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ENVIRONMENTAL HEALTH INSPECTION: SANITATION, LIGHTING, AND NOISE LEVELS AT SUNGAI KUNJANG AND SAMARINDA SEBERANG TERMINALS

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ABSTRACT

Background: This study aimed to analyze the sanitation quality of terminals as public spaces from an environmental health perspective. High mobility at terminals increases the risk of environment-borne diseases, while studies integrating sanitation inspections with lighting and noise measurements remain limited. Therefore, this study was conducted to identify the gap between actual sanitation conditions and applicable standards.

Methods: A descriptive observational study with a cross-sectional design was conducted at Sungai Kunjang Terminal and Samarinda Seberang Terminal, Samarinda City, East Kalimantan. Data were collected through direct observation using a sanitation inspection checklist covering four variables: outdoor environmental sanitation, building and space sanitation, sanitation facilities, and comfort and safety. Lighting and noise levels were measured using a lux meter and a sound level meter. Data were analyzed descriptively and compared with applicable standards.

Results: Sungai Kunjang Terminal met the standards for building and space sanitation (82,67%) and sanitation facilities (82,60%), but not for outdoor environmental sanitation (46,03%) and comfort and safety (43,30%). Samarinda Seberang Terminal met the standard only for building and space sanitation (85,33%), while the remaining variables scored below the required threshold. Average lighting intensity at Sungai Kunjang Terminal (56,67 lux) did not meet the standard, whereas Samarinda Seberang Terminal (104,65 lux) generally met the standard. Noise levels at both terminals remained below the permissible limit of 70 dB.

Conclusion: The sanitation quality of both terminals has not yet fully met applicable standards. The main deficiencies were found in outdoor environmental sanitation and comfort and safety, while inadequate sanitation facilities were identified only at Samarinda Seberang Terminal. These findings highlight the need for targeted improvements in terminal sanitation management to support environmental health.

KEYWORDS: Sanitation Facilities; Sanitation Inspections; Noise; Lighting; Terminals

1. Introduction

Sanitation in public facilities is an important component of environmental health because it directly affects the safety, comfort, and well-being of users. Transportation terminals are public places with high human mobility, making them vulnerable to environmental health problems and the transmission of environment-borne diseases (Muhammad et al., 2024). According to the World Health Organization (WHO), sanitation encompasses efforts to control environmental factors that may adversely affect human

health. As urbanization and transportation activities continue to increase, maintaining adequate sanitation in terminal environments has become an important public health concern (Yasin & Yuliani, 2024).

Research findings indicate that sanitation conditions at terminals in Indonesia still frequently fall short of established standards. Common problems include inadequate sanitation facilities, such as limited access to clean water, toilets, and waste management infrastructure (Firdanis et al., 2022). Another study also found that certain environmental sanitation components at some terminals do not meet health standards (Vebrianti et al., 2021). Poor sanitation conditions may reduce user comfort and satisfaction with terminal services, highlighting the importance of maintaining adequate environmental quality in public facilities (Hidayat et al., 2025). In addition, inadequate environmental hygiene can contribute to increased vector populations and elevate the risk of disease transmission. High fly density has been observed in terminal environments with poor sanitation conditions, indicating potential public health concerns (Pakpahan et al., 2023).

On the other hand, the implementation of sanitation inspections remains suboptimal because they are not conducted routinely and do not utilize a standardized monitoring system (Yusmidiarti, 2024). Manual methods still dominate, while digital checklist-based systems have been proven to enhance the effectiveness of sanitation monitoring (Musadek et al., 2021). Differences in sanitation conditions among terminals also indicate variations in the fulfillment of environmental sanitation indicators, which impact service quality and economic activities (Salmalia et al., 2023) Variations in sanitation quality may influence the level of service provided by terminals, particularly in terms of user comfort, cleanliness, and accessibility of sanitation facilities (Azzahra & Kumalasari, 2025). In addition, terminal environmental conditions can affect transportation-related economic activities, as cleaner and more comfortable facilities are more attractive to users and support terminal operations (Djaga et al., 2025).

