



EVALUATION OF NOISE LEVEL IN DINOYO ROADS, MALANG EAST JAVA

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ABSTRACT

The Dinoyo road is a connecting road and the entrance of Malang city from the north side starts from Soekarno-Hatta roads, then becomes the entry point to the tourist area of Batu City and several campuses. The volume of vehicles on the Dinoyo road often experiences a significant increase. The types of activities in the Dinoyo road area are very diverse, making the intensity of traffic movements on this road to be high and potentially lead to traffic congestion. Increasing the number of movements using motorized vehicles can cause congestion and can reduce environmental quality and cause impacts, one of which is noise. Measurements are made to determine L_s , that is, certain values of noise change. (fluctuations during a certain time, which is equivalent to the noise level of steady noise at the same time interval) in units of dB. The measurement procedure is carried out by taking two times (morning and evening time). Each measurement time is carried out at 3 points with 5 times replication of data every 15 minutes. The results of the measurement value at the highest morning time division are 95.5 dB (triple road section on the fourth measurement) and the lowest is 82.2 dB (one road on the first measurement). Furthermore, the classification of the measurement value at the highest afternoon time division is 100 dB (road two on the third measurement) and the lowest is 81.7 dB (road three on the first measurement). Efforts that can be made by the community to reduce noise include the use of earplugs or sound absorbers installed in stores or homes, as well as controlling at the source, and receiving the sound so that unwanted things do not occur.

Key words: Noise, Noise Control, Road Noise, Noise Impact.

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1. INTRODUCTION

Increased per capita income makes people able to buy private vehicles. The number of traffic flows and types of vehicles using road segments is increasing¹. Traffic Research 2017 in Beritagar.id published in March 2018, Malang City is included in the three largest cities in Indonesia, where Malang City is the third largest city in Indonesia with a traffic jam rate of 11.3 minutes / day². This time is calculated from the average duration of traffic jams at rush hour every day.

Malang is one of the big cities in Indonesia and is experiencing rapid population growth supported by many tourist destinations in the area of Malang City and its surroundings. Growth in vehicle ownership and growth in transportation activity has increased. The addition of the number of motorized vehicles in the city of Malang continues to increase every year and is not comparable with the growth of roads. Based on data from the Malang City Central Statistics Agency as of July 2017, the number of motorbikes was 441,123 units in 2015 and rose to 456,693 units in 2016. While the total number of four-wheeled vehicles and other large vehicles was 106,432 units in 2015. Up to 111,026 units. vehicles in 2016. The population of Malang City alone was 895,387 in early 2017. The high number of vehicles has become one of the factors causing congestion in this city. Moreover, the city road section has barely increased. Because the road capacity is not able to keep up with the number of vehicles, it is one of the factors causing congestion. The city government has difficulty adding roads because of some limited budgets until it is difficult to free land owned by residents for road construction³.

The Dinoyo road in Malang City is a connecting road and the entrance of Malang city from the north side starts from Soekarno-Hatta roads, then becomes the entrance to the tourist area of Batu City and several campus areas. The volume of vehicles on the Dinoyo road often experiences a significant increase. The types of activities in the Dinoyo road area are very diverse, making the intensity of traffic movements on this road to be high and potentially lead to traffic congestion. Increasing the number of movements using motorized vehicles can cause congestion and can reduce environmental quality and cause impacts, one of which is noise^{4,5}.

Noise according to Minister of Environment Decree No. 48 1996 is an unwanted sound from a business or activity at a certain level and time that can cause human health problems and environmental comfort. The acceptable noise level depends on how long the noise is received⁶⁻⁸. Sound pollution has an adverse effect on human health exposed to noise such as hearing loss⁹⁻¹¹. Any sound that is too loud to filter out human hearing will cause problems and disorders of the ear. Noise from motorized vehicles for a long time will cause discomfort and make the surrounding environment disturbed¹².

The research that underlies the background of this research is the increase in the number of motorized vehicles causing an increase in noise levels on the highway. The impact of this noise caused inconvenience to both road users and the surrounding community. Road with a volume of heavy vehicles and light vehicles that are quite a lot more at risk of producing noise. This study took place on Jalan Ahmad Yani Pabelan Surakarta. The variables sought were: traffic volume, vehicle travel time and noise intensity. This data is then used to find the noise level empirically and non-empirically which is then compared to the standard level permitted according to the environment minister's decree in 1996. The results of this study

indicate that the noise level on the road has exceeded the allowable level. One of the handling efforts is to transfer heavy vehicle routes ¹³.

