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THE EFFECT OF TRAFFIC VOLUME ON THE NOISE CAUSED BY MOTORIZED VEHICLES IN FRONT OF KARYA BHAKTI PRATIWI DRAMAGA HOSPITAL, BOGOR

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ABSTRACT

Transportation is the movement or transfer of both people and goods from a place of origin to a destination. In this movement or movement, of course, using transportation facilities in the form of vehicles which in operation cause noises such as engine sound coming out through the muffler or horn. At a certain level, these sounds can still be tolerated in the sense that the consequences they cause are not a nuisance, but at a higher level, the sound generated by these vehicles is already a nuisance or pollution, which is called noise. The activity of the population of Bogor district a suburb of the capital city of Jakarta in Indonesia is relatively high. Along with economic development in the Bogor district, the number of motorized vehicles operating both private and public vehicles has also increased. The purpose of this study was to determine the average volume of motorized vehicles that pass through the Dramaga highway, especially in front of Karya Bhakti Pratiwi Hospital, and also to determine the level of noise generated due to the volume of motorized vehicles. The method used in this study is a quantitative method by calculating the number of vehicles and the average volume of vehicles and data analysis. The data taken is vehicle volume data every 15 minutes and noise levels using a Sound Level Meter (SLM). In this study, three SLMs were used which were placed at three points. The results showed that the volume of vehicles affects the noise level quite significantly. The results of data analysis show that the effect of volume on noise is 12.6%, where the equation is as follows, y = 72.898 - 0.003 x1 + 0.220x2 - 0.054x3. This equation means that if there is no decrease in motorcycle volume, light vehicle volume, and heavy vehicle volume, the noise level in SLM 1 is 72.898 dBA. However, if there is an increase in the number of light vehicles by 0.220, it is found that the number of motorcycles and heavy vehicles is decreased by 0.22, so the noise level will increase by 0.003 dBA.

Keywords: volume, traffic, sound level meter (SLM), motorcycle, hospital.

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INTRODUCTION

Transportation is the movement or transfer of both people and goods from a place of origin to a destination. In this transfer or movement, of course, transportation is used in the form of a vehicle, which in its operation produces noises such as the sound of an engine coming out through the exhaust or horn. At a certain level, these sounds can still be tolerated in the sense that the consequences they cause are not a nuisance, but at a higher level, the sound produced by the vehicle is already a nuisance or pollution called noise [1].

The Jalan Raya Dramaga Km.7, Dramaga, Dramaga District, Bogor Regency, West Java 16880, is a road in Bogor Regency whose traffic volume continues to increase. This road is traversed daily by motorized vehicles, public transport, private transport and goods transport. This fairly dense traffic volume can disturb residents and activities in the area, one of which is the Karya Bhakti Pratiwi Dramaga Hospital. According to the Decree of the State Minister for the Environment [2], it is defined that the Threshold Limit Value (NAB) or standard noise level permitted for health facility areas is 55dBA. Based on the problem formulation mentioned above, the aim of this research is as follows:

- Find out the level of traffic noise generated in front of the Karya Bhakti Pratiwi Dramaga Hospital, Bogor Regency.
- Determine the relationship between the volume of motorized vehicles and the noise generated in front of the Karya Bhakti Pratiwi Dramaga Hospital, Bogor Regency.

Definition of Noise

Based on a decision issued by the Ministry of the Environment [2] it is stated that noise is unwanted sound from human business or activities at a certain level and time which can cause disturbances to human health and environmental comfort. Even though noise is an unwanted sound, sometimes noise can be beneficial. Useful in the sense that noise can be used to attract attention or expect a response from someone. For example, a baby crying and someone screaming for help. Meanwhile, the impact caused by noise is a physical and psychological disturbance. Currently, noise is one of the causes of environmental disease.

The noise level generated by a means of transport in a noise-sensitive activity environment can be estimated approximately without great difficulty. In the case of highways, various equations have been created to estimate noise levels at various distances from the highway. This noise level depends on the traffic volume and vehicle mix, especially the percentage of trucks. Noise is generated by road traffic at an approximately constant speed with a volume such that there is always traffic flow according to the following equation:

$$T = 10 \text{ Log } _{10} q - 10 \text{ Log}_{10} d + \text{Log}_{10} + \text{Log}_{10} u + 20 \quad (1)$$

With:

T = Average noise level at a receiver that is dBA distance from a source.
d = Distance between the receiver and the imaginary lane in the middle of the traffic lane.
q = Traffic volume, (vehicles/hour)
u = Average traffic speed, (miles/hour)

This equation applies to volumes above 1000 vehicles/hour. It is assumed that there are no obstructions or obstacles such as buildings or tall walls between the road and the point where the noise level is expected except for a few trees or bushes. The location of an imaginary lane is based on the estimated location of a noise source in one line that would produce the same noise characteristics as that of the furthest lane.

Types of noise based on source origin, noise in buildings, and noise due to traffic, noise can be classified based on the following:

- Impulsive noise, namely noise that does not come continuously, but in pieces. For example: noise that comes from the sound of a piling machine.
- Continuous noise, namely noise that comes continuously over a long period. For example: noise that comes from the sound of the engine being turned on.
- Semi-continuous noise, namely continuous noise that only lasts for a moment, then disappears and may come again. For example: noise that comes from the sound of passing cars or airplanes.
- Intermittent noise, namely noise that occurs continuously, but there are periods of relative quiet. For example: traffic noise, noise at the airport.
- Noise sources which include the distance of the noise source to the building, the noise level of the source, frequency, duration, and time of occurrence of the noise. To reduce the intensity of noise, this can be done by moving the building away from the sound source. If the sound source is moved twice the original distance, it can reduce the noise by up to 6 dBA.
- The medium through which noise travels is influenced by air conditions, the distance that noise sound waves travel is related to the distance to the source of the building noise, the presence of objects in the medium that allows for bending and reflection of sound waves).
- Buildings as noise receivers which include the overall density level of the building in the form of walls, floors, ceilings, and roofs, the density between one building and another, and the possibility of using additional materials in the building that can avoid the impact of noise. The proximity of buildings causes sound reflections to become stronger.

Most motorized vehicles in 2nd or 3rd gear produce noise of 75 dBA with a frequency of 100 - 7000 Hz.

Causes of Noise

According to [3], noise sources are divided into three types, namely point sources, plane sources, and line sources. For traffic noise included in the line source criteria, noise sources originate from:

- Interior noise (inside)

Interior or internal noise is a source of noise that originates from humans, household appliances, or building machines.

- Outdoor noise (outside)

Outdoor noise or outside noise is a source of noise that comes from traffic, transportation, industrial activities, equipment visible in buildings, building construction sites, road repairs, sports activities, and others outside the room or building.

Sources of noise caused by traffic can be defined as follows:

Traffic, one source of noise is the sound of road traffic. Traffic noise on the highway is caused by sound from motorized vehicles where the sound originates from the vehicle engine, vehicle exhaust sound, and sound from the interaction between the wheels and the road. Of the several sources of noise originating from transportation traffic activities, noise originating from road traffic provides the most disturbing proportion of noise frequencies. Noise due to traffic is one of the sounds that cannot be avoided in modern life and also one of the undesirable sounds. Factors that influence noise due to traffic include the following: Influence of traffic volume (Q), the Influence of average speed vehicle (V), the influence of road grade, the influence of observation distance (D), the influence of the type of road surface, the influence of traffic composition, and the influence of the surrounding environment [3], [5].

Noise Limitations

The decision of the State Minister for the Environment [2] sets noise level standards for certain areas according to Table-1. These noise level standards are measured based on the average equivalent noise level measurement (Leq).

Table-1. Standard values of noise level [2].

