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Judul Karya Tulis : Noise Level Evaluation and Mapping in Klotok Landfill
Using Golden Surfer Software
Jenis Publikasi : Jurnal
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Tingkat Kesamaan (%) : 9%

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Noise Level Evaluation and Mapping in Klotok Landfill Using Golden Surfer Software

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Submission date: 08-Dec-2022 02:00PM (UTC+0700)

Submission ID: 1975116981

File name: Muhammad_A_S_Jawwad_-_ICESET_NST_Proceeding.pdf (414.56K)

Word count: 1772

Character count: 8908

Noise Level Evaluation and Mapping in Klotok Landfill Using Golden Surfer Software

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ABSTRACT

Sounds that are not desired by the listener, where the sound can distract, interfere with activities, or cause danger during daily activities, can be called noise. Noise at a certain level originating from the sound of work tools in the production process can cause comfort and health to be disturbed. The lousy impact that often occurs if a person is exposed to noise for too long is the effect on hearing, which can cause deafness, but this can be controlled by using hearing protection equipment that will determine the amount of compensation value to be received by the surrounding community. The existence of the Landfill, which is often located in the middle of community settlements, has a direct impact, one of which is noise during every working hour of the Landfill's operations. One example of a Landfill that is still active today is the Klotok Landfill which is located in Pojok District, Kediri City. In this research, noise mapping was carried out to determine the pattern of noise distribution that occurs in the work environment. Making a noise contour map due to these activities will use a software called Surfer, which is a simple program to generate noise curves (noise contours) spatially the location of potentially hazardous areas. The result shows that activities at the Klotok Landfill have noise values ranging from 40 to 92 dB. The highest noise is in the location around landfill area 3, which is actively operating. The high noise level also can be found in the weighbridge, which is a place for transporting vehicles to pass. Evaluations at points 17, 18, and 19 indicated the need for protective wear, such as earmuffs or setting a break every 1.4, 3.6, and 2.2 hours for area workers.

Keywords: Air quality, air pollution, golden surfer, Klotok, landfill

Introduction

Sounds that are not desired by the listener, where the sound can distract, interfere with activities, or cause danger during daily activities, can be called noise. Noise at a certain level originating from the sound of work tools in the production process can cause comfort and health to be disturbed. At the same time, the sense of hearing picks up noise from sound vibrations from various sound sources. The ear, in one duration, receives several sound waves with different frequencies (Ahmad et al., 2018; Casas et al., 2014) The lousy impact that often occurs if a person is exposed to noise for too long is the effect on hearing, which can cause deafness, but this can be controlled by using hearing protection equipment that will determine the amount of compensation value to be received by the surrounding community (Rimantho, 2016).

How to cite:

Jawwad, M. A. S., Pahlevi, M. R., Nugraha, I. et al. (2022). Noise level evaluation and mapping in Klotok landfill using Golden Surfer software. 3rd International Conference Eco-Innovation in Science, Engineering, and Technology. NST Proceedings. pages 332-335. doi: 10.11594/nstp.2022.2749

Almost entirely, waste management activities at the Landfill are sure to have potential health risks, both to the directly involved workers and the people who live around them. The existence of the Landfill, which is often located in the middle of community settlements, has a direct impact, one of which is noise during every working hour of the Landfill's operations. One example of a Landfill that is still active today is the Klotok Landfill which is located in Pojok District, Kediri City (Fithri & Annisa, 2015; Fredian et al., 2013)

Noise mapping can be used to determine the pattern of noise distribution that occurs in the work environment. Making a noise contour map due to these activities will use a software called Surfer, which is a simple program to generate noise curves (noise contours) spatially the location of potentially hazardous areas. Theoretically, the impact of noise itself varies, such as hearing loss which causes temporary deafness and even permanent deafness, health problems such as psychological disorders (coronary heart disease, stress, fatigue), and physiological disorders (increased blood pressure, blood vessel construction, increased pulse, sensory disturbances) and balance disorders (Luxson et al., 2012; Tarwaka, 2015). Based on this, in this study, noise mapping activities will be carried out in the Klotok Landfill area and residential areas around the Landfill. Points that have a noise value above the threshold will be calculated as the maximum working time in that area using calculations from NIOSH. An evaluation will also be carried out on the PPE used by workers at the Landfill and its compliance with applicable laws.

