Jurnal Arsitektur dan Perencanaan (JUARA)
Hal. 38-44: ISSN Online: 2620-9896
Vol 9, No 1 (2025): Februari (Jurnal Arsitektur dan Perencanaan)

Measurement of Noise Level in Student Vertical Residential Learning Area

Verza Dillano Gharata[1], Widi Dwi Satria[2], Rahmad Hidayat[3], Dikky Kristopel Simanjuntak[4], Azhar Priawan[5]
Institut Teknologi Sumatera[12345]
Email: verza.gharata@ar.itera.ac.id

Abstract

Noise pollution has the potential to cause both psychological and physiological disturbances. The Institut Teknologi Sumatera (ITERA) provides various facilities to support academic activities, one of which is Student Dormitory 3. The first floor of this dormitory accommodates a study room as well as residential units designated for students with disabilities. The study room is frequently utilized for a wide range of student activities, encompassing both academic and non-academic purposes.

The objective of this research is to evaluate the noise levels within the study room and to compare the findings with established health regulations. A quantitative research method was employed, involving direct measurement of noise levels in Student Dormitory 3 using a Sound Level Meter (SLM). Measurements were conducted during morning, afternoon, and evening sessions, complemented by photographic documentation of ongoing activities at the time of measurement.

The results indicate that the noise levels in the study room exceed the permissible thresholds for educational and residential facilities. Consequently, the implementation of acoustic treatment is recommended to mitigate noise propagation and to minimize its impact on the surrounding environment.

Keywords: Learning Area , Student Residence, Noise Level, Sumatra Institute of Technology
Article history: Received: 2025-09-26; Revised: 2025-10-18; Accepted: 2025-11-25

INTRODUCTION

Noise is defined as unwanted or disturbing sound. Noise pollution is a consequence of urbanization, which can cause environmental disturbances (Bolund & Hunhammar, 1999). While the body may adapt to noise up to a certain level, the nervous system remains vulnerable (Satwiko, 2009). Noise significantly affects individuals in both physical and psychological aspects.

In health contexts, noise refers to sounds that reduce hearing ability either quantitatively (hearing threshold shift) or qualitatively (narrowing of auditory spectrum). Noise level is closely related to intensity, frequency, duration, and time patterns. The tolerance of an individual depends on the duration of exposure as well as the nature of their activities. For instance, patients or individuals focusing on worship activities may be more susceptible to noise disturbances (Djalante, 2010).

Figure 1. Institut Teknologi Sumatera Student Dormitory 3
Source: Personal Documentation, 2025

Institut Teknologi Sumatera, established in 2014 in South Lampung Regency, has experienced a steady increase in student intake. In 2024, 4,477 new students were admitted, bringing the total active

student population to 25,784. Among them, 2,111 students originated from Lampung, while the remainder came from outside the province (Gharata et al., 2024). Dormitories play an essential role, accommodating first-year students for one year (Dwi Satria et al., 2023). ITERA operates three dormitory buildings, all of which share similar designs, layouts, and facilities. On the first floor, each dormitory provides bedrooms, disabled-access bedrooms, multipurpose study rooms, internet facilities, laundry space, and administrative offices.

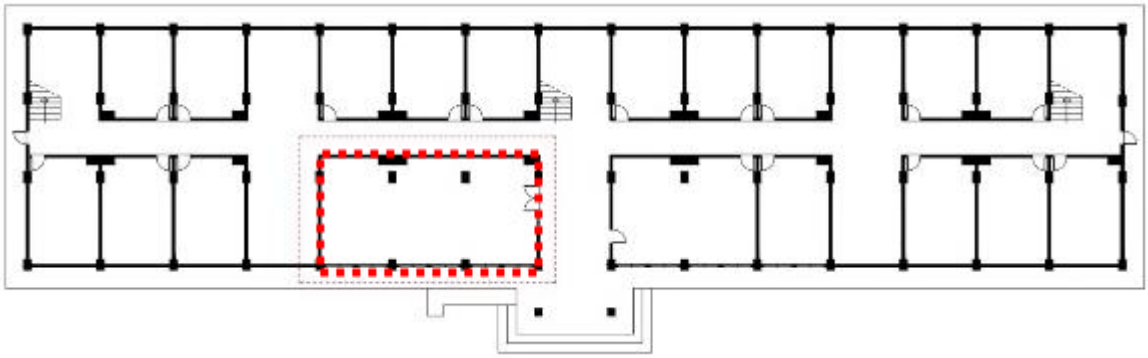

Figure 2. Location of the Study Room in ITERA Dormitory 3
Source: Personal Documentation, 2025

