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Research paper

Sustainable relationships volume traffic towards noise inside motorcycle and non-motorcycles in the city Bogor

Syaiful Syaiful [1, 2] *, Asep Mulyadi [1]

[1] *Civil Engineering Departement Ibn Khaldun University Bogor, Indonesia*
[2] *Doctoral Student Multidisciplinary Program, Bogor Agricultural University*
**Corresponding author E-mail: syaiful@ft.uika-bogor.ac.id*

Abstract

Motorcycles on the highway produce very varied noise. Noise also has a considerable impact on tranquility and comfort in areas directly in contact with roads. This research examines school *SDN I Cibuluh No. 222, Bogor*. The work steps are to measure the distance of the school area by the highway, take the traffic data and measure the noise level. The methods are (1) literature review, (2) initial survey, (3) data collection stage, (4) primary and secondary data processing, (5) analyzing data, and (6) drawing conclusions. The result of calculation shows that the relation of volume of motorcycle (x1) to noise (y) is 17,8% and the non motorcycle volume (x2) with noise is 3,8%. The conclusion obtained is that based on existing regulations for schools the allowable data of 55 dB_A means that it is above the permissible threshold. The continuity of the vehicle volume relation with noise is very significant.

Keywords: *Noise; Non Motorcycle; Motorcycle; Sustainability; Volume.*

1. Introduction

The development of roads, especially in the main city of Bogor, has not been aligned with the growth of traffic and increasing vehicles [1-3]. Noise can cause discomfort or increased stress, confusion, and can increase emotions [4-6]. If at the time of learning will be disruptive and ineffective [7], [8]. Students need concentration when in luck [9], [10]. The sound quality is determined by the frequency and intensity of sound/unit area. Whereas noise is an unexpected source of sound but can not be denied and may interfere with hearing [11-13]. The causes of noise sources from this research are continuous, simultaneous and once motorcycle. Further to the threshold of the quality standard for noise is otherwise fatal and not exceeding 8 hours a day [14].

1.1. Motor vehicle traffic

Volume of motorcycle means counting the number of vehicles passing through a certain point. Calculate volume, speed and density using the formula below.

$$Vi = s/t \quad (1)$$

$$V = (V_{SPM} \times n_{SPM}) + (V_{NSPM} \times n_{NSPM}) / n_{spm} + n_{nspm} \quad (2)$$

Vi = Sped of each vehicle (km/hour)
V = average speed of vehicle (km/hour)
s = distance traveled at certain time period (km)
t = travel time (hour)
n_{SPM}, n_{NSPM}, = number of samples for motorcycle (SPM), non motorcycle (NSPM).
Volume (Q) dan total Volume (Q_{total}) are calculated by the equation:

$$Q = n/t \quad (3)$$

$$Q_{Total} = Q_{SMP} + Q_{NSPM} \quad (4)$$

With:
Q = volume of vehicle (vehicle/hour)
Q_{SPM}, Q_{NSPM} = volume of each vehicle type (vehicle/hour)
N = number of vehicles (vehicles)
T = observation time interval (hour)
Density is calculated based on the value of velocity and current. Formulated:

$$D = q/V_{sms} \quad (5)$$

With:

q = flow (smp/hours) dan V_{sms} = Space mean speed (km/hours)

1.2. Volume of motorcycle and non motorcycle

In determining the speed of the vehicle is at high speed motorcycles remain unverified and the continuous arrangement for the rider by improving the stability. Most motorcycles use high gears that produce high noise as well [15]. Statistical data of the research in this study is quantitative that is considered and included in the data continuum ordinal data group [16]. To get the population the way is to have the quality set by the researcher in studying the collection of individuals something then drawn the conclusion. While the sample means to count the number and characteristics and is part of the population. Determining the sampling technique is sampling and determining a research and schematically various sampling techniques [17], [18].

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$$n = [N/ (N(d^2) + 1)] \quad (6)$$

With:
n = sample
N = population
d = precision value (0, 05)
Supported also with the economic development of the city of Bogor the better. If the increased volume of motor vehicles, the noise will also increase [19-21].

2. Materials and methods

The aim of this research 1) Getting the relationship of traffic volume of motorcycle and non motorcycle to noise level and 2) Determine the sustainability of the noise levels obtained in front of the school due to the presence of motorcycles and non motorcycles.

2.1. Place and research methods

Place and location of research is *Bogor-Jakarta, SDN 1 Cibuluh No. 222 Bogor*, West Java Indonesia.

Fig. 1: Research sites.

2.2. The research method is presented in the following flow diagram

The following shows the research methodology based on Figure 2 below.

