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Determination of Acoustic Sound Level in Swali Market Environment

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Abstract : *This study assessed the levels of environmental noise pollution in Swali Market, Yenagoa, Bayelsa State, with the aim of comparing measured noise levels against national and international permissible limits. Field measurements were conducted across multiple monitoring points within the market, and parameters such as maximum noise level (Lmax), minimum noise level (Lmin), equivalent continuous equal energy level (Leq), average noise level (Lavg), and noise pollution level (Lnp) were determined. Results indicated that noise levels at all monitoring points consistently exceeded the Federal Ministry of Environment (FMEnv), National Environmental Standards and Regulations Enforcement Agency (NESREA), and World Health Organization (WHO) permissible exposure limits of 75 dB(A) and 70 dB(A) for commercial environments. The computed average Leq of 114.4 ± 2.3 dB(A) exceeded NESREA and WHO standards by 60.1% and 71.8%, respectively, ranking very high by regulatory benchmarks. Findings revealed that noise values were highest in the fish/yam market and slaughter areas, with maximum values of 85.0 dB(A) and 84.0 dB(A), respectively. Cumulative noise levels for all monitoring points similarly surpassed stipulated limits. Prolonged exposure to such elevated noise levels is hazardous and may result in hearing impairment, stress-related conditions, sleep disturbance, and reduced overall well-being, especially among traders who spend up to 12 hours daily in the market. These findings corroborate earlier studies in Port Harcourt and Abuja, which reported high and unsatisfactory noise levels in market environments. The study concludes that Swali Market is subject to critical noise pollution that constitutes a significant public health risk. It is recommended that noise mitigation strategies, including public health education, noise zoning, and enforcement of regulatory standards, be urgently implemented to safeguard traders, customers, and the surrounding community.*

Keywords: *Environmental noise pollution, Swali Market, Acoustic sound level, Public health risk, Noise mitigation strategies*

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1.0 Introduction

Environmental noise has become one of the most pervasive forms of pollution in modern human settlements, spreading from its source to surrounding areas and affecting people, property, and ecosystems. Among urban environments, open markets stand out as major contributors to community noise due to the diverse range of activities and structures that generate both intermittent and continuous sounds. In Nigeria, noise from markets is often intense and unregulated, making it one of the most persistent environmental challenges in commercial areas**.**

Noise is generally defined as unwanted sound (Brüel & Kjær, 2001). Sound itself is a vibration that propagates through a medium such as air, water, or solids, but when it becomes unexpected, unpleasant, or disruptive, it is termed noise (Singh & Davar, 2004). A healthy young adult's hearing range typically extends from 20 Hz to 20 kHz, with audible intensities from 0 dB (threshold of hearing) to 130 dB (threshold of pain) (Cutnell & Johnson, 1998). When sound levels exceed these safe thresholds, they can cause discomfort, hearing impairment, and other health effects**.** Noise pollution—also called environmental or sound pollution—arises mainly from transportation systems,

industrial machinery, and human activities (Ijaiya, 2014).

Previous studies (Mackenzie & David, 2008) have identified noise as one of the most widespread environmental pollutants associated with human activity. According to the World Health Organization (WHO, 1999) and the National Environmental Standards and Regulations Enforcement Agency (NESREA, 2009), noise can be broadly categorized into residential, commercial, and industrial types. Residential noise originates from households and domestic activities; industrial noise results from machines and manufacturing processes; while commercial noise—common in markets—stems from trade-related human interactions and mechanical activities.

Commercial activities such as buying, selling, and transportation are vital for socio-economic growth, but in developing countries, these are frequently accompanied by environmental degradation and poor acoustic control (Ugbebor et al., 2017). The WHO (2001) warns that continuous exposure to noise levels above 85 dB(A) can cause irreversible hearing loss and other physiological complications.

In Nigeria, rapid urbanization and population growth have intensified market activities, often leading to noise levels that exceed both national and international standards. The Federal Ministry of Environment (FMEnv, 1991) specifies that noise in commercial areas should not exceed 70 dB(A) during the day. However, several studies (Olayinka, 2013; Ugbebor et al., 2017) have recorded average market noise levels between 90–100 dB(A), which far surpass these limits. Similarly, Oyedepo and Saadu (2009) observed that urban markets and transportation hubs across Nigeria regularly violate permissible exposure levels, posing long-term health risks for traders and residents.