Figure 3. Photo of the Study Room in ITERA Dormitory 3
Source: Personal Documentation, 2025

Table 1. Standard Table of Noise Levels in Areas

Zone	*Scope*	*Noise Level (dB)*
A	research centers, hospitals, health care, social facilities	35-45
B	housing, educational and recreational facilities	45-55
C	offices, shops, trade and markets	50-60
D	industrial environments, factories, train stations and bus terminals	60-70

According to the Indonesian Ministry of Environment Decree No. 48 of 1996 and Ministry of Health Regulation No. 718 of 1987, the noise threshold for educational and residential areas is 45–55

dB, with a maximum of 55 dB (Table 1). Learning processes require high concentration, and excessive noise disrupts memory retention and cognitive performance (Zahrany et al., 2022). Furthermore, excessive noise in residential facilities negatively affects rest quality, leading to mental health issues such as anger, depression, and anxiety (Yu & Li, 2024). Hence, educational environments must remain clean, comfortable, and free from noise pollution to ensure optimal learning conditions (Carolina et al., 2021).

The purpose of this study is to measure noise levels in ITERA Student Dormitory 3 study rooms, compare them with health regulations, and analyze their impacts on adjacent environments such as dormitory bedrooms.

RESEARCH METHOD

In this study, a quantitative method was employed by measuring the noise levels in Dormitory 3 of Institut Teknologi Sumatera using a Sound Level Meter (SLM). Data collection was carried out by conducting measurements in the student study room, and the data obtained were processed in tabular form.

The measurement of sound intensity was conducted simultaneously using four Sound Level Meters at predetermined points. The results of these measurements were recorded and compared with the standards and threshold limits required for educational and residential facilities. The measurement times were divided into three periods: morning, afternoon, and evening (Gharata et al., 2023). The selection of these times was based on six-hour intervals and also considered periods of student activity peaks in the ITERA Dormitory 3 study room.

a. P1 (morning measurement) was conducted at 08:00 WIB using the Sound Level Meter (SLM).
b. P2 (afternoon measurement) was conducted at 14:00 WIB using the Sound Level Meter (SLM).
c. P3 (evening measurement) was conducted at 20:00 WIB using the Sound Level Meter (SLM).

Noise data collection was carried out simultaneously at four different points (Figure 4).

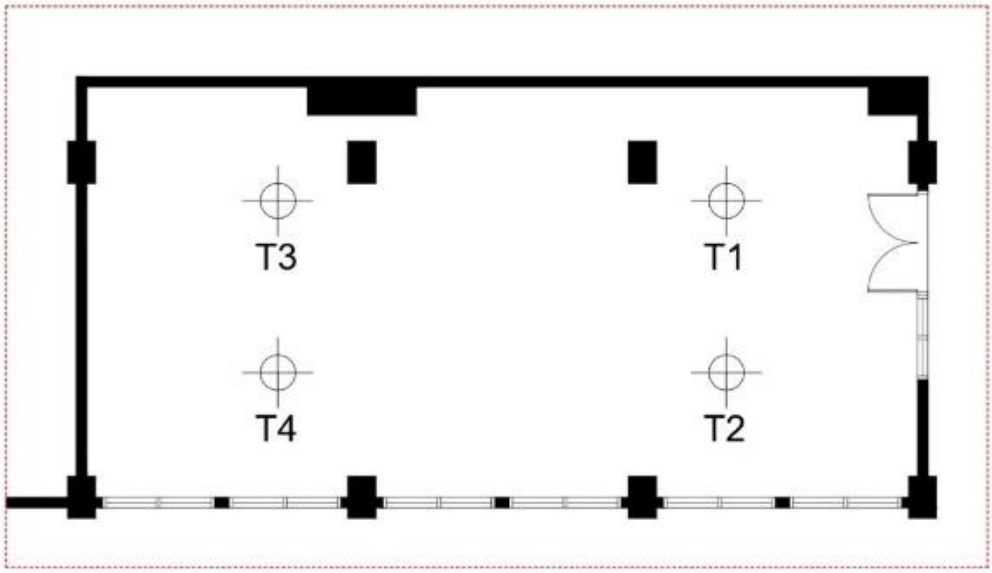

Figure 4. Measurement Points of the Study Room in ITERA Dormitory 3
Source: Personal Documentation, 2025

RESULT AND DISCUSSION

The measurement results at each point and time showed different noise level values. The measurements obtained using the Sound Level Meter (SLM) are presented in tabular form for each measurement period. The conditions during the noise measurement in the study room (multipurpose room) were also documented through photographs.

