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Assessment of Environmental Noise Pollution Across Urban Land-use Types and Self-reported Health Impacts in Ayobo Community, Lagos State, Nigeria

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ABSTRACT
Noise pollution has become a major environmental health concern in rapidly urbanizing cities of developing countries as a result of increasing traffic, commercial activities, and widespread dependence on electricity generators. This study assessed environmental noise levels and evaluated residents' perceptions of noise sources, associated health effects, and mitigation measures in Ayobo community, Lagos State, Nigeria. Ambient noise levels were measured with a Smart Sensor Digital Sound Level Meter during morning and evening periods, while structured questionnaires were administered to 276 residents to obtain information on perceived noise sources, self-reported health effects, and existing control measures. Data obtained were analysed using SPSS version 25.0. Morning noise levels ranged from 45.78±2.85 dB(A) to 74.69±3.57 dB(A), while evening values ranged from 49.69±6.02 dB(A) to 74.46±9.43 dB(A). The overall mean noise levels in the morning and evening were 63.29 dB(A) and 62.48 dB(A), respectively, exceeding recommended national and international guideline values of 55 dB(A) and 45 dB(A) in the morning and evening. Questionnaire results revealed self-reported vehicular traffic (96.0%), commercial activities (87.3%), music and record stores (78.4%), and electricity generators (73.4%) as the principal contributors to environmental noise, while self-reported health effects included headache (97.6%), annoyance (87.3%), insomnia (82.7%), tinnitus (71.3%), and elevated blood pressure (69.8%). The findings demonstrate that environmental noise pollution is widespread across the study area and poses important public health concerns. Therefore, strengthening environmental noise regulations, implementing continuous monitoring programmes, and increasing public awareness are recommended to reduce community noise exposure and its health consequences.

Keywords: Sound Level Meter, Environmental Noise Exposure, Public Health, Urban Environmental Health, Questionnaire

INTRODUCTION

Environmental noise pollution has become an increasingly important issue for environmental and public health worldwide due to rapid urbanization, population growth, industrial expansion, and intensified transportation activities. Unlike many environmental contaminants, noise is an invisible pollutant that can adversely affect human health, psychological well-being, and overall quality of life. World Health Organization (WHO) identifies noise pollution as the second most important environmental health risk after air pollution, with millions of people, especially vulnerable groups, routinely exposed to harmful sound levels (WHO, 2018; WHO, 2021). Noise is a stressor that interferes with sleep, communication, learning, and occupational performance, and increases the risk of adverse health outcomes (Olamijulo *et al*., 2016; Akande and Yusuf, 2022). Environmental noise originates from anthropogenic activities, including heavy-duty vehicles, road transportation (blaring of horns), railways, aircraft, industrial operations, commercial activities, construction works, neighborhood activities, public address systems, and electricity generators (Environmental Noise Pollution, 2014; WHO, 2018).

Urban expansion has considerably altered the acoustic environment of cities, particularly in developing countries where weak environmental regulations, mixed land-use development, poor urban planning, and inadequate infrastructure contribute to increasing community noise exposure (Abdullahi, 2026; Basner and McGuire, 2018). Beyond hearing impairment, prolonged exposure has been linked to annoyance, sleep disturbance, impaired cognitive performance, reduced academic achievement, hypertension, cardiovascular diseases, endocrine dysfunction, anxiety, depression, metabolic disorders, and reduced quality of life (WHO, 2018; Münzel *et al*., 2021; Clark and Paunovic, 2018). Noise is an unrecognized threat or unseen danger that triggers health issues, such as lack of sleep, heart diseases, low academic performance, and hearing impairment, among others. The increasing level of noise in the cities has been associated with the upsurge in industrial, commercial, transport-related, and recreational activities. However, the main driving forces responsible for prolonged exposure to noise in developing countries include elevated population, urbanization, and technological advancement (Dietrich, 2017).

In urban metropolises, noise pollution has been associated with a threat to human quality of life and well-being. About 1.1 billion people aged 12 and 35 years were at risk (WHO, 2021). High vehicular traffic, roadside trading, commercial centres, religious activities, entertainment facilities, construction projects, and generator usage collectively

contribute to elevated environmental noise levels that frequently exceed national and international permissible limits (Akande and Yusuf, 2022; Musiliu, 2022; Eghomwanre *et al.,* 2025).

Previous investigations conducted in several Nigerian cities have consistently reported environmental noise levels exceeding the limits recommended by the World Health Organization (WHO), the National Environmental Standards and Regulations Enforcement Agency (NESREA), and the Lagos State Environmental Protection Agency (LASEPA). Vehicular traffic, electricity generators, roadside trading, commercial establishments, religious activities, and public address systems have repeatedly been identified as the principal contributors to community noise pollution (Aderinola and Owolabi, 2020; Akande and Yusuf, 2022; Musiliu, 2022; Eghomwanre *et al.,* 2025).

Therefore, this study assessed environmental noise levels across residential, commercial, institutional, and designated silence zones within Ayobo Community, Lagos State, Nigeria. Specifically, the study quantified ambient noise levels across selected land-use categories, identified the predominant sources of environmental noise as perceived by residents, evaluated the associated health effects, and examined the mitigation measures adopted within the community. The findings are expected to provide scientific evidence that could guide environmental health professionals, urban planners, policymakers, and regulatory agencies in developing effective interventions for community noise exposure and protecting public health.

MATERIALS AND METHODS

Description of the Study Area

This study was conducted in Ayobo Community, located within Alimosho Local Government Area of Lagos State, Nigeria. Ayobo is a rapidly developing peri-urban settlement characterized by increasing population density, mixed land-use patterns, expanding commercial activities, educational institutions, residential neighbourhoods, transportation corridors, and relatively low-activity (silence) zones. The rapid urban growth and diverse human activities make the community appropriate for assessing variations in environmental noise across different land-use categories.

Geographical location: 6°27′14″N and 6°31′27″N; 3°23′40″E and 3°22′45″E, generally low lying 11 m above sea level (Awodele *et al.,* 2016).

