve road geometric data.
3. *Stopwatch* for data collection on the speed of vehicles that pass through the road.

Data processing

To process data obtained from survey results, done using a tool in the form of a computer with *Microsoft Excel* program and data selection to get the composition of vehicles that use the road sections reviewed. Data results that have been processed are grouped according to type or each group of data presented in group form, consists of:

1. The condition of the A. Yani Street, Satui with the composition with a median.
2. The condition of the A. Yani Street, Satui with the composition without a median.

Furthermore, the data is grouped according to the composition of the vehicle, and the percentage of heavy vehicles. Furthermore, *traffic counting* data processed into hourly traffic flow data to get the volume in amp/hour. Then the data obtained, analyzed until it gets capacity, the degree of saturation, level of service, and the appropriate equation model. By comparing the two models, it is expected that the median influence on performance on the road section is seen.

3. Results and Discussion

Data Description

Data that has been collected is secondary data and primary data. Secondary data obtained is geometric data of the road in the form of a road profile size on both roads. Primary data obtained is data on traffic volume and Traffic speed data which was done on October 18, 2018, one observation day in 12 hours. Observations start from 06.00 - 18.00 local time, with a measurement time intervals 10 minutes, and with a total of 13 surveyors. After the data is obtained in 10-minute intervals, then the data is made into a 1-hour interval. The reviewed road is Jl. A. Yani, Satui. The road reviewed is divided into two sections, the first section is the road with the median and the second section is the road without the median, with a length of one road is 50 meters in total 100 meters.

Road Geometric Data

From the results of the road profile measurements, data is obtained that the road segments reviewed have data as follows:

1. Road data with a median, the road under study has two lanes, each of which is divided into one strip. Each strip has a width of 6 meters, a shoulder width of 3.5 meters and a median width of 0.75 meters.
2. Road data without a median, the road under study has one lane with a width of 6 meters and there are two strips. Each strip has a width of 3 meters and a shoulder width of 2.75 meters.

Traffic Volume Data

Analysis of traffic volume data on median and non-median roads on A.Yani Street, Satui can be seen as follows:

1. The results of the analysis of traffic volume on the road with a median.

Table 1 Traffic Volume data on Roads with Median

PERIOD	DIRECTION	TIME	MC	LV	HV	TOTAL
Morning 06.00-10.00	Pelaihari - Satui	09.30 - 10.30	96.6	148	94.5	339,1
	Satui - Pelaihari		98.1	167	72	337,1
	Total					676.2
Noon 10.00-14.00	Pelaihari - Satui	10.00 - 11.00	96	134	72	302
	Satui - Pelaihari		107.1	169	76.5	352.6
	Total					654.6
Afternoon 14.00-18.00	Pelaihari - Satui	15.50 - 16.50	145.5	166	78	389.5
	Satui - Pelaihari		159.9	145	70.5	375.4
	Total					764.9