No.	Allocation of area/activity environment	Noise Level (dBA)
1.	Area Allocation: • Housing and settlements • Trade and services • Offices and trade • Green open space • Industry • Government and public facilities • Recreation • Special: Airports, train stations, seaports, cultural heritage.	 55 70 65 50 70 60 70 60
2.	Activity Environment • Hospital or similar • School or something similar • Place of worship or similar	 55 55 55

Road traffic is the main source of noise that disturbs most urban communities. Available evidence suggests that traffic noise is a major source of environmental dependency. The sound generated by traffic is the sound of traffic which is influenced by the level of sound strength, how often it occurs in one unit of time, and the frequency of the sound produced. Noise will disturb humans, both in the form of audiometric disturbances and non-audiometric disturbances. The main effect of noise is an audiometric disturbance, namely damage to the human hearing system, especially if the noise level has exceeded a certain threshold. Hearing damage is not only affected by the level of noise but also depends on the length of exposure to the noise. If the noise level reaches 140 dBA or more it will rupture the eardrum.

Noise Level Determination

- Direct measurement with a sound level meter. Direct noise level measurements must use a sound level meter that meets the requirements of the IEC (International Electrotechnical Commission) 651 class 2 standard. Measurements are carried out to obtain the equivalent average noise index (Leq). The use of a sound level meter that does not have a Leq calculation device is permitted, but the final results must be converted to obtain an adjusted Leq value. The duration of the measurement follows the provisions of point 4.2, with a measurement interval of 15 minutes.
- Prediction of noise levels, carried out for roads that have not been built or roads that will experience improvements. The method that can be used is the method stated in construction and building guidelines no. Pd.T-10-2004-b, the use of other prediction methods can be justified if it can be proven that the method is statically feasible and agreed upon by the parties with an interest in the prediction data.

Noise Handling

- Handling noise at the source, handling noise at the source of noise can be done through several things, namely as follows: traffic control, restrictions on heavy vehicles, speed regulation, improving slopes, and selecting the type of road pavement.
- Handling noise on propagation paths, handling noise on propagation paths can be done in several ways, namely by installing noise dampeners (BPB).
- Handling noise at the reception point, and handling noise at the propagation path can be done by changing the orientation of the building in concept and application of methods, and effectiveness. Insulation on building facades in terms of concept and application of methods and effectiveness.

Transportation Type

Types of vehicles are differentiated according to [6] which consist of light vehicles, namely heavy vehicles (Iheav vehicles), motorbikes (cycle motorbikes), and non-motorized vehicles. Based on the Central Bureau of Statistics [31], a passenger car is any motorized vehicle equipped with seating for eight people excluding the driver's seat, whether equipped or not equipped with luggage.

Road Function

According to the Directorate General of Highways General of Highways' Road Geometric Planning Procedures Manual [6] according to the function of roads they are divided into arterial roads, collector roads, local roads, and neighborhood roads.

Arterial roads are roads that connect national activity centers or between national activity centers and regional activity centers

- Collector roads, roads connecting national activity centers with local activity centers, between regional activity centers, or between regional activity centers and local activity centers.
- Local roads, roads that connect national activity centers and environmental activity centers, between regional activity centers and environmental activity centers, between local activity centers, or local activity centers and environmental activity centers.

- Environmental roads, roads that connect activity centers in rural areas and roads within the rural area.

Road Class

The classification of roads according to class is related to the road's ability to accept traffic loads, expressed in heaviest axle loads (MST) in tons as in table 2 below.

Table-2. General road classification [6].

Road Class	Road Function	Maximum Vehicle Dimensions		Heaviest Axis Load
		Long (m)	Wide (m)	
I	Arteries	18	2,5	10
II	Arteries	18	2,5	10
III A	Arteries	18	2,5	8
III A	Collector	18	2,5	8
III B	Collector	12	2,5	8
III C	Local	9	2,1	8

Road Status

According to Government Regulations [7] the status of roads is as follows: national roads, provincial roads, district or municipal roads, village roads, special roads.

National roads consist of primary arterial roads, primary collector roads connecting provincial capitals, toll roads, and national strategic roads.

Provincial roads, the administration of provincial roads is the authority of the provincial government. Provincial roads consist of a primary collector road that connects the provincial capital with the district or city capital, provincial strategic roads, and roads in special areas of the capital Jakarta. Road sections are determined by the governor with a provincial governor's decree.

District roads, the administration of district roads is the authority of the district government. Regency roads consist of a primary collector road which does not include national roads and provincial roads, a local primary road that connects the district capital with the sub-district capital, the district capital with the village center, between the sub-district capital, the sub-district capital with the village, and between village. Secondary roads that do not include provincial roads and secondary roads within the city. District strategic roads, and district road sections are determined by the regent with a regent's decree.

City roads are public roads in the secondary road network within the city, under the authority of the city government. City road sections are determined by the mayor with a mayoral decree.

Village roads are primary environmental roads and local primary roads which do not include district roads in rural areas and are public roads that connect areas and/or within villages.

Road Type

According to the Indonesian Road Capacity Manual [6], the type of road determines the lane and direction of the road segment, namely as follows: 2-lane 1-way road (2/2 UD), 2-lane 2-way undivided road (2/2 UD), 4-lane road undivided lanes (4/2 UD), 4-lane 2-way divided roads (4/2 UD), 6-lane 2-way roads divided (6/2 UD).

Traffic

Traffic parameters related to noise level analysis are traffic volume and speed. Volume is the number of vehicles that pass one observation point in a unit of time, while speed is the rate of travel over distance per unit of time. Speed is calculated using the following equation:

$$V = S/t \quad (2)$$

with:
V = average vehicle speed (km/hour)
S = distance traveled in a certain period (km)
t = travel time (hours)

Volume (Q) and percentage of heavy vehicles (PHV) are found using the equation:

$$Qtotal = QLV + GHV + QMC \quad (3)$$

$$PHV\% = (QHV/Qtotal)x100\%$$

with:
Qtotal = total vehicle volume (vehicles/hour)
QLV, QHV, QMC = volume of each type of vehicle (vehicles/hour)

Traffic Noise

Noise is one of the unwanted noises. However, there is some traffic noise that is needed, for example, the sound of vehicle horns or the sound of trains when crossing the highway to warn road users. However, this exception is only for special situations, and in general, the noise generated by the transportation system is unwanted.
Regression analysis is an analysis used to find out how the independent variables and related variables are related to a functional or causal relationship. Regression shows a tendency towards the average and the same results for subsequent measurements to predict a variable and a second variable that is already known. To find out the relationship between the variable x and the variables, you can use the variable x on the abscissa and the variable on the ordinal to obtain a scatter diagram of the values x and. If a straight line is drawn that is the sum of the squares of the vertical distances from each point, then this line is called a regression line. The benefit of the regression line is to estimate the value of the dependent variable from the independent variable if the independent variable is already known. Regression analysis is used to study and measure the statistical relationship that occurs between two or more variables. In simple regression, two variables are studied.

Correlation coefficient. To determine whether something has a level of correlation or degree of relationship with other variables, a correlation test is used. If Y tends to increase and X increases, then the correlation

is called positive correlation or direct correlation. On the other hand, if Y tends to decrease while X increases, then the correlation is called negative correlation or inverse correlation. If there is no visible relationship between the variables, it is said that there is no correlation between the two variables. The correlation between these variables can be expressed by a correlation coefficient (r). The r value ranges between -1 and +1. The signs (+) and (-) are used for positive correlation and negative correlation. In this research, the correlation analysis stage is the most important in determining the relationship between the independent variable and the dependent variable or between independent variables.

