

NOISE LEVELS ALONG THE PALEMBANG-INDERALAYA HIGHWAY

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NOISE LEVELS ALONG THE PALEMBANG-INDERALAYA HIGHWAY

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ABSTRACT

Background: Palembang – Indralaya highway is a cross-provincial road where motor vehicle activity is constant, causing noise and affecting settlements along the road. Constant exposure to the noise that exceeds quality standards (55 dB) stipulated in Environmental Ministerial Decree (KEP.48/MENLH/11/1996), can cause a variety of health problems, such as hearing loss and psychological disorders. Therefore, this study is conducted to determine the noise level along the Palembang-Indralaya road.

Method: This study used an observational approach through direct observations and measurements using the Mini InScienPro SQ-100 sound level meter. The noise level is measured at two locations, i.e., on the curb and in houses located along the highway.

Results: Based on the observations and measurements, the highest noise intensity was during the daytime (78.0 - 102.4 dB). The highest intensity of noise inside and outside the house are 74 and 90 dB, respectively. This is due to the high volume and activity of vehicles crossing the highway.

Conclusion: The intensity of the noise received by the residents along the highway is above the quality standards, so as to handle the noise, trees need to be planted around the housing (barrier plants).

Keywords: Noise Intensity, Highway, Sound Level Meter

ABSTRAK

Latar Belakang: Jalan raya Palembang – Indralaya merupakan jalan lintas provinsi dimana aktivitas kendaraan bermotor tidak pernah berhenti, sehingga menimbulkan kebisingan dan mempengaruhi pemukiman di sepanjang jalan. Paparan kebisingan secara terus-menerus yang melebihi baku mutu (55 dB) yang ditetapkan dalam Keputusan Menteri Negara Lingkungan Hidup (KEP.48/MENLH/11/1996), dapat menyebabkan berbagai masalah kesehatan, seperti gangguan pendengaran dan gangguan psikologis. Oleh karena itu, penelitian ini menentukan tingkat kebisingan di sepanjang jalan Palembang-Indralaya.

Metode: Penelitian ini menggunakan pendekatan observasional melalui pengamatan dan pengukuran langsung menggunakan Mini InScienPro SQ-100 sound level meter. Tingkat kebisingan diukur di dua lokasi, yaitu, di tepi jalan dan di rumah-rumah yang terletak di sepanjang jalan.

Hasil Penelitian: Berdasarkan hasil pengamatan dan pengukuran menunjukkan bahwa intensitas kebisingan tertinggi berada pada saat siang hari (78,0-102,4 dB). Intensitas kebisingan di dalam dan di luar rumah tertinggi secara berurutan adalah 74 dan 90 dB. Hal ini disebabkan karena tingginya volume dan aktifitas kendaraan yang melintasi jalan raya

Kesimpulan: Intensitas kebisingan yang diterima oleh masyarakat yang berada di sepanjang jalan berada diatas baku mutu yang telah ditentukan sehingga untuk meminimalisirnya dapat dengan melakukan penanganan terhadap media suara, seperti menanam pohon-pohon di sekitar perumahan (*barrier tanaman*).

Kata Kunci: Intensitas Kebisingan, Jalan Raya, Sound Level Meter

INTRODUCTION

Nowadays, humans are increasingly exposed to pollution, whether we realize it or not. One of them is noise pollution. This pollution is often neglected, perhaps because its effects are not directly visible compared to other forms of pollution. However, it is as dangerous as other forms of pollution and can cause various health problems for human.¹ Unlike chemical pollution, noise hazards do not build up in the body or the environment but can cause short-term and long-term adverse effects to human.²

Human settlement is one of the areas that is vulnerable to noise and ironically, the community is unaware of this danger. Generally, the danger of noise is of particular concern in the industry, so there have been control measures done to overcome the risks that may arise, through controlling sources of noise, mediators, and receivers. Meanwhile, noise control measures in residential areas are not fully understood by the community.

The source of noise in residential areas is dominated by activity on the highway. Noise disturbance caused by the highway depends on three main causes; the type, speed and number of vehicles, the type of road surface structure,³ the characteristics of buildings and the total population.³ In roads, vehicles contribute about 70% of noise. Vehicle noise is produced by the engine and the exhaust system of vehicles, aerodynamic friction, interaction between the vehicle and the road system, and by the interaction between vehicles and indiscriminate use of vehicle horns.^{4,5,6} At low levels, the sounds generated by motor vehicle activity are tolerable, but at high levels, such sounds become a nuisance.⁷ These disturbances cause disorders that can significantly affect human health.