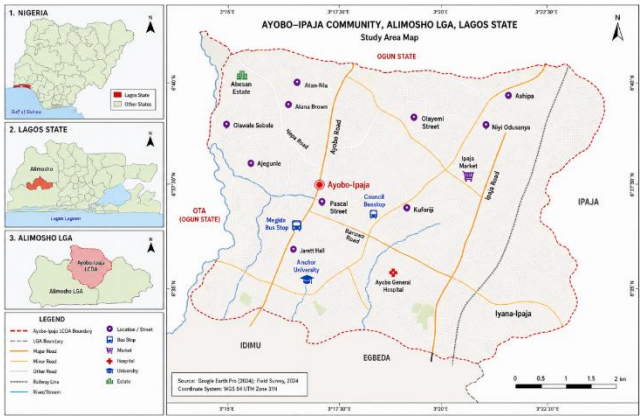


Figure 1: Map Showing the Sampled Site

Study Area and Design

A cross-sectional environmental assessment was conducted in Ayobo Community, Lagos State, Nigeria. The study combined ambient noise measurements, structured questionnaire survey, and field observations to assess eenvironmental noise levels across different land-use categories and residents' perceptions of associated health effects.

Selection of Sampling Locations

Twenty-three sampling locations were purposively selected across four land-use categories; commercial/market; (8), residential (5); institutional (5) and quiet zones (5). Representative sampling locations were selected within each land-use category to capture the diversity of environmental noise conditions across Ayobo Community (Figure 1). The geographical coordinates of all monitoring sites were recorded using a handheld Global Positioning System (GPS) receiver.

Environmental Noise Measurement

Ambient environmental noise was measured using a calibrated Smart Sensor Digital Sound Level Meter (Model AR824) with a measurement range of 30–130 dB(A). The instrument was calibrated before sampling. Noise measurements were conducted over 24 consecutive days during morning (07:00–09:00 h) and evening (18:00–20:00 h) periods. At each location, the instrument was positioned approximately 1.2 m above ground level, and readings were recorded at five-minute intervals over a 30-minute sampling period using the slow response setting. Equivalent continuous sound pressure levels (LAeq) were determined and compared with applicable environmental noise guidelines. Table 1 shows the LASEPA standard for daytime and night-time noise levels.

Questionnaire Survey

A structured questionnaire survey was conducted to assess respondents' perception of environmental noise, self-reported health effects associated with noise exposure, awareness of noise pollution, and mitigation measures. Stratified sampling was adopted to ensure adequate representation of the different land-use characteristics within the study sites. The study area was stratified into four land-use categories based on their predominant activities: commercial/market (n = 8), institutional (n = 5), residential (n = 5), and silent zones (n = 5), resulting in a total of 23 sampling locations. To ensure an adequate and balanced representation of respondents. Twelve questionnaires were administered at each location, resulting in a target sample of 276 respondents. Eligible respondents were selected based on their presence and willingness to participate in the study. Individuals who had spent sufficient

time and years within the selected area were included to ensure their responses reflected actual experiences and perceptions towards the prevailing environmental noise. Participation was voluntary, and consent was obtained verbally before questionnaire administration. Face-to-face interviews lasted approximately 15 – 20 minutes, and verbal informed consent was obtained before participation.
Simultaneously, field observations were undertaken to identify predominant anthropogenic activities contributing to environmental noise at each sampling location.

Inclusion/Exclusion Criteria
The study involved only individuals from the selected sampling locations, primarily focusing on those aged 18 years or older, who were in a good state of physical and mental health.

Ethical Considerations
Participation in the questionnaire survey was voluntary, and verbal informed consent was obtained from all participants before data collection.

Statistical Analysis
Data obtained from environmental noise monitoring and questionnaires were validated, entered into Microsoft Excel for coding, and subsequently analysed using the Statistical Package for the Social Sciences (SPSS) version 25.0. The validation process enabled the researcher to determine the questionnaire's validity and response rates. The normality of environmental noise data was assessed. Descriptive statistics including means, standard deviations, frequencies, and percentages were used to summarize noise measurements and questionnaire responses. Paired-samples t-tests were used to compare morning and evening noise levels where the data met the test assumptions. Pearson's correlation was applied, and statistical significance was set at $p < 0.05$.

Table 1: Day-Night Time Standards for Ambient Noise Level

Set Limit dB Area	Day Time	Night Time
Residential Zone	55 dBA	45 dBA
Commercial Zone	70 dBA	60 dBA
Industrial Zone	90 dBA	65 dBA

Source: LASEPA, 2019

RESULTS AND DISCUSSION

Results

Environmental Noise Levels at Selected Land Types Respondent's Housing Zones

The measured environmental noise levels in the residential neighbourhoods of Ayobo Community are shown in Table 2. Morning (LAeq) ranged from 59.1±6.92 to 68.1±8.05 dB (A) and 62.31±7.22 to 66.46±8.91 dB (A) in the night-time hours. Ayobo-Mongoro consistently recorded the highest mean noise levels during both monitoring periods, while Alana Brown exhibited the lowest daytime noise level. Comparison with the WHO (2018) and LASEPA (2019) guideline values showed that all monitored residential locations surpassed the recommended day and night-time limit of 55 and 45 dB(A), respectively. Residential areas located adjacent to major roads and commercial activities generally exhibited higher noise levels than those situated farther from intense anthropogenic activities.
The residential noise levels were quite high in the evening compared to the morning period. The noise standard for residential areas is 45 dB (A) for night-time. Figure 2 shows noise levels in residential neighbourhoods compared with standards. Thus, noise pollution was prevalent in the housing environment in Ayobo community and hence might limit the habitability quality of the dwellings in these neighbourhoods. Significant variation ($p<0.05$) in the environmental noise levels at the selected areas was observed in the morning and evening. The order of the assessed noise level is Ayobo-Mongoro > Atan-Nla > Adeoye > Amule Crescent > Alana-Brown.

