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Measurement of Noise Intensity in the Al-Mahirah Lamdingin Market Area, Banda Aceh City in 2024

Rahmat Ali Muktdin[1*], Fahmi Ichwansyah[2], Tiara Mairani[3]

[1]Faculty of Public Health, University of Muhammadiyah Aceh, | rahmadr579@gmail.com

[2]Faculty of Public Health, University of Muhammadiyah Aceh | fahmiupf@gmail.com

[3]Faculty of Public Health, University of Muhammadiyah Aceh | tiara.mairani@unmuha.ac.id

* Corresponding Author: rahmadr579@gmail.com

ABSTRACT

Introduction: Noise is a fairly important issue, especially in relation to comfort. Excessive noise levels in markets can have very dangerous negative impacts in many ways, namely health impacts as well as psychological and technical impacts.

Objective: The purpose of this study is to identify the noise level that occurs in the market area using a Sound Level Meter (SLM) and to map the noise level in the Al-mahirah Lamdingin market.

Methods: This study uses an observation method, data collection is carried out by direct observation and measurement of the research object. The sample in this study is one of the sectors of the community trade center, namely the Al-Mahirah Lamdingin market in Banda Aceh city which consists of 93 kiosks with 639 traders. Inclusion criteria are places where people often gather and pass by, areas that are flanked by lots of noise and come from different sources and machines that operate more than 4 hours in 1 day. Exclusion criteria are locations/areas that do not have noise sources and are far from the main road shoulder, machines that operate for less than 4 hours and operate only at certain times. Data were analyzed using Microsoft Excel software.

Results: The results of the study showed that the noise intensity at the Al-Mahirah Lamdingin Market was already in the risky category because it had the highest noise intensity of 55.2 dBA, but did not exceed the threshold value that had been set, namely 65 dBA.

Conclusion: Based on the measurement of noise intensity in the Al-Mahirah Lamdingin market, the noise intensity value does not exceed the noise quality standard value but is already at a risky stage because the measurement results are close to the set quality standard and the frequency and time of noise exposure are quite long with the target group. It is necessary to carry out control at each point such as changing the layout of the machine so that the noise does not collect in one place and the use of Hearing Protection Equipment (APT) or it can be by controlling the device, be it equipment renewal or repair.

Keywords: Noise; Market; Threshold Value; Control; Noise Source

INTRODUCTION

Markets as a hub for trade and services are expected to cause uncontrollable noise. The crowds that occur in this market area can certainly cause quite high noise and of course can have an impact on everyone who is active in the market, especially sellers and buyers. In Banda Aceh there are 5 traditional markets, one of which is Al-Mahirah Lamdingin Market, this market has a total building area of 5,934 meters2 consisting of 93 stalls and 639 traders. Al-Mahirah Market was selected based on the sample criteria that had been determined, namely the market with the most traders and conducive operational hours, There are 3 sources of noise produced from the market area, namely engine sounds, vehicle sounds, and sounds from human activities. Measurement of the noise level in the Al-Mahirah Market Area can be done to find out how much noise level can be generated from activities in the market and the impact that can be produced. Noise can cause miscommunication disturbances when traders give change because concentration is disturbed, some people who feel very disturbed and become dizzy even feel a decrease in hearing that affects the activity being carried out [1].

Al Mahirah Market is a traditional market that provides a new magnet for economic growth in Banda Aceh, especially for the Gampong Lamdingin, Lambaro Skep, and Lampulo areas, Kuta Alam District and the Coastal area of Syiah Kuala District. The Lamdingin area and the coastal area are now a developed and developing area, this can be seen from the number of new buildings that have sprung up and business actors around the market continue to increase [2].

Noise is an unwanted sound or noise that can interfere with health, comfort and can cause deafness. Noise is a fairly important problem, especially in relation to comfort. Excessive noise levels in the market can have a very dangerous negative impact in many ways, namely the impact in terms of health and also in terms of psychology and technical. Damage to the hearing aid is one of the impacts in terms of health and psychologically the impact that can be caused is emotional disturbance while in terms of technical noise can be an indication of a problem with the existing equipment. These health disorders are not only hearing disorders but also cause hypertension. Hypertension is triggered by unstable emotions that can cause stress. Continuous stress will cause narrowing of the blood vessels, thus stimulating the heart to work harder to pump blood throughout the body. if this happens continuously for a long time, blood pressure will increase and this increase is called hypertension [3].