2. The results of the analysis of traffic volume on the road without a median.

Table 2 Traffic Volume data on Roads without Median

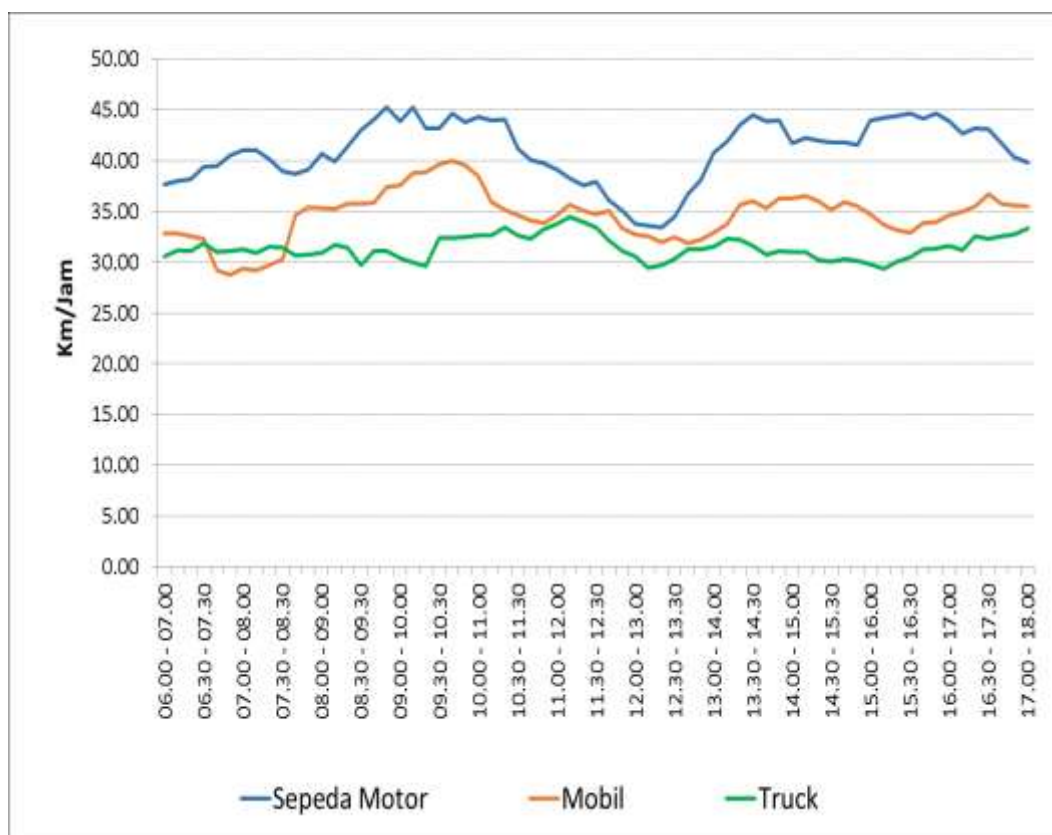
PERIOD	DIRECTION	TIME	MC	LV	HV	TOTAL
Morning 06.00-10.00	Pelaihari - Satui	09.30 - 10.30	94,8	143	93	330,8
	Satui - Pelaihari		96,3	162	70,5	328,8
	Total					659,6
Noon 10.00-14.00	Pelaihari - Satui	10.00 - 11.00	94.8	128	72	294.8
	Satui - Pelaihari		105.9	164	76.5	346.4
	Total					641.2
Afternoon 14.00-18.00	Pelaihari - Satui	16.00 - 17.00	146.7	161	88.5	396.2
	Satui - Pelaihari		153.3	142	55.5	350.8
	Total					747

Traffic Speed Data

Analysis of speed data on bermudian and non-median roads on A.Yani Street, Satui can be seen as follows:

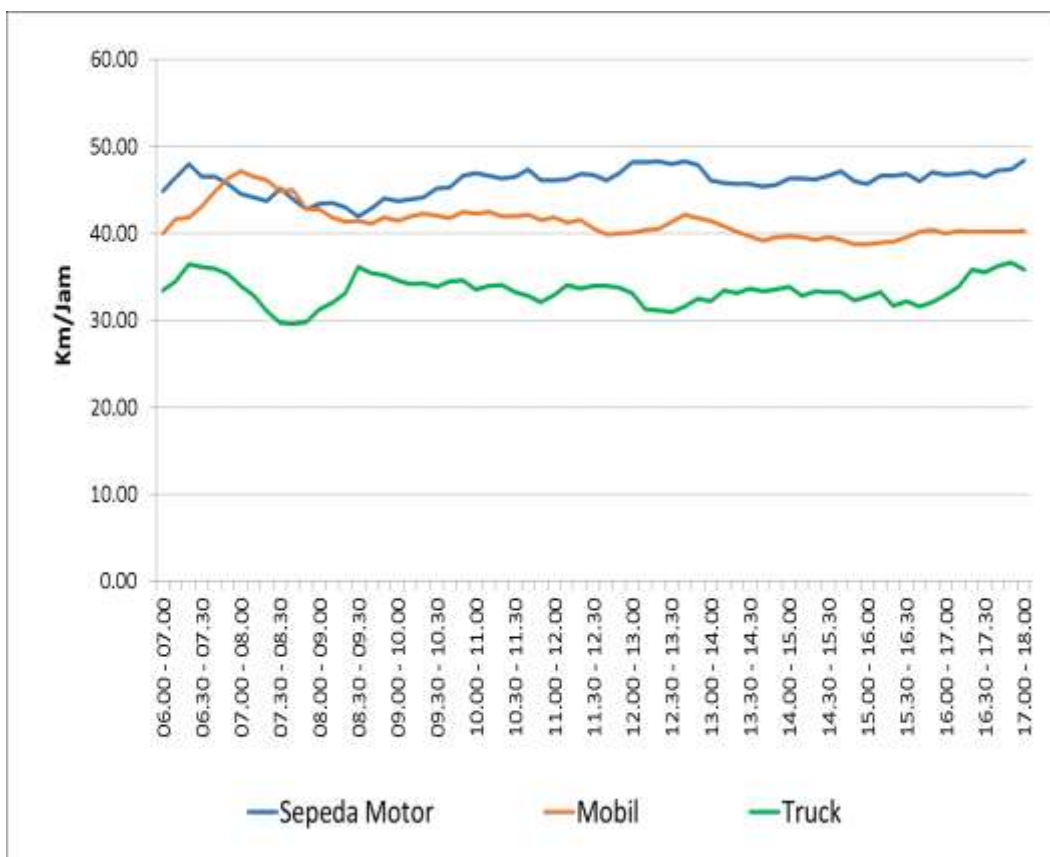
1. Traffic Speed data road with a median