The highest exterior noise level at the time of L1 at the UPI Campus Gate point (1A) was 73.72 dB (A). Noise level (LS) between 69.63-61.60 dB (A), night noise level (LM) between 48.10-38.72 dB (A) and day-night noise level (NGO) between 67, 91-59.93 dB (A). The highest interior noise level at activity in Building D (2B) is 69.96 dB (A) while the highest interior noise level when empty occurs at Building G (7B) at 69.37 dB (A). The exterior noise value at the time L1-L4 exceeds the Noise Level Standard while the interior noise value when the activity conditions partially exceeds the Noise Level Standard except Building G (7B) and noise values when empty conditions exceeds the noise level standard except UPI Sport & Exhibition Hall (1B), Building B (3B) and Building A (4B). Exterior control recommendations in the form of vegetation planting while interior controls are in the form of improvements to building construction ¹⁴.

With the potential for noisy sources in the Dinoyo roads area, the Noise Level Evaluation study was carried out on the road section of the Dinoyo road in Malang, East Java. The goal is to measure and compare the noise level in the Dinoyo road area; evaluating noise data obtained by comparing the noise level standard values for the connecting area that has been established by Minister of Environment Decree No. 48 1996; and provide noise control recommendations on the Dinoyo roads area for high noise sources.

2. METHOD

The implementation of the research begins by determining the noise level / area of measurement. The measurement area is determined in the intersection area of the three streets of the Malang road. The intersection of the three Dinoyo roads is the basis of the selection because the 3-way junction Dinoyo Malang City, East Java is a congested road because the road is the main road leading to the city of Batu. In addition there are UNISMA Hospital, Dinoyo mall, Dinoyo Market, as well as main roads for Brawijaya University students, Maulana Malik Ibrahim Malang Islamic State University, and Muhammadiyah Malang University which make the road very crowded. The measurement method used is to use the direct measurement method ^{7,15,16}.

Data collection in this study includes secondary data and primary data. Secondary data in the form of a map of the Dinoyo three-way intersection, noise level measurement data at 3 points on the Dinoyo road section. Use equipment in the form of a sound level meter as a noise data recorder. Measurements are made to determine Ls, that is, certain values of noise change. (fluctuations during a certain time, which is equivalent to the noise level of steady noise at the same time interval) in units of dB ^{7,17}. The measurement procedure is carried out by taking two times (morning and evening time). Each measurement time is carried out at 3 points with 5 times replication of data every 15 minutes.



Figure 1. Sound Level Meter and Dinoyo three-way Intersection

3. RESULT AND DISCUSSION

Observations and video recordings are performed for all selected tasks. The general results of the study indicate the posture of evaluating with different methods on the tasks evaluated resulting in the same results. However, some differences occur for the position of the neck and wrist. Furthermore, the method directly provides a variety of information revealed clearly in different aspects of the workstation for ergonomics and decision makers. The main advantage of the direct method is to observe whether body movements when performing tasks are symmetrical.

The intersection of the three sections of Dinoyo road, East Java is a congested road because the road becomes a connecting road to the tourist area of Batu City which at certain times becomes very high volume due to the number of domestic tourists who come, also becomes the area of community meeting points in education and market areas. With the implementation procedures that have been made, the measurements are carried out at 3 points in the intersection of the three Dinoyo road sections with 5 replications in every 15 minutes. The following is an illustration of the 4 points at the intersection of the three sections of Dinoyo road, shown in Figure 2.



Figure 2. Measurement Point for the intersection of the three sections of Dinoyo road

In accordance with the data collection method described earlier, the following is the result of noise data collection at the intersection of the three sections of Jalan Dinoyo during the morning as shown in table 1.

Table 1 The measurement results in the morning

Position	Noise Level (dB)					Average
	1	2	3	4	5	
Roads 1	88.2	93.2	89	89.3	90.6	90.06
Roads 2	89.8	88.2	92.3	91.5	90.4	90.44
Roads 3	94.2	93.6	92.2	95.5	92.4	93.58

According to the results of the noise level classification based on intensity, the noise at the 3 intersection points of the three Dinoyo roads sections is above 85 dB so that it is included on a very hard intensity scale. This intensity is far higher than the maximum level permitted by the Ministry of Health in zone D which is equal to 70 dB.

Referring to the results of the study, there is an influence of noise on humans depending on the level of sound produced. At the level of 85-95 dB, if in a long period of time it will cause mental / physical fatigue, damage to the hearing instrument and decreased hearing power. The following is the result of noise data retrieval at the intersection of three sections of Dinoyo road during the afternoon, as shown in table 2.

Table 2 The measurement results in the afternoon

Position	Noise Level (dB)					Average
	1	2	3	4	5	
Roads 1	97.6	90.9	87.9	90	91.1	91.5
Roads 2	90.9	93.3	100	90.5	89.4	92.82
Roads 3	81.7	92	93.1	89.8	94.3	90.18

As in the morning, the noise at the 3 intersection points of the three Dinoyo roads segments in Malang City is above 85 dB so that it is included on a very hard intensity scale. This intensity is far higher than the maximum level permitted by the Ministry of Health in zone D which is equal to 70 dB so it can affect mental / physical fatigue, damage to hearing instruments and decreased hearing power.

