

## Attitudes and Responses Residents Against Traffic Noise in Malang City, East Java, Indonesia

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### Abstract

Traffic noise that exceeds the required noise level standard in the Minister of Environment Decree No. 48 of 1996 of the Republic of Indonesia can interfere with physiological and psychological health. This research was conducted in the city of Malang, which aims to determine the attitudes and responses of residents who live around the road sections to the noise coming from motorized vehicles that expose it. The study was conducted with interviews assisted with closed and open questionnaires. Simultaneously with the interview, data collection of noise levels outside and inside the house was carried out using a sound level meter. Interviews were conducted between 16:00 and 21:00. Respondents' responses are divided into four variables, namely perception, expectation, attitude, and adjustment to the noise that exposes it. From the separately processed noise level data, it is found that around the road segments in Malang City have far exceeded the required noise level, which is an average of 85.2 dB. From the descriptive analysis obtained facts, respondents have the perception that their place of residence is in a noisy environment. In these conditions, they hope that motor vehicle noise can be reduced or minimized. They are not comfortable living in a noisy environment. There are even some of them who want to move house to a place that is not noisy. Most of them make adjustments to noise with certain treatments. However, quite a number of them did not make any adjustments.

**Keywords:** noise, perception, expectation, attitude, adjustment

### INTRODUCTION\*

The Government of the Republic of Indonesia has set the noise level standard through the Minister of Environment Decree No. 48 of 1996 [1]. What is meant by Noise Level Standard is the maximum limit of the noise level that is allowed to be discharged into the environment from businesses or activities so as not to cause disturbance to human health and environmental comfort.

There are consequences caused by the high level of noise that exposes humans, whether caused by motorized vehicles or industry. The main social consequence of hearing damage is the inability to understand speech in the conditions of everyday life, and this is considered an annoying social barrier.

Loud sounds are said to cause hearing problems [2]. However, low noise levels can also have a nonauditory effect. This effect can be physiological, such as hypertension or asthma or psychological, such as irritation. Psychological effects such as clarity of speech, decreased ability to read and understand, lack of concentration, lack of memory, decreased motivation, and increased irritation [3]. In several studies also showed a decrease in motivation [4].

Physiological studies on heart rate, catecholamines, and cortisol levels provide evidence that noise can cause stress and sometimes pose a threat [5]. Also, noise can interfere with short-term memory [6].

Also, some noise effects may be permanent. The Munich study shows that some cognitive functions, such as speech perception, do not improve with The noise stoppage [7].

Traffic noise results in physical and psychological disturbances, especially in the morning and evening, affecting: irritability, insomnia, difficulty concentrating, and conservation disorders [8]. Traffic noise was also felt by residents as a problem that disrupted their lifestyle, more than half of the people

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interviewed considered moving to a quieter environment [9].

Research in Jakarta also shows that noise influences community disturbance [10]. However, the research conducted in Padang showed that the majority of respondents felt only slightly disturbed by outside noise [11].

Research in Serdang Raya, Selangor, Malaysia provides an interesting conclusion. The noise value to be higher than the guideline value, in contradiction survey results show that most of the time sleeping citizens are not affected, and they are not bothered by traffic noise. This is mainly because most of the population in the study area has been there for more than 19 years and this is enough to illustrate the pattern of results where most residents are accustomed to traffic noise and they adapt to everyday life. However, countermeasures such as noise barrier construction are strongly recommended to limit chronic effects [12].

Cristian Camusso and Cristina Pronello examined the attitudes of different people towards noise disturbance in urban areas. Obtained from a dose-response relationship that shows that there is a low correlation between noise and disturbance [13].

Given the increased noise level along the highway, it is important to reduce noise intensity. Various methods of self-adjustment have been carried out, among others by building noise barriers around the highway [14].

The effect of structuring urban parks and other landscapes on the psychological benefits of traffic noise has been investigated. The results showed that landscape plants can moderate the effects of noise on emotions caused by noise and visual stimulation. These findings indicate that landscape plants have the advantage of smoothing the effects of noise through the emotional processing of research subjects, which is called a reduction in 'psychological noise' [15]. Research related to plants that can reduce noise has been conducted in Sidoarjo, East Java [16] dan also in Malang City [18].

Noise, specifically transportation noise, is not believed to be a direct cause of mental illness, but it is assumed that it accelerates and intensifies the development of latent mental disorders (WHO 2000). Studies on the adverse effects of transportation noise on mental health include symptoms such as anxiety, emotional stress, nervousness, nausea, headaches, instability, argumentativeness, mood changes, increased social conflict, and general psychiatric

disorders, including neurosis, psychosis, and hysteria [19].