The results of the analysis of traffic speed data on A.Yani Street, Satui. Precisely on the road that has a median can be seen as follows:



Picture 1 Road Traffic Speed Chart with Median, Direction of Pelaihari-Satui

In Picture 1, it can be seen that the maximum speed on the road with a median, the direction of Pelaihari – Satui, for motorbikes at 09.10 - 10.10 at speeds of 45,30 km/hour. For cars at 09.40 – 10.40 at speeds of 40,03 km/hour. For trucks at 11.10 – 12.10 at speeds of 34,44 km/hour.

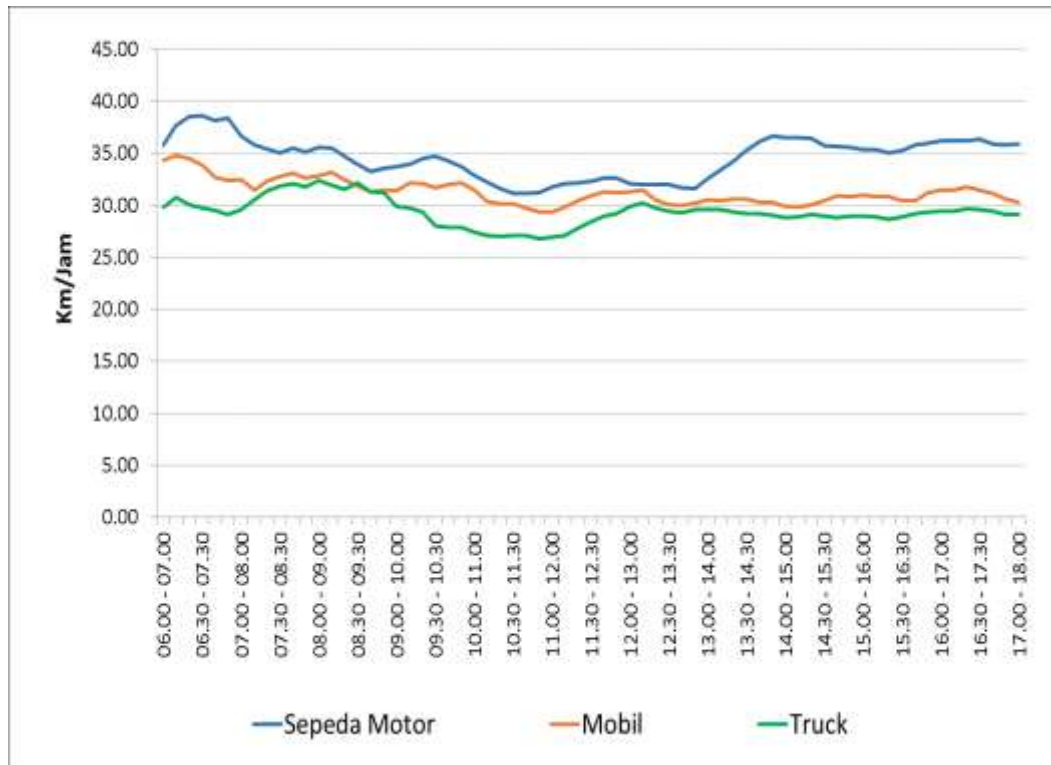


Picture 2 Road Traffic Speed Chart with Median, Direction of Satui-Pelaihari

In Picture 2, it can be seen that the maximum speed on the road with a median, the direction of Satui-Pelaihari, for motorbikes at 17.00 – 18.00 at speeds of 48,43 km/hour. For cars at 07.00 – 08.00 at speeds of 47,11 km/hour. For trucks at 16.50 – 17.50 at speeds of 36,71 km/hour.