Table 2: Noise Levels in Residential Neighbourhoods in Ayobo Community

S/N	Location	Morning			Evening/Night		
		Min	Max	Mean ± SD (dBA)	Min	Max	Mean ± SD (dBA)
1	Adeoye Street	57.6	81.2	$63.81±5.74^{d}$	52.1	76.4	$64.73±6.51^{cde}$
2	Ayobo Mongoro	53.7	79.3	$68.06±8.05^{ef}$	51.7	79.4	$66.46±8.91^{cde}$
3	Amule Crescent	54.6	68.8	$59.98±4.27^{c}$	52.2	69.7	$65.15±4.93^{cde}$
4	Atan-Nla Street	54.1	72.3	$63.85±6.57^{d}$	48.7	73.4	$62.31±7.22^{c}$
5	Alana Brown	48.3	68.8	$59.07±6.92^{c}$	56.7	72.3	$66.03±3.71^{cde}$
	Permissible limit			55 dB			45 dB

*Values = mean±SD
*Superscripts with the Same Number of Asterisks are not Significantly ($p<0.05$) Different (DMRT)
*(LASEPA, 2019, WHO, 2018) Permissible Noise Limit for Average Outdoor Noise at Daytime and Evening Time

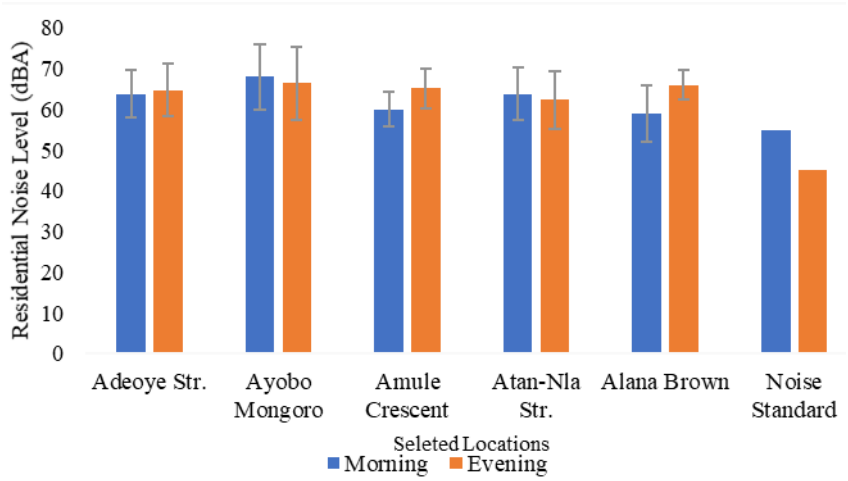


Figure 2: Variation in Noise Levels in Residential Neighbourhoods Compared with Standard

Silence Zones

Environmental noise measurements within the designated silence zones revealed comparatively lower sound pressure levels than those observed in residential, institutional, and commercial areas (Table 3). Morning mean noise levels ranged from 45.78 ± 2.85 dB(A) at Pascal Street to 53.07 ± 2.14 dB(A) at Olawale-Sobola, whereas evening measurements ranged from 49.69 ± 6.02 dB(A) at Pascal Street to 56.14 ± 7.51 dB(A) at Kuforiji.

Although these locations recorded relatively lower environmental noise levels, most sampling points still exceeded the permissible limits recommended by WHO and NESREA for silence zones. Pascal Street consistently exhibited the lowest environmental noise exposure, reflecting its relatively low traffic density and limited commercial activities. Conversely, higher noise levels recorded at Olawale-Sobola, Kuforiji, and Abesan Estate may be attributed to increasing residential development, vehicular movement, and nearby commercial activities. Environmental noise varied significantly among the observed silence zones. Elevated noise levels observed around the university locations are likely associated with intensive vehicular movement, roadside commercial activities, student movement, public transportation, and other surrounding anthropogenic activities. Figure 3 shows the noise level of the silence zone compared with the standard.

Table 3: Noise Levels in Silence/Sparse Residential Neighbourhoods in Ayobo Community

S/N	Location	Morning			Evening		
		Min	**Max**	**Mean ± SD (dBA)**	**Min**	**Max**	**Mean ± SD (dBA)**
1	Olawale Sobola	49.2	56.4	53.07±2.14^{b}	45.1	67.3	50.63±5.86^{a}
2	Orelusi Street	43.9	58.2	47.68±5.77^{c}	42.6	64.1	52.38±5.96^{ab}
3	Abesan Estate	41.8	61.2	51.33±4.71^{ab}	45.7	64.3	53.01±6.35^{ab}
4	Pascal Street	43.7	50.1	45.78±2.85^{a}	43.3	56.3	49.69±6.02^{a}
5	Kuforiji	43.7	57.2	48.96±3.69^{a}	40.8	66.4	56.14 ±7.51^{ab}
	Limit			40/50 dB			35/40 dB

*Values = Mean ± SD

*Superscripts with the Same Number are not Significantly ($p<0.05$) Different (DMRT)

*(NESREA, 2009) Permissible Noise Limit for Average Outdoor Noise at Daytime and Evening Time

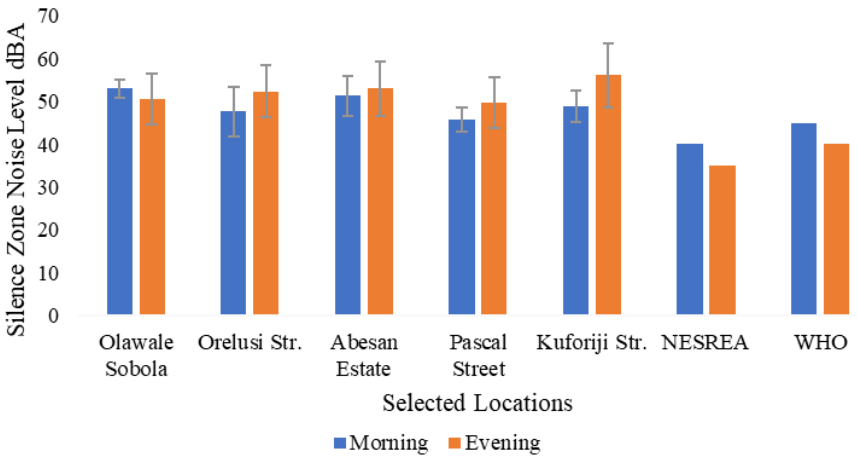


Figure 3: Variation in Noise Levels Across Silence Zones Compared with Standard

Institutional Areas

Table 4 shows noise levels within the institutional zone at different times of the day. Mean noise levels ranged between 50.77 ± 3.86 dB(A) at Jaret Hall and 67.09 ± 6.92 dB(A) at Local University Area 2 in the morning. In the evening, noise levels ranged from 56.57 ± 5.84 dB(A) to 68.64 ± 8.16 dB(A), with Local University Area 1 recording the highest average value.