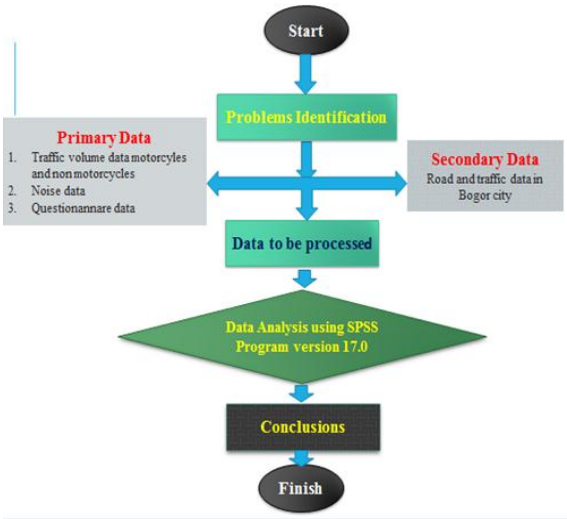

Fig. 2: Flowchart of research method.

3. Results and discussion

Traffic volume data obtained without adding calculation of Passenger car equivalents [7].
That is HV = 1,30, LV = 1,00, Motorcycle = 0,4, non motorcycle = 1,00.

3.1. The results of traffic volume on the first day, the second day, the third day and the fourth day

1) On the first day the highest volume of motorcycles is 10.868,00 cycles/hour, between 07.30 - 07.45. While non motorcycles amounted to 1.636,00 cycles/hour, between 12:15 to 12:30. For the lowest volume of motorcycles at 972,00 cycles/hour, between 06.00 and 06.15, while non motorcycle volume is 240,40 cycles/hour, between 17.45 - 18.00.
2) For the second day the highest volume of motorcycles is 7.668,00 cycles/hour, between 16.45 - 17.00, while non motorcycles are 1.260,00 cycles/hour, between 09.30 - 09.45. For the lowest volume results on motorcycle traffic of 1.968,00 cycles/hour, which occurred at 09.45 - 10.00 hours while for non motorcycle traffic 329,60 cycles/hour, between 17.45 - 18.00.
3) The third day of the highest volume results for motorcycle traffic of 14.768,00 cycles/hour, which occurred at 06.30 - 06.45, while for non motorcycle traffic of 1.540,00 cycles/hour, which occurred at at 16.30 - 16.45. For the lowest volume results on motorcycle traffic of 1.472,00 cycles/hour, which occurred at 17.45 - 18.00 while for non motorcycle traffic of 157,90 cycles/hour, which occurred at 17.45 – 18.00.
4) The fourth day was obtained the highest volume for motorcycle traffic of 9.244,00 cycles/hour, which occurred at 06.30 - 06.45, while for non motorcycle traffic of 1.848,00 cycles/hour, which occurred at 15.30 - 15.45. For the lowest volume results on motorcycles traffic of 792,00 cycles/hour, which occurred at 12.15 - 12.30 hours while for non motorcycle traffic 284,96 cycles/hour, which occurred at 17.45 – 18.00.

For more details, it is presented in the form of Figure 3, Figure 4, Figure 5, and Figure 6 as below.

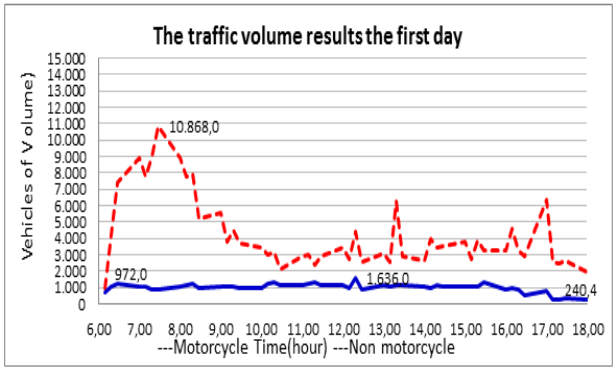

Fig. 3: Results of traffic volume on the First day.

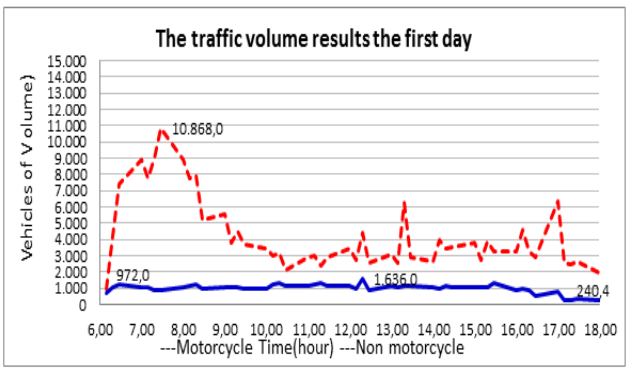

Fig. 4: Result of traffic volume on the Second day.

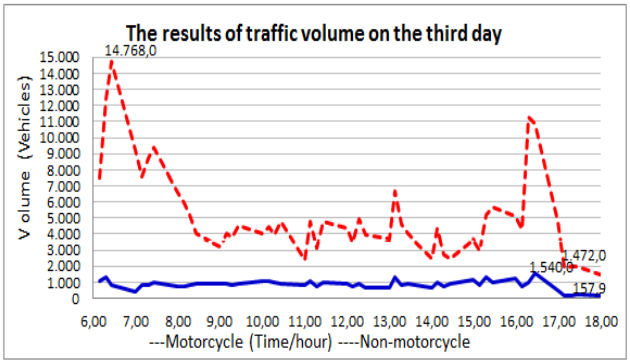

Fig. 5: Result of traffic volume on the Third day.