Prolonged exposure to noise levels over 85 dB may result in permanent or temporary loss of hearing.⁸ Noise can also cause psychological effects in the form of speech disorders, sleep disturbances, impaired concentration which results in decreased performance, communication disorders, and disorders of mental emotional as well as disorders of the heart system and blood circulation. Mental emotional disorders can include disruption of work comfort, irritability, and short temper. Other health risks include coronary heart disease, ulcers, colitis, migraine, and increased blood pressure.^{9,10}

Along highways, traffic is the main source of noise that disturbs most people. Despite the fact that noise on highways has been a long-standing problem, however, no solution has been developed to address this issue. The noise that is generated on highways tends to vary in constancy, depending on vehicle density on a thoroughfare. The longer the road, the higher the likelihood that the number of passing vehicles and traffic noise will increase. As a result, the health of residents who live along roadsides is adversely affected.²

The noise level in Singapore increased along with the increase of population and road traffic, where there are 951.307 vehicles on Singapore highways at the end of June 2011, a 37% increase from 2000.¹ Other data showed that the level of noise at Kuwait metropolis highway during peak hours and outside peak hours ranges from 66.7 to 94.8 dBA and 64.9 to 89.1 dBA, respectively.¹¹ In Indonesia alone, there are several studies related to noise levels in settlements/housing, including those in Iswar and Malkhamah's research which shows that the noise level in a residential environment in Yogyakarta ranges from 71.89 dBA to 75.64 dB,¹² Still in Yogyakarta, other studies conducted by Efendi and Malkhamah has noise levels ranged from 60.7 dBA to 74.5 dBA,¹³ and the noise level in housing in DKI Jakarta ranged from 63.59 dBA to 84.0 dBA.¹⁴ From these studies it is known that the noise level in settlements is very high, referring to the Decree of the Minister of Environment No.48 of 1996, where the noise level for settlements should not exceed 55 dB.¹⁵

Adherence to this policy is necessary, especially along highways, such as the Palembang–Indralaya highway. This pathway is a cross-provincial road that serves as the only access to Sriwijaya University. The students, lecturers, and staff of the institution always travel through this road by way of public transport and private vehicles. Additionally, it is frequently traversed by heavy vehicles that carry products that are widely available in South Sumatra Province. The Palembang–Indralaya highway is therefore always full of activity. This high activity has tremendously affected the settlements along the road.

On the basis of the above-mentioned issues, this study assumed that residents living along the Palembang–Indralaya highway are susceptible to health problems given their exposure to motor vehicle activity. In addition to experiencing hearing loss, the residents may be suffering from other disorders, such as sleep disturbance, concentration and communication disorders, and emotional instability that influences blood pressure. To help

minimize these problems, this research determined the noise levels along the Palembang–Indralaya highway through observation and instrument-aided measurement.

METHODOLOGY

This research was conducted via an observational approach that features direct measurement using a Mini InScienPro SQ-100 sound level meter. Noise was measured in two locations: on the edge of the highway and in the houses located along it. The points along the highway at which noise was to be measured were determined by examining road segments that are prone to congestion and located in the vicinity of residential areas. The points in the homes at which noise was measured were the living room, kitchen, and bedroom as these were assumed to be the rooms where the occupants spend most of their time. A total of 10 points were assigned as measurement areas along the road, and 106 points were identified as measurement areas inside and outside the houses. The measurements were conducted in the morning, afternoon, evening, and night.

RESULTS

Noise levels have been measured at 10 points along the Palembang-Indralaya highway, with four measurement⁴ done every day during the study period indicating that they are all above the quality standards stipulated in the Decree of the Minister of Environment No.48 of 1996, presented in table 1. From the results of observations and measurements, the noise level in the morning ranged from 66.7 dB to 97.2 dB, during the day ranged from 78.0 dB to 102.4 dB, in the afternoon ranged from 73.4 dB to 87.4 dB, and at night it ranges from 73.9 dB to 85.4 dB. Overall, the noise level ranged from 66.7 dB to 102.4 dB. Table 1 shows that noise intensity along the Palembang–Indralaya highway was highest during the day, ranging from 78.0 to 102.4 dB.

Table 1.
Noise Intensity along the Highway of Palembang-Indralaya

No	Measurement Point	Morning	Afternoon	Evening	Night
1	Point 1	78.5-93.7	78.0-88.2	79.6-85.3	72.8-85.0
2	Point 2	75.0-85.4	87.4-102.4	73.8-76.4	74.2-82.9
3	Point 3	66.7-87.0	80.5-94.7	75.7-82.8	74.1-83.2
4	Point 4	81.3-86.0	80.2-92.9	76.7-83.2	74.1-83.2
5	Point 5	80.2-97.2	81.6-99.3	73.7-87.4	74.6-80.9
6	Point 6	79.9-89.2	84.8-100	73.5-79.9	74.8-83.4
7	Point 7	68.8-78.9	84.8-94.2	78.5-85.4	77.7-85.1
8	Point 8	77.3-89.6	84.0-98.2	81.1-87.2	77.7-82.0
9	Point 9	68.1-85.9	87.3-90.3	74.9-83.6	77.9-85.4
10	Point 10	79.0-84.8	79.3-89.7	77.7-83.5	73.9-84.9

Table 2.
Statistic Measures of Noise Intensity in and Outside Resident Living Along the Highways of Palembang-Indralaya

Statistic Measure	Inside (dB)	Outside (dB)
Mean	60,41	76,31
Median	60,10	77,70
Deviation Standard	8,166	7,534
Varian	66,682	56,768
Skewness	-0,022	-0,823
Error of Skewness Standard	0,235	0,235
Kurtosis	-1,025	0,725
Error of Kurtosis Standard	0,465	0,465
Minimum	45	51
Maximum	74	90
The total of Measurement Point	106	106

The results of the measurements conducted inside and outside the houses located along the highway are presented in Table 2. The average noise levels inside and outside the houses was 60.41 dB and 76.31 dB respectively. It can be concluded that the public is exposed to noise from the highway that exceeds the quality standards. Inside the houses, the lowest noise level is 45 dB and the highest is 74 dB, while outside the houses, the lowest noise level is 51 dB and the highest is 90 dB.