Data analysis, observing the level of noise pollution on straight roads with the type of hospital research object. In this case, it is assumed that the addition of the noise pollution level (Y) is the dependent variable. The dependent variable is placed at three points SLM 1 on the sidewalk as the 0-meter point, SLM 2 is located 5 meters from the sidewalk, and SLM 3 is located 15 meters from the sidewalk to the entrance to the Karya Bhakti Pratiwi Dramaga Hospital. This dependent variable will be influenced by several independent variables, namely:

X1 is the first independent variable/motorcycle volume (SM)

X2 is the second independent variable/light vehicle volume (KR)

X3 is the third independent variable/volume of Heavy Vehicles (KB)

Based on the data above, a linear regression model approach is obtained, namely: Y = a0 + a1. x1 + a2.x1 + a2.x2 + a3.x3. The respective coefficients a0, a1, a2, and a3 are coefficients determined based on research data.

RESEARCH METHODS

Research Sites

In general, the location of this research is in the Dramaga sub-district, Bogor Regency. The location for calculating vehicle speed and volume and measuring noise intensity levels was chosen on Jalan Raya Dramaga, in front of the Karya Bhakti Pratiwi Dramaga Hospital. In selecting the location of the measurement point, the number of vehicles passing Jalan Raya Dramaga has been presented.

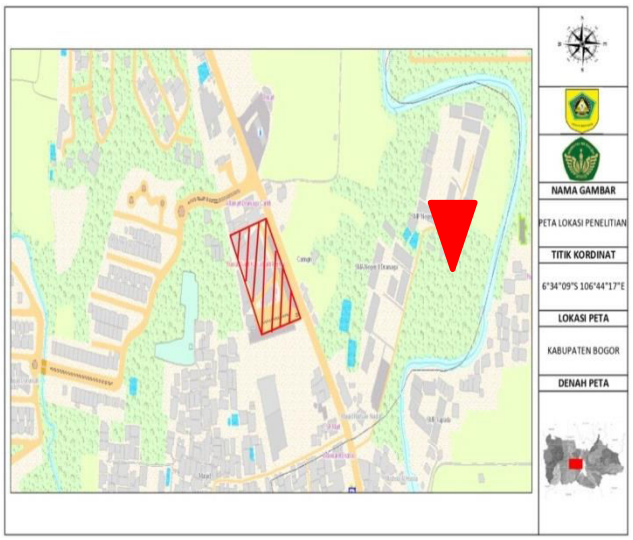

Figure-1. Karya Bhakti Pratiwi Dramaga Hospital (Source: Geospatial Information Agency).

Research Methodology

This research uses a quantitative method, a research method whose data source is taken through mathematical samples. The benefits of this method are that it sharpens research results, the research flow becomes clear, it can produce useful research, the research can be accounted for, and it can overcome limitations.

RESEARCH FLOW CHART

The research method carried out is presented in a flow diagram as in Figure-2 below.

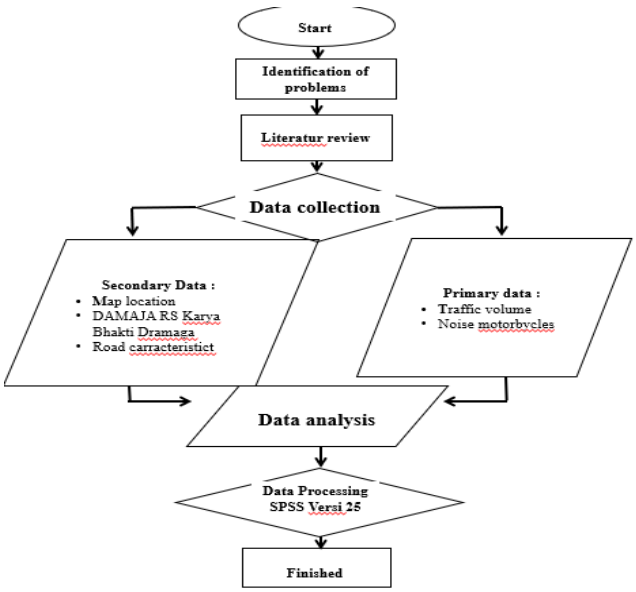

Figure-2. Research flow diagram (Source: Analysis Results).

Data Processing Methods

For this research, to determine the relationship between vehicle volume and the level of noise intensity produced, the research was carried out from 06:00 to

18:00. From the results of measurements carried out over five days, the relationship between vehicle volume and noise intensity level is known, so the effect will then be analyzed. Based on research on the relationship between vehicle volume and noise intensity levels, it is known that times with high noise intensity levels. Next, noise samples are taken at each test point at a predetermined time. The selection of sampling or data collection time is based on the level of sound intensity produced ranging from the lowest to the highest level.

Data processing in this research uses statistical methods, especially regression analysis which is used for modeling and investigating the magnitude of the relationship between the independent and dependent variables. The computer programs used are Microsoft Excel and SPSS [8]. Creating a multiple regression analysis model was carried out by creating two noise level model scenarios from the data obtained. The processing carried out is as follows:

- Data obtained from the field is entered into a table which becomes basic data ready to be processed.
- The basic data or raw data is reprocessed to obtain average speed, traffic flow, and noise levels.
- The basic data or raw data is reprocessed to obtain the number or volume of vehicles, traffic flow, and noise levels.
- Regression analysis is carried out based on data that has been processed and also tested on the model parameters. An important thing that must also be tested is the degree of relationship between the variables.

Prospective Noise

Noise due to traffic, and sound generated from transportation activities is a sound that is not constant. The disturbance caused by noise depends on the level of sound intensity, how often it occurs, and the frequency produced [10], [11], [13], [22]. Noise in motor vehicles is mainly produced by the vehicle engine during combustion, exhaust, horn, and braking, and due to the interaction between the wheels and the wheels in the form of friction which produces sound. The sound of motorized vehicles sometimes creates sounds that are unpleasant to the ears. If you pay attention to residents or residents who live on the side of the main road, there is a huge potential for acute hearing loss. This hearing loss will result in damage to the ear wall and cause deafness in the ear over time [12]. Not recommended for small children who live constantly on the side of the road. Deafness will suffer more quickly in children who hear the sound of motorized vehicles every day [14].

Transport travel

Transportation trips are carried out by people who have many activities outside the home. Activities outside the home require people to move. A planned move requires a means of transportation. The means of transportation used now vary, including using public transportation or using private transportation [15], [16], [17]. The advantages and disadvantages of public and private means of transportation depend on the purpose of the trip and the reach of achieving that purpose. So a good journey will result in a good destination too. A pleasant journey will also have pleasant results [18], [19], [20], 21]. So a clear concept is needed when carrying out transportation trips. In controlled travel, the vehicle used is safe, and the driver's condition is fictitious and healthy [23], [24], [25]. No hearing loss. There is no deficiency in vision. Do not consume illegal drugs and drink alcoholic beverages. This condition will make a person's journey more comfortable and away from traffic accidents [26], [27], 28], [29], [30]

RESULTS AND DISCUSSIONS

Data Results

The results of the traffic data calculated are data per 15 minutes for 12 hours a day. Data was taken from 06.00 to 18.00. This data was taken for 4 days, namely Monday 27 February 2023, Tuesday 28 February 2023, Wednesday 1 March 2023, and 11 Saturday 2023.

This traffic data is obtained from the calculation of the Equivalence of Passenger Cars (EMP). The use of this calculation is intended to make traffic analysis easy to carry out, the passenger car unit factor (SMP) for each motorized vehicle according to the Indonesian Road Capacity Manual [2], for urban roads is as follows:

Heavy Vehicle (HV)	= 1.30
Light Vehicles (LV)	= 1.00
Motorcycle (MC)	= 0.40
Non-motorized vehicles	= 1.00 [2].

In its implementation, the grouping is divided into two groups, namely motorbikes and light vehicles, where motorbikes (MC) have a value of 0.40, and light vehicles include (private cars, public transport, and goods transport) with an EMP of 1.00.

Data Collection Results

The results of data collection carried out over four days are presented in consecutive table form as in the image below.

