

Analysis of Traffic Noise in Taman Kota Lumintang Denpasar

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Abstract:

This research was conducted to analyze the level of traffic noise in Lumintang City Park, Denpasar. The measurement method is by using a direct method that is using an integrating sound level meter that has an LTMS measurement facility, namely Leq with a measuring time every 5 seconds. The examination is carried out by measuring for 10 minutes. The measurement time is carried out during the 24 hour activity (NGO) on December 3, 2018. The measurement distance ranges from 5-10 meters from the road, with a height of 1-1.2 m from the ground level. The results of the research on the level of traffic noise in Lumintang City Park Denpasar showed the noise level that exceeded the noise level quality standards of the green open space area of 50 dB, where in the first lane the traffic noise level was 92.52 dB at L3. While the noise research in lane 2 shows that the highest traffic noise level of 85.70 dB occurs at L5. For day and night (NGO) noise levels in lane 1 amounting to 70.13 dB and lane 2 of 67.95 dB has exceeded the quality standard of green open space, so that it can cause physical and psychological disturbances for visitors to the Taman Lumintang City of Denpasar..

Keywords: *Noise, Traffic Noise, Lumintang*

Preliminary:

Denpasar City as the capital city of Bali Province, has now become one of the major cities in Indonesia. Various community backgrounds with ethnicity, ethnicity, religion, and education are easily found in cities with a population of around 897,300 people (Denpasar City Statistics Center, 2016). An increase in the population in Denpasar City will cause problems in the transportation sector. One of these problems is the problem of increasing the number of motorized vehicles.

According to the Bali Provincial Statistics Agency, the number of motorized vehicles in Bali Province in 2017 reached 3.9 million units. Of the total number of motorized vehicles, 1.29 million units operate in the Denpasar City area. The increase in motorized vehicles in the city of Denpasar reaches 14% per year, not balanced by the increase in the length of roads which is only 3.6% per year (Department of Transportation of Denpasar City, 2017). The increase in the number of motorized

vehicles operating on the road, will increase the traffic load and cause various problems such as congestion problems and traffic noise. Motorized vehicles are a means of transportation, in the context of noise levels grouped as moving sources. It is estimated that the distribution and intensity of noise levels in urban areas will vary in each region, depending on the type of land use in the area. The transportation system planning factor is also sure to greatly affect the spread of noise level pollution, follow transportation routes in urban areas.

The high noise intensity exceeds the standard of noise quality with a long exposure time which is the cause of health problems such as disturbances in the auditory sense and the potential for hypertensive attacks. Besides causing outward impacts, noise can also have psychological effects such as emotional disturbances and lifestyle disorders (Subagya & Yayan, 2009). Based on the Decree of the Minister of Environment in KepMenLH No. 48 of 1996 concerning Quality Standards for Noise Levels, noise is an unwanted sound from a business or activity at a certain level and time that can cause disruption to human health and environmental comfort.

Theoretical Review:

Sound:

Sound sources are all objects that vibrate and produce sounds that propagate through mediums or intermediate substances. Sound waves consist of vibrating molecules propagating in all directions, the molecules crammed in several places, resulting in a region of high pressure or compression (compression), but in a rarefaction, resulting in a low pressure region. High and low pressure waves alternately move through medium or conductive substances in the form of air, gas, liquid and solid substances. With this principle this wave includes longitudinal waves (Tipler, Paul A. 1998).

Noise:

Based on a decision issued by the Ministry of Environment in KepmenLH No. 48 of 1996 concerning Noise Level Standards says that noise is an unwanted noise from a business or human

activity at a certain level and time that can cause human health problems and environmental comfort. Even though noise is an unwanted sound but sometimes noise can be useful. Useful in the sense of noise can be used to attract attention or expect a response from someone. For example, babies cry and cry from someone's help. While the impact caused by noise is physical and psychological disorders. Nowadays noise is one of the causes of environmental diseases (Slamet, 2006). The level of noise intensity is measured and expressed in Decibels (dBA). Meanwhile, what is meant by noise level quality standards is the maximum level of noise that is permitted to be discharged into the environment from a business or activity so that it does not cause human health problems and environmental comfort.