DISCUSSION

Highway is the main source of noise in the settlement areas.¹⁶ Traffic noise is very dependent on several parameters, such as the traffic volume, the traffic flow typology, the vehicles typology, the road and pavement features, the speed, and the interaction between tires and the road.¹⁷ The Palembang–Indralaya highway is a cross-provincial thoroughfare where the volume of vehicles is constantly increasing. The types of vehicles that travel over this road range from private vehicles and public transportation to heavy vehicles. Because it is the only access road to the University of Sriwijaya, the number of university students, employees, and lecturers increase vehicular volume on weekdays. This increased volume causes noise levels along the highway to exceed 55 dB. With the increasing of motorized vehicle use, noise level on the edges of highways in some major cities in Indonesia generally approaching 70 to 80 dBA.¹⁸

In the public health sciences, noise is defined as an unexpected and unpleasant, disturbing sound or a sound that is desirable but may potentially cause health problems. The World Health Organization categorized noise as a type of pollutant. Noise sources include motor vehicle activity. As the number of motorcycles increase, highway noise levels in some major cities in Indonesia generally approach 70–80 dB(A).¹⁸ Noise due to highway activity has been referred to through several terms, such as environmental noise, road traffic noise, traffic noise, and transportation noise. Environmental noise pertains to undesirable noise caused by a small source (except industrial sites) and is usually caused by human activities and transportation activities, such as those occurring on highways, railways, and airports.¹⁹

The noise level on the highway is greatly influenced by the type, speed, and number of vehicles. The type of road surface structure and building characteristics also influence the level of noise exposure in the community.³ The results of this study indicate that the noise level is highest during the daytime, where it is the peak rush hour due to the increase of vehicle volume, both private vehicles, public transportation, and heavy vehicles.

Other studies mentioned that noise level can also be generated from engine speed. AlQdah investigated noise pollution from the type of car that is often used by Arabs. The result of the research shows that the noise levels produced by variable engine speed ranged from 750 to 4000 rpm were recorded. The sound level found to be 59.45 dBA when the vehicle in motion at normal speed. When the vehicle at idle speed 750 rpm the maximum noise level measured at the back exhaust 50.4 dBA where the minimum level recorded at the right side 40.8 dBA.²⁰

Other studies conducted by Khasanah, et. al. on one of the Yogyakarta highways shows that the equivalent noise level in the morning measurement ranges from 68.5 dBA to 72.4 dBA, during the day it ranges from 69.1 dBA to 71.3 dBA, and in the afternoon it ranges from 67.9 dBA up to 70.6 dBA.²¹ These results indicate the noise level exceeds the standard due to the high traffic flow along the road.²¹

Dratva et al.'s study in Switzerland revealed the actual effects of the noise level generated by vehicular current on disturbances in the surrounding community. Constant exposure to noise poses adverse effects, such as psychological disorders, including difficulty concentrating and sleeping, irritability, and stress; the other negative effects of noise are dizziness, fatigue, decreased labor, hearing loss, muscle tension, blood vessel contraction, increased blood pressure and heart rate rhythm, and increased adrenaline production.²² Noise is also unfavorable for the cardiovascular system.²³

Residents who live along the edge of the Palembang–Indralaya highway occupy a noisy risk area, as evaluated on the basis of related criteria. Such locations are those that span an area of 0–10 m from the edge of pavement, experience a noise level of more than 75 dB(A) (Leq), and experience a noise intensity of 75–90 dB(A) for a maximum of 10 hours per day in the daytime and less than 4 hours per day at night.²⁴

The noise that occurs in residential areas requires serious handling given human health effects that ultimately influence the quality of life in these communities.¹⁴ Setiawan explained that noise can be addressed by focusing on three factors, namely, the sound source, the voice media, and the receiver. Among these factors, addressing the sound media provides a solution to noise problems; an example solution is to plant trees (barrier plants) around houses.¹⁴ Mak and Leung has shown that there's a decrease of noise level after barrier installation, from 17 dBA to 0,2 dBA.²⁵

CONCLUSION

Noise intensity along the Palembang–Indralaya highway was highest during the day (78.0–102.4 dB). The noise intensity levels inside and outside the homes of the highest populations were 74 and 90 dB, respectively. From the result, it is concluded that all of the noise levels are exceeding the quality standards set in the Minister of Environment Decree No.48 of 1996. For this reason, it is necessary to take control measures so that people exposed to noise along the highway can be protected from the risk of noise, by handling sound media, like planting trees around housing (plant barriers).

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