Volume Processing Results

The results of volume processing on data for Monday, February 27 2023 are as follows:

Based on the guide for calculating traffic volume using a predetermined formula, namely the number of vehicles passing a fixed point on the road per unit time.

$$Q = n/t \quad (4)$$

with:

Q	= Traffic Volume (vehicles/hour)
n	= Number of passing vehicles (kind)
t	= Time (hours)

Calculation example:

Data on the number of vehicles needed in 15 minutes is

Number of passing vehicles (n) = 260 vehicles
So, Volume (Q) = n/t
= ((260))/((0.25))
= 1,040 vehicles/hour

Results of SLM Data Collection on Monday

Results of data collection for SLM1, SLM2, and SLM3 on Monday 27 February 2023, Sound Level Meter results for distances 00.00, 05.00, and 15.00 from the main road.

Vehicle Volume and Noise Data Processing

The results of motor vehicle and noise data processing using the SPSS version 25 program. Data selection was carried out in the field and the processing results were obtained according to the attached page. To show that the recommended data is for the volume of motorbikes, light vehicles, and heavy vehicles respectively.

Correlation Test

Correlation testing is used to find the relationship between two or more independent variables that are jointly linked to the dependent variable so that the contribution of the independent variable which is the object of research to the dependent variable is known as in Table-3 below.

Table-3. Interpretation of the r value [9].

No	r	Interpretation of r Values
1	0	Not correlated
2	0,01 – 0,20	Very low
3	0,21 – 0,40	Low
4	0,41 – 0,60	A bit low
5	0,61 – 0,80	High enough
6	0,81 – 0,99	Tall
7	1	Very high

Hypothesis

Ha = There is a significant influence between the volume of motorbikes, the volume of light vehicles, and the volume of vehicles heavy with noise

Ho = There is no significant influence between the volume of motorbikes, the volume of light vehicles, and the volume heavy vehicles with noise

α = 5.00%

STATISTICAL ANALYSIS OF DATA

Statistical Analysis of Data for Monday 27 February 2023, Distance 00.00 m with SLM 1.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike volume (SPM/x1), light vehicle volume (KR/x2), and heavy vehicle volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 0.00 m using SLM1. The equation is y = 70.429 – 0.001x1 + 0.002x2 + 0.007x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 0.37, which means that x1, x2, and x3 have an effect of 3.7% on y.

The results of the ANOVA test obtained an F-count value = 5.69 with a probability value (sig) = 0.638. From the input data we get the F-Table value = 2.816 so F-Calculate>F-Table, then Ha is accepted and Ho is rejected.

The results of the coefficients test, the volume of motorbikes, the volume of light vehicles, and the volume of heavy vehicles have constant values (ao) = 70.429, (a1) =
-0.001, (a2) = 0.002 and (a3) = 0.007. The t-count value = 40.905 and the value (sig) = 0.000, from the data the t-table value = 2.015, then the t-table value > t-table, then Ha is accepted and Ho is rejected.

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn regarding the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is a significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM 1 on Monday with a distance of 00.00 m from the edge of the highway.

Table-4. ANOVA test results for SLM 1 with the volume of motorbikes, light vehicles, and heavy vehicles.

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.565	3	2.522	.569	.638[b]
	Residual	194.909	44	4.430		
	Total	202.473	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume KR, Volume SPM

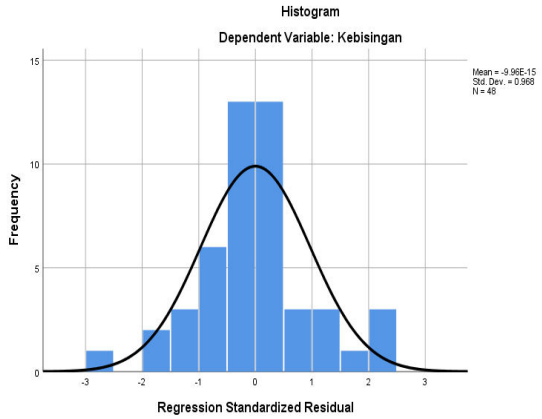

Figure-3. SLM 1 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

Statistical analysis of data for Monday 27 February 2023, distance 05.00 m with SLM 2.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike volume (SPM/x1), light vehicle volume (KR/x2), and heavy vehicle volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 03.00 m using SLM2. The equation is y = 65.414 + 0.000x1 + 0.001x2 + 0.012x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 0.20, which means that x1, x2, and x3 have an effect of 2.1% on y.

The results of the ANOVA test obtained an F-count value = 2.98 with a probability value (sig) = 0.827. From the input data we get the F-Table value = 2.816 so F-Calculate> F-Table, then Ha is accepted and Ho is rejected.

The results of the coefficients test, the volume of motorbikes, the volume of light vehicles, and the volume of heavy vehicles have constant values (ao) = 65.414 (a1) = 0.000, (a2) = 0.001 and (a3) = 0.012. The t-calculation value was obtained = 41.622 and the value (sig) = 0.000, from the data the t-table value was obtained = 2.015, then t-calculation > t-table, then Ha was accepted and Ho was rejected.

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn regarding the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is a significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM 2 on Monday with a distance of 05.00 m from the edge of the highway.

Table-5. ANOVA test results for SLM2 with the volume of motorbikes, light vehicles, and heavy vehicles.

ANOVAa						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.299	3	1.100	.298	.827[b]
	Residual	162.394	44	3.691		
	Total	165.693	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume KR, Volume SPM

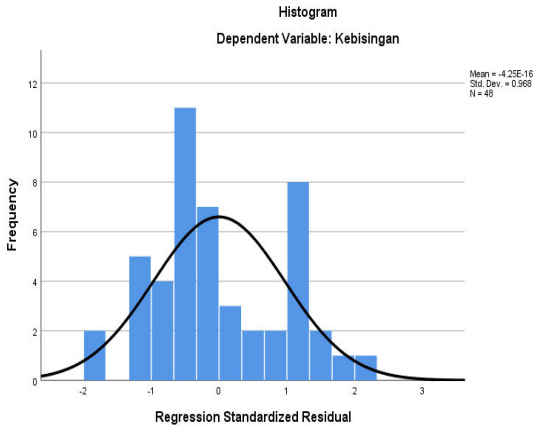

Figure-4. SLM 2 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

Statistical Analysis of Data for Monday 27 February, Distance 15.00 m with SLM 3.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike volume (SPM/x1), light vehicle volume (KR/x2), and heavy vehicle volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 16.00 m using SLM3. The equation is y = 60.341 - 0.001x1 + 0.002x2 - 0.003x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 0.51, which means that x1, x2, and x3 have an effect of 5.1% on y.

The results of the ANOVA test obtained an F-count value = 7.84 with a probability value (sig) = 0.509. From the input data we get the F-Table value = 2.816 so F-Calculate> F-Table, then Ha is accepted and Ho is rejected.

The results of the coefficients test, the volume of motorbikes, the volume of light vehicles, and the volume of heavy vehicles have constant values (ao) = 60.341, (a1) =
-0.001, (a2) = 0.002 and (a3) = -0.003. The t-calculation value was obtained = 33.216 and the value (sig) = 0.000, from the data the t-table value was obtained = 2.015, then

t-calculation > t-table, then Ha was accepted and Ho was rejected.

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn regarding the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is a significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM 3 on Monday with a distance of 15.00 m from the edge of the highway.

Table-6. ANOVA test results for SLM3 with the volume of motorbikes, light vehicles, and heavy vehicles.