Work efficiency and productivity can be disrupted by high noise levels because they can affect mind concentration, interrupt rest, and sleep. Even prolonged noise exposure can cause hearing loss or become deaf. Regarding social impacts, housing areas in areas close to sources of noise have high land values and even the selling price of residential buildings can be very low. Examples like this are in the area around airports [20].

Noise also affects student learning activities. They feel very disturbed in learning activities [21]. The same thing is also shown that there is a relationship between the perception of noise with student motivation. The higher the perception of noise, the lower their motivation to learn. Conversely, the lower the perception of noise, the higher their learning motivation [22].

From previous findings it can be concluded that noise exceeding the required threshold can interfere with physiological and psychological health. Thus, this study aims to determine the extent of the attitudes and responses of residents who live around the road sections to the high level of noise that exposes them.

## **MATERIAL AND METHOD**

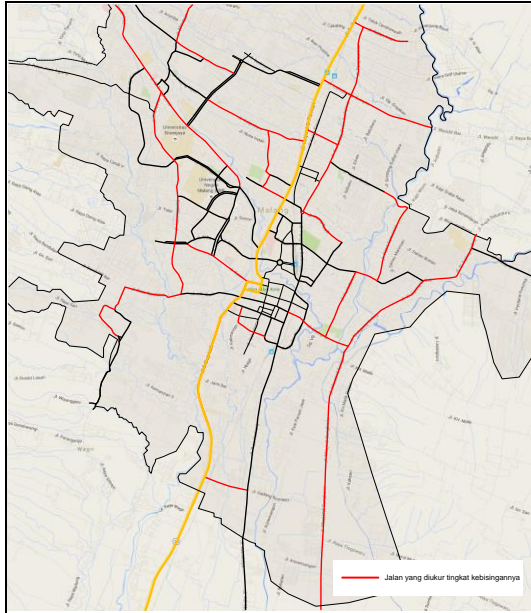
### **Research Location**

The study was conducted in the city of Malang, East Java province, Indonesia. This city is the second-largest city in East Java after Surabaya. The geographical position of the city of Malang is in the position of 112° 38' 01.7" East Longitude and 7° 58' 42.2" South Latitude with an area of 11,006 Km<sup>2</sup>. Malang City is surrounded by sub-districts which are included in the administrative area of Malang Regency.

Like the city in general in Indonesia, Malang city people tend to choose a place to live on the edge of the highway. The highway network in Malang city is divided according to its functions including Primary Arterial road (11.82 km), Secondary Artery (15.94 km), Primary Collector (8.16 km), Secondary Collector (27.09 km), Primary Local (9.66 km), Secondary Local (590.67 km). The total length of the road is 663.34 km. Malang City's road transportation pattern is a radial concentric pattern with an inner ring system of the local road network that forms a grid pattern.

From our related research, we conclude that the level of road traffic noise in Malang has

exceeded the required noise level. The average noise level is 84.28 dB, which is greater than the noise level that is suitable for settlement ( $\leq 55$  dB). A map of motorized traffic noise in Malang can be seen in Figure 1.



**Figure 1.** Map of Noise from Motorized Vehicle Resources in the City of Malang

The level of traffic noise that exceeds the threshold of the Decree of the Minister of Environment No. 48 of 1996 [1], theoretically, it can disrupt societies exposed both physiologically and psychologically.

### Research Method

The method used in this study is a survey conducted by interview. The tool used to retrieve data is a questionnaire. To get noise level data a sound level meter is used.

### Sample Determination

The study population is the people who live around the highway. The houses that are sampled are residential houses that have not functioned as places of business that occupy space on the roadside.

Determination of the sample is based on the function of the road chosen 41 sections consisting of 4 primary segments of arteries, 4 segments of secondary arteries, 2 segments of the primary collector, 13 segments of the secondary collector, 2 segments of the primary locator, and 16 segments of secondary locator segment. The determination of these sections is based on road segments in which there are many

residential houses that are not used as a place of business or business.

The number of samples is calculated based on suggestions from Gay and Diehl (1992), for descriptive studies, the minimum sample is 10% of the population [23]. The number of samples of 10% from a population of 1202 houses obtained a minimum of 120 houses. In this study, proportionally the sample was taken randomly and developed into 160 houses.