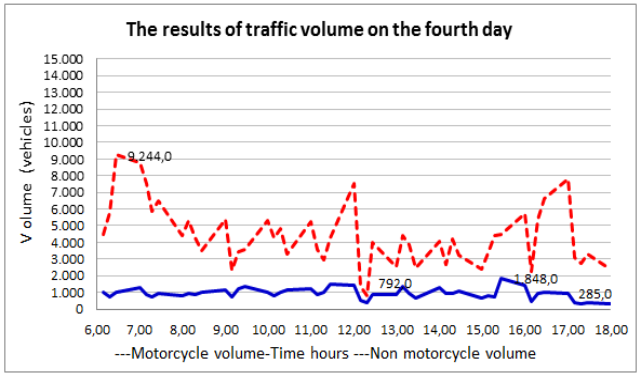

Fig. 6: Result of traffic volume on the Fourth day.

3.2. Sound level meter results the first day, the second day, the third day and the fourth day

1) The first day was obtained the highest noise result in SLM 1 of 100,00 dB_A, which occurred at 06.45 - 07.00, at SLM 2 of 90,50 dB_A that occurred at 09.45 - 10.00, and at SLM 3 of 84,00 which occurred at 13.00 - 13.15 hours. For the lowest noise results in SLM 1 of 79,70 dB_A, which occurred at 10.00 - 10.15, at SLM 2 of 69,90 dB_A that occurred at 11:30 to 11:45, at SLM 3 of 66,60 which occurred at 14.45 – 15.00. And on this day the average noise figure in SLM 1 of 89,00 dB_A, in SLM 2 of 78,00 dB_A, and in SLM 3 of 72,30 dB_A.
2) On the second day was obtained the highest noise result in SLM 1 of 93,10 dB_A, which happened at 16.00 - 16.15, at SLM 2 equal to 84,7 dB_A happened at 11.00 - 11.15, and at SLM 3 equal to 81,20 which occurred at 17.15 - 17.30. For the lowest noise results in SLM 1 of 77,70 dB_A, which occurred at 12:15 to 12:30 hours, in SLM 2 of 66,40 dB_A that occurred at 10:30 to 10:45, at SLM 3 of 61,00 which occurred at 15.00 - 15.15. And on this day the average noise figure in SLM 1 is 84,90 dB_A, SLM 2 is 75,90 dB_A, and SLM 3 is 70,40 dB_A.
3) While the third day obtained the highest noise results in SLM 1 of 94,60 dB_A, which occurred at 07.00 - 07.15, in SLM 2 of 87,20 dBA that occurred at 15:45 to 16:00, and in SLM 3 of 80,80 which happened at 06.30 - 06.45. For the lowest noise results in SLM 1 of 77,70 dB_A, which occurred at 12:15 to 12:30 hours, at SLM 2 of 66,40 dB_A that occurred at 10:30 to 10:45, at SLM 3 of 63,20 which occurred at 12.30 - 12.45. And on this day the average noise figure in SLM 1 is 85,70 dB_A, SLM 2 is 76,90 dB_A, and in SLM 3 is 70,50 dB_A.
4) For the fourth day, the highest noise result in SLM 1 was 96,40 dB_A, which happened at 07.00 - 07.15, at SLM 2 88,70 dB_A happened at 13.45 - 14.00, and in SLM 3 78,80 which occurred at 13.15 - 13.30. For the lowest noise result in SLM 1 is 75,60 dB_A, happened at 09.15 - 09.30, at SLM 2 equal to 68,60 dB_A happened at 12.45 - 13.00, at SLM 3 equal to 64,50 happened at 12.00 - 12.15. And on this day average noise figure in SLM 1 is 85,80 dB_A, SLM 2 is 77,80 dB_A, and SLM 3 is 71,10 dB_A.

More details will be displayed in the form of a diagram in Figure 7, Figure 8, Figure 9 dan figure 10 below.

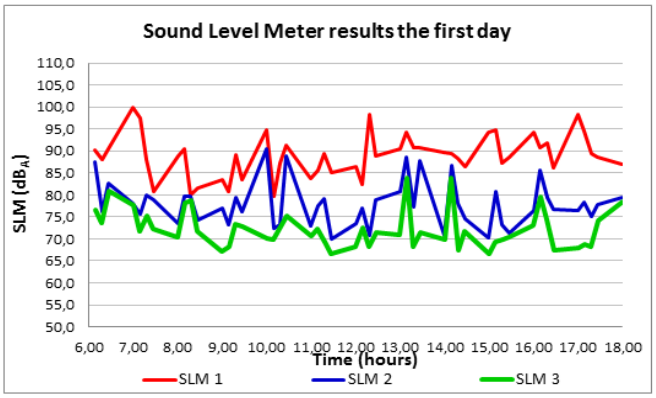

Fig. 7: The First day of Sound level meters.