4. CONCLUSIONS

Based on the results of noise level measurements at the three intersection points of the three Dinoyo roads sections with different conditions, the noise level at the intersection of the three Dinoyo roads segments in Malang City is at a disturbing level and exceeds the noise level standards set by the Ministry of Health, with value classification the highest measurement of the morning time division is 95.5 dB (triple road section on the fourth measurement) and the lowest is 82.2 dB (one road section on the first measurement). Furthermore, the classification of the measurement value at the highest afternoon time division is 100 dB (road two on the third measurement) and the lowest is 81.7 dB (road section three on the first measurement). Efforts that can be made by the community to reduce noise include the use of earplugs or sound absorbers installed in stores or homes, as well as controlling at the source, and receiving the sound so that unwanted things do not occur.

REFERENCES

- [1] Sam F. Studi Model Hubungan Karakteristik Lalu Lintas dengan Tingkat Kebisingan Kendaraan pada Ruas Jalan Tol Ir. Sutami Makassar. J Tugas Akhir Jur Tek Sipil Fak Tek Univ Hasanuddin Makassar. 2012.
- [2] Rentjoko A. Kota Anda termasuk sepuluh termacet di Indonesia? Beritagar.id. <https://beritagar.id/artikel/berita/kota-anda-termasuk-sepuluh-termacet-di-indonesia>. Published 2018. Accessed January 23, 2019.
- [3] Arifin Z. Jumlah Kendaraan Hampir Separuh Penduduk Kota Malang. Liputan6.com. <https://www.liputan6.com/regional/read/3337501/jumlah-kendaraan-hampir-separuh-penduduk-kota-malang>. Published 2018. Accessed January 23, 2018.
- [4] Putri SR, Unas S El, Hasyim MH, Sipil JT, Teknik F, Brawijaya U. Studi Kelayakan Finansial Pada Proyek Pembangunan Mall Dinoyo Kota Malang. J Rekayasa Sipil. 2013;7(3):257-263.
- [5] Dewi TC. Analisis Perilaku Pedagang Pasca Relokasi Pasar Dinoyo ke Merjosari. Jesp. 2015;7(1):5-11.
- [6] Setiawan MF. Tingkat Kebisingan Pada Perumahan di Perkotaan. Tek Sipil dan Perenc. 2010;12(2):191-200.
- [7] Negara M, Hidup L. Menteri Negara Lingkungan Hidup Tentang Baku Tingkat Kebisingan.; 1996:1-7.
- [8] Siswanto A, Haryuti AIT. Kebisingan. Balai Hiperkes dan Keselam Kerja Jawa Timur. 1991.

- [9] Banerjee D, Chakraborty SK, Bhattacharyya S, Gangopadhyay A. Appraisal and mapping the spatial-temporal distribution of urban road traffic noise. *Int J Environ Sci Technol.* 2009;6(2):325-335. doi:10.1007/BF03327636
- [10] Datta JK, Sadhu S, Gupta S, Saha R, Mondal NK, Mukhopadhyay B. Assessment of noise level in Burdwan town, West Bengal. *J Environ Biol.* 2006;27(3):609-612.
- [11] de Kluizenaar Y. Adverse Effects of Long Term Exposure to Road Traffic Noise.; 2015. <http://hdl.handle.net/1765/78214>.
- [12] Imandita V, Muzayanah. Analisis Kebisingan Dan Volume Lalu Lintas Kendaraan Di Jalan Ketintang Kota Surabaya. *Swara Bhumi.* 2018;5(61):193-199.
- [13] Wilis Renggani G. Analisa Tingkat Kebisingan Lalu Lintas Di Jalan Raya Ditinjau Dari Baku Tingkat Yang Diijinkan. *Engineering.* 2007;6(1):1-11.
- [14] Goembira F, Ihsan T, Fahyudi M. Analisis Tingkat Kebisingan Di Kawasan Kampus Universitas Putra Indonesia (Upi) Di Kecamatan Lubuk Begalung Kota Padang. *J Tek Lingkungan.* 2016;13(1):29-34.
- [15] Health NI for OS and. Criteria for a recommended standard: occupational noise exposure: revised criteria 1998. US Dep Heal Hum Serv Public Heal Serv Centers Dis Control Prev. 1998.
- [16] Crocker MJ. *Handbook of Acoustics.* John Wiley & Sons; 1998.
- [17] TE Rusjadi, Dodi; R Palupi M. Kajian Metode Sampling Pengukuran Kebisingan dari Keputusan Menteri Lingkungan Hidup No. 48 Tahun 1996. *J Standarisasi.* 2011;13(3):297-304.