The World Health Organization (WHO) says that noise is a threat that is often underestimated but can cause a number of short-term and long-term health problems, such as sleep disturbances, cardiovascular impacts, poor performance at work and school, hearing loss, and so on. Noise has emerged as an environmental nuisance and people are increasingly complaining about excessive noise [4].

According to the WHO, more than 5% of the world's population or 430 million people need rehabilitation to cope with their hearing loss (including 34 million children). It is estimated that by 2050, more than 700 million people – or 1 in every 10 people – will have hearing loss. Disabling hearing loss refers to hearing loss greater than 35 decibels (dB) in the ear with better hearing. Nearly 80% of people with hearing loss live in low- and middle-income countries. The prevalence of hearing loss increases with age, among those over 60 years old, more than 25% develop disabling hearing loss [5].

Based on data from the 2023 Indonesian Health Survey (SKI), it was found that in Indonesia there are 0.4% of the population with hearing loss or around 1 million people, of which the provinces of DI Yogyakarta and Papua Pegunungan are the provinces with the highest prevalence and the provinces of Riau and South Sumatra are the provinces with the lowest prevalence. The population with hearing loss in Indonesia is distributed in several age groups where the most are in the age group over 75 years old with a prevalence of 36.6%. While in Aceh itself there are 0.4% of the population who experience hearing loss or are ranked 15th out of 38 provinces in Indonesia, this figure is obtained from the results of the Indonesian National Health Survey (SKI) and of course it is necessary to take control measures to reduce this number [6].

METHOD

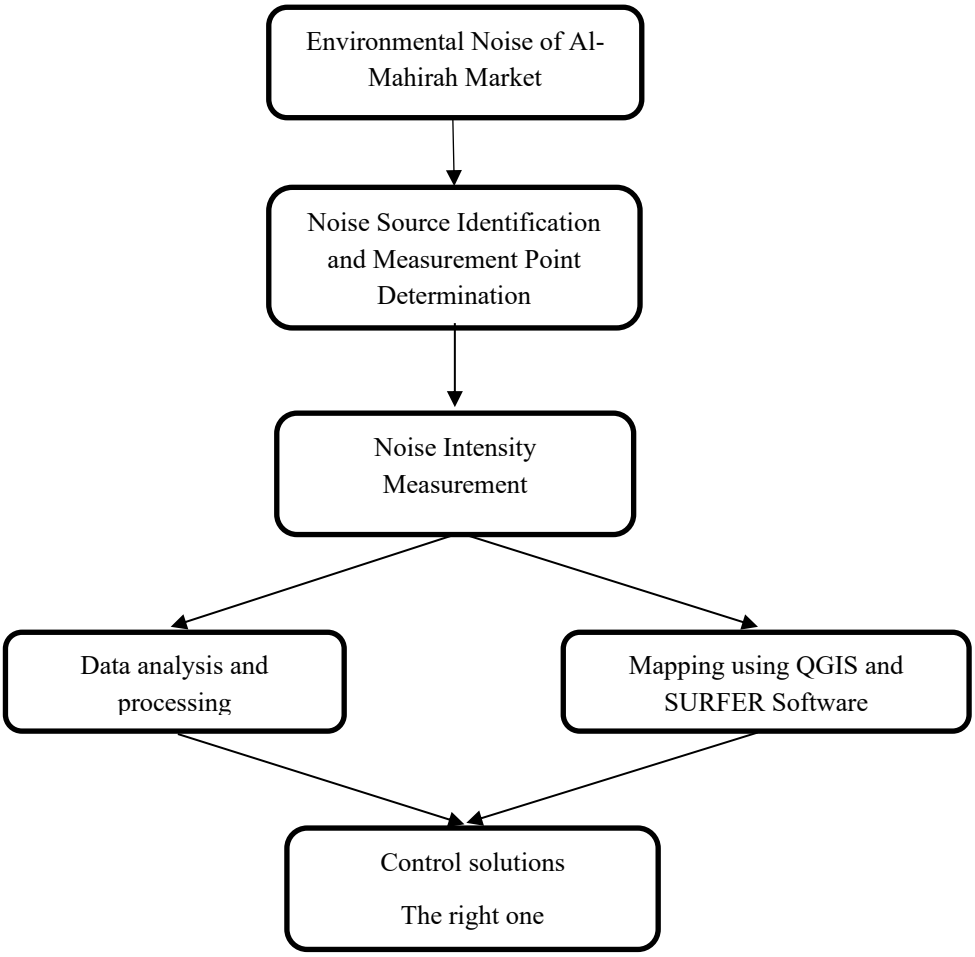
This research is a quantitative research with an Analytical Descriptive research design where the research aims to describe sitetically, factually and accurately about the facts and properties of a certain object or population, This research is an action reasearch, which is research that aims to get a solution that will be applied to the market as a form of improvement/control. The research was conducted in a market that was actively operating for only about 12 hours so that the formula used was the formula to calculate the afternoon leq (Ls).