Except for Jaret Hall during the morning monitoring period, all locations were above the institutional environment when compared with recommended limits (Figure 4).

Table 4: Noise Levels in the Institutional Zone in Ayobo Community

S/N	Sampled Location	Morning			Evening		
		Min	Max	Mean ±SD (dBA)	Min	Max	Mean ±SD (dBA)
1	Jaret Hall	41.6	57.7	50.77 ± 3.86^{ab}	46.8	66.4	56.57 ± 5.84^{b}
2	Local Univ1	57.3	73.7	66.39 ± 3.64^{de}	54.4	80.3	68.64 ± 8.16^{def}
3	Local Univ2	48.6	77.3	67.09 ± 6.92^{def}	50.4	71.9	64.21 ± 5.49^{cd}
4	Babs Ayorinde	50.1	68.2	59.81 ± 4.04^{c}	55.6	76.3	65.44 ± 5.30^{cde}
5	Olayemi Street	62.2	69.5	66.48 ± 2.56^{def}	56.7	75.3	65.31 ± 4.81^{cde}
	Permissible Limit			55			45

*Values = Mean±SD

*Superscripts with the Same Numbers of Asterisks are not Significantly ($p<0.05$) Different (DMRT)

*(NESREA, 2009, WHO, 2018) Permissible Noise Limit for Average Outdoor Noise at Day Time and Evening Time

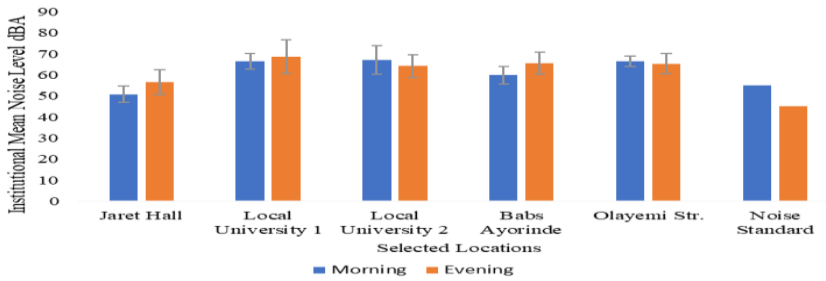


Figure 4: Variation in Noise Levels Across Institutional Zones Compared with Standard

Commercial and Market Areas

Commercial and market environments recorded the highest environmental noise levels among all land-use categories investigated (Table 5). Morning mean noise levels ranged from 67.86 ± 6.44 dB(A) at Niyi Odusanya Market to 74.69 ± 3.57 dB(A) at Council Bus Stop, while evening measurements varied between 52.63 ± 6.79 dB(A) at Ajegunle and 74.46 ± 9.43 dB(A) at Ipaja-Ayobo. Approximately three-quarters (75%) of the assessed locations exceeded the recommended environmental noise limits established by WHO, NESREA, and LASEPA for 65 dB (A) (Figure 5). Council Bus Stop, NEPA Road, Genesis Road, and Ipaja-Ayobo consistently recorded the highest daytime noise levels, reflecting the influence of heavy vehicular traffic, roadside trading, commercial activities, public address systems, and electricity generators. Lower evening noise levels observed at Genesis Road and Ajegunle, which were within the permissible limit for the commercial zone, may be attributed to reduced commercial activities and lower traffic volume.

Conclusively, commercial land-use areas exhibited the higher environmental noise burden within the study area, indicating that residents, traders, commuters, and civil servants/workers operating within these environments experienced higher environmental noise exposure than those in residential, institutional, or silence zones.

Table 5: Noise Levels in Commercial/Market Zone in Ayobo Community

S/N	Sampled Sites	Morning			Evening		
		Minimum	Maximum	Mean ± SD (dBA)	Minimum	Maximum	Mean ±SD (dBA)
1	Ashipa	60.2	78.5	69.44 ± 6.21^{efg}	55.6	89.1	70.44 ± 9.48^{efg}
2	Niyi Odusanya M	60.4	86.1	67.86 ± 6.44^{def}	56.4	96.1	67.05 ± 12.08^{cde}
3	IBTC Bus-stop	51.7	80.3	70.41 ± 6.82^{efgh}	54.3	85.2	73.37 ± 9.74^{fg}
4	Ipaja-Ayobo	66.5	75.1	70.53 ± 3.07^{efgh}	61.3	91.8	74.46 ± 9.43^{g}
5	NEPA Road	67.6	78.1	73.65 ± 3.22^{hi}	62.2	75.6	66.99 ± 3.23^{cde}
6	Council Bus-stop	67.6	79.6	74.69 ± 3.57^{i}	49.3	72.3	65.78 ± 5.54^{cde}
7	Genesis Road	66.9	81.8	73.41 ± 5.04^{ghi}	44.5	65.5	54.72 ± 6.31^{ab}
8	Ajegunle	63.4	86.3	70.73 ± 5.75^{fgh}	42.1	69.1	52.63 ± 6.79^{ab}
	Permissible Limit			65/70			55/60

*Values = mean ± SD

*Superscripts with the Same Number of Asterisks are not Significantly ($p<0.05$) Different (DMRT)

*(NESREA, 2009; WHO, 2018; LASEPA, 2019) Permissible Noise Limit for Average Outdoor Noise at Daytime and evening Time