ANOVA[b]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	11.598	3	3.866	.784	.509[b]
	Residual	216.979	44	4.931		
	Total	228.577	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume KR, Volume SPM

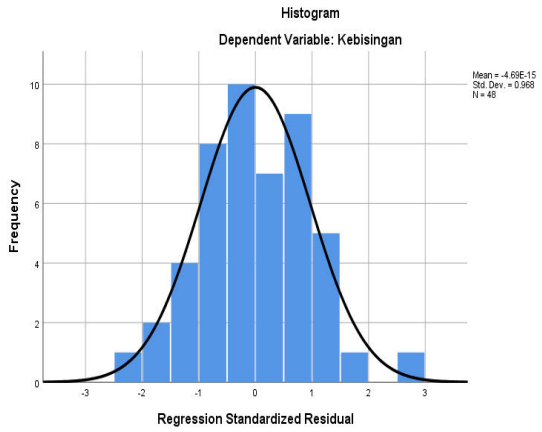

Figure-5. SLM3 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

Statistical Analysis of Data for Tuesday 28 February 2023, Distance 0.00 m with SLM 1.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike volume (SPM/x1), light vehicle volume (KR/x2), and heavy vehicle volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 0.00 m using SLM1. The equation is y = 72.898 - 0.003 x1 + 0.220x2 - 0.054x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 126, which means that x1, x2, and x3 have an effect of 12.6% on y.

The results of the ANOVA test obtained an F-Calculation value = 2.106 with a probability value (sig) = 0.113. From the input data we get the F-Table value = 2.816 so F-Calculate < F-Table, then Ha is rejected and Ho is accepted.

The results of the coefficients test, the volume of motorbikes, the volume of light vehicles, and the volume of heavy vehicles have constant values (ao) = 772.898, (a1) = -0.003, (a2) = 0.002 and (a3) = -0.054. The t-count value = 32.527 and the value (sig) = 0.000, from the data the t-table value = 2.015, then the t-table value > t-table, then Ha is accepted and Ho is rejected.

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn regarding the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is no significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM 1 on Tuesday at a distance of 0.00 m from the edge of the highway.

Table-7. ANOVA test results for SLM 1 with the volume of motorbikes, light vehicles, and heavy vehicles.

ANOVA[b]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	31.599	3	10.533	2.106	.113[b]
	Residual	220.051	44	5.001		
	Total	251.650	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume KR, Volume SPM

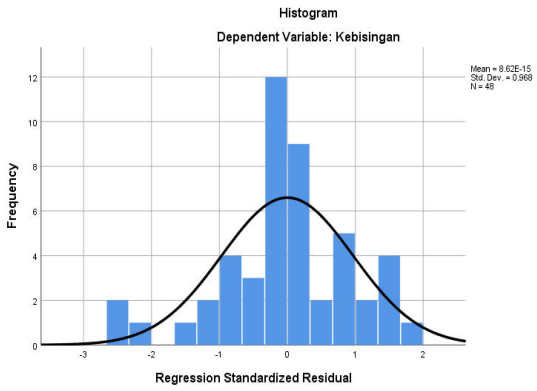

Figure-6. SLM 1 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

Statistical Analysis of Data for Tuesday 28 February 2023, Distance 5.00 m with SLM 2.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike volume (SPM/x1), light vehicle volume (KR/x2), and heavy vehicle k volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 03.00 m using SLM2. The equation is y = 66.619 - 0.002x1 + 0.002x2 - 0.036x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 0.90, which means that x1, x2, and x3 have an effect of 9.0% on y.

The results of the ANOVA test obtained an F-count value = 1.459 with a probability value (sig) = 0.239. From the input data we get the F-Table value = 2.816 so F-Calculate < F-Table, then Ha is rejected and Ho is accepted.

The results of the coefficients test, the volume of motorbikes, the volume of private vehicles, and the volume of public vehicles have constant values (ao) = 66.619, (a1) = -0.002, (a2) = 0.002 and (a3) = 0.036. The t-count value = 31.551 and the value (sig) = 0.000, from the data the t-table value = 2.015, then the t-table value > t-table, then Ha is accepted and Ho is rejected.

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn regarding the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is no significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM2 on Tuesday with a distance of 05.00 m from the edge of the highway.

Table-8. ANOVA test results for SLM 2 with the volume of motorbikes, light vehicles, and heavy vehicles.

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.431	3	6.477	1.459	.239[b]
	Residual	195.319	44	4.439		
	Total	214.750	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume KR, Volume SPM

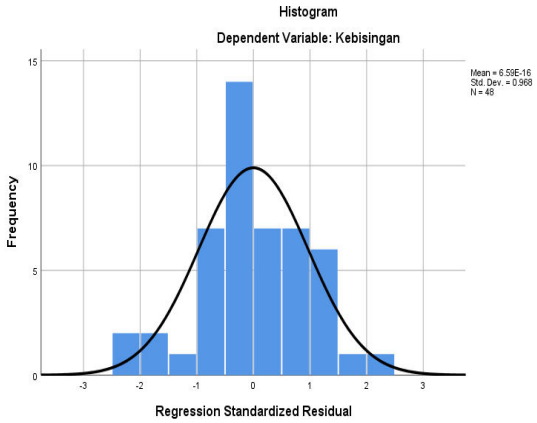

Figure-7. SLM 2 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

Statistical Analysis of Data for Tuesday 28 February 2023, Distance 15.00 m with SLM 3.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike volume (SPM/x1), n light vehicle volume (KR/x2), and heavy vehicle volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 16.00 m using SLM3. The equation is y = 61.969 - 0.002x1 - 0.001x2 - 0.021x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 0.110, which means that x1, x2, and x3 have an effect of 11.0% on y.

The results of the ANOVA test obtained an F-count value = 1.810 with a probability value (sig) = 0.043. From the input data we get the F-Table value = 2.816 so F-Calculate<F-Table, then Ha is rejected and Ho is accepted. The results of the coefficients test, the volume of motorbikes, the volume of light vehicles, and the volume of heavy vehicles have constant values (ao) = 61.969, (a1) = -0.002, (a2) = 0.001 and (a3) = -0.021. Obtained t-count = 34.790 and value (sig) = 0.000, from the data obtained t-table value = 2.015, then t-count > t-table, then Ha is accepted and Ho is rejected

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn about the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is no significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM 3 on the day Tuesday at a distance of 15.00 m from the edge of the highway.

Table-9. ANOVA test results for SLM 3 with the volume of motorbikes, light vehicles, and heavy vehicles.

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.154	3	5.718	1.810	.159[b]
	Residual	138.999	44	3.159		
	Total	156.153	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume KR, Volume SPM

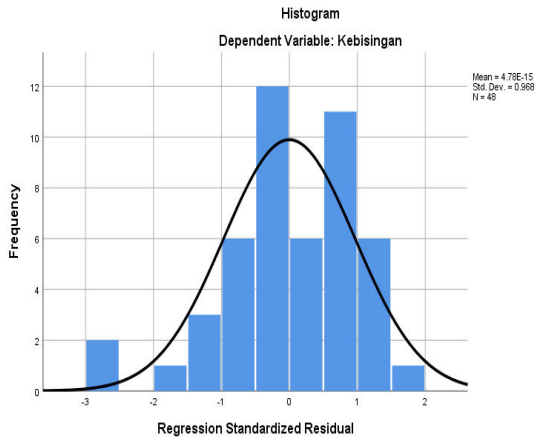

Figure-8. SLM 3 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

Statistical Analysis of Data for Wednesday 01 March 2023, Distance 0.00 m with SLM 1.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike volume (SPM/x1), light vehicle volume (KR/x2), and heavy vehicle volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 0.00 m using SLM1. The equation is y = 72.683 - 0.001x1 + 0.001x2 - 0.041x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 0.42, which means that x1, x2, and x3 have an effect of 4.2% on y.

The results of the ANOVA test obtained an F-Calculation value = 6.42 with a probability value (sig) = 0.592. From the input data we get the F-Table value = 2.816 so F-Calculate> F-Table, then Ha is accepted and Ho is rejected.

The results of the coefficients test, the volume of motorbikes, the volume of light vehicles, and the volume of heavy vehicles have constant values (ao) = 72.683, (a1) = -0.001, (a2) = 0.001 and (a3) = -0.041. The t-count value was 40.238 and the value (sig) = 0.000, from the data we got the t-table value = 2.015, then t-count > t-table, then Ha was accepted and Ho was rejected.