The population of this sample is all markets in Banda Aceh city, which consist of 5 markets, namely, Aceh Market, Gampong Baru Market, Peuniti Market, Setui Market, and Al Mahirah Market. Aceh Market consists of 564 kiosks with 311 traders. Gampong Baru Market consists of 4 kiosks with 21 traders. Peuniti Market consists of 48 kiosks with 75 traders. Furthermore, Setui Market consists of 26 shops with 69 traders. Finally, Al-Mahirah Market, consists of 93 kiosks with 639 traders.

The sample in this study is one of the sectors of the community trade center, namely the Al-Mahirah Lamdingin market in Banda Aceh city which consists of 93 kiosks with 63 traders. The sampling technique used is Purposive sampling, which is one of the non-random sampling techniques where researchers determine sampling by determining special characteristics/criteria that are in accordance with the research objectives so that they are expected to answer research problems. The sample selection criteria are: Markets that operate from morning to evening, markets with the largest number of traders, have a wide area coverage and a large number of operational machines so that they are the most at-risk locations. The instruments used in this study are: Sound Level Meter (SLM), tripod, meter, work instruction sheet, measurement sheet/form and measurement point plan [7,8].

The determination of the measurement location point was selected based on the area close to the noise source and the place where market visitors often gather and pass by so that there is a risk of health problems if exposed to the sound source for a long period of time.

The initial stage in the data collection process is: determining the measurement time, data collection must be done by 2 people, one to see the time and give a signal of the instantaneous noise level reading every five seconds within 10 minutes and the second person records the instantaneous noise level reading from the sound level meter (SLM). With a sound level meter, the level of instantaneous sound pressure is measured dB (A) for 10 (ten) minutes and 120 point data is obtained [9].



This study uses an observation method, data collection is carried out by observation and measurement directly on the object of research, The source of noise at the location of this research is 3 sources, namely engine sound, vehicle sound and human voice with 6 measurement points using the Sound Level Meter tool. This research was conducted by 5 people, namely researchers and 4 enumerators who contributed to the measurement. from the three sources above, measurements are carried out using the same method, namely using the Sound Level Meter (SLM) tool.

Data processing in this study uses the descriptive Statistical Analysis technique, namely the calculation of numbers using existing formulas and assisted by using the Microsoft Excel application. The method of analyzing data to obtain noise information is: after obtaining noise level data from the measurement results as in appendix II, then the analysis of the measurement results is carried out. The result of the noise level measurement, calculated to

obtain Leq (12 hours). Leq is the average noise level of variable (fluctuating) noise, with the equation of logarime count.

After the noise intensity results are obtained, mapping is carried out using Surfer software to see the distribution of sound intensity at each measurement point so that safe and unsafe locations can be determined for market visitors. This determination is determined through the latitude and longitude coordinates at the measurement location and then analyzed using Surfer software so that the mapping results are obtained as in Figure 4. Then Mapping is carried out using QGIS Software to classify Areas with their respective noise sources.

RESULT

Based on the research carried out, the calculation of the daytime Leq (Ls) for 12 hours of work operations is carried out, then the results are obtained as shown in Table 1 below

Table 1. Noise Measurement Results

Sample Point	Noise Level (dBA)							LS	NAB
	Time								
	L1	**L2**	**L3**	**L4**	**L5**	**L6**	**L7**		
T1	42	36,8	37,8	37,5	42,4	38,3	41,1	51,4 dBA	65 dBA
T2	34,6	35,2	35,6	37,8	41,6	38,7	27,5	48,8 dBA	65 dBA
T3	30,9	35	35,2	33,8	35,9	35,4	25,7	45,5 dBA	65 dBA
T4	35,4	37,6	35,1	45,2	43,3	38	31,6	51,7 dBA	65 dBA
T5	44,3	44,3	43,6	43,5	43,7	43,8	43,1	55,2 dBA	65 dBA
T6	35,2	33,3	43,1	33	33,7	38,6	33,7	49 dBA	65 dBA

Based on the results of the measurement table conducted at the Al-mahirah market with operating hours from 05:00 - 18:00 at 6 sample points along with different noise sources at each point, the highest noise intensity results were obtained at point 5 with a noise intensity of (55.2) dBA, this value is still below the noise threshold value set by the Ministry of Environment and Forestry (KEMENLHK) but has entered the category of being at risk of causing health problems if exposed for a long period of time. However, these results may differ according to the time the measurement was taken. The level of noise intensity can be higher if the measurement is taken on holidays or before a certain event.