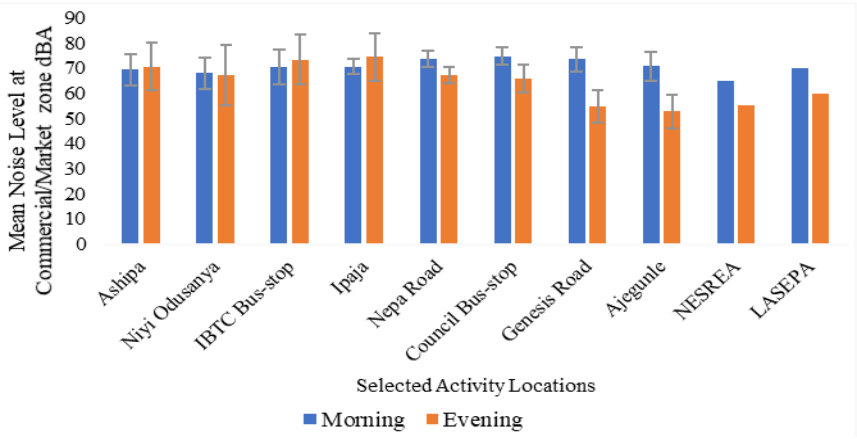


Figure 5: Variation in Noise Levels at Commercial/Market Zones Compared with Standard

Overall Environmental Noise Levels Across Different Land-Use Categories

The grand mean environmental noise level across commercial, silent, institutional and residential zones was 63.29 dB(A) during the morning and 62.48 dB(A) during the evening. These average values indicate that environmental noise pollution is pervasive throughout the study area and frequently exceeds internationally accepted exposure limits irrespective of land-use type (Table 6). Residential areas recorded average values of 62.95 and 64.93 dB(A) during the morning and evening periods, respectively, exceeding the permissible guideline values for residential environments. Similarly, institutional areas recorded average values of 62.11 and 64.03 dB(A) for both periods of the day, indicating persistent exposure above the recommended limits for educational environments. Silence zones exhibited the lowest average environmental noise levels, with mean values of 51.96 and 53.37 dB(A) for both morning and evening (Table 6). Although these values were comparatively lower than those recorded in other land-use categories, they nevertheless exceeded the recommended permissible limits for designated quiet areas, suggesting that even relatively low-activity environments within Ayobo Community are affected by environmental noise pollution.

Table 6: Overall Noise level Around the Activity Types

Land use zone type	Morning Mean noise level (dB)	Allowable noise limit (morning)	Evening Mean noise level (dB)	Allowable noise limit (evening)
Residential	62.9	55/60	64.9	45/50
Silence	51.9	55	53.3	45
Institutional	62.1	55	64.1	45
Commercial	71.3	65/75	65.6	55
Grand mean	63.29		62.48	

Field Survey, 2026

Correlation Analysis Results of Environmental Noise Level

Table 7 shows the Pearson correlation analysis, which was based on the twenty-three (23) sampling locations for both morning and evening. The result revealed a moderate to strong significant positive association between morning and evening environmental noise levels across the land use categories/23 sampling locations ($r=0.655$, $p<0.001$). The Spearman rank correlation analysis similarly showed a significant positive association ($p = 0.562$, $p = 0.005$), indicating that locations with relatively higher morning noise levels generally tended to have higher evening noise levels.

Table 7: Correlation Between Morning and Evening Noise Levels Across Sampling Locations

Variables	**N**	**Pearson's**	**P-value**	**Spearman's p**	**p-value**	**Interpretation**
Morning noise vs Evening noise level	23	0.655**	<0.001	0.562**	0.005	Positive, statistically significant

**Correlation is Significant at the 0.01 level (2-tailed)

*N=Aggregate of all Land use Types/Number of Sampling Locations; r=Pearson Correlation Coefficient; p=Spearman Rank Correlation Coefficient.

Comparison of Morning and Evening Noise Across Selected Sampling Sites

Table 8 presents the variation in environmental noise levels between morning and evening across the 23 sampling sites. The results indicate considerable spatial and temporal variability in measured noise levels, suggesting that the intensity of environmental noise differed across locations and periods of measurement. The paired-samples t-test indicate determines differences in the statistical significance of morning and evening periods across the sites. The reported t-test results indicate statistically significant differences which were observed at Amule Crescent ($p = 0.013$), Atan-Nla ($p = 0.006$), Alana Brown ($p = 0.002$), Orelusi Street ($p = 0.001$), Abesan Estate ($p = 0.040$), Pascal Street ($p = 0.045$), Jaret Hall ($p = 0.020$) and, Ashipa ($p = 0.020$). In contrast, the differences in about 12 locations such as Adeoye Street, Ayobo. Mongoro, Kuforiji, Local Univ1 among others were not statistically significant at the 5% significance level ($p>0.05$).

Table 8: Variation in Environmental Noise Across the Twenty-Three Sampling Sites

S/N	Location	Test Parameter	Mean	T-test, Sig	Evening-Morning (dB(A))
1	Adeoye str.	Morning	63.8		
		Evening	64.7	-1.383; 0.301	+0.9
2	Ayobo Mongoro	Morning	68.1		
		Evening	66.4	2.079; 0.173	-1.7
3	Amule Crescent	Morning	59.9		
		Evening	65.1	-9.865; 0.013	+5.2
4	Atan-Nla street	Morning	63.8		
		Evening	62.3	13.400; 0.006	-1.5
5	Alana Brown	Morning	59.1		
		Evening	66.0	-23.039; 0.002	+6.9
6	Olawale Sobola	Morning	53.1		
		Evening	67.3	-1.142; 0.372	+14.2
7	Orelusi street	Morning	47.6		
		Evening	52.3	-13.272; 0.001	+4.7
8	Abesan Estate	Morning	51.3		
		Evening	53.0	-4.869; 0.040	+1.7
9	Pascal street	Morning	45.7		
		Evening	49.6	-4.557; 0.045	+3.9
10	Kuforiji	Morning	48.9		
		Evening	56.1	3.118; 0.089	+7.2
11	Jaret Hall	Morning	50.7		
		Evening	56.5	-6.879; 0.020	+5.8
12	Local Univ1	Morning	66.3		
		Evening	68.6	0.219; 0.847	+0.3
13	Local Univ2	Morning	67.1		
		Evening	64.2	1.871; 0.202	-2.9
14	Babs Ayorinde	Morning	59.8		
		Evening	65.4	-7.346; 0.018	+5.6
15	Olayemi Street	Morning	66.4		
		Evening	65.3	0.418; 0.717	-1.1
16	Ashipa	Morning	69.4		
		Evening	70.4	-22.300; 0.002	+1.0
17	Niyi Odusanya	Morning	67.8		
		Evening	67.1	2.122; 0.052	-0.7
18	IBTC busstop	Morning	70.4		
		Evening	73.3	-2.594; 0.122	+2.9
19	Ipaja	Morning	70.5		
		Evening	74.4	-0.805; 0.434	+3.9
20	Nepa road	Morning	73.6		
		Evening	66.9	0.922; 0.454	-6.7
21	Council bus stop	Morning	74.6		
		Evening	65.7	1.715; 0.228	-8.9
22	Genesis road	Morning	73.4		
		Evening	54.7	2.678; 0.050	-18.7
23	Ajegunle	Morning	70.7		
		Evening	52.6	5.082; 0.001	-18.1