The results of noise level measurements in the morning indicated that, at four measurement points, the noise levels were generally above the average threshold, except at point T1 (Table 2). During

the measurement, the environment was relatively quiet, with only two students working on assignments (Figure 5). This quiet condition occurred because many students had already attended lectures and left the dormitory. However, at this time, point T3 was identified as the most dominant source of noise, as students were working on assignments while also playing music from a laptop. This resulted in a maximum noise level of 84 dB being recorded at point T3. This value is significantly higher than the maximum permissible standard for study areas, which is 55 dB.

Figure 5. Morning Measurement Conditions
Source: Personal Documentation, 2025

Table 2. Morning Noise Levels

Point	Morning Noise Levels (dB)		
	Min	***Max***	***Average***
T1	41,6	75,9	54,7
T2	47,4	88,4	65,3
T3	50,1	84	65,4
T4	46,4	78,7	61,6

The results of noise measurements in the afternoon showed that noise levels at all four measurement points exceeded the average threshold (Table 3). During the afternoon measurement, there were more students in the study room, with a total of seven students present. This increase occurred because some students had already returned from lectures, resulting in a higher number of students in the study room of ITERA Dormitory 3.

Figure 6. Afternoon Measurement Conditions
Source: Personal Documentation, 2025

Table 3. Afternoon Noise Levels

Point	Afternoon Noise Levels (dB)		
	Min	***Max***	***Average***
T1	45,9	86	59
T2	40,7	80,2	60,3
T3	42,1	100,6	57,5
T4	41,6	86,6	56

Activities in the study room were also more complex compared to those in the morning. These included group work on assignments as well as a student taking a nap (Figure 6). During the afternoon measurement, Point T3 was identified as the highest source of noise, as it was the gathering place for students working in groups. Activities such as talking, shouting, and laughing among the group members generated noise levels reaching up to 100 dB. Interestingly, the student who was sleeping appeared to be completely undisturbed by the group activities taking place beside them.

The results of noise measurements at night showed that noise levels at all four measurement points exceeded the average threshold (Table 4), namely 55 dB. In the evening, the study room of ITERA Student Dormitory 3 was the busiest compared to other measurement times. This was because almost all dormitory residents had already returned from their classes. During the evening measurement, a total of 12 students gathered in the study room (Figure 7).

Figure 7. Nighttime Measurement Conditions
Source: Personal Documentation, 2025

The activities observed during the evening measurement were quite varied, including group work on assignments, playing games, and some students simply browsing on their smartphones. The students engaged in group work were divided into two areas, namely at measurement points T1 and T3. At point T1, group activities were dominated by talking, laughing, and also playing music from a laptop, resulting in sound exposure reaching point T2 and even spreading outside the study room. This condition poses a problem, especially if the adjacent room is used as a bedroom for students with disabilities, who require a quiet environment to rest or study in their rooms. At point T3, there were also students working in groups. However, the activities at this point were more focused on working on laptops, with less music and lower levels of talking and gaming.

Noise levels reaching 107.5 dB and 101.6 dB were highly disturbing. A noise level of 100 dB is equivalent to the intensity of a car horn at a distance of 3 meters (Mediastika, 2006). A redesign of this study room is urgently needed to prevent noise from spreading into surrounding spaces. Furthermore, no acoustic treatments were observed in the study room of ITERA Dormitory 3. The ceramic floor in the room is a strong sound-reflective material, and the glass partitions allow sound to pass through the gaps at the upper and lower sections of the glass panels.

Table 4. Nighttime Noise Levels

Point	Nighttime Noise Levels (dB)		
	Min	***Max***	***Average***
T1	53,5	107,5	82,4
T2	48,9	101,6	65,6
T3	47,6	97,8	58,8
T4	41,2	71,1	57,7

CONCLUSION

Based on measurements conducted at three different times of day and four different points within the study room of ITERA Student Dormitory 3, the following conclusions can be drawn:

1. Noise levels in the morning at three points were found to exceed the permissible thresholds for educational and residential facilities. Although the room was not crowded, noise-generating activities such as playing loud music increased the overall noise levels.
2. Noise levels in the afternoon were above the threshold, ranging from 56–60.3 dB, with maximum levels reaching 100 dB. The room was busier than in the morning, and activities such as loud conversations, laughter, and shouting contributed to the high noise levels. Interestingly, one student was observed sleeping without being disturbed despite the high noise.
3. Noise levels in the evening were the highest compared to morning and afternoon. This was due to many students returning from classes and engaging in activities such as group work or gaming in the study room. The average noise level reached 80 dB, with a maximum of 107.5 dB, which is highly disruptive. Loud music, laughter, and shouting were the main sources causing the noise to exceed the permissible threshold.