Globally, the WHO (2018) recommends that day-time noise should not exceed 55 dB(A) and night-time noise 45 dB(A). Yet, enforcement in developing nations remains weak due to limited monitoring infrastructure, insufficient public awareness, and poor urban planning (Belojevic & Jakovljevic, 2014). This lack of enforcement leads to uncontrolled noise levels in dense, economically vibrant areas such as marketplaces.

Marketplaces like Swali Market in Yenagoa, Bayelsa State, present a unique context for environmental noise assessment. Swali Market serves as the primary commercial hub for thousands of residents and traders, characterized by constant vehicular movement, power generators, hawkers, loudspeakers, and construction noise. The cumulative effect of these activities creates an acoustic environment that potentially exceeds safety thresholds and affects both physical and mental well-being.

Although previous studies have examined noise levels in road junctions, industrial areas, and urban centers in Nigeria (Oyedepo, 2012; Adejobi & Olorunfemi, 2016), there is a noticeable absence of empirical data on commercial noise exposure in Bayelsa State, particularly in Swali Market. This constitutes a significant knowledge gap in understanding the extent, sources, and impacts of marketplace noise in the Niger Delta region.

Therefore, the aim of this study is to evaluate acoustic noise levels in Swali Market, Yenagoa, and assess their implications for public health and environmental quality. The specific objectives are to:

(i) measure and monitor minimum and maximum noise levels across different market sections over three consecutive days;
(ii) determine equivalent continuous noise levels (Leq) and noise pollution levels (Lnp);
(iii) Compare the measured noise parameters with national (FMEnv, NESREA) and international (WHO) permissible standards; and
(iv) Assess the potential health implications of noise exposure on traders and residents in the market environment.

The significance of this research lies in its contribution to local and regional environmental management strategies**.** By providing baseline data on the acoustic environment of Swali Market, this study supports sustainable urban planning, promotes public health awareness, and informs policy interventions for noise control. The findings are expected to assist environmental regulators, health practitioners, and urban planners in developing effective mitigation measures that balance economic activities with environmental sustainability. This study addresses the urgent need to integrate acoustic management into Nigeria's broader urban development framework, ensuring that economic growth in market environments does not compromise the health and well-being of communities.

1.1 Study Area

The study area is Swali Market, Yenagoa, located in Yenagoa Local Government Area of Bayelsa State, Nigeria. Geographically, it lies within latitude 4°55'9.01"N and longitude 6°16'5.01"E, with an altitude of about 18 meters above sea level (Anekwe & Olarenwaju, 2019). Bayelsa State itself lies within the core Niger Delta region of Nigeria. Swali Market is the largest and most populous market in Bayelsa State, situated along the Nun River near the SMV sand dredging site. It serves as a hub of commercial activities where virtually all categories of goods and services are available. By the side of the market is a jetty that provides transport access to riverine communities. Boat drivers and owners make brisk business conveying goods and passengers to and from various destinations along the Atlantic shoreline. The market plays a crucial role in the economic wellbeing of the citizenry. Natives from riverine fishing towns such as Koluama, Akassa, Nembe, Brass, and Okpoama regularly ferry their produce to Swali Market using engine boats, speed boats, and canoes. On arrival, they offload and sell their produce, while also purchasing items for resale on their return trips (Anekwe & Olarenwaju, 2019). Swali Market opens daily from Monday to Saturday, but its major market day is Thursday, attracting traders and visitors from across Bayelsa State and neighboring states such as Delta and Rivers. On such days, commercial activities peak, making it a vibrant center of trade and cultural exchange. In addition to commerce, the market environment is influenced by industrial noise generated both from market activities and from surrounding industries such as sawmills. This industrial-level noise is considered a significant source of environmental pollution (Anekwe & Avwiri, 2024).