At the local level, Sungai Kunjang Terminal and Samarinda Seberang Terminal are two terminals that play a crucial role in community mobility within the city of Samarinda (Sulistiono, 2023). The increasing demand for transportation services requires terminal managers to maintain adequate infrastructure, environmental quality, and sanitation conditions to ensure safe and comfortable public services (Handayani, 2025). However, environmental management including waste management and sanitation systems in the areas surrounding the terminals remains a challenge that can affect environmental health quality (Ferdian et al., 2022). Suboptimal environmental conditions have the potential to increase health risks for terminal users and the surrounding community (Sultan, 2024). Despite its importance, studies that simultaneously assess sanitation conditions, lighting intensity, and noise levels in terminal environments remain limited, particularly in East Kalimantan.

Terminal sanitation management also contributes to the achievement of the Sustainable Development Goals (SDGs), particularly Goal 3 (Good Health and Well-being), Goal 6 (Clean Water and Sanitation), and Goal 11 (Sustainable Cities and Communities) (Dirmansyah et al., 2024). Therefore, this study aims to analyze the sanitation quality of Sungai Kunjang Terminal and Samarinda Seberang Terminal by assessing sanitation conditions, lighting intensity, and noise levels. The findings are expected to provide a comprehensive overview of terminal environmental health conditions and serve as a basis for improving terminal sanitation management (Fasya et al., 2024).

2. Methods

This study is a descriptive observational study using a cross-sectional approach, aimed at assessing sanitation conditions in public areas at two public transportation terminals in Samarinda City, East Kalimantan. The sanitation inspection was conducted on Sunday, May 3, 2026, at approximately 10:00 a.m. WITA, under hot weather conditions while the terminals were actively operating and quite crowded. The assessment was conducted at two locations: the Sungai Kunjang Terminal, located on Jl. Untung Suropati, Karang Asam Ulu, and the Samarinda Seberang Terminal, located on Jl. Bung Tomo, Sungai Keledang, Samarinda City, East Kalimantan.

Data collection was carried out through direct observation using an observation sheet as the primary instrument. The observation sheet was systematically designed based on sanitation indicators for public places, covering four main components, namely: (I) Outdoor Environmental Sanitation with a weight of 17, covering the location, the area outside the building, the parking area, and the perimeter wall; (II) Indoor and Building Sanitation, with a total weight of 15, consisting of departure/arrival areas, waiting rooms, and office spaces; (III) Sanitation Facilities, with a weight of 25, covering clean water supply, restrooms, trash bins, temporary waste storage areas, and storm drains; and (IV) Comfort and Safety, with a weight of 15, covering lighting, noise levels, ventilation, fire extinguishers, and first-aid kits.Each component is evaluated based on sub-indicators with specific values set forth in the observation sheet, and the final score is calculated by multiplying the score for each met component by its respective weight, resulting in a maximum total score of 100. A terminal is deemed to meet sanitation requirements if it achieves a score of ≥75%, in accordance with regulations regarding the operation of healthy terminals issued through the Guidelines for the Operation of Healthy Terminals (Indonesian Ministry of Health, 2021) and Ministry of Transportation Regulation No. PM 24 of 2021. These regulations emphasize the importance of four main aspects: outdoor environmental health, indoor space and building health, sanitation facilities, and comfort and safety. Observations are conducted directly in the field to ensure the consistency and accuracy of assessments across all locations.

