Analysis of railway noise level against the level of disruption of communities living in the area around the railway in the semarang city

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Abstract. One of the most significant modes of transportation in moving a country's economic sector is the train, being able to move large quantities of goods and people effectively, therefore at this time the government continues to intensify railroad development. One of the negative impacts that will arise as a result of railroad construction is increased noise in the area along the railroad tracks in the city of Semarang. Bulu Lor settlement has exceeded the quality standard of 57 dBA from the threshold of 55dBA, this is due to the high frequency of trains that cross the settlement as much as 73 series of trains per day. Besides that, the high number of vehicles passing by the area as a result of the activities of the local community, especially near the main road of the settlement also significantly increased noise. In this study, the highest noise of 67.3 dBA was found in Tawang Station. Nearly 50% of the people who live in the area around the railroad in Semarang city have experienced symptoms of stress, whether physical, emotional, intellectual or interpersonal.

1. Introduction
The increased railway development is certain to increase noise along the railroad tracks, which has the potential to disrupt the peace and comfort of residents who live nearby, therefore, it must be anticipated that railway development in Indonesia emphasizes sustainable development and environmental insight [1]. In this research, the relation of Railway Noise Level to the Level of Disruption and Psychological Condition of Communities Living in the Area Around the Railway[2]. Some noise impact reports in Indonesia include; in 2007 Ikron et al reported that noise severely disrupted the psychological health of children of Cipinang Muara Elementary School in Jatinegara District, Jakarta. Hellena, in 2011 Teachers who teach in noise-exposed schools have a risk of voice fatigue 3.4 times higher than teachers who teach in schools that are not exposed to noise. Johar M et al, Noise affects the concentration of the effectiveness of the teaching and learning process at Bandung.

2. Experimental
Prior to the measurement of the research variables, a preliminary survey was conducted to ensure the accuracy of the method, the location of the research data collection, the determination of respondents, the
number of surveyors and the need for equipment during data collection in the area around the railroad along Semarang City. The reason for choosing this location is because it is the busiest route so it has a high noise level. The value of the noise level day and night is calculated, compared to the standard noise level set by the government with a tolerance of +3 (in accordance with the provisions of the Ministry of Environment) with the formula [6],

\[
L_{am} = 10 \log \frac{1}{24} \left[ \sum_{i=1}^{16} 10^{L_{ei}/10} + \sum_{j=1}^{8} 10^{(L_{ej}+10)/10} \right]
\]

where \( L_{am} \) is the noise level day and night, \( L_{ei} \) noise level noise in time interval \( i \) and \( L_{ej} \) noise level noise time interval \( j \). For the Measurement of Psychological Conditions in a way distributing questionnaires to people who live in the area around the railroad in the city of Semarang.

3. Results and discussion
Measurement of noise levels around the railroad is done in 24 hours divided into time intervals of day and night time. The results of measurements of Noise and Noise levels are presented in Table 1

| Location               | Noise level measurement (dBA) | I    | II   | III  | average |
|------------------------|------------------------------|------|------|------|---------|
| Bulu Lor settlement    |                              | 56.7 | 58.1 | 56.4 | 56.7    |
| Tawang Station         |                              | 68.7 | 65.8 | 67.5 | 68.7    |
| Tlogomulyo Urban Village|                             | 62.6 | 60.7 | 63.9 | 62.6    |

The table shows the level of noise day and night in Bulu Lor settlement which is crossed by 73 trains every day, has exceeded the quality standard, this is due to the high frequency of trains that cross the settlement, besides the high number of vehicles passing through the area as due to local community activities especially near the main road of the settlement also significantly increased noise.

The questionnaire consisted of 40 items, in the form of statements that were both favorable and unfavorable. Scale presentation is based on 4 categories, namely SS (very often), S (often), JRG (rare) and TP (never). The scoring method used for favorable statements is by giving a score of four (4) if very often, a score of three (3) if often, a score of two (2) if rare and a score of one (1) if never. As for the unfavorable statement is to score one (1) if very often, score two (2) if often, score three (3) if rare and score four (4) if never.
Table 2. Distribution of items on the stress scale of residents living on the railroad tracks

| Stress Symptoms | Favourable | Unfavourable | Total |
|-----------------|------------|--------------|-------|
| Physical        | 1, 5, 9, 13, 17 | 21, 25, 29, 33, 37 | 10    |
| Emotional       | 2, 6, 10, 14, 18 | 22, 26, 30, 34, 38 | 10    |
| Intellectual    | 3, 7, 11, 15, 19 | 23, 27, 31, 35, 39 | 10    |
| Interpersonal   | 4, 8, 12, 16, 20 | 24, 28, 32, 36, 40 | 10    |
| Total           |            |              | 40    |

The first symptoms of stress are physical symptoms. From the results of an analysis of 30 respondents showed: between 6.7% to 43.3% of respondents experienced physical symptoms as an indicator of stress, among others, from 30 respondents 13 people experienced complaints of decreased appetite (43.3%) while 2 people experienced complaints of loss of energy on arrival (6.7%).

The second symptom of stress is an emotional symptom. From the results of an analysis of 30 respondents showed: between 16.7% to 43.3% of respondents experienced emotional symptoms as indicators of stress. For the record, not every respondent experiences the same emotional disturbance. In detail, emotional symptoms experienced include: Of the 30 respondents 5 people who experienced complaints felt pressured by the environment in which they lived (16.7%) and 13 people felt happy when they were not at home / out of the neighborhood (43.3%).

The third symptom of stress is an intellectual/cognitive symptom. From the results of an analysis of 30 respondents showed: between 10% to 33.3% of respondents experienced intellectual / cognitive symptoms as an indicator of stress. For the record, not every respondent experiences the same intellectual / cognitive impairment. In detail, the intellectual / cognitive symptoms experienced include: 3 people experienced complaints of not being able to think clearly when faced with 10% problems and 10 people experienced complaints that it was difficult to concentrate when doing a task or work (33.3%).

The fourth symptom of stress is interpersonal symptoms. From the results of an analysis of 30 respondents showed: between 16.7% to 33.3% of respondents experienced interpersonal symptoms as an indicator of stress. For the record, not every respondent experiences the same interpersonal disorder. In detail, the interpersonal symptoms experienced include: 5 people stated not active in environmental activities (16.7%) and 9 people said they did not hesitate to berate others when angry (30%).

From the results of the analysis above, it can be concluded, from 30 respondents, almost 43.3% showed experiencing symptoms of stress, both physical, emotional, intellectual and interpersonal. But the important thing to note, not all people experience all the symptoms. This can be understood because each individual has their own coping mechanism, which is not part of the things examined in this study, so the symptoms experienced are also different.

4. Conclusion
In this study, the highest noise of 67.3 dBA was found in a special place, Tawang Station and 43.3% of the people who live in the area around the railroad in Semarang city show experiencing symptoms of stress, both physical, emotional, intellectual and interpersonal.
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