Swali Market is not only a commercial hub but also a socio-cultural melting pot where different ethnic groups interact, reflecting the multi-ethnic composition of Bayelsa State. The market is characterized by a dense arrangement of stalls, shops, and makeshift structures that contribute to the overall vibrancy but also to the chaotic nature of the acoustic environment. The market's proximity to transportation nodes such as the jetty, bus stops, and motor parks increases vehicular and marine traffic, which further intensifies the level of noise pollution in the area (Eja & Arikpo, 2012). The activities of power generators, loudspeakers used by traders, and the hawking style of sales promotion are also dominant sources of noise (Oyedepo, 2012). The Niger Delta region, where Swali Market is located, is well known for its economic significance due to oil and gas exploration. However, it is also highly vulnerable to environmental challenges, including noise, air, and water pollution (Nriagu et al., 2016). As the largest market in Bayelsa State, Swali is central to both rural and urban trade linkages, connecting riverine communities with urban consumers. This linkage fosters economic integration but also results in increased environmental pressures, particularly in terms of waste management and noise emissions (Emenike et al., 2017). The topography and layout of Swali Market also play a role in amplifying noise levels.

The close clustering of stalls and the absence of proper acoustic planning create an environment where sound reverberates, magnifying the intensity of noise pollution (Ugbebor et al., 2017). Studies have shown that traditional open markets in Nigeria generally lack environmental control measures, making them hotspots for excessive and uncontrolled noise (Adewumi & Adebayo, 2020). This makes Swali Market an ideal case study for assessing commercial noise pollution in the Niger Delta region. Furthermore, the market's economic importance has made it a focal point for urban expansion and infrastructural development in Yenagoa. The inflow of traders and customers from within and outside Bayelsa State has increased commercial density, thereby elevating environmental stressors, including noise levels (Aluko, 2018). Given that noise pollution is often overlooked compared to other environmental issues, there is a pressing need to generate empirical data on its prevalence in Swali Market to inform regulatory actions and urban management strategies (Babisch, 2006; WHO, 2018). By situating Swali Market within the broader socio-economic and environmental context of Bayelsa State, this study highlights the significance of monitoring and controlling noise levels in commercial hubs. The insights generated will contribute to creating healthier and more sustainable urban market environments.

Fig. 1: Map of Yenagoa and Environs Showing Swali Market Location

2.0 Materials and Methods

A digital sound level meter (Model BK Precision 732A, IEC 651 TYPE II) was used to measure noise levels in situ. The instrument provides instant real-time readings in line with regulatory noise measurement standards, complemented by a sound level meter software application. A Global Positioning System (GPS) device was used to record the coordinates of each measurement point, while a stopwatch was employed to monitor measurement durations. Noise readings were taken at 12-second intervals for 5 minutes at each measurement point.

3.1 Experimental Design and Measurement

The entire Swali Market and its environs were categorized into four main sections which included

(i) Section A – Along roadside/roundabout

(ii) Section B – Slaughter/waterside
(iii) Section C – Inside/main market
(iv) Section D – Fish market/Yam zone

In each section, five (5) different points were systematically monitored using the digital sound meter. The instrument was set to the A-weighting scale with fast response mode, following regulatory standards. Measurements of sound pressure levels (dB) were taken at 15-minute intervals during daytime hours (9:00 a.m. – 4:00 p.m.). The sound level meter was positioned three (3) meters above ground level in accordance with ISO 9613 noise measurement procedures. At each point, five (5) sound pressure readings were recorded.

Noise monitoring was conducted on three different days including Tuesday, 23rd February, Saturday, 3rd July and Monday, 5th July. Generally, 60 data sets were collected across all sections. The latitude and longitude coordinates of each point were tracked using GPS to ensure accurate geolocation of measurements.

3.2 Descriptors and equations

Statistical noise descriptors were used to analyze and evaluate noise pollution within the market. These include: Noise Average (Lavg), Equivalent Continuous Noise Level (Leq), Noise Pollution Level (Lnp), and Noise Exceedance Factor (NEF). Measured noise levels in the market and its surroundings were compared with the Federal Ministry of Environment (FMEnv) permissible limits as contained in FEPA guidelines. The computed values were further compared with standards from the World Health Organization (WHO) and the National Environmental Standards and Regulatory Enforcement Agency (NESREA).