In addition to sanitation inspections, light intensity measurements were also taken using a digital lux meter (INS DX-100, calibrated) placed at a height of ±85 cm above the floor surface, in accordance with standard work surfaces. Measurements were taken at three points in the Sungai Kunjang Terminal (area: 55 m^2) and twelve points in the Samarinda Seberang Terminal (area: 480 m^2), with each point measured from four directions (front, right, left, and back) for approximately 30 seconds per point without repetition. The average illuminance results from all measurement points were then compared to the terminal area lighting standard of ±100 lux, as specified in the sanitation assessment instrument sheet. Noise level measurements were also conducted using a digital sound level meter (Krisbow KW06-290, calibrated) placed at a height of approximately 120 cm above the floor surface, positioned perpendicular to the sound source. Each measurement point was recorded for approximately 60 seconds, and the average value was noted; this was then compared to the noise threshold of 55 dBA, as specified in the assessment instrument sheet.

3. Result

This study employed a descriptive observational method through sanitation inspections conducted at the Sungai Kunjang Terminal and the Samarinda Seberang Terminal. Assessments were carried out using a terminal sanitation inspection checklist that

covered variables related to outdoor environmental hygiene, indoor space and building hygiene, sanitation facilities, as well as comfort and safety. The percentage for each variable was calculated by dividing the total score by the maximum score and then multiplying by 100%.

Table 1 shows the results of the sanitation inspection at Sungai Kunjang Terminal based on the variables of outdoor environmental health, indoor and building health, sanitation facilities, and comfort and safety. The assessment results were used to determine the level of compliance with terminal sanitation requirements.

Table 2 shows the results of the sanitation inspection at Samarinda Seberang Terminal based on the variables of outdoor environmental health, indoor space and building health, sanitation facilities, and comfort and safety. The assessment results were used to determine the level of compliance with terminal sanitation requirements.

Based on the inspection results, both terminals have reasonably good conditions regarding spaces and buildings; however, several aspects of sanitation and safety still need improvement, particularly in the terminal's external environment, certain sanitation facilities, and aspects of user comfort and safety.

Table 1. Sungai Kunjang Terminal

Variables	Score	%	Status
Outdoor Environmental Sanitation	725	46,03%	Does not meet standard
Building and Space Sanitation	1.240	82,67%	Meets standard
Sanitation Facilities	2.065	82,6%	Meets Standars
Comfort and Safety	650	43,3%	Does not meet standard

Table 2. Samarinda Seberang Terminal

Variables	Score	%
Outdoor Environmental Sanitation	1.150	73,02%
Building and Space Sanitation	1.280	85,33%
Sanitation Facilities	1.385	55,4%
Comfort and Safety	850	56,67%

The sanitation inspection results revealed different performance patterns between the two terminals. Sungai Kunjang Terminal met the standards for building and space sanitation (82,67%) and sanitation facilities (82,60%), but showed poor performance in outdoor environmental sanitation (46,03%) and comfort and safety (43,30%). In contrast, Samarinda Seberang Terminal only met the standard for building and space sanitation (85,33%), while outdoor environmental sanitation (73,02%), sanitation facilities (55,40%), and comfort and safety (56,67%) remained below the required threshold. These findings indicate that building and space sanitation was the strongest aspect at both terminals, whereas outdoor environmental sanitation and comfort and safety were the main issues requiring priority improvements.

Figure 1. Sketch of the Lux Meter Measurement Locations at the Samarinda Sebrang Terminal