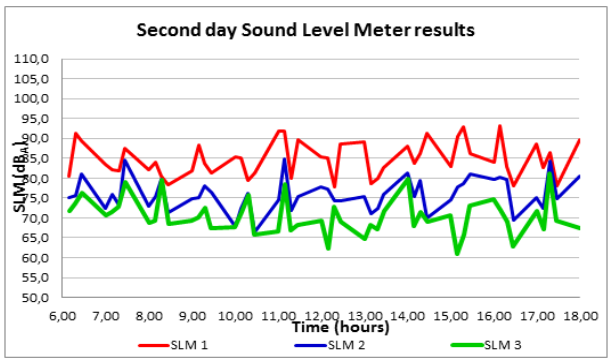

Fig. 8: The Second day of Sound level meters.

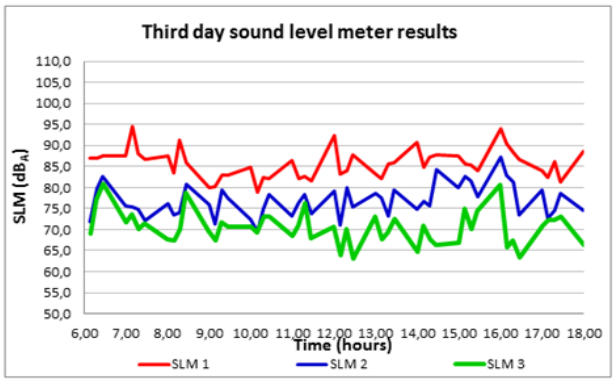

Fig. 9: The Third day of Sound level meters.

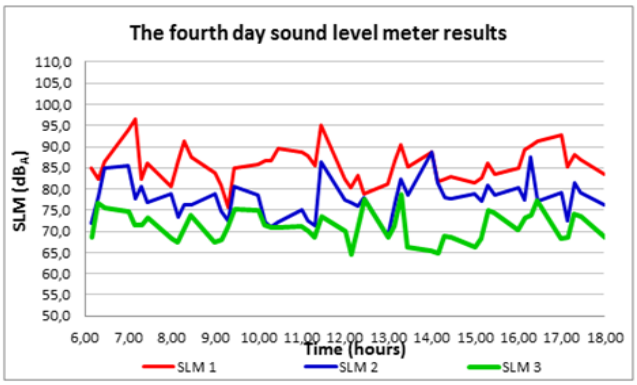

Fig. 10: The Fourth day of Sound level meters.

3.3. Results obtained from the questionnaire data

In taking the number of sample questionnaire is based on the calculation of population data from the population distribution in sub district North Bogor, Bogor City.

Table 1: The population distribution of Bogor City in 2009 is shown in data [22]

No	Sub district	Total population	Distribution (%)	Population density (soul/Ha)
1	Southern Bogor	180.270	19	59
2	Eastern Bogor	94.722	10	93
3	Bogor North	166.943	17	94
4	Middle Bogor	112.425	11	138
5	Western Bogor	205.997	21	63
6	Tanah Sareal	185.847	19	99
	Bogor City	946.204	100	80

As for the projected population in district North Bogor, Bogor City can be taken from the projection of population of Bogor City in 2013 which is shown by the data in Table 2.

Table 2: Projected population of Bogor City in 2013 [22]

No	Sub district	population (soul) Projected			
		2013	2018	2023	2028
1	Southern Bogor	207.064	236.995	271.251	310.460
2	Eastern Bogor	108.896	125.768	145.255	167.761
3	Bogor North	210.223	261.796	326.022	406.005
4	Middle Bogor	112.472	115.415	118.435	121.534
5	Western Bogor	231.186	262725	298567	339298
6	Tanah Sareal	203.901	238.984	280.103	328.296
Total		1.073.742	1.241.683	1.439.633	1.673.354

3.4. Sample

In determining the number of samples in this study determined by using the Slovin formula in equation (6):
In can results:

$$n = [\{210.223/(210.223 \times (0,05)+ 1)]$$

$$n = 399,24 \approx 400$$

So the result of the calculation of the number of questionnaires taken in 400 people who are scattered and move in the northern region of Bogor, especially in the area around *SDN 1 Cibuluh No. 222* Bogor City.
The implementation of the questionnaire was made in 7 questions and each of the 3 answers, (a) yes disturbed, b) sometimes disturbed, c) undisturbed). In 400 respondents are grouped into 3 groups namely, respondents students, teachers and employees and community groups. Of the three groups in the results obtained as follows:
1) Student respondents
From a total of 70 respondents the students replied:
a. Choice (a) yes disturbed, as many as 172,
b. Options (b) sometimes, as many as 226, and
c. Choice (c) not disturbed, as many as 92.
Shown in Figure 11 below.