3.2.1 Equivalent Continuous Noise Level (Leq)

Leq represents the average sound energy over a specific period for constant or continuous noise sources, such as road traffic. It can also be categorized based on the time of day:

Day-Night Average Level (DNL or LDN): This measures cumulative exposure to sound over a 24-hour period, with a 10 dB(A) penalty added to night-time noise to reflect higher sensitivity at night. By definition, the L_{eq} can be expressed according to equation 1

$$L_{eq} = 10 \times log_{10}\left[\frac{1}{T}\sum_{i=1}^{n}(10^{0.1L_i} \times t_i)\right] \quad (1)$$

where T = total observation time, L_i = noise level of the i-th sample, t_i = duration of the individual sound level sample. Using the calculated L_{eq}, the the noise pollution level (L_{np}) can be evaluated using equation 2

$$L_{np} = L_{eq} + K \times \delta \quad (2)$$

In equation 2, K is a constant (2.565 for this type of environment) and δ represents standard deviation (7.4 dB for A-weighted levels)

3.2.2 n-Percent Exceeded Level (Ln)

The n-percent exceeded level represents the sound level that is exceeded for n percent of the total measurement time. For instance, L10 denotes the sound level exceeded 10% of the time, L50 indicates the sound level exceeded 50% of the time, and L90 refers to the sound level exceeded 90% of the time, which is usually regarded as the background noise level.

The Noise Climate (NC) is defined as the difference between L10 and L90, expressed mathematically as

$$NC = L10 - L90 \quad (3)$$

The Traffic Noise Index (TNI) is a measure used to assess the impact of traffic-related noise on the environment. TN can be calculated using the formula

$$TNI = 4 \times (L10 - L90) + L90 = 30dB(A) \quad (4)$$

The TNI value, expressed in decibels [dB(A)], provides an indication of the overall annoyance caused by fluctuating traffic noise levels.

4.0 Results

The results of the acoustic noise levels in Swali Market are presented in Tables 1 and 2. Table 1 presents the maximum and minimum acoustic noise levels recorded at the various sections of the market. Table 2 presents the computed average noise levels (Lavg),

equivalent continuous noise levels (Leq), and noise pollution levels (Lnp), and compares them against standard permissible limits set by WHO, NESREA, and FMEnv.

Table 1: Result of Min and Max acoustic noise levels

S/N	Zones	Latitude	Longitude	Minimum	Maximum
1	Keke park along market	4.9197597	6.2689191	75.3	82.6
2	Yam Depot	4.9192077	6.268822	65.2	70.8
3	Saw mill	4.9206401	6.2631658	80.6	83.8
4	Market entrance	4.9204681	6.262487	72.1	79.9
5	Main road	4.9205786	6.2632613	72.5	82.0
6	Music shops	4.9190759	6.2669939	78.5	82.2
7	Roundabout	4.916855	6.2664343	66.5	83.3
8	Inside Market	4.917829	6.26633	53.8	78.1
9	Inside mtk (a)	4.9178906	6.2663236	57.0	78.0
10	Fish	4.9150867	6.2670513	57.2	78.2
11	ISlaughter	4.914827	6.2664079	60.5	80.5
12	Inside market (b)	4.9163965	6.2656649	55.5	77.7

Table 2: Computed Average Noise Level, Lavg, Leq and Lnp versus Standards

	Lavg	Leq	WHO limit	NESREA limit	Lnp	NEF	Noise rating	Impact/Risk ranking
Day 1	78.6	93.6	70	75	99.6	1.75	Very high	Significant
Day 2	75.5	91.7	70	75	91.7	1.82	Very high	Significant
Day 3	81.6	93.8	70	75	81.6	1.92	Very high	Significant
Average	**78.57±3**	**93.03±2.3**	70	75	**90.97**	1.83		

The results of field measurements on Day 1, compared with the FMEnv permissible limit, are presented in Fig. 5. A minimum noise value of 75.0 dB(A) was recorded inside the main market, while the maximum noise value of 85.0 dB(A) was observed in the Fish Market/Yam Zone. The highest noise levels (Lmax) were recorded at the Fish Market/Yam Zone (85.0 dB(A)) and the Slaughter/Waterside (84.0 dB(A)), both of which exceeded the FMEnv regulatory limit (Fig. 5). These findings indicate that the maximum noise levels in Swali Market during monitoring surpassed the permissible standards. Prolonged exposure to such elevated noise levels poses significant health risks, particularly the potential for hearing impairment among traders and other exposed individuals.