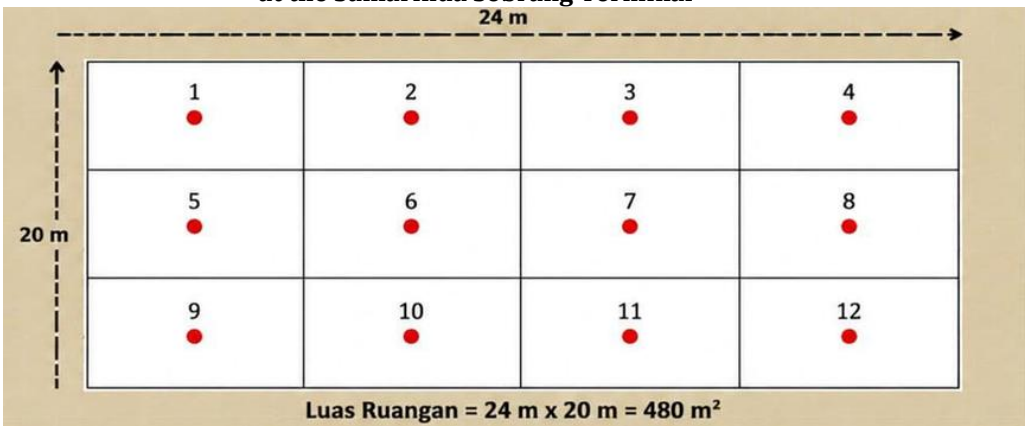

Figure 2. Sketch of the Lux Meter Measurement Locations at the Sungai Kunjang Terminal

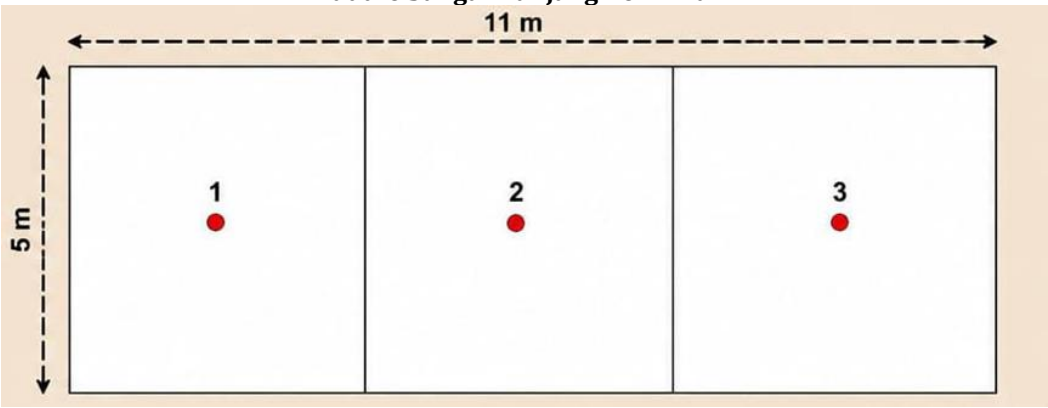

Table 3. Comparison of Lux Meter Measurement Results

Parameter	Sungai Kunjang Terminal	Samarinda Seberang Terminal
Room Area	55 m^2	480 m^2 (24 × 20 m)
Number of measurement points	3 titik	12 points
Measurement direction	Front, right, left	Front, right, left, rear
Highest light intensity	76,67 lux (point 2)	151,25 lux (point 6)
Lowest light intensity	40,00 lux (point 3)	32,50 lux (point 2)
Forward average	60,00 lux	110,00 lux
Average right-hand traffic	56,67 lux	103,75 lux
Average left turn	53,33 lux	106,17 lux

Parameter	Sungai Kunjang Terminal	Samarinda Seberang Terminal
Average rearward direction	–	96,67 lux
Average total illuminance	56,67 lux	104,65 lux
Lighting standards for terminal areas	±100 lux	±100 lux
Compliance with standards	Does not meet the applicable standard.	Generally complies with the applicable standard.
Interpretation	The lighting distribution is uneven, and the average illuminance level remains low.	Although the average illuminance has met the applicable standard, the lighting distribution is still not uniform.

The lighting measurements showed that Samarinda Seberang Terminal performed better than Sungai Kunjang Terminal. The average illuminance level at Samarinda Seberang Terminal reached 104,65 lux and generally met the recommended standard (±100 lux), whereas Sungai Kunjang Terminal only achieved 56,67 lux. Despite this difference, both terminals exhibited uneven light distribution across measurement points, indicating that improvements in lighting placement and distribution are still required to enhance user comfort and safety.