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn regarding the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is a significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM 1 on Wednesday with a distance of 0.00 m from the edge of the highway.

Table-10. ANOVA test results for SLM 1 with the volume of motorbikes, light vehicles, and heavy vehicles.

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.910	3	2.637	.642	.592[b]
	Residual	180.626	44	4.105		
	Total	188.537	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume, KR, Volume SPM

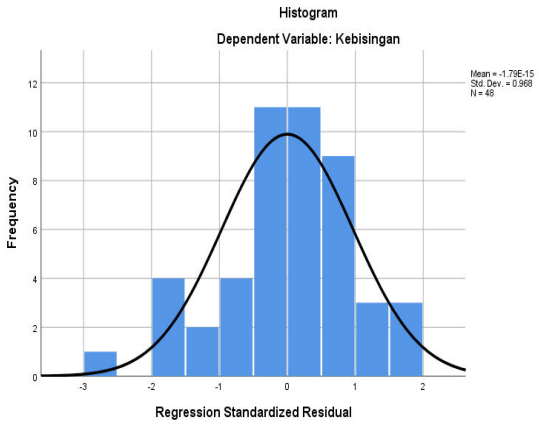

Figure-9. SLM 1 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

Statistical Analysis of Data for Wednesday 01 March 2023, Distance 05.00 m with SLM 2.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike volume (SPM/x1), light vehicle volume (KR/x2), and heavy vehicle volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 03.00 m using SLM2. The equation is y = 67.103 - 0.002x1 + 0.002x2 - 0.036x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 0.66, which means that x1, x2, and x3 have an effect of 6.6% on y.

The results of the ANOVA test obtained an F-Calculation value = 1.039 with a probability value (sig) = 0.385. From the input data we get the F-Table value = 2.816 so F-Calculate < F-Table, then Ha is rejected and Ho is accepted.

The results of the coefficients test, the volume of motorbikes, the volume of light vehicles, and the volume of heavy vehicles have constant values (ao) = 67.103, (a1) = -0.002, (a2) = 0.001 and (a3) = -0.036. The t-count value = 42.479 and the value (sig) = 0.000, from the data the t-table value = 2.015, then the t-table value > t-table, then Ha is accepted and Ho is rejected.

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn about the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is no significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM 2 on the day Wednesday at a distance of 03.00 m from the edge of the highway.

Table-11. ANOVA test results for SLM 2 with the volume of motorbikes, light vehicles, and heavy vehicles.

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.784	3	3.261	1.039	.385[b]
	Residual	138.140	44	3.140		
	Total	147.925	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume KR, Volume SPM

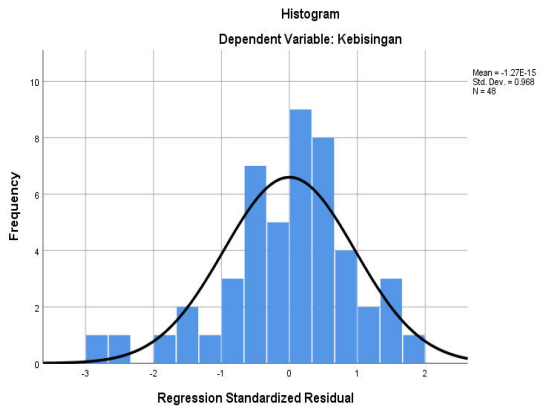

Figure-10. SLM 2 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

Statistical Analysis of Data for Wednesday 01 March 2023, Distance 15.00 m with SLM 3.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike volume (SPM/x1), light vehicle volume (KR/x2), and heavy vehicle volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 16.00 m using SLM3. The equation is y = 62.409 - 0.002x1 + 0.001x2 - 0.040x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 0.62, which means that x1, x2, and x3 have an effect of 6.2% on y.

The results of the ANOVA test obtained an F-count value = 9.63 with a probability value (sig) = 0.419. From the input data we get the F-Table value = 2.816 so F-Calculate> F-Table, then Ha is accepted and Ho is rejected.

The results of the coefficients test, the volume of motorbikes, the volume of private vehicles, and the volume of public vehicles have constant values (ao) = 62.409, (a1) = - 00021, (a2) = 0.001 and (a3) = - 0.040. The t-count value = 38.602 and the value (sig) = 0.000, from the data the t-table value = 2.015, then the t-table value > t-table, then Ha is accepted and Ho is rejected.

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn regarding the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is a significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM 3 on Wednesday with a distance of 16.00 m from the edge of the highway.

Table-12. ANOVA test results for SLM 3 with the volume of motorbikes, private vehicles, and public transportation.

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	30.324	9.498	3	3.166	.963	.419[b]
	Residual	144.701	44	3.289		
	Total	154.199	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume KR, Volume SPM

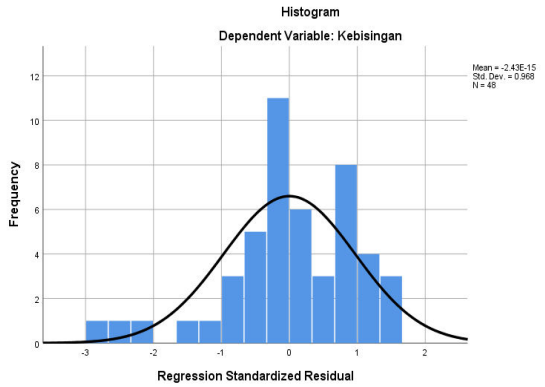

Figure-11. SLM 3 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

Statistical Analysis of Data for Saturday 11 March 2023, Distance 0.00 m with SLM 1.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike speed (SPM/x1), light vehicle volume (KR/x2), and heavy vehicle volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 0.00 m using SLM1. The equation is y = 74.683 - 0.002 + 0.001x2 + 0.087x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 0.93, which means that x1, x2, and x3 have an effect of 9.3% on y.

The results of the ANOVA test obtained an F-Calculation value = 1.496 with a probability value (sig) = 0.229. From the input data we get the F-Table value = 2.816 so F-Calculate < F-Table, then Ha is rejected and Ho is accepted.

The results of the coefficients test, the volume of motorbikes, the volume of light vehicles, and the volume of heavy vehicles have constant values (ao) = 74.683, (a1) = -0.002 (a2) = 0.001 and (a3) = 0.087. The t-count value = 49.212 and the value (sig) = 0.000, from the data the t-table value = 2.015, then the t-table value > t-table, then Ha is accepted and Ho is rejected.

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn regarding the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is no significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM 1 on the day Saturday with a distance of 0.00 m from the edge of the highway.

Table-13. ANOVA test results for SLM1 with the volume of motorbikes, light vehicles, and heavy vehicles.

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.316	3	6.105	1.496	.229[b]
	Residual	179.529	44	4.080		
	Total	197.845	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume SPM, Volume KR

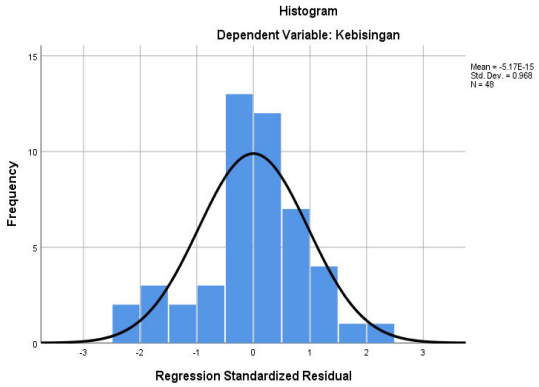

Figure-12. SLM 1 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

Statistical Analysis of Data for Saturday 11 March 2023, Distance 05.00 m with SLM2.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike speed (SPM/x1), light vehicle volume (KR/x2), and heavy vehicle volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 03.00 m using SLM2. The equation is y = 67.961 - 0.001 - 0.001x2 + 0.073x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 0.63, which means that x1, x2, and x3 have an effect of 6.3% on y.