Recommendations based on the findings of this study include:

1. A redesign of the ITERA Dormitory 3 study room is necessary to prevent noise from spreading into student bedrooms and adjacent spaces.
2. Sound-absorbing materials should be installed in the study room, such as soft carpets and acoustic panels, to reduce reflections and absorb sound effectively.
3. Clear zoning should be established between public and private areas within the dormitory to ensure that bedrooms are not adjacent to study rooms.
4. Strict regulations should be implemented to prohibit loud music. As an alternative, dormitory management could provide background music that enhances students' concentration with calmer tones. Soft music can contribute significantly to relaxation and improved focus (Tziovara et al., 2024).

Since one student was observed sleeping despite high noise levels in the afternoon, further research is needed to examine the impact of noise on the users of ITERA Dormitory 3 study room.

ACKNOWLEDGEMENTS

This research was supported by the Architecture Study Program, Faculty of Infrastructure and Regional Technology (FTIK), Institut Teknologi Sumatera.

BIBLIOGRAPHY

Bolund, P., & Hunhammar, S. (1999). Ecosystem services in urban areas. *Ecological Economics*, *29*(2), 293–301. https://doi.org/https://doi.org/10.1016/S0921-8009(99)00013-0

Carolina, Y., Nurhasanah, N., & Ivansyah, O. (2021). Sebaran Kebisingan Kawasan Kampus Pada Hari Kerja dan Hari Libur. *Prisma Fisika*, *9*(3), 258. https://doi.org/10.26418/pf.v9i3.51211

Djalante, S. (2010). Analisis Tingkat Kebisingan di Jalan Raya yang Menggunakan Alat Pemberi Isyarat Lalu Lintas. *Jurnal SMARTek*, *8*(4), 280–300.

Dwi Satria, W., Tika Elsandi, R., & Yuningsih, Y. (2023). Factors in Selecting Rental Housing Based on ITERA Student Preferences. *International Journal of Architecture and Urbanism*, *7*(1), 26–33. https://doi.org/10.32734/ijau.v7i1.11685

Gharata, V. D., Satria, W. D., & Arminda, W. (2023). Penerapan Kualitas Akustik pada Ruang Kelas Studio Arsitektur (Studi Kasus: Kelas Studio Gambar Laboratorium Teknik 2, Institut Teknologi Sumatera). *Jurnal Arsitektur TERRACOTTA*, *4*(2), 123. https://doi.org/10.26760/terracotta.v4i2.8545

Gharata, V. D., Satria, W. D., Hidayat, R., Calista, J. D., & Bastari, A. S. M. (2024). Penerapan Prinsip Akustik Ruang Auditorium (Studi Kasus: Auditorium Gedung Kuliah Umum 1 Institut Teknologi Sumatera). *Jurnal Arsitektur TERRACOTTA*, *5*(1), 101–115. https://doi.org/10.26760/terracotta.v5i1.10498

Mediastika, C. E. (2006). *Akustika Bangunan: Prinsip-prinsip dan Penerapannya di Indonesia* (H. W. Hardani (ed.)). Erlangga. https://books.google.co.id/books?id=pAjU2E%0AQ_6_QC.

Satwiko, P. (2009). *Fisika Bangunan* (S. Suyantoro (ed.)). Andi Offset.

Tziovara, P., Antoniadou, C., & Antoniadou, M. (2024). Patients' Perceptions of Sound and Noise Dimensions in the Dental Clinic Soundscape. *Applied Sciences (Switzerland)*, *14*(6). https://doi.org/10.3390/app14062587

Yu, H., & Li, A. (2024). Assessing Traffic Noise and Its Impact on High-Rise Apartment Buildings Adjacent to an Urban Expressway: A Case Study in Chengdu, China. *Buildings*, *14*(5). https://doi.org/10.3390/buildings14051377

Zahrany, F., Rahma, L., Kinasih, S., Pamungkas, U. R., & Yanitama, A. (2022). Analisis kebisingan pada ruang kuliah dan lingkungan kampus Universitas Negeri Semarang. *Proceeding Seminar Nasional IPA XII*, 254–261.