### Research Variable

The data identified as ordinal data arranged in a questionnaire. The closed answers provided are choices: strongly disagree, disagree, neutral, agree, and strongly agree. Noise level data is obtained using a sound level meter that is taken together with the interview. Data retrieval time is in the range of the afternoon until the evening when residents are already at home.

Research variables include: perception (x1), expectations (x2), attitude (y1), and self-adjustment (y2). Each variable is broken down into questions which are indicators that reflect each of these variables.

### Data Processing

The collected data is then reduced and tabulated for further processing. Data is processed and presented descriptively in the form of frequency tables and mean indicators for each variable.

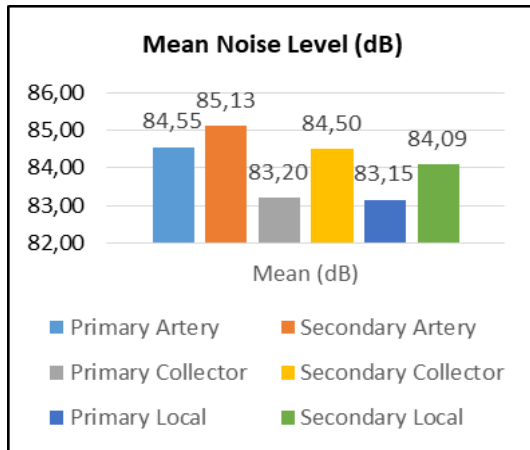
## RESULT AND DISCUSSION

In the initial stage, the noise level in each respondent's house is first measured and then averaged from the group of houses in each of the roads. From the results of the average noise of each road section then calculated the average noise in the road function group and the total average. The results of the average noise level sourced from the highway can be seen in Table 1 and Figure 2.

**Table 1.** Average Noise Levels for Each Road Function

No	Road Function	Average Noise (dB)
1	Primary Artery	84.55
2	Secondary Artery	85.13
3	Primary Collector	83.20
4	Secondary Collector	84.50
5	Primary Local	83.15
6	Secondary Local	84.09
Rata-rata Total		84.10

Source: Primary data processed



**Figure 2.** Average Noise Levels for Each Road Function

The value of the average noise level on each road function and as a whole shows that the noise level on the road network in Malang has exceeded the required standard. Decree of the Minister of Environment No. 48 of 1996 has determined that the noise level standard for housing and settlements is 55 dB [1]. The measured average noise level is 84.1 dB which means there is a difference of 29.1 dB above the standard threshold. This fact shows that the noise level around the road segments in the city of Malang is already too noisy and not suitable for shelter.

Theoretically, high noise levels will adversely affect human physiological and psychological health. However, from the results of previous studies in several regions and countries, it turns out that people do not always provide an adequate response to the high levels of noise that expose it.

The response of the community in this study was seen from the variables of perception, expectations, attitudes, and their adjustment to the traffic noise that exposed it. Each variable is broken down into several indicators to clarify the description of the variable. The following can be seen how their responses are in Tables 2 through 5.

### Respondent's Perception

Respondents' perception of noise is that they feel that traffic noise has exposed their neighborhoods. This perception consists of six indicators: respondents have the perception that the home environment is very noisy (x1.1), living in a noisy area (x1.2), the road near the house is getting more crowded and noisy (x1.3), the noise generated from the road disturbing the peace of the house (x1.4), people cannot avoid everyday traffic noise (x1.5), and noise disturbs health (x1.6). A description of the data is presented in Table 2.

**Table 2.** Description of Respondents' Perception Variables

Variable	Items	Frequency of Answer (f) and Percentage (%)										Mean
		SD (1)		D (2)		N (3)		A (4)		SA (5)		
		f	%	f	%	f	%	f	%	f	%	
Perception (x1)	x1.1	3	1.9	40	26.0	12	7.8	94	61.0	5	3.2	3.38
	x1.2	4	2.6	16	10.4	17	11.0	105	68.2	12	7.8	3.68
	x1.3	3	1.9	34	22.1	11	7.1	97	63.0	9	5.8	3.49
	x1.4	3	1.9	18	11.7	13	8.4	111	72.1	9	5.8	3.68
	x1.5	1	0.6	3	1.9	13	8.4	103	66.9	34	22.1	4.08
	x1.6	1	0.6	3	1.9	17	11.0	107	69.5	26	16.9	4.00
	Cumulative	19.6				8.6		71.8				3.72
Mean of Perception Indicator												

**Notes:** Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA)  
the home environment is very noisy (x1.1), living in a noisy area (x1.2), the road near the house is getting more crowded and noisy (x1.3), the noise generated from the road disturbing the peace of the house (x1.4), people cannot avoid everyday traffic noise (x1.5), and noise disturbs health (x1.6).