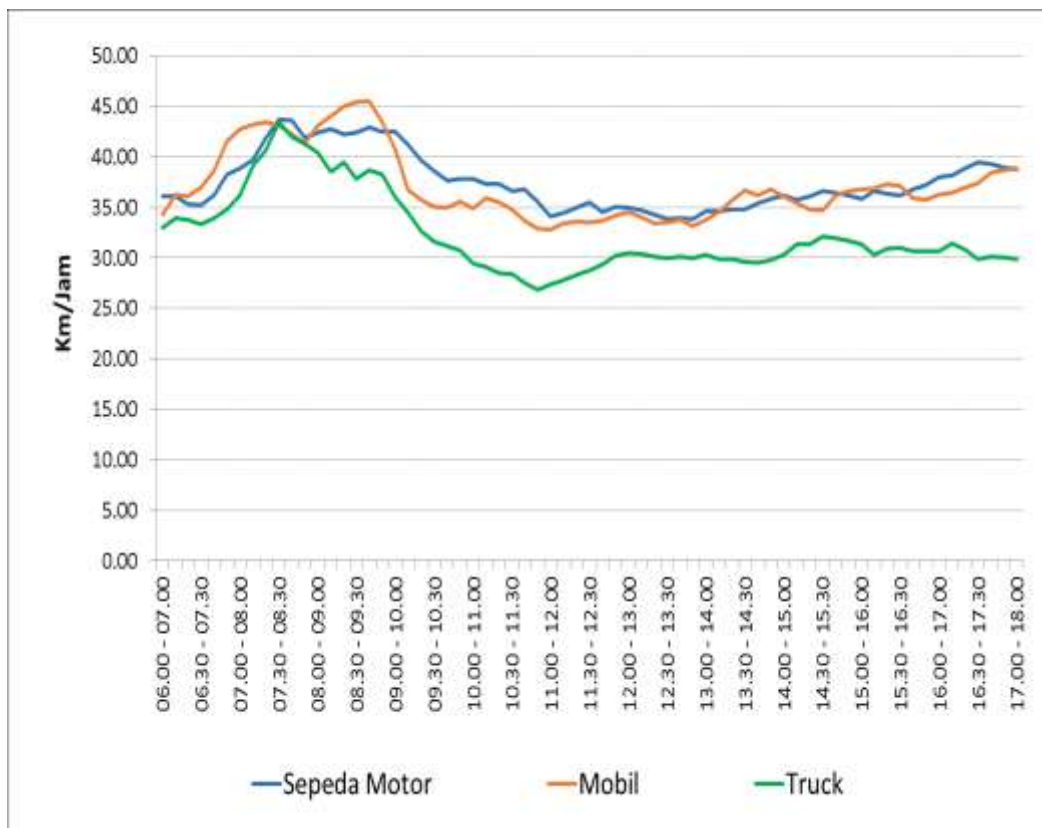
2. Traffic Speed data road without a median

The results of the analysis of traffic speed data on A.Yani Street, Satui. Precisely on roads that do not have a median can be seen as follows:



Picture 3 Road Traffic Speed Chart without Median, Direction of Pelaihari-Satui

In Picture 3, it can be seen that the maximum speed on the road without a median, the direction of Pelaihari – Satui, for motorbikes at 06.30 – 07.30 at speeds of 38,64 km/hour. For cars at 06.10 – 07.10 at speeds of 34,78 km/hour. For trucks at 08.00 – 09.00 at speeds of 32,35 km/hour.



Picture 4 Road Traffic Speed Chart without Median, Direction of Satui-Pelaihari

In Picture 4, it can be seen that the maximum speed on the road without a median, the direction of Pelaihari – Satui, for motorbikes at 07.30 – 08.30 at speeds of 43,73 km/hour. For cars at 08.40 – 09.40 at speeds of 45,54 km/hour. For trucks at 07.30 – 08.30 at speeds of 43,46 km/hour.

Traffic Density Data

To get a relationship between speed, volume and density is the speed and volume data obtained from the survey results. Then the data is processed into traffic density data.

