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Analysis of Noise Levels in the Trade and Service Area using a Sound Level Meter: A Case Study in the Trade Area of Pasar Baru, Pauh District, Padang city

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A B S T R A C T

Background. Sound Level Meter (SLM) is a tool used to measure how much noise affects workers in carrying out work. The Pasar Baru area is an area that has a fairly high density of trading activities and has busy traffic routes which have the potential to cause disruption and impact the residents around the area. This research was conducted with a purpose to find out whether the noise level that occurs can still be tolerated or has exceeded the noise level threshold value so that steps can be determined that need to be taken to reduce noise and to reduce the negative impact of the noise.

Method. SLM measured the instantaneous sound pressure level dB(A) for 5 (five) minutes for each measurement point and readings are taken every 5 seconds. Leq (5 minutes) which represents a certain time interval, so that 60 data are obtained from the measurement results.

Results. Based on the average results obtained for the level of disturbance that has been carried out at five points, it shows that all points have exceeded the quality standard value for the level of disturbance with an average of Point A 70.62 dB; Point B 75.36 dB; Point C 70.21; Point D 73.98 dB; and Point E 75.91 dB.

Conclusion. The figures obtained from the results of measurements and calculations show that the Pasar Baru area can be declared as an unsafe area for the hearing of the surrounding community because the interference has exceeded 70 dB.

Keywords: Sound Level Meter, Noise Levels, Hearing Disruption

BACKGROUND

In everyday life, especially work activities, there are many things that can disturb your comfort at work, one of which is caused by the noise you receive.[1] Noise is a disturbing sound from business or activities at a certain level and time that can cause problems with human health and environmental comfort. Noise is an important public health problem that can cause hearing loss, sleep disorders, cardiovascular disease, social disability, reduced productivity, negative social behavior, disruptive reactions, absenteeism and accidents.[2] According to the results of research conducted, excessive noise levels can cause serious hearing problems.[3]

Noise measurements can be done using a Sound Level Meter. Sound Level Meter is a tool used to measure how much noise affects workers during their activities. In line with research conducted by Indrayani (2020), a sound level meter can be used to measure noise levels which can cause pain in the ears.[4] Measurements using SLM were carried out for 5 minutes and readings were taken every 5 seconds. Sound Level Meter is used to measure noise between 30-130 dB in dBA units and from frequencies between 20-20,000 Hz.[5] The current research is concerned with the use of a sound level meter to measure noise levels in a specific area. There are only a small number of studies which have investigated issues that are relevant to the current research. One of the studies was relevant to a recent study is Indrayani et al. They measure and evaluate of Sound Intensity at The Medan Railway Station Using a Sound Level Meter. Value of noise intensity level at the city railway station of Medan at the time of departure and arrival of trains were obtained. Highest noise intensity level value for train departures is = 96.67 were measured drom the average value of the noise intensity level obtained. The lowest value of noise intensity level is = 81.4. The results obtained from the calculations were that the noise intensity level obtained exceeded the threshold value for noise intensity levels set by the Indonesian Government (β = 70 dB). Factors that affect the high value of this noise intensity level are the friction that occurs between the train wheels and rails, the high number of passengers, speaker notifications for departures and train horns.[4]

This research is similar to research that has been carried out in the Pasar Baru area, namely that the measurement value obtained using a sound level meter exceeds the predetermined threshold value, the threshold value for the train station area is the same as the threshold value for the trade and services area (70dB).[6] The Pasar Baru area is an area that has a fairly high density of trading activities and quite dense traffic routes in this area have the potential to cause noise which can have an impact on nearby residents. Traders and workers in the Pasar Baru area have the potential to suffer from hearing loss

due to the noise level they receive. Keputusan Menteri Negara Lingkungan Hidup Nomor 48 Tahun 1996 concerning Noise Level Standards, the Pasar Baru area is classified as a Trade and Services Area with a noise level standard of 70 dB.[1]

This paper tries to examine measurements using sound level meters carried out in Pasar Baru areas. Although there have been previous studies measuring noise using sound level meters, this research focuses on measuring noise levels in locations that have never been measured before.[7] Measurements are carried out directly at 5 sample points, the results obtained are written into a noise formular and then the average is calculated. The results obtained are compared with the threshold values set by KepmenLH - 48/MENLH/11/1996.[8] This research was conducted with a purpose to find out whether the noise level that occurs can still be tolerated or has exceeded the noise level threshold value so that steps can be determined that need to be taken to reduce noise and to reduce the negative impact of the noise.