Noise levels measured on day 2 in comparison with FMEnv limit are shown in Fig. 6. A minimum noise level of 75.0dB (A) was measured inside swali market; while a maximum level of 85.0dB (A) was recorded at Slaughter waterside and fish market/yam zone. Minimum noise levels, Lmin are below FMEnv limit, while maximum noise levels exceeded FMEnv limit at all monitoring points within the market (Fig. 6). The maximum noise level obtained during monitoring exceeded regulatory standard. This implies that traders exposed for a long period of time can be negatively affected. This level of noise is capable of causing psychiatric disorder in them, thus poses significant risk to business operators in the market. Also, long time exposure can cause

annoyance which may leads to more serious psychological problems among the exposed.
Lastly, results of noise levels monitored on day 3 in comparison with FMEnv limit are presented in Fig. 7. A minimum noise value of 75.0dB (A) was obtained inside Swali market; while a maximum noise value of 85.0dB (A) was measured around fish market/yam zone (Fig. 7). The high noise levels recorded around Swali market area was caused by clusters of marketers in the area. Noise levels of these magnitudes portend serious health implications on those doing business in the market area.
These elevated noise levels can potentially trigger psychological symptoms such as headaches, nausea, argumentativeness and changes in mood and anxiety in traders and merchants.

Fig. 5. : Noise Level Survey at Swali Market (Day 1)

Fig. 6. Noise Level Survey at Swali Market (Day 2)

These noise levels lasting for a long time could pose serious health effects on those doing business in the market. This implies that cases increased blood pressure level, noise induced stress and increased cortisol levels could exist among traders and merchants in the market, but they may not be cognizant of it.

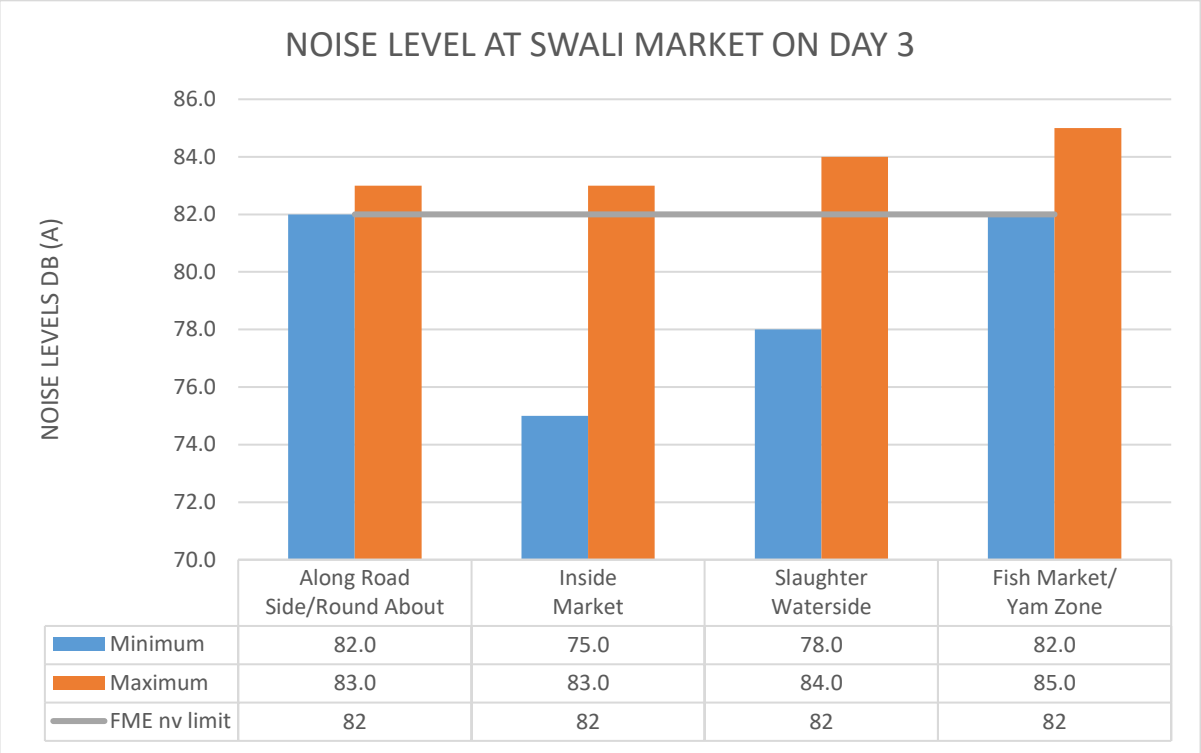

Fig. 7. Noise Level Survey at Swali Market (Day 3)