Noise Due to Traffic:

Sound generated from transportation activities is a sound that is not constant. The noise caused by noise depends on the level of sound intensity, how often it occurs and the frequency produced. Noise in motorized vehicles is mainly generated by vehicle engines during combustion, exhaust, horns, braking and due to interaction between the wheels and the road in the form of friction that produces sound. Most motorized vehicles on gear 2 or 3 produce noise of 75 dB (A) with a frequency of 100-7000Hz. Heavy vehicles (trucks and buses) are the main sources of noise on the highway (AASHTO, 1993). Private cars tend not to cause too much noise. But because of the large number, the noise produced is quite large. When the engine is turned on and will do maximum acceleration, noise is generated by the sound of the engine, whereas if the vehicle is traveling at high speed the main source of noise is the sound of wheel friction and road pavement. For this type of diesel-engined truck and the power generated by the engine is greater, it produces a noise level greater than 15 dB (A) from a private vehicle. The sound of combustion that occurs in the engine produces a large contribution in the cause of noise especially when the truck reaches speeds of 80 km / h (AASHTO, 1993). Traffic noise is in the frequency

range 100-4000 Hz. Noise due to exhaust noise of motor vehicles occurs above the frequency of 250 Hz (AASHTO, 1993).

Noise Quality Standard:

Determination of noise level quality standards related to land allotment problems contained in the table below:

Area Designation / Health Environment	Noise Level (dBA)
a. Area designation	
- Housing and settlement	55
- Trade and services	70
- Office and trade	65
- Green open space	50
- Industry	70
- Government and public facilities	60
- Recreation	70
- Special:	
- Airport	70
- Railway station	70
- Seaports	
- Cultural heritage	
b. Activity environment	
- Hospital or the like	55
- School or the like	55
- Place of worship or the like	55

Here's how to calculate Leq :

$$LEQ = 10 \text{ Log } \frac{1}{N} [\sum ni \cdot 10^{li/10}] .dB$$

Whereas the LS research method is calculated as follows:

$$LS = 10 \text{ Log } \frac{1}{16} [\sum \cdot 10^{li/10}] .dB$$

And LM are calculated as follows:

$$LM = 10 \text{ Log } \frac{1}{8} [\sum \cdot 10^{li/10}] .dB$$

Noise levels that have exceeded the noise level need to be looked at by NGO values from field measurements. NGOs are calculated by the formula:

$$LSM = 10 \text{ Log } \frac{1}{24} [\sum \cdot 10^{li/10}] .dB$$

Evaluation Method of NGO Value which is calculated compared to the standard noise level determined by tolerance of + 3 dB (A).

Noise Impacts:

Sounds with an intensity ranging from 50 - 55 dBA are referred to as noise that can cause sleep disturbances so that when you wake up your body becomes tired and tired, while sounds with an intensity of 90 dBA can disrupt the autonomic nervous system. Noisy with an intensity of 140 dBA can cause vibrations inside the head, severe pain in the ear, impaired balance and vomiting. Sudden loud noises can cause blood pressure to rise, the vibration of the pulse increases and the production of lymph nodes decreases and the digestive process stops (American Academy of Ophthalmology and Otolaryngology). The table below shows the physical and psychological effects that arise at different levels of sound intensity.

Noise Level (dBA)	Impact
135	Pain
110	Inconveniences
88	Weakness in the sense of hearing
80	Annoying (harming)
65	Disturb

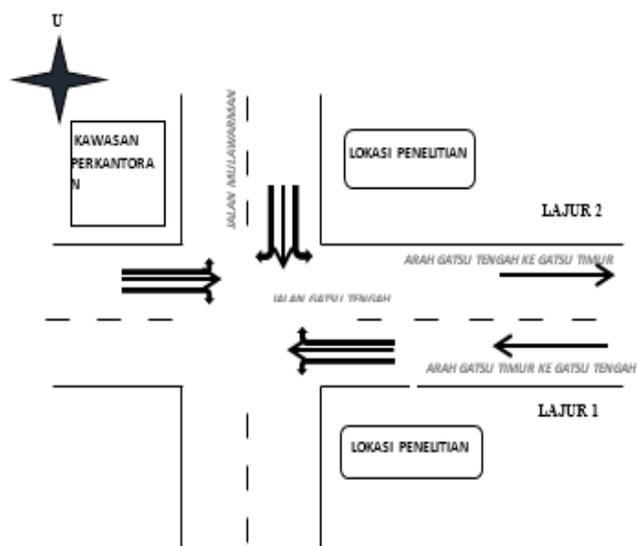
Source: S.S Dara. 2002. *A Textbook of Environmental Chemistry and Pollution Control*. New Delhi.

Research Methodology:

Location and Time of Research

Research the level of traffic noise at Leq day and night (LSM) at Lumintang Denpasar City Park on Jalan Gatot Subroto Tengah City of Denpasar. The location of the study is on two points of the road, namely in the 1 direction lane Gatot Subroto Timur towards the direction of Gatot Subroto Tengah with coordinates 8°38'13.1 "S 115°12'45.8" E and 2-way Lanes Gatot Subroto Tengah heading to Gatot Subroto Timur with coordinates 8°38 14.5 "S

115°12'45.8" E. Traffic noise level research (NGO) is carried out during the activities of 1 full day (24 hours) on Monday December 3, 2018.