Table 4. Comparison of Sound Level Meter Measurement Results

No	Measurement Location	Measured Noise Level (dB)	Noise Standard	Compliance Status
1	Sungai Kunjang Terminal	55,6 dB	70dB	Meets standard
2	Samarinda Seberang Terminal	52,2 dB	70 dB	Meets standard

Noise measurements indicated that both terminals maintained sound levels below the permissible limit of 70 dB. Although Sungai Kunjang Terminal recorded slightly higher noise levels (55,6 dB) than Samarinda Seberang Terminal (522 dB), both locations can still be categorized as meeting the applicable standards. Therefore, noise does not currently represent a major environmental health concern compared with sanitation and lighting conditions, which require greater attention.

4. Discussion

This study analyzes sanitation conditions at two public transportation terminals in Samarinda City—Sungai Kunjang Terminal and Samarinda Seberang Terminal—based on four main variables: outdoor environmental hygiene, indoor and building hygiene, sanitation facilities, and comfort and safety aspects (Falih et al., 2021). The study results indicate that both terminals do not yet fully meet environmental sanitation standards. While both

locations demonstrate adequate conditions for indoor space and building hygiene, outdoor environmental sanitation and aspects of comfort and safety remain below the acceptable thresholds. This condition reflects an imbalance in sanitation management, where improvements are more focused on indoor areas compared to the outdoor environment, which is more vulnerable to environmental exposure and user activities.

Specifically, the substandard outdoor environmental sanitation scores at both terminals are primarily driven by inadequate drainage systems that allow standing water, poor management of solid waste leading to scattered garbage in the terminal yard, and a lack of routine cleanliness maintenance. These specific deficiencies create highly favorable conditions for disease vectors, such as flies and mosquitoes, to breed. These findings align with the research by Vebrianti et al. (2021b) and Firdani et al. (2023), which reported that outdoor environmental sanitation components at terminals tend to have lower scores compared to indoor building and facility components.

At the Samarinda Seberang Terminal, the inadequate condition of sanitation facilities presents a significant public health concern. The failure to meet these standards is largely attributed to the limited availability of clean water access, poorly maintained public toilets, and an insufficient number of closed trash bins relative to the terminal's capacity. Inadequate sanitation facilities in high-traffic public areas such as terminals have the potential to increase the risk of cross-contamination and the spread of infectious diseases (Muhammad et al., 2024). Differences in performance between terminals indicate that the size and scale of a terminal do not always correspond to proportional sanitation management. As emphasized by Salmalia et al. (2021), the availability of sanitation facilities must be aligned with the terminal's capacity and user volume.

The results of the lighting intensity measurements add an important dimension to the sanitation assessment of the two terminals. Although Samarinda Seberang Terminal generally met the ±100 lux standard, both terminals exhibited uneven light distribution. This inadequacy is primarily caused by an insufficient number of lighting fixtures, suboptimal placement of lamps, and a failure to maximize natural daylight penetration into the passenger waiting areas. Inadequate lighting can affect the comfort and safety of terminal users and potentially worsen overall environmental hygiene conditions. These findings align with the low comfort and safety scores at Sungai Kunjang Terminal, a factor that can be directly attributed to insufficient lighting in the terminal area.

In addition to sanitation and lighting, noise levels represent a critical variable in assessing terminal environmental health. The noise measurements yielded 55,6 dB at Sungai Kunjang Terminal and 52,2 dB at Samarinda Seberang Terminal. Both values are well below the established quality standard of ≤70 dB for public service areas. The relatively low noise levels observed can be attributed to the spatial layout of the terminals, which allows for sufficient acoustic dispersion, as well as the specific traffic volume and operational intensity during the measurement periods. While current noise levels do not pose a risk of auditory fatigue or comfort disruption for users, proactive acoustic management—such as maintaining vegetation buffers or zoning passenger waiting areas away from vehicle idling zones—remains necessary to anticipate future increases in transportation activity.