4.1 Discussion

The cumulative noise levels recorded across all monitoring points in Swali Market, when compared with the Federal Ministry of Environment (FMEnv) permissible limits, are presented in Fig. 8. The findings revealed that the cumulative levels exceeded the stipulated standards at every monitoring point within the market. Such sustained exceedances are indicative of chronic environmental noise pollution. Continuous exposure to noise levels of this magnitude is hazardous and may result in significant health risks for traders, customers, and others who spend extended hours conducting business in the market environment. Documented risks include noise-induced hearing impairment, heightened stress levels, sleep disturbance, reduced communication efficiency, and diminished overall well-being (Basner et al., 2014; WHO, 2018). These results align with findings from previous studies. For instance, Ugbebor et al. (2017), in their investigation of Oil Mill Market in Port Harcourt, reported elevated noise levels in market environments that exceeded regulatory standards. Similarly, Ibekwe et al. (2016) documented unsatisfactory noise levels in market areas of Abuja, a cosmopolitan city, which further corroborates the observations of the present study. Collectively, this evidence underscores the widespread nature of noise pollution in Nigerian markets and its potential deleterious impact on public health. The cumulative noise levels recorded across all monitoring points in Swali Market, when compared with the Federal Ministry of Environment (FMEnv) permissible limits, are presented in Fig. 8. The findings revealed that the cumulative levels exceeded the stipulated standards at every monitoring point within the market. Such sustained exceedances are indicative of chronic environmental noise pollution. Continuous exposure to noise levels of this magnitude is hazardous and may result in significant health risks for traders, customers, and others who spend extended hours conducting business in

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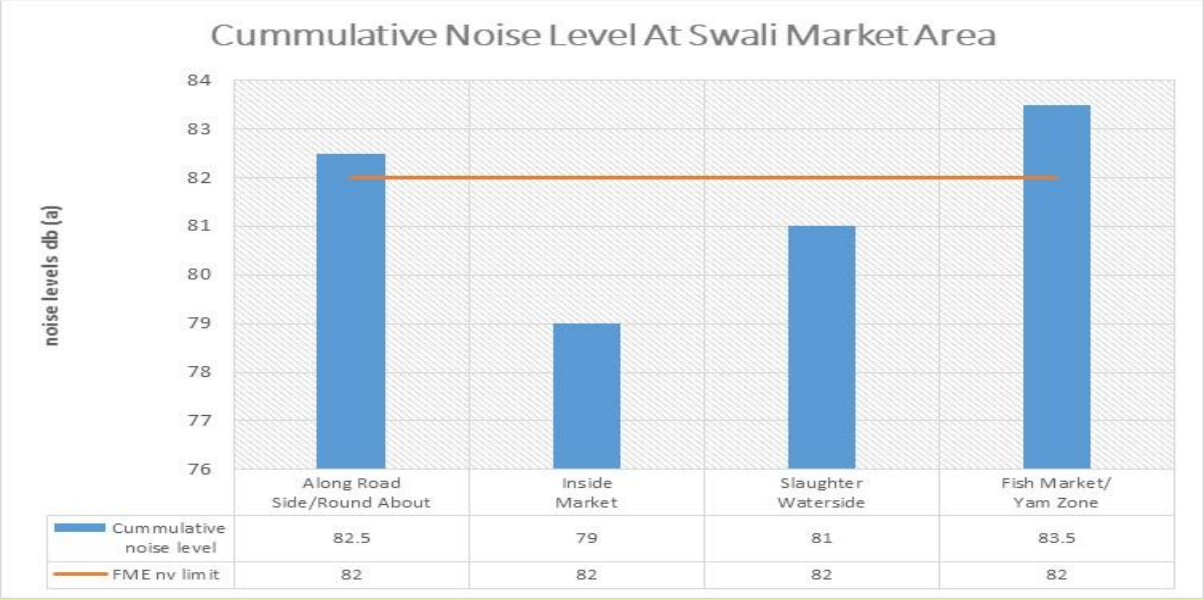