METHOD

Noise was measured on May 17 2023 in the Pasar Baru area using a Sound Level Meter. Measurements must be carried out by two or more people with the task of one person looking at the time and the other person recording the SLM measurement results. The tools and materials used in this measurement are SLM, noise formula form, and stopwatch. The Sound Level Meter used is an InScienPro sound level meter with the SLM specification number SND-99.[9] The noise formula form is used to compile the results obtained from SLM measurements and the stopwatch is used to see the measurement time which is carried out every 5 seconds with a time span of 5 minutes.[10] The designated noise measurement points are Point A (BRI Education Center Bus Stop), Point B (Pasar Baru Intersection), Point C (BRI Education Center), Point D (Roti O), and Point E (Bank BRI Unit Pasar Baru).

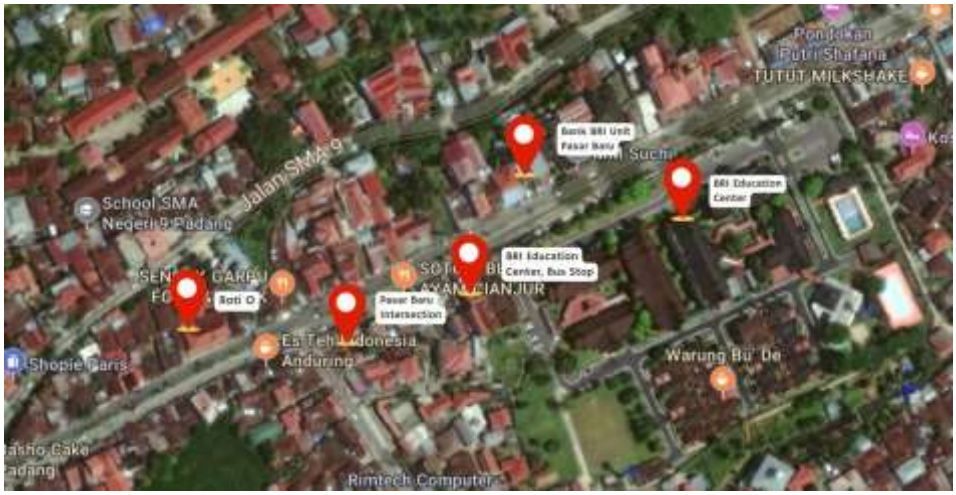

Figure 1. Research Location Point

Measurements begin by determining a good sampling point at a distance of 2-3 meters from the wall. Hold the Sound Level Meter at a height of 1-1.2 meters and point the microphone at the sound source then turn it on.[11] Set the response F (fast) and filter A at continuous intensity or slow at impulsive intensity. Shift the sound range, according to the intensity of the environmental sound and note the number that appears on the display every 5 seconds in the noise formular form.[12]

RESULT

The measurement sampling points were selected based on the results of discussions and observations around the Pasar Baru by including categories of areas that have the potential to receive the most noise. The results of noise measurements using a Sound Level Meter will be processed by finding the average calculation for each sampling point and all sampling points that have been measured. The following are the calculation results and averages of noise measurements at 5 points in Pasar Baru, Padang.

Table 1. Noise level measurement table

Sample Point	Location	Noise Level dB (A)
A	BRI Education Center, Bus Stop	72.62
B	Pasar Baru Intersection	75.35
C	BRI Education Center	70.21
D	Roti O	73.98
E	Bank BRI Unit Pasar Baru	75.91

The results of measurements carried out in the Pasar Baru area showed that the average measurements were Point A (72.62), Point B (75.35), Point C (70.21), Point D (73.98), and Point E (75.91). This measurement was carried out for five minutes at each sample point. Recordings were carried out every 5 seconds during the measurement time at each sample point.

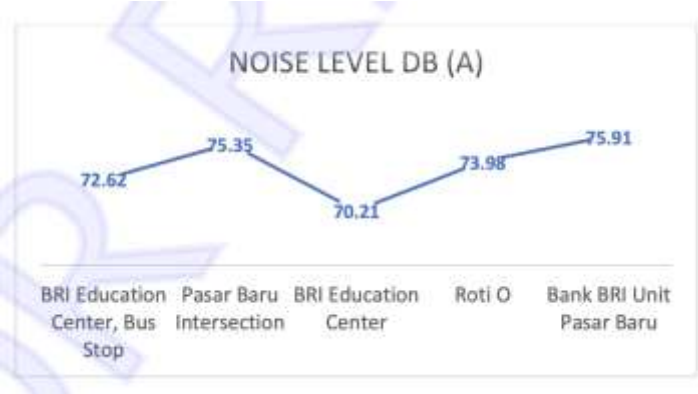

Figure 2. Measurement value for each sample points

From figure 2, it can be seen that value of noise intensity level at the Bank BRI Unit Pasar Baru. Leq value on average the highest noise intensity level for Bank BRI Unit Pasar Baru occurs on the night of Wednesday 17 May 2023 of = 75.91. This is because the measurements were carried out during the day on Wednesday, where there was traffic density at that time. Wednesday is a working day when everyone uses vehicles to move from home to work and vice versa. This measurement is also carried out during the day when working people start to take their lunch break so many workers use vehicles to get out of their workplace.7 The Pasar Baru area is also a crossroad that is usually used by trucks to mobilize to the main road, especially at the Pasar Baru intersection. As for the average Leq value of the lowest noise intensity level in can be on Wednesday the 17th of May 2023 amounted to = 70.21 . This is because the sample points are in the educational area. In this area, the noise intensity decreases because there are not many vehicles passing by.13