The results of the ANOVA test obtained an F-count value = 9.84 with a probability value (sig) = 0.409. From the input data we get the F-Table value = 2.816 so F-Calculate> F-Table, then Ha is accepted and Ho is rejected.

The results of the coefficients test, the volume of motorbikes, the volume of light vehicles, and the volume of heavy vehicles have constant values (ao) = 67.961, (a1) = -0.001, (a2) = -0.001 and (a3) = 0.073. The t-count value = 51.114 and the value (sig) = 0.000, from the data the t-table value = 2.015, then the t-table value > t-table, then Ha is accepted and Ho is rejected.

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn regarding the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is a significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM 2 on Saturday with a distance of 03.00 m from the edge of the highway.

Table-14. ANOVA test results for SLM2 with the volume of motorbikes, light vehicles, and heavy vehicles.

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.250	3	3.083	.984	.409[b]
	Residual	137.807	44	3.132		
	Total	147.057	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume SPM, Volume KR

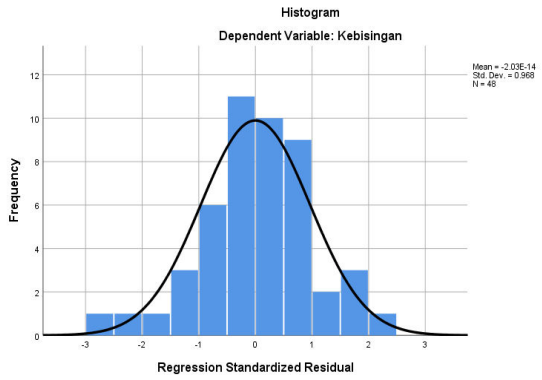

Figure-13. SLM 2 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

Statistical Analysis of Data from Saturday 11 March 2013, Distance 15.00 m with SLM 3.

Data analysis and processing using SPSS version 25 obtained noise level (y), motorbike volume (SPM/x1), light vehicle volume (KR/x2), and heavy vehicle volume (KB/x3), based on a 95% confidence level. The results of the equation using the data above are presented in the form of the equation below, which represents a distance of 16.00 m using SLM3. The equation is y = 63.419 - 0.001x1 + 0.000x2 + 0.066x3.

- Test criteria

The results of testing the summary model obtained a value of RSquare = 0.70, which means that x1, x2, and x3 have an effect of 7.0% on y.

The ANOVA test results obtained an F-count value = 1.096 with a probability value (sig) = 0.361. From the input data we get the F-Table value = 2.816 so F-Calculate < F-Table, then Ha is rejected and Ho is accepted.

The results of the coefficients test, the volume of motorbikes, the volume of light vehicles, and the volume of heavy vehicles have constant values (ao) = 63.412, (a1) = -0.001, (a2) = 0.000 and (a3) = 0.066. The t-count value = 51.580 and the value (sig) = 0.000, from the data the t-table value = 2.015, then the t-table value > t-table, then Ha is accepted and Ho is rejected.

- Hypothetical decisions

From the results of the statistical tests above, a hypothesis can be drawn regarding the influence of motorbike vehicle volume, light vehicle volume, and heavy vehicle volume, that there is a significant influence between motorbike vehicle volume, light vehicle volume, and heavy vehicle volume on the noise that occurs at SLM 3 on Saturday with a distance of 15.00 m from the edge of the highway.

Table-15. ANOVA test results for SLM3 with the volume of motorbikes, light vehicles, and heavy vehicles.

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.801	3	2.934	1.096	.361[b]
	Residual	117.819	44	2.678		
	Total	126.619	47			

a. Dependent Variable: Noise
b. Predictors: (Constant), Volume KB, Volume SPM, Volume KR

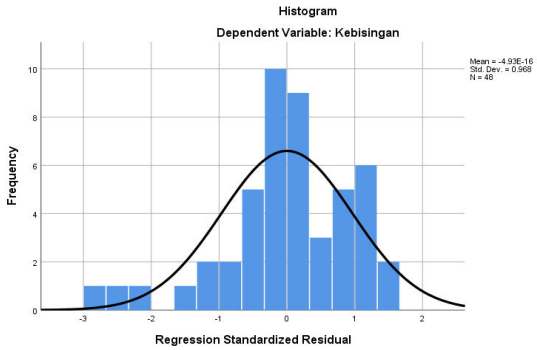

Figure-14. SLM3 histogram for the volume of motorbikes, light vehicles, and heavy vehicles.

DISCUSSIONS

Based on the results displayed above, the effect of noise on the volume of motorized vehicles is as in Table 16 below.

Table-16. Equations during the 4-day study.

No	Description	Equality	Distance
1	Monday/27-2-2023	y = 70,429 – 0,001x1 + 0,002x2 + 0,007x3.	0,00m
2	Monday/27-2-2023	y = 65,414 + 0,000x1 + 0,001x2 + 0,012x3.	0,50m
3	Monday/27-2-2023	y = 60,341 - 0,001x1 + 0,002x2 - 0,003x3.	15,00m
4	Tuesday/28-2-2023	y = 72,898 - 0,003 x1 + 0,220x2 - 0,054x3.	0,00m
5	Tuesday/28-2-2023	y = 66,619 - 0,002x1 + 0,002x2 - 0,036x3.	0,50m
6	Tuesday/28-2-2023	y = 61,969 - 0,002x1 - 0,001x2 - 0,021x3.	15,00m
7	Wednesday/01-3-2023	y = 72,683 - 0,001x1 + 0,001x2 - 0,041x3.	0,00m
8	Wednesday/01-3-2023	y = 67,103 - 0,002x1 + 0,002x2 - 0,036x3.	0,50m
9	Wednesday/01-3-2023	y = 62,409 - 0,002x1 + 0,001x2 - 0,040x3.	15,00m
10	Saturday/11-3-2023	y = 74.683 - 0.002 + 0.001x2 + 0.087x3.	0,00m
11	Saturday/11-3-2023	y = 67.961 - 0.001 - 0.001x2 + 0.073x3.	0,50m
12	Saturday/11-3-2023	y = 63.419 - 0.001x1 + 0.000x2 + 0.066x3.	15,00m

Based on Table-16 above, the furthest opportunity is 15 meters from the main road, which means that the contribution is 11.0% based on the equation calculation below, y = 61.969 - 0.002x1 - 0.001x2 - 0.021x3, the meaning of this equation is if there is increasing the volume of motorbikes, the volume of light vehicles and the volume of heavy vehicles, the noise at SLM 3 is 61.969 dBA. So there is an increase in the number of vehicles by 0.002 and a decrease in the number of motorbikes and public transportation by -0.001, so there will be an increase in noise by 0.001 dBA at SLM 3.

CONCLUSIONS

The volume of motorbikes and the volume of light vehicles and heavy vehicles have a significant influence on noise. From all analytical calculations, the greatest similarity was found on the second day of research, point one (Sound Level Meter 1), with a contribution of 12.6%. The following calculations are obtained, y = 72.898 - 0.003 x1 + 0.220x2 - 0.054x3. The equation means that if there is no decrease in the volume of motorbikes, the volume of light vehicles, and the volume of heavy vehicles, the noise level at SLM 1 is 72.898 dBA. However, if there is an increase in the number of light vehicles by 0.220, there will be a decrease in the number of motorbikes and large vehicles by 0.22, then the noise level will increase by 0.003 dBA. If this happens, the volume of motorbikes, light vehicles, and heavy vehicles also has a significant influence on noise. The second largest equation was obtained on the second day of research at the third point (Sound Level Meter 3) with a contribution of 11.0% based on the calculation of the equation below, y = 61.969 - 0.002x1 - 0.001x2 - 0.021x3, the meaning of this equation is if there is increasing the volume of motorbikes, the volume of light vehicles and the volume of heavy vehicles, the noise at SLM 3 is 61.969 dBA. So there is an increase in the number of vehicles by 0.002 and a decrease in the number of motorbikes and public transportation by -0.001, so there will be an increase in noise by 0.001 dBA at SLM 3.