Fig. 8. Cumulative Noise Level Survey at Swali Market

The results of the analysis of Equivalent Continuous Equal Energy Level (Leq) and Noise Pollution Levels (Lnp) clearly demonstrated the extent of noise pollution prevailing in the market environment. The computed average noise level (Lavg) for the market was found to far exceed both the National Environmental Standards and Regulations Enforcement Agency (NESREA) permissible exposure limit of 75 dB(A) and the World Health Organization (WHO) guideline of 70 dB(A) for commercial environments, as presented in Table 3 and illustrated in Fig. 10. Specifically, the total Leq value of 114.4 ± 2.3 dB(A) was observed, representing an exceedance of the NESREA standard by 60.1% and the WHO limit by 71.81%. According to international noise assessment criteria, this value is ranked as "very high" and constitutes a significant environmental hazard. An Leq of such magnitude implies that continuous exposure poses serious health risks, including auditory fatigue, hearing loss, stress, and other physiological or psychological disorders (Basner et al., 2014; WHO, 2018). Based on occupational health and safety guidelines, individuals should not be exposed to such noise levels for more than two hours per day. However, field observations revealed that the majority of traders remain in the market environment for up to 12 hours daily, thereby experiencing prolonged exposure. This highlights not only the severity of the noise hazard but also the lack of awareness among traders regarding the deleterious health effects of chronic noise exposure. The situation underscores an urgent need for public health interventions, awareness campaigns, and regulatory enforcement to protect the health and well-being of individuals working within such environments. The results of the analysis of Equivalent Continuous Equal Energy Level (Leq) and Noise Pollution Levels (Lnp) clearly demonstrated the extent of noise pollution prevailing in the market environment. The computed average noise level (Lavg) for the market was found to far exceed both the National Environmental Standards and Regulations Enforcement Agency (NESREA) permissible exposure limit of 75 dB(A) and the World Health Organization (WHO) guideline of 70 dB(A) for commercial environments, as presented in Table 3 and illustrated in Fig. 10. Specifically, the total Leq value of 114.4 ± 2.3 dB(A) was observed, representing an exceedance of the NESREA standard by 60.1% and the WHO limit by 71.81%. According to international noise assessment criteria, this value is ranked as "very high" and constitutes a significant environmental hazard. An Leq of such magnitude implies that continuous exposure poses serious health risks, including auditory fatigue, hearing loss, stress, and other physiological or psychological disorders (Basner et al., 2014; WHO, 2018). Based on occupational health and safety guidelines, individuals should not be exposed to such noise levels for more than two hours per day. However, field observations revealed that the majority of traders remain in the market environment for up to 12 hours daily, thereby experiencing prolonged exposure. This highlights not only the severity of the noise hazard but also the lack of awareness among traders regarding the deleterious health effects of chronic noise exposure. The situation underscores an urgent need for public health interventions, awareness campaigns, and regulatory enforcement to protect the health and well-being of individuals working within such environments. Comparable research across Nigerian markets confirms this alarming trend. Adewumi and Adebayo (2020) documented similarly elevated Leq values in traditional open markets of Southwestern Nigeria, stressing that sustained exposure at such levels contributes to hypertension, stress-related illnesses, and social conflicts. Likewise, Oyedepo and Saadu (2009) reported that noise levels in Ilorin metropolis significantly surpassed NESREA and WHO thresholds, with market areas and motor parks identified as critical hotspots. Emenike et al. (2017) also highlighted environmental