DISCUSSION

Based on the average results obtained for the noise levels that have been carried out at five sample points, it shows that all points have exceeded the quality standard value for noise levels in trade and service areas according to KepmenLH -48/MENLH/11/1996, namely 70 dBA.6 These points are at Point A (BRI Education Center Bus Stop), Point B (Pasar Baru Intersection), Point C (BRI Education Center), Point D (Roti O), and Point E (Bank BRI Unit Pasar Baru), with each average measurements were 76.62 dB, 75.35 dB, 70.21 dB, 73.98 dB, and 75.91 dB. There are several factors that influence the measurement results at each point, such as traffic density, type of vehicle passing, number of vehicles passing. Sample points that are close to the main road will have high noise levels. The higher the traffic density of vehicles and activities in the area, the more it will affect the noise level.[12]

The types of vehicles originating at these five points generally come from both two-wheeled and four-wheeled vehicles. The sound produced by these vehicles also greatly influences the noise level, such as the sound of vehicle horns, sirens, mechanical friction between tires and the road during sudden braking and high speed, and exhaust sound. The more vehicles passing on the highway, the higher the noise intensity.[14] The Pasar Baru area is the economic center in the process of buying and selling goods and services near Andalas University.

The activities in Pasar Baru certainly make the area always crowded and busy because it is always busy with students and people who live nearby. Types of vehicles often pass through this area, thus affecting the noise level in this area. The many sounds of engines, sirens and exhausts color this area, especially when going to work and coming home from work.[15] The average noise measurement at 5 sample points around the Pasar Baru areas is categorized as having passed the minimum standard in accordance with KepmenLH - 48/MENLH/11/1996, namely 74.41.[16]

This could be an intervention for the relevant agencies because the Pasar Baru area has exceeded the quality standards for trading area noise levels. Based on the average value obtained from noise measurements, it can be seen that the Pasar Baru area is an area that is unsafe for the hearing of the surrounding community because the noise has exceeded 70 dB.17 Control efforts that can be taken to reduce noise levels, especially in areas such as Pasar Baru, are:

1. Speed restrictions

Reducing the speed limit on the highway can help reduce noise. Vehicles moving at high speed tend to produce louder sounds. Implementing lower speed limits can help reduce noise levels around roadways.

2. Promotion of sustainable transportation

Promotion of transportation in the community can encourage people to use sustainable transportation, such as cycling, walking or using public transportation, which can help reduce the number of vehicles on the road. By reducing vehicle volume, road noise can be reduced significantly.

3. Traffic management

Designing efficient traffic systems and optimizing vehicle flow can help reduce road noise. For example, using good road geometry design, optimal traffic light settings, and avoiding vehicle pile-ups that cause horn sounds and excessive acceleration.

CONCLUSION

Based on measurements all sample points measured have exceeded the quality standard for noise levels in trade and service areas according to Minister of Environment Decree 48/MENLH/11/1996, namely 70 dB. The sample point measured was point A which was located at the Sendik bus stop at 11.15 WIB – 11.20 WIB with an average measurement of 70.62 dB. Point B is located at Simpang Pasar Baru at 11.25 WIB –11.30 WIB with an average measurement of 75.36 dB. Point C with the BRI Sendik location at 11.33 WIB – 11.38 WIB with an average measurement of 70.21 dB. Point D with the location in front of Roti O at 11.52 WIB – 11.57 WIB with an average measurement of 73.98 dB. Point E with the location of Bank BRI Pasar Baru unit at 11.58 WIB – 12.03 WIB with an average measurement of 75.91 dB.

Pasar Baru is a trading center for goods and services for the surrounding community. Pasar Baru is also a center of student activity where students also live around the Pasar Baru area. To be able to overcome the noise levels in the Pasar Baru area, motor vehicle users can be advised to use mufflers that comply with standards and use public transportation to reduce the volume of motorized vehicles in the Pasar Baru area. Apart from that, you can also plant sound absorbers such as shrubs.

Conflict of Interest

No potential conflict of interest relevant to this article was reported

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