Although it does not exceed the set noise quality standard value, it is also necessary to carry out control at several points that are measured because it has a fairly high sound intensity and can risk interfering with communication and health due to being exposed for too long and continuously. The Fluctuating Chart of noise intensity in the Al-Mahirah Lamdingin market can be seen in Figure 1 and Figure 2 below:

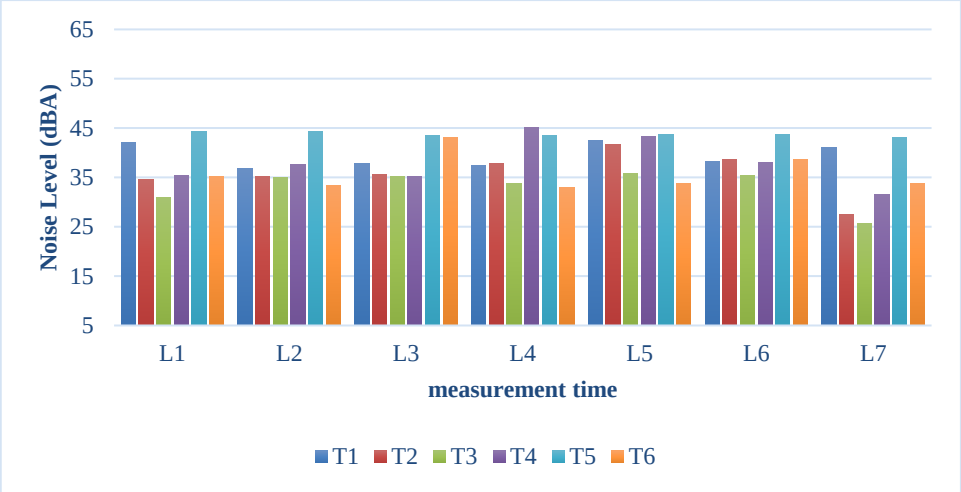


Figure 1. Noise Intensity Fluctuations Per Minute Chart

The figure above is a graph of noise intensity per minute, at points 4 and 5 are the points that have the highest noise intensity so that later it will be assessed whether it is risky or not, if it is at risk, control efforts will be given according to the point and source of the sound. Each dot is marked with a different color, as seen in the image above point 1 is marked with dark blue, point 2 is marked with orange, point 3 is marked with gray, point 4 is marked with yellow, point 5 is marked with light blue and point 6 is marked with green.

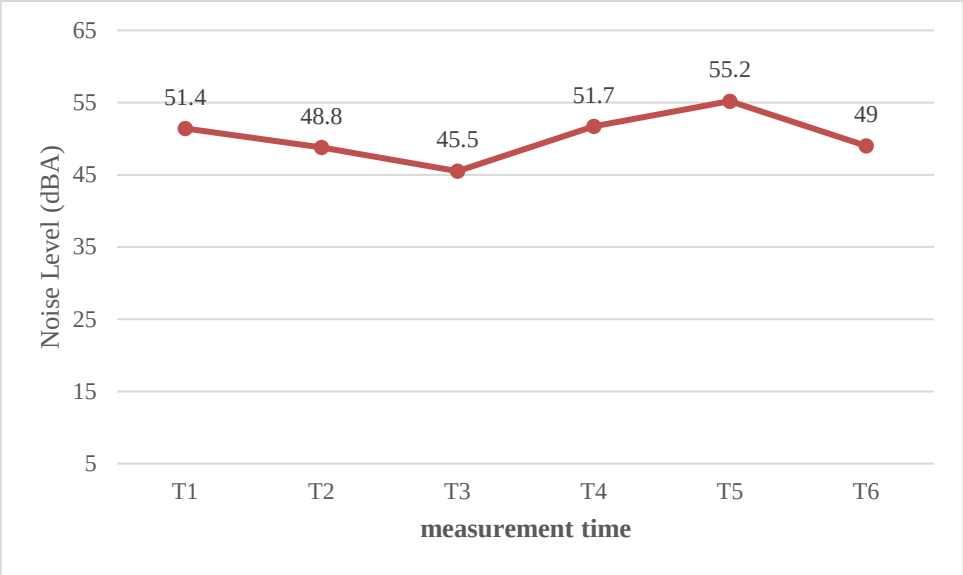


Figure 2. Noise Intensity Fluctuation Chart during the day (Ls)

The image above is a Noise Intensity Chart during the day (Ls) from the chart above can be seen point 5 is the point that has the highest noise intensity and is included in the Risk category with a noise intensity value of 55.2 dBA so it is necessary to make control efforts at that point to prevent chronic health problems in sellers who are in the area of that point.