Calculation of density data for A.Yani Street with median direction Pelaihari-Satui, taken for example at 07.00 - 08.00, with a sample of traffic speed data that is taken is data on the speed of the car and data on the volume of traffic at that hour, the results are as follows:

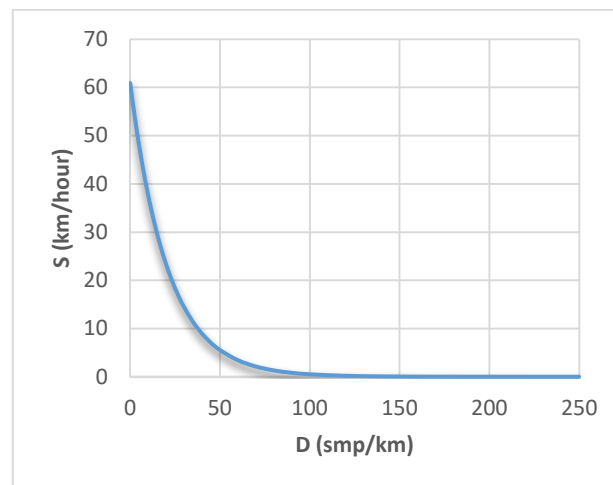
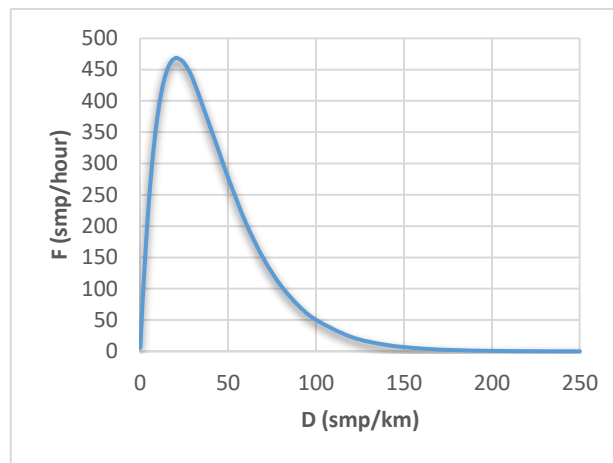
$$S = 29,34 \text{ km/hour}$$

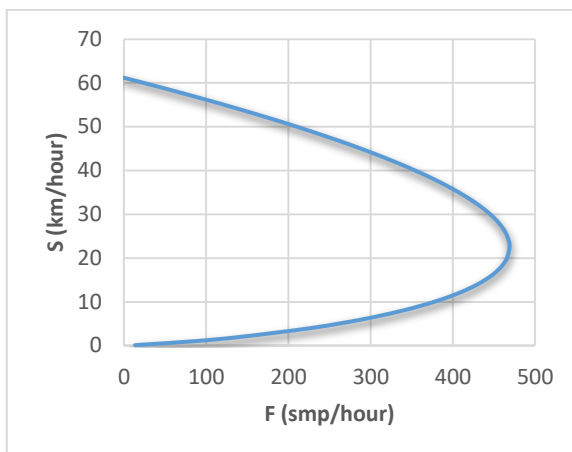
$$F = 303,63 \text{ amp/hour}$$

$$\text{So that: } D = \frac{F}{S} = \frac{303,63}{29,34} = 10,35 \text{ SMP/km}$$

Data Analysis on Roads with Median

Data analysis using a model *Greenshield*, *Greenberg*, and *Underwood* for the road with median as shown in Picture 6.