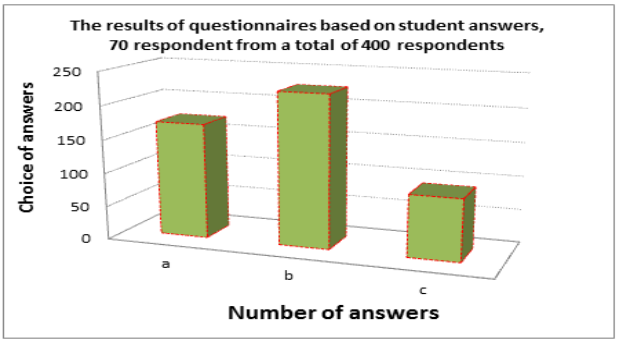

Fig. 11: Results of the Questionaires based on Student.

2) Respondents teachers and employees
Out of a total of 15 teachers and staff responded:
a. Choice (a) yes disturbed, as many as 14,
b. Options (b) sometimes, as many as 58 and
c. Choice (c) disturbed, as many as 33.
Shown in Figure 12 below.

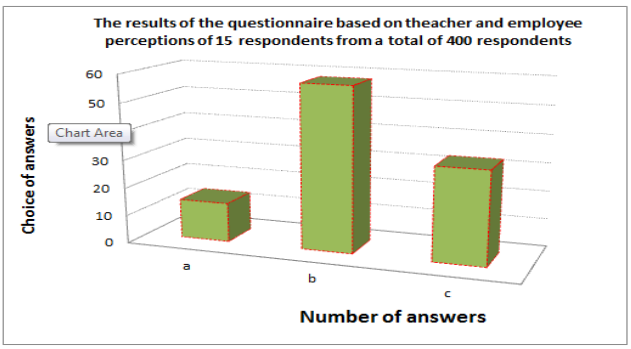

Fig. 12: Results of the Questionaires based on Theacer and Employees.

3) Respondents public perceptions/community
Of the total 315 people responded:
a. Choice (a) yes disturbed, as many as 542,
b. Options (b) sometimes, as many as 1.069 and
c. Choice (c) not disturbed, as many as 593.
Shown in Figure 13 below.

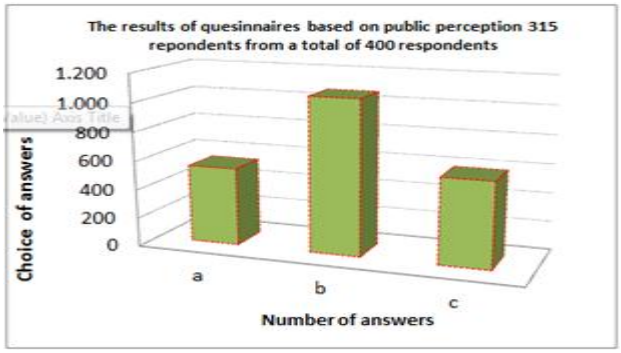

Fig. 13: Results of the Questionaires based on Public Perceptions/Community.

3.5. Multiple regression analysis results

1) The result of multiple regression statistic analysis the first day
   a. Results of multiple regression statistical analysis SLM 1 distance 0,00 m from the highway. The calculation results are in obtaining the mean value for SLM 1 of 89,0063 dB_A, for motorcycles of 4.078 cycles/hour and non motorcycles of 1.005 cycles/hour.
   b. The results of multiple regression statistical analysis SLM 2 distance 5,12 m from the highway. The calculation results obtained in the mean value for SLM 2 of 77,9896 dB_A, for motorcycles 4.078 cycles/hour and non motorcyccles for 1.005 cycles/hour.
   c. The result of multiple regression analysis of SLM 3 distance of 10,24 m from highway. The calculation results are in get the mean value for SLM 3 is 72,3250 dB_A, for motorcycle 4.078 cycles/hour and non motorcycle equal to 1.005 cycles/hour.
2) The results of multiple regression statistical analysis on the second day
   a. Results of multiple regression statistical analysis SLM 1 distance 0,00 m from the highway. The calculation result is got the mean value for SLM 1 equal to 84,8667 dB_A, for motorcycle 4488 cycles/hour and non motorcycle equal to 819 cycles/hour.
   b. The results of multiple regression statistical analysis SLM 2 distance 5,12 m from the highway. The calculation results obtained in the mean value for SLM 2 is 75,9188 dB_A, for

motorcycle 4.488 cycles/hour and non motorcycle equal to 819 cycles/hour.

c. The result of multiple regression analysis of SLM 3 distance of 10,24 m from highway. The calculation result is got the mean value for SLM 3 is 70,4375 dB_A, for motorcycle 4.488 cycles/hour and non motorcycle equal to 819 cycles/hour.