Measurement Method:

Measurement of noise level according to KepmenLH No. 48 of 1996 concerning the Standard for Quality of Noise Levels carried out in a Direct Way, namely using an integrating sound level meter tool that has an LTMS measurement facility, namely Leq with a measuring time every 5 seconds. The examination is carried out by measuring for 10 minutes. The time of measurement is carried out during 24 hour activities (NGOs) with the following distribution:

- a. Noise level during the day is measured at the highest for 16 hours (LS) at intervals of 06.00 - 22.00.
- b. The noise level at night is measured at 8 hours (LM) at intervals of 22.00-06.00. each measurement must be able to represent a certain time interval by setting at least 4 measurement times during the day and at least 3 measurement times at night.

Example:

- L1 is taken at 07.00 representing 06.00 - 09.00
- L2 taken at 10:00 represents 09.00 - 11.00
- L3 taken at 3:00 p.m. represents 14:00 - 17:00
- L4 is taken at 20.00 representing 17:00 - 22:00
- L5 is taken at 23.00 representing 22.00 - 24.00

- L6 is taken at 01.00 representing 24.00 - 03.00 hours
 - L7 taken at 04.00 represents 3:00 - 6:00
- With Remarks:

- Leq: Equivalent Continuous Noise Level is the value of the noise level of the noise that changes (fluctuating) for a certain time, which is equivalent to the noise level of steady noise at the same time interval. The unit is dB (A).
- LTM5 = Leq with sampling time every 5 seconds
- LS = Leq during the daytime
- LM = Leq during the night
- LSM = Leq during day and night

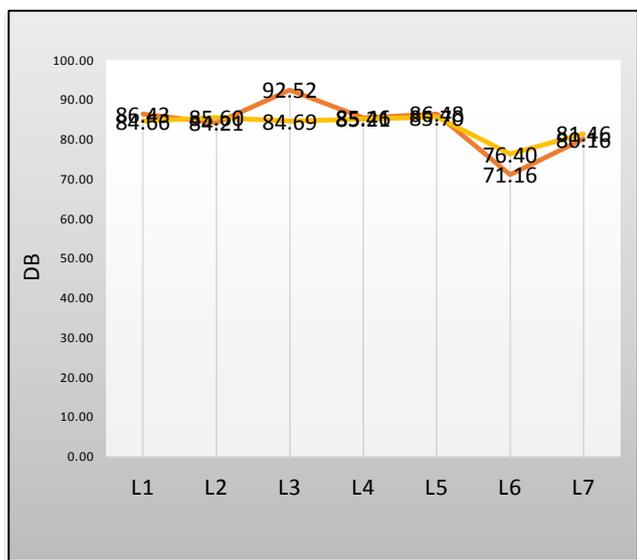
Results and Discussion

Traffic Noise Level Analysis:

The implementation of traffic noise level measurements was carried out during 24 hour activities (NGOs) in accordance with the Decree of the Minister of Environment Number Kep 48 / MENLH / 11/1996 in 1996 concerning the Standard of Traffic Noise Levels by carrying out measurements at L1 to L7. Traffic noise measurement results that have been converted into equations in Chapter II Literature Review page 24 to produce the equivalent Continuous Traffic noise level (Leq) data shown in the table below.

No	Measurement Time		Traffic Noise Level dB(A)	
			Lane 1	Lane 2
	Hour (WITA)	Symbol		
1	06.00 - 09.00	L1	86,43	84,66
2	10.00 - 11.00	L2	84,21	85,60
3	12.00 - 16.00	L3	92,52	84,69
4	17.00 - 20.00	L4	85,46	85,21
5	21.00 - 24.00	L5	86,48	85,70
6	01.00 - 03.00	L6	71,16	76,40
7	04.00 - 05.00	L7	80,16	81,46
Daytime Average		LS	82,80	80,08
Average Night		LM	78,46	78,42
Day and Night Average		Lsm	70,36	68,54

From the table above it can be concluded that in lane 1, the highest level of traffic noise occurs at L3 which is equal to 92.52 dB and the lowest occurs at L6 which is equal to 71.16 dB. Whereas in lane 2, the highest traffic noise level occurs at L5 which is equal to 85.70 dB and the lowest occurs at L6 which is equal to 76.40 dB. Based on the results of calculations, it is known that the level of traffic noise generated at two measurement locations with the same measurement distance has a different level of traffic noise. The level of traffic noise can change due to the level of traffic noise generated from a sound source that is different every time. The following is an analysis of two research location points:



The calculation of traffic noise level in Figure 4.1 shows that at all research times of L1, L2, L3, L4, L5, L6, L7 (100%) show the results of traffic noise levels that exceed the quality standards in Lumintang City Park Denpasar by 50 dB, where at L3 around 12.00 - 16.00 WITA is the time with the highest continuous traffic noise level (Leq) that is equal to 92.52 dB. While the research on the level of traffic noise in lane 2 shows that the highest continuous traffic noise level (Leq) of 85.70 dB occurs at L5. The results of measuring the level of traffic noise in Lumintang City Park Denpasar showed high results both during the day and night. This is because Jalan Gatot Subroto Denpasar City is also a national road that connects large vehicles that cross either to the Province of West Nusa Tenggara and its surroundings or to the East Java

and surrounding provinces so that the road is always crowded at all times. If it is associated with the impact of traffic noise, the data will be obtained as follows.