**Sources:** Primary data processed

From the above table, the mean value of the perception variable is 3.72, which means that most respondents have a perception that the residential environment feels noisy from the road. Overall, 71.8% of respondents agreed that road traffic noise had exposed the home

environment, 19.6% disagreed, and 8.6% did not provide a clear response.

### Respondents' Expectation

Respondents' expectations are the desire for efforts to reduce the high noise level. Respondents have expectations consisting of six

indicators: there needs to be traffic regulation on the highway to reduce noise (x2.1), the need for alternative traffic lanes (x2.2), it is necessary to prohibit the use of motorcycles that have modified exhaust so that it becomes noisy (x2.3), motorists should order traffic (x2.4), the public

should install boards/banners prohibiting the use of noisy exhausts (x2.5), and motor vehicle manufacturers should make environmentally-friendly vehicles (x2.6). A description of the data is presented in Table 3.

**Table 3.** Descriptions of Respondents' Expectation Variables

Variable Indicator	Items	Frequency of Answer (f) and Percentage (%)										Mean
		SD (1)		D (2)		N (3)		A (4)		SA (5)		
		f	%	f	%	f	%	f	%	f	%	
Expectation (x2)	X2.1	0	0.0	3	1.9	9	5.8	116	75.3	26	16.9	4.07
	x2.2	0	0.0	1	0.6	10	6.5	118	76.6	25	16.2	4.08
	X2.3	0	0.0	3	1.9	6	3.9	121	78.6	24	15.6	4.08
	X2.4	0	0.0	1	0.6	7	4.5	124	80.5	22	14.3	4.08
	X2.5	0	0.0	6	3.9	7	4.5	115	74.7	26	16.9	4.05
	X2.6	0	0.0	4	2.6	7	4.5	119	77.3	24	15.6	4.06
	Cumulative			1.3		5.2		93.5				4.07
Mean of Expectation Indicator												

**Notes:** Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA)  
There needs to be traffic regulation on the highway to reduce noise (x2.1), the need for alternative traffic lanes (x2.2), it is necessary to prohibit the use of motorcycles that have modified exhaust so that it becomes noisy (x2.3), motorists should order traffic (x2.4), the public should install boards/banners prohibiting the use of noisy exhausts (x2.5), and motor vehicle manufacturers should make environmentally-friendly vehicles (x2.6).

**Sources:** Primary data processed

From the table above, the mean value of the expectation variable is 4.07, it can be understood that more than half of the respondents expect to minimize noise generated from the highway. Overall, 93.5% of respondents expect motor vehicle traffic noise to be lowered, 1.3% have no expectations, and 5.2% do not provide a clear response.

### Respondents' Attitude

Attitude is the evaluative response of respondents [24] expressed as feeling comfortable or uncomfortable towards the high level of traffic noise in the vicinity. The respondent's attitude consists of eight indicators: noise at home disturbs calm (y1.1), noise in the saturating home environment (y1.2), prefers to find a place to live in a quiet area (y1.3), does not like to live in a noisy house (y1.4), wanting to move house to a quiet environment (y1.5), not happy in a noisy home environment (y1.6), feeling annoyed due to motor vehicle noise (y1.7), and more suitable stay in a quiet place from noise (y1.8). A description of the data is presented in Table 4.

From Table 4, the mean value of the attitude variable is 3.67, meaning that most respondents feel disturbed and uncomfortable living in a noisy home environment, some even want to move to a non-noisy environment. Overall, 77.9% of respondents felt disturbed and uncomfortable living in noisy environments, 14.9% were comfortable, and 7.2% did not provide a clear response.

### Respondents' Adjustment

Self-adjustment is the ability of individuals to deal with demands, both from within themselves and from the environment so that there is a balance between meeting needs with environmental demands, and creating harmony between individuals and reality [25]. Adjustment to noise that exposed respondents consists of five indicators: use ear protectors (y2.1), speak louder (y2.2), find alternatives to quieter houses elsewhere (y2.3), plant noise-reducing plants in front of the house (y2.4), and installing a noise barrier on the front fence of the house (y2.5). A description of the data is presented in Table 5.