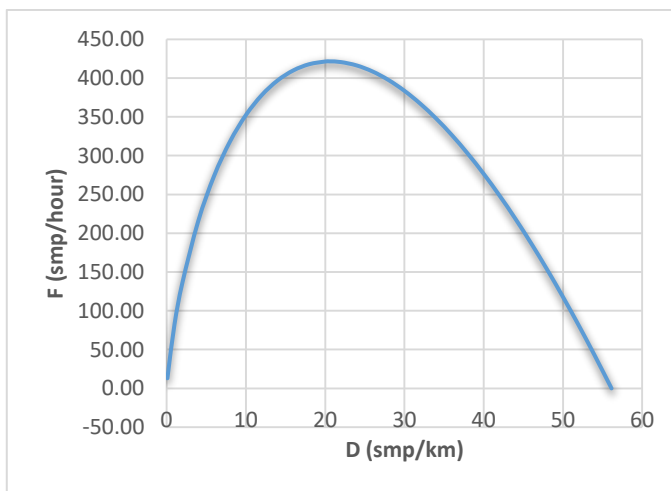


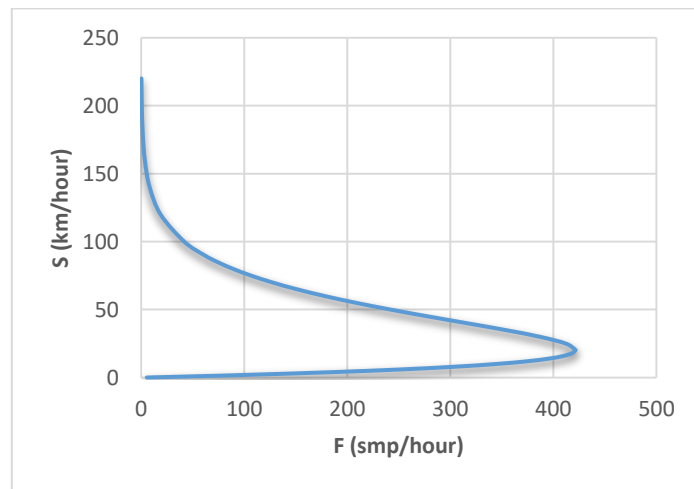
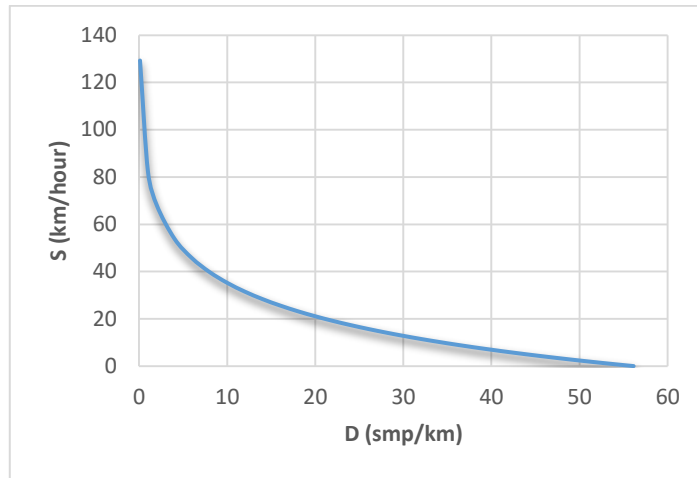
Picture 6 Relationship between Volume, Speed, and Road Density with Median

In Picture 6 on the analyzed road, volume maximum 468,75 amp/hour, speed maximum 60,87 km/hour, and density maximum 133,67 SMP/km.

Data Analysis on Roads without Median

Data analysis using a model *Greenshield*, *Greenberg*, and *Underwood* for the road without median as shown in Picture 7.