Socio-demographic Characteristics of Respondents and Perception of Environmental Noise

The sampled respondents from the various area units in the metropolis have a good spread across age, gender, educational, and occupational groups (Table 9). The sample comprised 52.2% females and 47.8% males, indicating a relatively balanced gender distribution. The majority (38.0%) fell within the age group 26–35 years, 18–25 years (31.9%), 36–45 years (20.7%), and above 46 years (9.4%).

Approximately 65% of the respondents were married, whereas 34.8% were unmarried. In terms of their educational background, most of the respondents had tertiary education (47.3%), while those who had no formal education, primary education, and secondary education represented 25.3%, 16.7%, or 10.7% of the sample, respectively. This shows that most of the respondents are literate. Occupationally, traders and artisans constituted the largest proportion (38.8%), who was predominantly small shop owners, followed by civil servants (23.2%) and self-employed individuals (19.2%).

In terms of residential duration, 60.5% of respondents had lived in the study area for over 12 years. Period of exposure is an independent risk factor for noise-related effects among

workers in Benin City (Eghomwanre *et al*., 2023). The majority (50.8%) of the respondents reported spending 10-14 hours daily, indicating prolonged exposure to environmental noise (Table 9).

Residents' perceptions of environmental noise are presented in Table 10. More than half of the respondents (56.9%) perceived environmental noise levels within the study area as high, while 35.9% considered the noise level moderate and only 7.2% perceived it as low.

The majority of respondents (60.5%) reported experiencing the highest level of environmental noise during the evening period, followed by morning (25.4%), whereas 14.1.% indicated afternoon as the period of least exposure.

Table 9: Socio-demographic Characteristics of Respondents (N = 276)

Characteristics	No. of respondents	Percent
Gender		
Male	132	47.8
Female	144	52.2
Age range		
18-25 years	88	31.9
26-35 years	105	38.0
36-45 years	57	20.7
Above 46	26	9.4
Education status		
No formal	70	25.3
Primary	46	16.7
Secondary	29	10.7
Tertiary	131	47.3
Marital status		
Single	96	34.8
Married	180	65.2
Occupation		
Civil-servant	64	23.2
Trader/Artisan	107	38.8
Retiree	22	7.9
Self-employed	53	19.2
Student	30	10.9
Duration of occupancy (years)		
3 - 6	59	21.4
7 - 12	50	18.1
12 and above	167	60.5
Duration of stay in a day (hours)		
<5	15	5.4
5 – 9	28	10.1
10 – 14	140	50.8
15 – 19	75	27.2
20 – 24	18	6.5

Table 10: Perception of Noise and Duration of Exposure of Respondents

Characteristics	Frequency	Percentage
Description of noise level		
High	157	56.9
Moderate	99	35.9
Low	20	7.2
Duration of exposure of noise		
Morning	70	25.4
Afternoon	39	14.1
Evening	167	60.5
Noise affects health		
Yes	171	62.0
No	105	38.0
Noise affects children than adult		
Yes	197	71.4
Reasons for choice of living in this area		
Accommodation/personal property/Family	59	21.4
Job/earn a living/Proximity to workplace/shop	134	48.6

Characteristics	Frequency	Percentage
Education	11	4.0
Conducive/passion/security	33	12.0
Electricity/basic amenities	39	14.0
Perception/noise management		
Aware of noise awareness campaign	31	11.2
Legislation to control noise is adequate	55	19.9
Government should impose fine on noise emitters	190	68.9

Additionally, 62.0% of the respondents reported that environmental noise negatively affects human health, demonstrating a high level of awareness of excessive environmental noise exposure. About 71% perceived children are more vulnerable to adverse noise effects than adults. Children's annoyance to noise may differ from adults in several ways. Children spent more time outdoors on playgrounds and in different school activities during daylight hours than adults. Children are in a critical developmental period and have a less developed coping repertoire, which makes them more sensitive to noise than adults (Pujol *et al*., 2014).

Regarding residential preference, 48.6% indicated that proximity to employment, commercial opportunities, or business activities influenced their decision to reside in the area despite the prevailing environmental noise. Other reasons given were buildings they inhabit were inherited property (21.4%), availability of electricity and other basic amenities (14.0%), security and environmental convenience (12.0%), and educational opportunities (4.0%) (Table 10).

The majority (68.9%) supported the imposition of fines and strict penalties on noise emitters, while 19.9% considered the existing formulation of legislation to be an appropriate measure for controlling environmental noise, and 11.2% reported being aware of any form of noise awareness campaign.

Self-reported Sources of Environmental Noise

Vehicular traffic was identified as the principal source of environmental noise by 96.0% of respondents, making it the most frequently reported contributor to community noise pollution. Other major sources included commercial activities (87.3%), music and record stores (78.4%), electric-generator sets (73.4%), public address systems, food grinding machines, and social ceremonies (Figure 6). Prolonged exposure to noise emitted from loudspeakers, megaphones, and generator sets constitutes a major factor of environmental noise which could cause potential adverse effects on human health (Ighoroje *et al*., 2004; Ologe *et al*., 2006; Eghomwanre *et al.,* 2025).