**Table 4.** Description of Respondents' Attitude Variables

Variable Indicator	Items	Frequency of Answer (f) and Percentage (%)										Mean
		SD (1)		D (2)		N (3)		A (4)		SA (5)		
		f	%	f	%	f	%	f	%	f	%	
Attitude (y1)	y1.1	5	3.2	20	13.0	11	7.1	113	73.4	5	3.2	3.60
	y1.2	4	2.6	16	10.4	13	8.4	113	73.4	8	5.2	3.68
	y1.3	0	0.0	14	9.1	15	9.7	111	72.1	14	9.1	3.81
	y1.4	2	1.3	30	19.5	6	3.9	105	68.2	11	7.1	3.60
	y1.5	0	0.0	22	14.3	13	8.4	110	71.4	9	5.8	3.69
	y1.6	6	3.9	31	20.1	14	9.1	96	62.3	7	4.5	3.44
	y1.7	4	2.6	9	5.8	8	5.2	123	79.9	10	6.5	3.82
	y1.8	5	3.2	15	9.7	9	5.8	115	74.7	10	6.5	3.71
	Cumulative	14.9%				7.2%		77.9%				3.67
Mean of Attitude Indicator												

**Notes:** Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA)  
 Noise at home disturbs calm (y1.1), noise in the saturating home environment (y1.2 prefers to find a place to live in a quiet area (y1.3), does not like to live in a noisy house (y1.4), wanting to move house to a quiet environment (y1.5), not happy in a noisy home environment (y1.6), feeling annoyed due to motor vehicle noise (y1.7), and more suitable stay in a quiet place from noise (y1.8).

**Sources:** Primary data processed

**Table 5.** Description of Respondents' Self-Adjustment Variables

Variable Indicator	Items	Frequency of Answer (f) and Percentage (%)										Mean
		SD (1)		D (2)		N(3)		A (4)		SA (5)		
		f	%	f	%	f	%	f	%	f	%	
Adjustment (y2)	y2.1	11	7.1	83	53.9	47	30.5	9	5.8	4	2.6	2.43
	y2.2	4	2.6	68	44.2	40	26.0	39	25.3	3	1.9	2.80
	y2.3	0	0.0	38	24.7	14	9.1	92	59.7	10	6.5	3.48
	y2.4	1	0.6	36	23.4	16	10.4	93	60.4	8	5.2	3.46
	y2.5	1	0.6	50	32.5	21	13.6	75	48.7	7	4.5	3.24
	Cumulative	37.9				17.9		44.2				3.08
Mean of Adaptation Indicator												

**Notes:** Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA)  
 Use ear protectors (y2.1), speak louder (y2.2), find alternatives to quieter houses elsewhere (y2.3), plant noise-reducing plants in front of the house (y2.4), and installing a noise barrier on the front fence of the house (y2.5).

**Sources:** Primary data processed

From the above table, the mean value of the adjustment variable is 3.08, meaning that more than half of the respondents take adjustment measures to overcome motor vehicle traffic noise. Overall, 44.2% made adjustments, 37.9% did not, and 17.9% did not provide a clear response.

## Discussion

Overall, the response of respondents can be explained that most respondents felt their place of residence was in a noisy environment. The source of the noise comes from motorized vehicle traffic in front of their homes.

Respondents hope that motor vehicle noise from the highway can be reduced or minimized. They feel uncomfortable living in a noisy home environment, even some of them want to move

house to a quiet environment. This is in line with the research of Al-Dakhlallah & Jadaan (2005) that most of the people interviewed considered moving to a quieter environment [9].

As a result of the discomfort, most of them are forced to make adjustments to the noise disturbance. However, what is interesting is that there were also quite a lot of respondents who did not adjust, which was 37.9%. They may give up or surrender to these conditions.

This contradiction is also shown by research conducted by Vera Surtia Bachtiar et al. (2018), that the majority of respondents felt only slightly disturbed by outside noise [11]. Also shown by the results of research in Serdang Raya, Selangor, Malaysia, conducted by Nadaraja et al. (2010) that some residents who had lived in a noisy area

for a long time did not find it disturbing their sleep [12].

## CONCLUSION

From this research, it can be concluded that the people who live around the highway in Malang have the perception that their place of residence is in a noisy environment. In these conditions, they hope that motor vehicle noise can be reduced or minimized because they are not comfortable living in noisy environments. There are some of them who want to move house to a place that is not noisy. Most of them make adjustments to noise with certain treatments to their homes. However, quite a number of them did not make any adjustments.

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