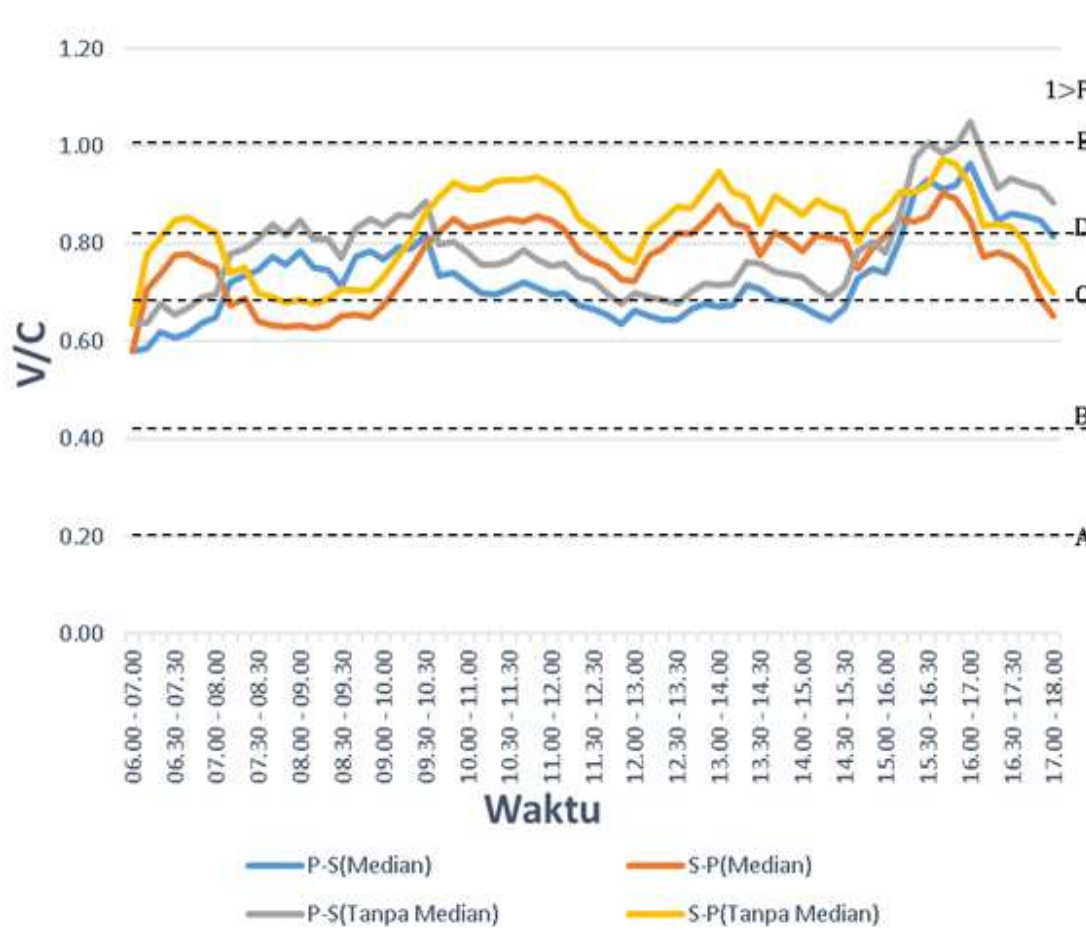


Picture 7 Relationship between Volume, Speed, and Road Density without Median

In Picture 7 on the analyzed road, volume maximum 421,51 amp/hour, speed maximum 129,2 km/hour, and density maximum 55,86 SMP/ km.

Level of Service

The results of data analysis to determine the level of service on A.Yani Street, Satui can be seen in Picture 8.



Picture 8 Graph Analysis Level of Service

4. Conclusion

From the results of research and data analysis on A.Yani street, Satui, the conclusion can be drawn as follows:

1. The maximum capacity on the road with a median is 468,75 amp/hour and on the road without the median is 421,51 amp/hour. On the road, without the median, there was a decrease in capacity of 47,24 amp/hour.
2. The relationship model that is suitable for the A.Yani street, Kota Satui on the road with the median is the *Underwood* model, $y = 61,161e^{-0.048x}$ with $R = 0,90675$ while on the road without the median is the *Greenberg* model, $y = -20,41\ln(x) + 82,208$ with $R = 0,90161$.

3. The results of data analysis on A.Yani street, Satui on the road with the median and the road without the median are as follows:
 - 1) On the road with the median traffic conditions that can be passed by the vehicle without congestion is at a speed of 22,5 km/hour and traffic density 20,83 SMP/km. Traffic density will jam at 133,67 SMP/km and began to exceed the capacity value of the road. Whereas in the free flow condition the speed is 60.87 km/hour with the value of traffic density approaching zero.
 - 2) On the road without median traffic conditions that can be passed by the vehicle without congestion is at a speed of 20,41 km/hour and traffic density 20,64 SMP/km. Traffic density will jam at 55,86 SMP/km and began to exceed the capacity value of the road. Whereas in the free flow condition the speed is 129,2 km/hour with the value of traffic density approaching zero.
 - 3) The free flow velocity of the median road segment is 60,87 km/hour, on that road, there is a decrease in free flow speed when compared to the free flow velocity on the non-median road segment of 129,2 km/hour. This decrease in speed occurs because of the curb on the road segment so that there is an increase in the driver's alertness through the road so that the driver decreases speed.

Suggestion

The suggestions that can be given by researchers after conducting this research are as follows:

1. Add traffic signs at the median end so that motor vehicles do not rotate carelessly so they do not cause traffic jams and accidents.
2. It will be better on the non-median road segment, widening the road and adding the median so that road users feel more secure and comfortable.
3. It will be better on the median road segment, added direction divider lines on each road so that traffic flow can be more regular.

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