3) The results of multiple regression statistical analysis on the third day

a. Results of multiple regression statistical analysis SLM 1 distance 0,00 m from the highway. The calculation results obtained in the mean value for SLM 1 is 85,6854 dB_A, for motorcycle 5.166 cycles/hour and non motorcycle equal to 854 cycles/hour.

b. The results of multiple regression statistical analysis SLM 2 distance 5,12 m from the highway. The calculation results obtained in the mean value for SLM 2 of 76,8875 dB_A, for motorcycles 5.166 cycles/hour and non motorcycles of 854 cycles/hour.

c. Multiple regression analysis of SLM 3 distance of 10,24 m from highway. The calculation results obtained in the mean value for SLM 3 of 70,5333 dB_A, for motorcycles 5.166 cycles/hour and non motorcycles of 854 cycles/hour.

4) The results of statistical analysis of multiple regression on the fourth day

a. Results of multiple regression statistical analysis SLM 1 distance 0,00 m from the highway. The calculation results obtained in the mean value for SLM 1 of 85,8229 dB_A, for motorcycles 4.359 cycles/hour and non motorcycle 927 cycles/hour.

b. The results of multiple regression statistical analysis SLM 2 distance 5,12 m from the highway. The calculation results obtained in the mean value for SLM 2 of 77,7937 dB_A, for motorcycles 4.359 cycles/hour and non motorcycle 927 cycles/hour.

c. The result of multiple regression analysis of SLM 3 distance of 10,24 m from highway. The calculation result is got the mean value for SLM 3 equal to 71,0812 dB_A, for motorcycle 4.359 cycles/hour and non motorcycle equal to 927 cycles/hour.

3.6. Based on the results of the questionnaire analysis

Based on the results of descriptive analysis the distribution of noise answers can be shown in Table 3 below.

Table 3: Results of Descriptive analysis of the questionnaire

No.	Noise question	Disturbed		Sometimes disturbed		Not distrubed		Total Number	
		Freq	%	Freq	%	Freq	%	Freq	%
1	Is it disturbed by noise from vehicle traffic during the activity?	143	35.8	198	49.5	59	14.8	400	100
2	Is the noise from private vehicles disturbing?	58	14.5	219	54.8	123	30.8	400	100
3	Is the noise from motorbikes disturbing?	179	44.8	193	48.3	28	7.0	400	100
4	Is the noise from public transportation disturbing?	84	21.0	239	59.8	77	19.3	400	100
5	Does feel the concentration decrease as a result of traffic noise?	152	38.0	134	33.5	114	28.5	400	100
6	Results it ever felt difficult communicating with others caused by traffic noise?	80	20.0	223	55.8	97	24.3	400	100
7	Does it often feel the disturbance of buzzing in the ears/head due to traffic noise?	32	8.0	147	36.8	221	55.3	400	100
	Total Number	728	26.0	1,353	48.3	719	25.7	2,800	100

Source: Data analysis results 2013.

The results of table 3 above are described based on the pie diagram in Figure 14 and Figure 15 below.

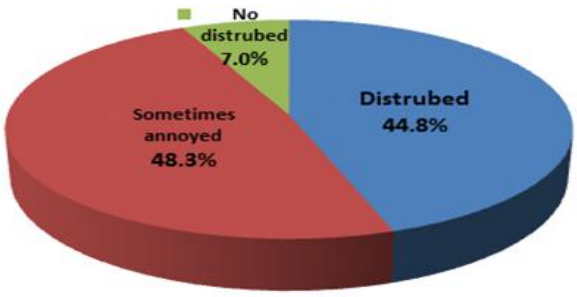

Fig.14: Pie chart of respondents regarding motorcycle noise.

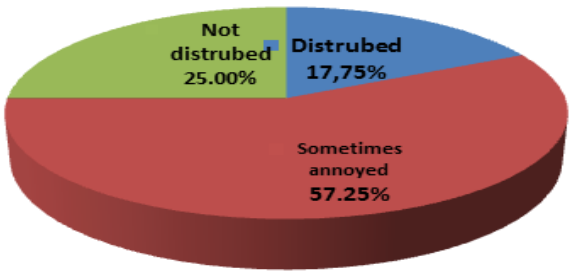

Fig. 15: Pie chart of respondents on non motorcycle noise.

3.7. Discussion of results of analysis and calculation

1) Effect of motorcycle and non motorcycle volume on noise on **the first day**

a. Discussion on SLM 1 distance 0,00 meter from the highway, effect of motorcycle volume. From the above calculation output get the following equation. y = a + bx1 = 89,298 + 6,974E-5 x1. This means that if there is no increase in motorcycle volume, the noise level in SLM 1 is 89,298 dB_A. And each additional motorcycle as much as 6,974E-5 then there is an increase of 1 dB_A on SLM 1, the influence of non motorcycle volume. From the above calculation output get the following equation. y = a + bx2 = 89,298 + 0,000x2 = 89,298. This means that if there is a decrease in non motorcycle volume, the noise level in SLM 1 is 89,298 dB_A.