The results of this study are consistent with various previous studies in Indonesia. Firdanis et al. (2022) and Vebrianti et al. (2021) reported that terminal sanitation conditions generally do not meet standards, particularly regarding the external environment and safety. This consistency of findings across locations indicates that terminal sanitation issues are

systemic and remain a challenge in the management of public transportation facilities. In the regional context of East Kalimantan, Hidayat et al. (2025), found a relationship between sanitation quality and terminal user satisfaction levels; thus, the low scores for sanitation facilities and comfort at both Samarinda terminals have the potential to directly impact user satisfaction. The findings of Azzahra & Kumalasari (2025), also indicate variations in sanitation conditions across terminals, with patterns of disparity between building conditions and the external environment that align with the results of this study.

From a public health perspective, suboptimal terminal sanitation conditions have direct implications for terminal users and vendors. Low scores for outdoor environmental sanitation which include drainage management and waste handling have the potential to serve as breeding grounds for disease vectors. Pakpahan et al. (2023) found a correlation between poor terminal environmental hygiene and high fly density, as flies act as mechanical vectors for gastrointestinal diseases. Therefore, improving outdoor environmental sanitation is a priority in efforts to prevent health risks (Fardin et al., 2022). Additionally, Yusmidiarti (2024), state that the lack of routine and standardized sanitation inspections is a major factor contributing to the poor quality of sanitation in public facilities. The use of digital technology in sanitation monitoring, such as the Android-based inspection app developed by Musadek et al. (2021) can serve as an alternative to enhance the effectiveness and consistency of oversight.

Improving terminal sanitation quality is also relevant to achieving the Sustainable Development Goals (SDGs), particularly Goals 3, 6, and 11. Efforts to improve terminal sanitation are part of fulfilling the public's right to a clean and healthy environment, as also emphasized by Cahyono et al. (2024), who noted that terminal areas have the potential to become sources of exposure to environmental pollutants (Gude et al., 2024). Therefore, sanitation interventions must encompass comprehensive and sustainable environmental management, not limited to the provision of physical facilities alone (Jufri et al., 2021).

This study has limitations, including an observational design with a cross-sectional approach and data collection at a single point in time, so it does not fully represent variations in sanitation conditions throughout the terminal's operational period (Alfarizi et al., 2024). The categorical nature of the observational instruments and the limited sanitation parameters measured also restrict the depth of the analysis (Budge et al., 2022). Nevertheless, the findings of this study still provide an actual picture of the sanitation conditions at both terminals and can serve as a basis for more targeted improvement planning and further research.

5. Conclusion

Based on the results of sanitation inspections at the Sungai Kunjang Terminal and the Samarinda Seberang Terminal, sanitation standards at both terminals do not yet fully meet the standards set by the Indonesian Ministry of Health. At Sungai Kunjang Terminal, two out of four variables met the standards, namely indoor and building sanitation (82,67%) and sanitation facilities (82,6%), while outdoor environmental sanitation (46,03%) and comfort and safety (43,3%) did not meet the standards. At Samarinda Seberang Terminal, only one of the four variables met the standards—namely, indoor and building cleanliness (85,33%)—while outdoor environmental cleanliness (73,02%), sanitation facilities (55,4%), and comfort and safety (56,67%) did not meet the applicable standards. In terms of lighting, the Sungai Kunjang Terminal (56,67 lux) did not meet the standard of ±100 lux, whereas the

Samarinda Seberang Terminal (104,65 lux) met the standard, although the distribution was not yet uniform. Noise levels at the two terminals were 55,6 dB and 52,2 dB, respectively, both of which are below the threshold of ≤70 dB. Structured intervention by terminal operators and local governments is needed, including improvements to sanitation infrastructure, enhanced lighting, and the implementation of routine inspections, as part of efforts to meet sanitation standards for public facilities.

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