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REFERENCES

[1] S. Djalante. 2010. Analisis tingkat Noise di jalan raya yang menggunakan alat pemberi isyarat lalu lintas (APILL) (Studi kasus: Simpang Ade Swalayan). SMARTek. 8(4).

[2] Menteri Lingkungan Hidup. 1996. Buku Tingkat Noise, Surat Keputusan Menteri Lingkungan Hidup

Nomor: Kep-48/MENLH/1996/25 November 1996. Jakarta.

[3] Aghnia R. A., Woro P. M., Muhammad A. 2021. Analisis Pengaruh Kecepatan dan Volume Kendaraan Terhadap Noise Di Suatu Kawasan. Jurnal Rekayasa Infrastruktur Sipil, 02(1): 1-8, Agustus 2021 Universitas Tidar Magelang.

[4] Didin S., Rulhendri. 2019. Kajian Tentang Pengaruh Kepadatan Lalu Lintas Terhadap Noise Yang Ditimbulkan Kendaraan Bermotor. Jurnal Teknik Sipil, 8(1), Juni 2019 Universitas Ibn Khaldun Bogor.

[5] Fernanda G. R., Mutia R. S., Angga M. S. 2017. Analisi Pengaruh Volume dan Kecepatan Kendaraan Terhadap Tingkat Noise Pada Jalan Dr. Djunjunan di Kota Bandung. Industrial Research Workshop and Seminar, July 2017 Politeknik Negeri Bandung.

[6] Anonim, 1997. Departemen Pekerjaan Umum Direktorat Jenderal Bina Marga, Pebruari 1997 Manual Kapasitas Jalan Indonesia (MKJI). Jakarta.

[7] Peraturan Pemerintah Republik Indonesia. 1985. PP. Nomor 26 Tahun 1985 tentang Jalan Kementerian Pekerjaan Umum dan Perumahan Rakyat - Departemen Pekerjaan Umum Direktorat Jenderal Bina Marga Penerbit Kementerian Pekerjaan Umum dan Perumahan Rakyat. Jakarta.

[8] IBM SPSS Statistics_25.0. x. Diakses 10 Maret 2023 Pukul 12.00. WIB.

[9] S. Syaiful, 2005. Analisis Noise Arus Lalu Lintas dan Geometri Jalan di Kawasan Simpang Lima Kota Semarang. Diponegoro University (Institutional Repository).

[10] S. Syaiful, N. Wahid. 2020. A Study of The Density of Motor Vehicles in Front of Bunda Hospital Margonda Depok Against Noise Pollution, The Spirit of Society Journal. 3(2).

[11] S. Syaiful, R. Andana. 2021. Passenger Car Speed Assessment Relationship to the Noise Caused. ASTONJADRO. 10(1): 41-49.

[12] S. Syaiful, H. Siregar, E. Rustiadi, E. S. Hariyadi, M. N. Prayudyanto, Rulhendri Rulhendri. 2022. Noise from the traffic volume of motorcycles during the Covid-19 pandemic: A case study of Wiyata Mandala Junior High School Bogor. Sustinere: Journal of Environment and Sustainability. 6(1): 44-54.

[13] S. Syaiful, H. Siregar, E. Rustiadi, E. S. Hariyadi, F. A. D. Ardila, C. F. R. Akbar. 2021. Traffic Density Due to Motorcycle Noise during the Pandemic Covid-19. ASTONJADRO. 11(1): 151-166.

[14] Syaiful Syaiful, Hermanto Siregar, Ernan Rustiadi, Eri Susanto Hariyadi. 2022. Performance of Three Arms Signalized Intersection at Salabenda in Bogor Regency, ASTONJADRO. 11(1): 13-29.

[15] S. Syaiful, H. Siregar, E. Rustiadi, E. S. Hariyadi. 2022. Model Rekayasa Lalu lintas dalam Sistem Transportasi dengan Pola Kerjasama antar Wilayah Berkelanjutan di Kota Bogor. IPB University.

[16] S. Syaiful, H. Rusfana. 2022. Rigid Pavement Planning in Traffic: Case Study in Ciherang Road and Pemuda Road, Bogor Regency, Indonesia. Journal of Applied Engineering Science. 1-13.

[17] S. Syaiful, Y. Pratama. 2019. Sustainable Studies about General Public Transport Performance in the City of Bogor, ARPN Journal of Engineering and Applied Sciences. 14(18): 3241-3247.

[18] S. Syaiful, D. Hariyadi. 2019. Case Study on Sustainable T-Jungtion Cibinong City Mall (CCM) in Bogor Indonesia, ARPN Journal of Engineering and Applied Sciences. 14(17): 2960-2971.

[19] S. Syaiful, H. Prayoga, J. Akbardin. 2020. Sustainable about the Need of Parking Systems at the Mall RDS Bogor, ARPN Journal of Engineering and Applied Sciences. 15(22): 2620-2626.

[20] S. Syaiful, A. Fadly. 2020. Analysis of the Effectiveness of Bus Services Outside of Campus IPB Dramaga Bogor. ASTONJADRO. 9(2): 173-186.

[21] S. Syaiful, H. Siregar, E. Rustiadi, E. S. Hariyadi. 2021. Traffic Improvement Strategy in Transportation System Using AHP Method. ARPN Journal of Engineering and Applied Sciences. 16(22): 2431-2439.

[22] Syaiful Syaiful, Renea Shinta Aminda, Yuggo Afrianto. 2023. Influence motorcycle density on noise sound at the highway. ASTONJADRO. 12(1): 304-313.

[23] S. Syaiful, P. Pratikso, S. W. Mudjanarko. 2023. Literature Study of the Sustainability Model of Transportation Facilities and Infrastructure in the Management of Public Transportation with the

Concept of Inter-Regional Cooperation (Case in the City and District of Bogor). ASTONJADRO. 12(2): 613-634.

[24] S. Syaiful, L. Lasmana. 2020. A Study on Level of Railway Road Damage with Sustainable PCI Method. ARPN Journal of Engineering and Applied Sciences. 15(8): 962-968, 25.

[25] S. Syaiful. 2020. Analysis of the Addition of Fiber the Strong Bending Mixed Concrete. ARPN Journal of Engineering and Applied Sciences. 15(6): 724-729.

[26] S. Syaiful. 2021. Additional Betonmix to Increase the Strength of Concrete Press. ARPN Journal of Engineering and Applied Sciences. 16(15): 1583-1589.

[27] J. Akbardin, D. Parikesit, B. Riyanto, A. T. Mulyono, S. Syaiful. 2020. Modelling of Trips Assignment Analysis for Roads Network System Based on Transportation Needs of Export Commodity. ARPN Journal of Engineering and Applied Sciences. 15(21): 2463-2470.

[28] S. Syaiful, H. Siregar, E. Rustiadi, E. S. Hariyadi. 2021. Traffic Improvement Strategy in Transportation System Using AHP Method. ARPN Journal of Engineering and Applied Sciences. 16(22): 2431-2439.

[29] D. Rimantho, S. Syaiful, N. Nurfaida, U. Sulandari. 2022. Electronic waste bank model as a solution for implementing circular economy: case study DKI Jakarta-Indonesia. Frontiers in Built Environment. 1(1): 01-13.

[30] S. Syaiful, H. Siregar, E. Rustiadi, E. S. Hariyadi, E. Sutoyo, B. Hartono. Formulate and Evaluate Transportation Infrastructure Facilities and Traffic Signs at Intersections. ARPN Journal of Engineering and Applied Sciences 17(4): 475-490.

[31] Biro Pusat Statistik. 2020.