b. Discussion on SLM 2 distance 5,12 meters from the highway, effect of motorcycle volume. From the above calculation output get the following equation. y = a - bx1 = 81,397 - 7,798E-5x1. This means that if there is no increase in motorcycle volume, the noise level in SLM 2 is 81,397 dB_A. And any reduction of motorcycles as much as 7,798E-5 then there is a decrease of 1 dB_A on SLM 2, the influence of non motorcycle volume. From the above calculation output get the following equation. y = a - bx2 = 81,397 - 0,003x2. This means that if there is a decrease in non motorcycle volume, the noise level in SLM 2 is 81,397 dB_A. That any non motorcycle volume decrease is -0,003 cycles/hour, it will decrease -0,003 dB_A, and every increase of one cycles/hour, hence noise will decrease equal to -0,003 dB_A.

c. Discussion on SLM 3 distance 10,24 meters from the highway, effect of motorcycle volume. From the above calculation output get the following equation. y = a + bx1 =

72,423 + 0,000x1 = 72,423. This means that if there is no increase in motorcycle volume, the noise level in SLM 3 is 72,423 dB_A, the influence of non motorcycle volume. From the above calculation output get the following equation. y = a - bx2 = 72,423 - 0,002x2. This means that if there is a decrease in non motorcycle volume, the noise level in SLM 3 is 72,423 dB_A. That any non motorcycle volume decrease is -0,002 vehicles/hour, it will decrease -0,002 dB_A, and every increase of one cycles/hour, hence noise will decrease equal to -0,002 dB_A.

2) Effect of motorcycle and non motorcycle volume on noise on **the second day**
   a. Discussion on SLM 1 distance 0,00 meters from the highway, effect of motorcycle volume. From the above calculation output get the following equation. y = a + bx1 = 83,755 + 0,001x1. This means that if there is no increase in motorcycle volume, the noise level in SLM 1 is 83,755 dB_A. And every addition of motorcycles as much as 0,001 then there is an increase of 1 dB_A on SLM 1, the influence of non motorcycle volume. From the above calculation output get the following equation. y = a - bx2 = 83,755 - 0.002x2. This means that if there is a decrease in non motorcycle volume, the noise level in SLM 1 is 83,755 dBA. That any non motorcycle volume decrease is -0.002 cycles/hour, it will decrease -0,002 dB_A, and every increase of one cycles/hour, hence noise will decrease equal to -0,002 dB_A.
   b. Discussion on SLM 2 distance 5,12 meters from the highway, effect of motorcycle volume. From the above calculation output get the following equation. y = a + bx1 = 77,638 + 8,803E-5x1. This means that if there is no increase in motorcycle volume, the noise level in SLM 2 is 77,638 dB_A, the influence of non motorcycle volume. From the above calculation output get the following equation. y = a - bx2 = 77,638 – 0,003x2. This means that if there is a decrease in non motorcycle volume, the noise level in SLM 2 is 77,638 dB_A. That any non motorcycle volume decrease is -0.003 cycles/hour, it will decrease -0,003 dB_A, and every increase of one cycles/hour, hence noise will decrease equal to -0,003 dB_A.
   c. Discussion on SLM 3 distance 10,24 meters from the highway, effect of motorcycle volume. From the above calculation output get the following equation. y = a + bx1 = 71,092 + 0,000x1. This means that if there is no increase in motorcycle volume, the noise level in SLM 3 is 71,092 dB_A, the influence of non motorcycle volume. From the above calculation output get the following equation. y = a + bx2 = 71,092 + 0,004x2. This means that if there is a decrease in non motorcycle volume, the noise level in SLM 3 is 71,092 dB_A.

3) Discussion of the influence of the volume of motorcycles and non motorcycles against noise on **the third day**
   a. Discussion on SLM 1 distance 0,00 meters from the highway, effect of motorcycle volume. From the above calculation output get the following equation. y = a + bx1 = 85,078 + 0,000x1. This means that if there is no increase in motorcycle volume, the noise level in SLM 1 is 85,078 dB_A. The influence of non motorcycle volume. From the above calculation output get the following equation. y = a - bx2 = 85,078 - 0,001x2. This means that if there is a decrease in non motorcycle volume, the noise level in SLM 1 is 85,078 dB_A. That any non motorcycle volume decrease is -0.001 cycles/hour, there will be a decrease of -0,001 dB_A, and every increase of one cycles/hour, the noise will decrease by -0.001 dB_A.
   b. Discussion on SLM 2 distance 5,12 meters from the highway, effect of motorcycle volume. From the above calculation output get the following equation. y = a + bx1 = 74,946 + 4,909E-5x1. This means that if there is no increase in motorcycle volume then the noise level in SLM 2 is equal to 74,946 dB_A, the influence of non motorcycle volume. From the above calculation output get the following equation. y = a + bx2 = 74,946 + 0,002x2. This means that if there is no increase in the volume of non motorcycle noise level in SLM 2 is equal to 74,946 dB_A.
   c. Discussion on SLM 3 distance 10,24 meters from the highway, effect of motorcycle volume. From the above calculation output get the following equation. y = a + bx1 = 69,755 + 0,000x1. This means that if there is no increase in motorcycle volume, the noise level in SLM 3 is 69,755 dB_A. The influence of non motorcycle volume. From the above calculation output get the following equation. y = a - bx2 = 69,755 - 0,001x2. This means that if there is a decrease in non motorcycle volume, the noise level in SLM 3 is 69,755 dB_A. That any non motorcycle volume decrease is -0,001 cycles/hour, there will be a decrease of -0,001 dB_A, and every increase of one cycles/hour, the noise will decrease by -0,001 dB_A.