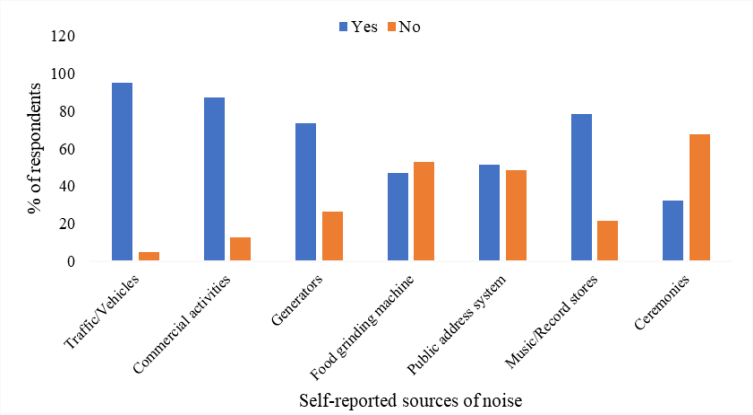


Figure 6: Self-reported Sources of Environmental Noise in the Activity Area

The respondents reported multiple effects, such as headache (97.6%), annoyance (87.3%), insomnia (82.7%), tinnitus (71.3%), elevated blood pressure (69.8%), increased heart rate (61.7%), speech interference (57.8%), difficulty concentrating (55.0%), stress or fatigue (33.8%), and hearing loss (28.3%) (Figure 7). Headache is one of the most common neurological problems, causing a substantial health and social burden on the human population (NICE, 2012).

A considerable proportion of respondents indicated that environmental noise interfered with their daily activities, particularly communication, concentration, rest, and sleep.

These findings suggest that respondents are exposed to significant adverse health outcomes attributable to traffic noise and commercial activities. The observed health effects are consistent with those reported in previous studies, which have demonstrated that prolonged exposure to traffic-related noise has adverse physiological health effects on public health (Gilani and Mir, 2021).

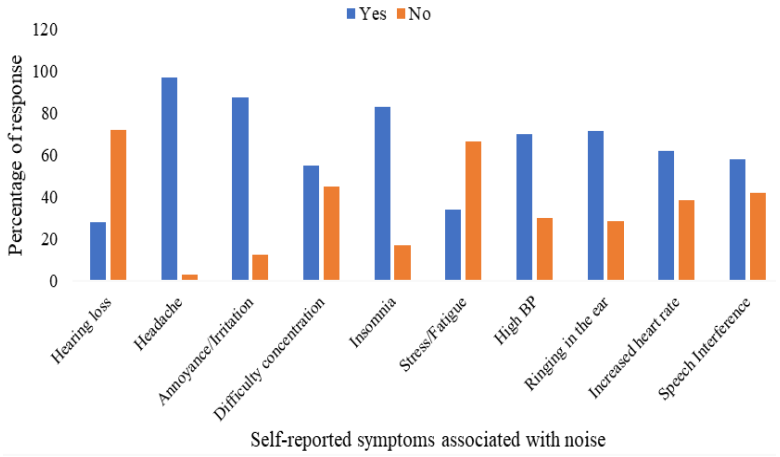


Figure 7: Self-reported Symptoms Associated with Environmental Noise

Discussion

The findings demonstrated that environmental noise levels varied significantly, with commercial areas exhibiting the maximum levels of noise pollution, followed by residential and institutional zones, while silence zones recorded comparatively lower values. Nevertheless, the majority of monitored locations exceeded the permissible limits recommended by the World Health Organization (WHO), the National Environmental Standards and Regulations Enforcement Agency (NESREA), and the Lagos State Environmental Protection Agency (LASEPA), indicating widespread environmental noise pollution within the study area.

Similar patterns have been reported in other Nigerian cities where commercial districts consistently experience the greatest environmental noise burden due to mixed land-use development and increasing traffic density (Akande & Yusuf, 2022; Musiliu, 2022; Eghomwanre et al., 2025). Comparable observations have also been reported internationally, where road traffic remains a dominant contributor to urban environmental noise exposure (European Environment Agency [EEA], 2020; WHO, 2018).

The relatively elevated environmental noise assessed in the activity points during early hours could be attributed to the rush to the office by different business men/women and workers in the morning and multiple sources of environmental noise such as activities of relaxation centers, intrusion of sounds from music players in the neighbourhoods, and the use of mobile electricity generators; traffic noise influence: the statistics of automobiles that ply these roads are generally high and major residential houses are close to the main road.

The high noise level assessed at evening hours coincided with the time when most people were retiring from the day's work. A sound level of 60 dBA in a residential area can result in temporary hearing impairment, while 100 dBA can cause permanent impairment (WHO, 2001; Olayinka, 2012). The World Health Organization (2018) has recommended a standard guideline value for average outdoor noise levels of 55 dBA during normal daytime (16 hours) to prevent significant interference with normal activities of local communities. This study is in line with the work of Chika-Njoku and Odinaka (2019) and similar to a study by Emenike and Sampson (2017) on levels of noise and quality of human livelihoods in neighbourhoods of Port Harcourt Metropolis, Nigeria.

Institutional/Educational zone, the high noise levels gotten from the institutional zone may be attributed to different activities that the pupils/students engaged in since they have been left free to play, scream, and shout without being monitored. Educational environments require relatively quiet surroundings to support effective teaching, learning, and cognitive performance. Persistent exposure to excessive environmental noise within these settings may impair speech intelligibility, concentration, memory, and academic achievement among learners. The external sources of noise include human voices nearby and blaring horns from vehicles outside the school premises, especially at the local university, which is on the main road that leads to Ayobo Market during the time of study. The sources of noise within the local university in proximity to the market are mainly traffic noise, music players, hawkers, people advertising products using loudspeakers and megaphones, among others. Similar findings have been reported in studies examining educational institutions and residential neighbourhoods in low- and middle-income countries, where inadequate urban planning has reduced the effectiveness of designated quiet areas (WHO, 2018; Mealings, 2022).