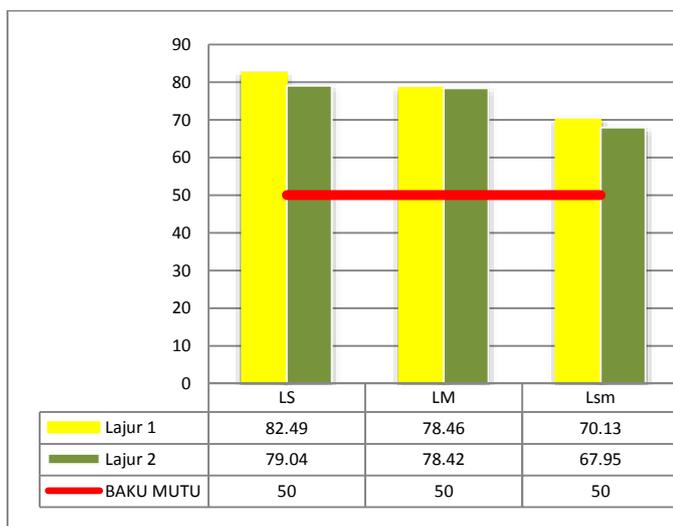
No	Traffic Noise Data	Value	Lane	Impact
1	L1	86,43	1	Annoying (harming)
2	L2	84,21		Annoying (harming)
3	L3	92,52		Weakness in the sense of hearing
4	L4	85,46		Annoying (harming)
5	L5	86,48		Annoying (harming)
6	L6	71,16		Disturb
7	L7	80,16		Annoying (harming)

From the table above it can be concluded that for lane 1, the percentage of traffic noise results is 14% disturbing, 14% causes weakness in the auditory sense and 72% interferes (harms). While in lane 2 the results are as follows.

No	Traffic Noise Data	Value	Lane	Impact
1	L1	84,66	2	Annoying (harming)
2	L2	85,60		Annoying (harming)
3	L3	84,69		Annoying (harming)
4	L4	85,21		Annoying (harming)
5	L5	85,70		Annoying (harming)
6	L6	76,40		Disturb
7	L7	81,46		Annoying (harming)

Whereas in lane 2, the percentage of the traffic noise level is 14% disturbing, and 86% in the disturbing category (detrimental). This is obviously very dangerous if it occurs continuously because it will affect the ability of human hearing and human behavior. However, if the traffic noise level data at

L1, L2, L3, L4, L5, L6, L7 is reprocessed using the NGO formula (Leq at day and night), then the traffic noise level for the Lumintang City Park in Denpasar obtained is as follows.



In lane 1 it will produce a total traffic noise level (day and night) of 70.13 dB. Whereas for lane 2 it will produce a total noise level (day and night) of 67.95 dB as shown in Figure 4.4 above. This result shows that in lane 1 and lane 2, the traffic noise level has exceeded the quality standard of 50 dB.

Conclusions and Suggestions:

Conclusion:

Based on the results of research in the field and analysis carried out, it can be concluded that the results of the traffic noise level in Lumintang City Park Denpasar show the noise level that exceeds the noise level quality of the area of green open space of 50 dB, where in line 1 traffic noise the highest of 92.52 dB occurs at L3. While the noise research in lane 2 shows that the highest traffic noise level of 85.70 dB occurs at L5. For day and night (NGO) noise levels in lane 1 amounting to 70.13 dB and lane 2 of 67.95 dB has exceeded the quality standard of green open space, so that it can cause physical and psychological disturbances for visitors to the Taman Lumajang City of Denpasar.

Suggestion:

Based on the conclusions of the results of the above research the researchers gave suggestions including the following:

1. To reduce or minimize the impact of traffic noise caused by traffic movements it is necessary to regulate traffic. Settings are intended to reduce the volume of passing traffic. This can be done by making traffic engineering in the area, for example by transferring current for heavy vehicles passing or regulating operating hours through the vehicle. Good traffic regulation can reduce the traffic noise level between 2 to 5 dB (A).
2. For the community to be able to find out the short-term and long-term impacts of noise and start using standard vehicles to reduce the impact due to noise generated.

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