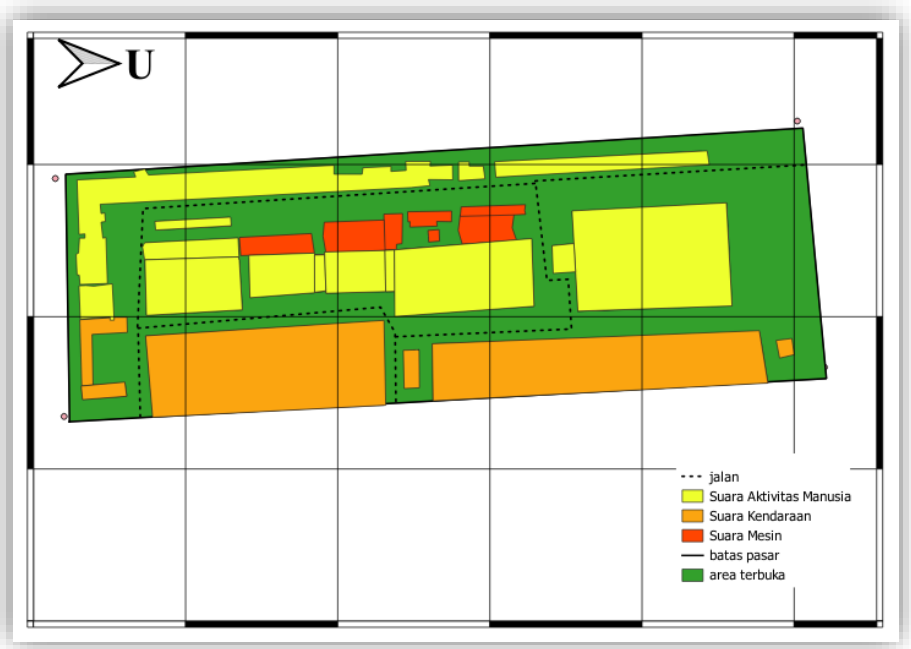


Figure 3. Noise Level Mapping at Al-Mahirah Market

From the image above, you can see that the area that is colored yellow is an area where the source of noise comes from human voice, then the area that is colored orange is an area where the source of noise comes from the sound of vehicles and the area that is colored red is an area where the source of noise comes from engine noise.