Areas like Jaret Hall are within the permissible noise limits of 55 dB and 45 dB (A) for morning and evening, respectively (WHO, 1999; NESREA, 2009). This finding is in line with the work of Aderinola and Owolabi (2020) on assessment of noise levels in selected areas within Akure, Nigeria Metropolis. The WHO guidelines state that the average noise level (LAeq) should be within 35 dB (A) in a classroom when the windows are closed (WHO, 1999).

For the commercial/market zone, the high noise level recorded was due to traffic congestion, and most of the selected areas exceed the WHO-recommended permissible noise limit for daytime exposure for commercial areas of 65 dB (A). This finding is similar to the work done by Usikalu and Kolawole (2018) on assessment of noise pollution in selected locations in Ota, Nigeria, and Yohanna-Gwanshaki *et al.* (2020) on evaluation of noise level in selected markets in Jos-North, Plateau State.

High noise levels in areas like Ashipa, IBTC, and the like could be attributed to anthropogenic activities: loudspeakers, roadside noise, and vehicular movement due to high traffic. The noise level measured at Ajegunle and Genesis in the evening was a little bit lower due to many road links (pathways), which reduced the concentration of noise to a dual-carriage road.

This present study further demonstrated significant variation in environmental noise. Residential, institutional, and silence zones generally recorded higher noise levels in the evening than in the morning, whereas commercial areas experienced greater daytime noise exposure. This temporal pattern reflects variations in daily human activities and transportation demand (Figure 6). Similar diurnal variations have been

reported in previous investigations conducted in Lagos, Port Harcourt, and other rapidly growing urban cities (Aderinola & Owolabi, 2020; Musiliu, 2022).

The observed differences are consistent with the understanding that environmental noise varies according to the timing and intensity of human activities and characteristics of individual locations. The result in this study is similar to the study of Ajayi and Adeleke (2022) in their study of Agodi Park and gardens in Ibadan, Nigeria, where they examined spatial noise variation and differences between morning and evening periods. Also, this result is similar to Zheng et al. (2025), whose findings showed significant differences between daytime and nighttime noise levels, with daytime noise being higher. They identified traffic-related variables and land use as important factors influencing the spatial distribution of environmental noise. Comparable findings were reported by Egbordi et al. (2026) on perceived noise levels, where the study observed significant variations in environmental noise across residential areas. They also identified generators, commercial centers, markets, transportation, and worship centers as important perceived sources of environmental noise.

The result also indicates that the majority of the land use is dominated by the mean noise pollution both in the morning and evening time periods as compared to the standards, as also reflected in Figure 5. This finding is similar to the work of Chika and Amadi-Wali (2019) on analysis of noise pollution levels across land use types in Port-Harcourt Metropolis, Rivers State, and David and Palamuleni (2015) on comparative land use-based analysis of noise pollution levels in selected urban centers.

This finding established that even in urban areas, environmental noise has reached a high level, showing that environmental noise has become one of the major environmental problems in rural areas of Lagos to be urgently tackled. The finding is in line with Musiliu (2022), on assessment of environmental noise level in selected rural and urban areas of Lagos State, Nigeria; their finding indicated that the day and night-time levels are above the recommended tolerable values.

The majority of respondents identified vehicular traffic as the principal source of environmental noise, followed by commercial activities, music outlets, electricity generators, public address systems, food processing equipment, and social events. These findings are consistent with previous Nigerian studies identifying road traffic, informal commercial activities, and generator use as the predominant contributors to urban environmental noise (Akande & Yusuf, 2022; Ogunseye et al., 2018; Eghomwanre et al., 2025). The widespread reliance on electricity generators due to unstable public power supply continues to represent a unique environmental challenge in many Nigerian cities and substantially increases community noise exposure.

Residents identified vehicular traffic, commercial activities, music outlets, and electricity generators as the dominant sources of environmental noise. These perceptions correspond closely with the measured environmental noise data, indicating that road transportation and commercial activities remain the principal contributors to community noise pollution in the study area. The dependence on private electricity generators resulting from irregular public power supply further increases environmental noise exposure.

Headache, annoyance, insomnia, tinnitus, elevated blood pressure, increased heart rate, speech interference, impaired concentration, stress, and hearing impairment were among the most frequently self-reported conditions. While hearing impairment remains an important consequence of prolonged noise exposure, recent research has demonstrated that cardiovascular diseases, sleep disorders, mental health disturbances, cognitive impairment, and reduced quality of life constitute major components of the environmental noise disease burden (Munzel et al., 2021; Guski et al., 2023).

CONCLUSION

This study provides evidence that environmental noise pollution is a significant environmental health challenge within Ayobo Community, Lagos State. Ambient noise levels varied significantly across the different land-use categories, with commercial areas recording the highest average values, followed by residential and institutional locations, while designated silence zones exhibited comparatively lower levels. However, environmental noise measurements at most sampling locations exceeded the guideline limits recommended by the World Health Organization (WHO), the National Environmental Standards and Regulations Enforcement Agency (NESREA), and the Lagos State Environmental Protection Agency (LASEPA), indicating widespread community exposure to excessive environmental noise.

This study showed a significant variation in noise levels within the period of the day and the predominant land-use zones. Commercial areas like Ipaja-Ayobo, IBTC, Ajegunle, and Council were identified as the core city and central business area, as they require noise control measures. The present status of noise pollution in parts of Ayobo community poses a severe health risk to the residents, especially the vulnerable groups with compromised health.

The study identified vehicular traffic, commercial activities, electricity generators, public address systems, and other anthropogenic activities as the principal contributors to environmental noise pollution. Furthermore, residents commonly reported headache, annoyance, insomnia, tinnitus, elevated blood pressure, impaired concentration, and other symptoms associated with prolonged environmental noise exposure, highlighting the potential public health implications of continuous exposure.

The study underscores the need for stronger enforcement of environmental noise regulations, routine environmental noise surveillance, improved land-use planning, effective traffic management, and public education on the health consequences of excessive noise exposure. Measures aimed at controlling generator noise, regulating commercial activities, and protecting educational and residential environments should be prioritized.

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The authors declared that this research did not receive any grant from any funding agencies.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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DATA AVAILABILITY

Data are provided within the manuscript.

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