Material and Methods

This research was conducted at the Klotok Landfill, Pojok District, Kediri City, East Java, in July 2022. The research time was carried out during working hours from 08.00 to 15.00 and was carried out at 21 points around the landfill. The research tools and instruments that will be used are the manual Sound Level Meter which has a measurement range of 35 – 130 dB to measure the level, Surfer 16 Software to create noise contours, and the Global Positioning System (GPS) to determine the coordinates of the measurement location.

The allowable working time based on the noise value is calculated by the equation:

$$T = \frac{480}{2^{\frac{(L-85)}{3}}}$$

Where T is the allowable exposure time at that point (minutes), and L is the measured noise value (dB).

Results and Discussion

Noise measurement at Klotok Landfill is carried out with Sound Level Meters at 21 points shown in the following map



Figure 1. Map of sampling in Klotok Landfill

The results of the noise measurement produce the data in the following table. Overall at the Klotok Landfill, the noise level is generally around 50 dB to 60 dB. The noise value increases at po.

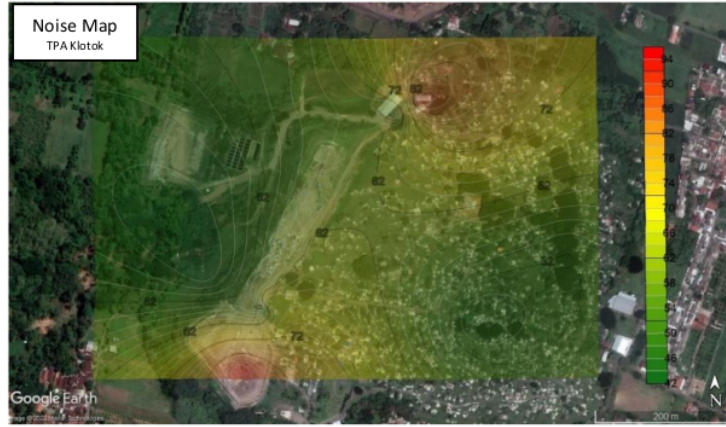


Figure 2. Map of noise distribution in Klotok Landfill

This high noise value is found in the south of the landfill. Landfill area 2, which is located in the west, is relatively quieter because there is no activity at landfill area 2. Landfill area 3, an active landfill, currently has two excavators operating and transport trucks that enter and leave to dispose of garbage. In addition, some scavengers are active in separating waste for sale or recycling.

Table 1. Noise Measurement Result in Klotok Landfill

Point	Noise Result (dB)
1	69.8
2	57.7
3	62.1
4	59.7
5	45.9
6	50.9
7	43.9
8	57.3
9	56.7
10	62.1
11	54.5
12	47.5
13	52.2
14	49.3
15	49.5
16	51.9
17	92.3
18	88.4
19	90.5
20	62.3
21	58.4

Points that are considered critical include points 17, 18, and 19, which are points that are densely packed with vehicle activities such as excavators and transport trucks. This figure exceeds the allowable noise limit in the Peraturan Menteri Ketenagakerjaan Nomor 5 Tahun 2018, which is summarized in the following table 2.

Table 2. Noise Limit on Exposure Time per Day

Exposure time per day (Hours)	Noise Limit (dB)
8	85
4	88
2	91
1	94

With noise exposure during working hours above 4 hours per day, it is necessary to evaluate noise at the Klotok Landfill. The measured noise values at points 17, 18, and 19 are calculated by the NIOSH formula to find the maximum time to work on a certain noise. The results are obtained in the following table 3.

Table 3. Evaluation of maximum working time at A certain noise

Point	Noise (dB)	Maximum Worktime (minute)	Maximum Worktime (jam)
17	92.3	88.8	1.4
18	88.4	218.8	3.6
19	90.5	134.6	2.2

Points 17 and 19, which are located around the excavator operating at landfill area 3, based on calculations, have an ideal working time of 1.4 hours and 2.2 hours, respectively. At the same time, point 18, which is on the weighbridge, has an ideal working time of 3.6 hours. This ideal working time can be used as a reference to set working hours and rest hours for workers at the Klotok Landfill. In addition, the use of ear protection, such as earmuffs, can be adjusted.

Conclusion

Activities at the Klotok Landfill have noise values ranging from 40 to 92 dB. The highest noise is in the location around landfill area 3, which is actively operating. High noise level also can be found in the weighbridge, which is a place for transporting vehicles to pass. Evaluations at points 17, 18, and 19 indicated the need for protective wear, such as earmuffs or setting a break every 1.4, 3.6, and 2.2 hours for area workers.

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