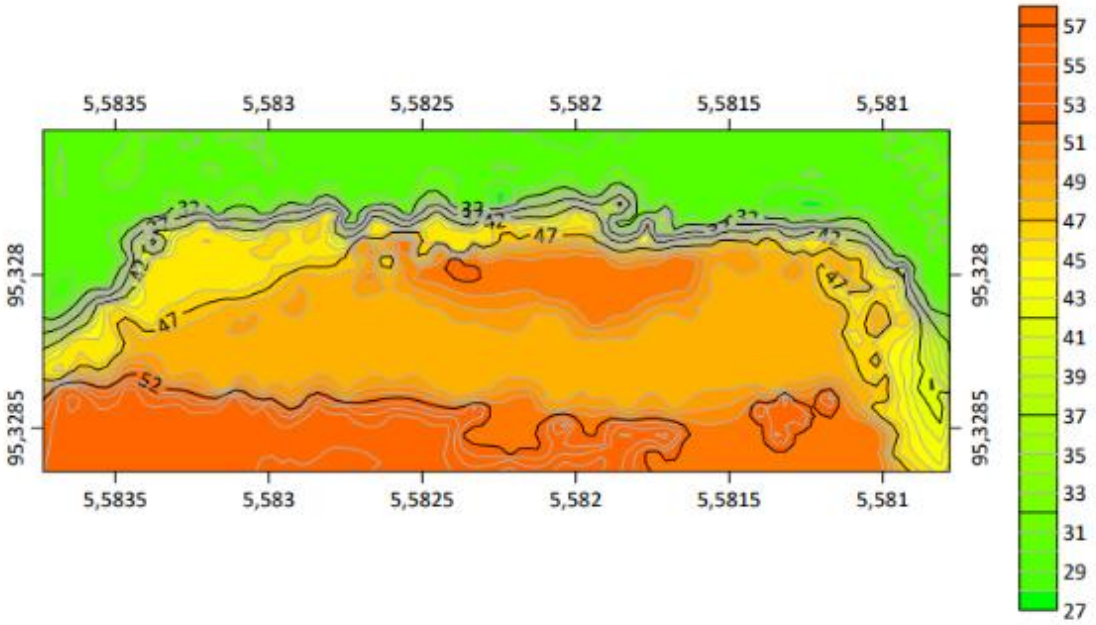


Figure 4. Al-Mahirah Market Noise Distribution Map

The explanation of the distribution map above is that the area that is colored in dark orange is an area that has a noise intensity between 51-60 dBA, the area that is colored orange is an area that has a noise intensity between 46-50 dBA, then the area that is colored yellow is an area that has a noise intensity between 41-45 dBA and the area that is colored green is the area that has the lowest noise intensity between 30-40 dBA. From the results of the mapping of the noise intensity level in the Al-mahirah market, there is no point that has a noise intensity that exceeds the Threshold Value (65 dBA). However, there are several points that are close to the noise quality standard and are considered to be at risk of causing health problems or chronic diseases due to prolonged and continuous exposure.

DISCUSSION

Based on the results of noise intensity measurements in the Al-Mahirah Lamdingin market, no points were found that exceeded the Threshold Limit Value with the highest noise intensity value of (55.2) dBA. This study is in line with the study conducted by Pratiwi et al., the noise intensity value is (65.1) dBA, but is not in line with the study conducted by Rusmayanti et al., the noise intensity value is (68.3 - 79.7) dBA [10].

The study is also in line with the study conducted by Neneng Fitrya et al., the highest noise intensity value is (62.8) dBA, but is not in line with the study conducted by Rika Lestari et al., the noise intensity value is (71.7 - 97.9) dBA [11,12].

The results above are close to the Threshold Limit Value set by the Ministry of Environment and Forestry (MENLHK) for office and trade purposes with a maximum Threshold Limit of 65 dBA and are at risk of causing health problems if exposed for a long period of time and continuously, health problems caused by this noise are usually chronic where health problems will be seen in the next few months to years.

Based on the measurements carried out, the highest noise intensity level is at point 5 because at this point it is an area that is directly exposed to engine noise and seen based on the research time, the highest noise intensity value occurred at 14:00 WIB. Measurements were taken on August 8, 2024 during the market's operating hours, namely from 05:00 - 18:00 WIB.

Suggestions for controlling and preventing health problems are to use Hearing Protection Equipment such as earmuffs and rearranging equipment that produces noise.

CONCLUSION

Based on the measurement of noise intensity in the Al-Mahirah Lamdingin market, the noise intensity value does not exceed the noise quality standard value but is already at a risky stage because the measurement results are close to the set quality standard and the frequency and time of noise exposure are quite long with the target group, the measurement results show that point 5 is the point with the highest noise intensity with the sound source coming

from the machine. Then the time with the highest noise intensity occurs at 14:00 this is influenced by the level of buyer visits and the increasing intensity of motorbike noise and human activity.

Based on noise mapping, it can be seen where the areas are at risk and not at risk which are marked with different colors for each noise intensity.

Then it is necessary to carry out control at each point such as changing the layout of the machine so that the noise does not collect in one place and the use of Hearing Protection Equipment (APT) or it can be done with control on the tool, either by updating the tool or repairing it such as replacing the old model coconut grater machine and it is no longer feasible with the latest machine, replacing the machine model used with a machine that has a sound intensity that is not too noisy or designing or modifying the coconut grater machine with additional/assistive tools so that the noise can be reduced. The intended aids are in the form of sound dampeners such as installing weights on the tool so that it does not vibrate and make noise or can also be done by locking the tool so that the tool does not vibrate and make noise.

SUGGESTION

Based on the findings and conclusions of this study, the first suggestion for market managers is to make changes to the layout of the machines and the distribution of equipment so that the sound is not only concentrated in 1 area/point, the second suggestion for sellers to check and maintain the machines regularly and use Ear Protection Equipment (APT) when operating the machines and the third suggestion for further researchers to conduct research on holidays/weekends and focus on traders and measure the long-term health impacts of noise exposure, then carry out periodic monitoring and compare noise levels from different days.

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