4) Effect of motorcycle and non motorcycle volume on noise on **the fourth day**
   a. Discussion on SLM 1 distance 0,00 meter from the highway, effect of motorcycle volume. From the above calculation output get the following equation. y = a + bx1 = 81,848 + 0,001x1. This means that if there is no increase in motorcycle volume, the noise level in SLM 1 is 81,848 dB_A, the influence of non motorcycle volume. From the above calculation output get the following equation. y = a - bx2 = 81,848 – 0,001x2. This means that if there is a decrease in non motorcycle volume, the noise level in SLM 1 is 81,848 dB_A. That any non motorcycle volume decrease of -0,001 cycles/hour, there will be a decrease of -0,001 dB_A, and every one day per day increase, the noise will decrease by -0,001 dB_A.
   b. Discussion on SLM 2 distance 5,12 meters from the highway, effect of motorcycle volume. From the above calculation output get the following equation. y = a + bx1 = 73,958 + 0,001x1. This means that if there is no increase in motorcycle volume, the noise level in SLM 2 is 73,958 dB_A, the influence of non motorcycle volume. From the above calculation output get the following equation. y = a + bx2 = 73,958 + 0,001x2. This means that if there is a decrease in non motorcycle volume, the noise level in SLM 2 is 73,958 dB_A.
   c. Discussion on SLM 3 distance 10,24 meters from the highway, Effect of motorcycle volume. From the above calculation output get the following equation. y = a + bx1 = 68,150 + 0,001x1. This means that if there is no increase in motorcycle volume, the noise level in SLM 3 is 68,150 dB_A, the influence of non motorcycle volume. From the above calculation output get the following equation. y = a + bx2 = 68,150 + 0,000x2. This means that if or not there is a decrease in non motorcycle volume, the noise level in SLM 3 is equal to 68,150 dB_A.

5) The discussion with the results of **the questionnaire**
   a. From the respondent's answer about the noise caused by motorcycle traffic as much as 193 respondents answered that sometimes it is disturbed or as much as 48,3% of the total answer, 179 respondents said yes disturbed or as much as 44,8% of the total answers, and 28 respondents answered uninterrupted or as many as 7,0% of the total answers. So the result of the whole respondent's answer has the greatest answer is sometimes disturbed by the noise generated by the passing motorcycle traffic.
   b. From the average score of respondents' answers about the noise generated by non-motorcycle traffic as much as 229 respondents answered sometimes it is disturbed or as much as 57,3% of the total answers, 100 respondents answered uninterrupted or as much as 25,0% of the total answers, and 71 respondents answered yes to be disturbed or as much as 17,8% of the total answers. So the result of the whole respondent's answer has the greatest answer sometimes disturbed by the noise caused by non motorcycle traffic passing by.

4. Conclusions

From the result of the research that the effect of traffic volume on noise caused by motorcycles and non motorcycles, the following results are obtained:

1) The volume of motorcycle traffic has a significant influence on noise occurring in **the fourth day** of research at the first point (Sound level meter 1), with a contribution of 17,8%. From the calculation of this analysis get the equation as below, $y = a + bx1 = 81,848 + 0,001x1$. This means that if there is no increase in motorcycle traffic volume then the noise level in SLM 1 is equal to 81,848 dB_A. The results of questionnaires obtained from 400 respondents answered are sometimes disturbed by the noise caused by motorcycle traffic, with a composition of 48,3% of the total answers, the remaining 44,8% and 7,0% for the answer is disturbed and not disturbed by the noise in caused by motorcycle traffic.
2) Non motocycle traffic volume has not significant effect on the noise occurring, from all analytical calculations obtained the largest equation derived from the equation on **the second day** at point (Sound level meter 3) with a contribution of 3,8%. From the calculation of this analysis get the equation as below, $y = a + bx2 = 71,092 + 0,004x2$. This means that if there is no increase in non motorcycle traffic volume then the noise level is equal to 71,092 dB_A. The average result of questionnaires obtained from 400 respondents answered is sometimes disturbed by the noise generated by non motorcycle traffic with a composition of 57,3% of the total answers, the remaining 25,0% and 17,8% for uninterrupted and disturbed answers by the noise generated by non motorcycle traffic.
3) In addition to vehicle volume and vehicle type factors, weather factors, road contours, exhaust types and vehicle fuels, and vehicle manufacturing, are other factors that can affect noise levels.

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