health hazards in Onitsha market, linking uncontrolled noise to both auditory and non-auditory health challenges. Globally, the risks associated with excessive Leq values have been extensively documented. Babisch (2006) demonstrated that long-term exposure to high noise levels elevates the risk of cardiovascular diseases, while Stansfeld and Matheson (2003) confirmed associations with sleep disturbance, reduced cognitive performance, and heightened anxiety. Belojevic and Jakovljevic (2014) further observed that noise sensitivity varies among individuals, with some populations exhibiting heightened vulnerability to stress and reduced task efficiency under continuous exposure. The persistence of such high Leq values in Nigerian markets reflects both infrastructural and regulatory shortcomings. Aluko (2018) emphasized that rapid urbanization and poor enforcement of environmental policies exacerbate noise problems in Nigerian cities. This is further compounded by inadequate noise monitoring and the absence of structured urban planning frameworks that prioritize acoustic comfort. Addressing this challenge requires a multipronged approach. First, regulatory agencies such as NESREA must intensify enforcement and monitoring of environmental noise standards in commercial centers. Second, market associations and local authorities should collaborate to introduce noise-mitigation strategies, such as designated loading/unloading zones, restrictions on loudspeakers, and structured market layouts. Finally, public enlightenment campaigns are critical to raise awareness among traders and customers about the health risks of noise pollution and the importance of adopting preventive measures (WHO, 2011; Ugbebor et al., 2017). Ultimately, unless urgent interventions are implemented, chronic exposure to noise levels exceeding 110 dB(A) in markets like Swali will continue to pose a significant public health threat, with long-term socio-economic implications for affected populations.

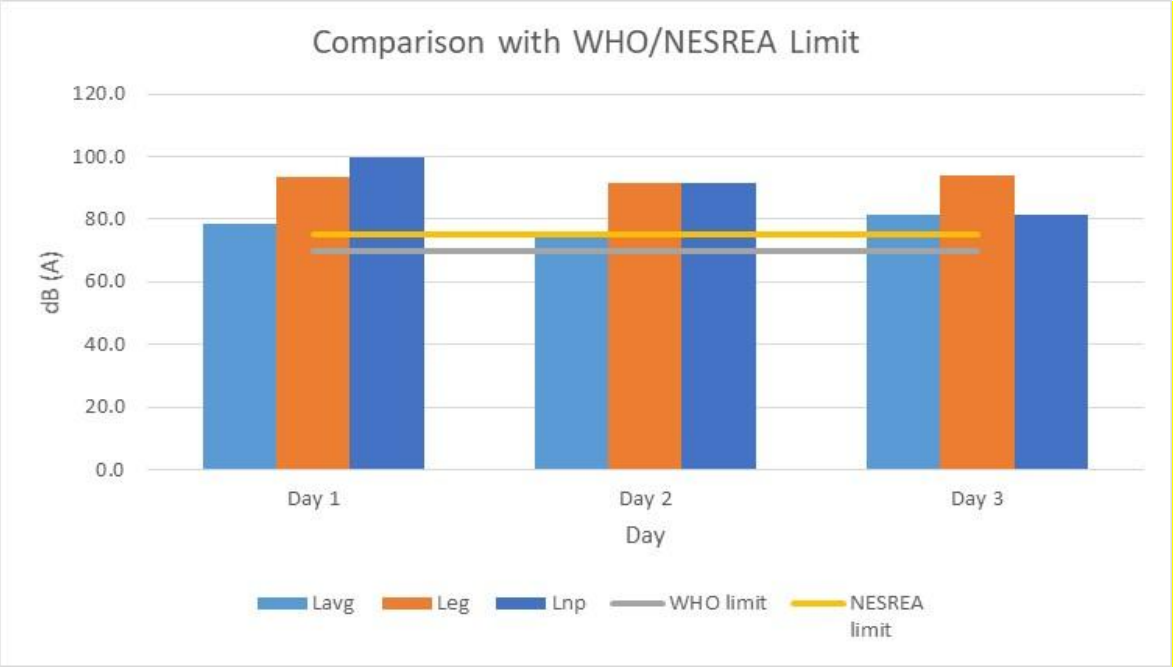

Fig. 9. Computed Lavg, Leq and Lnp in Comparison with NESREA/WHO Limit

4.0 Conclusion

The study revealed that acoustic noise levels in Swali Market, Yenagoa, significantly exceeded national and international permissible limits. Recorded sound levels ranged from 78.0 to 85.0 dB(A), surpassing the Federal Ministry of Environment (FMEnv) and NESREA limit of 75 dB(A) and the WHO limit of 70 dB(A). The computed average equivalent continuous

noise level (Leq) of 114.4 ± 2.3 dB(A) was far above regulatory standards, indicating very high noise pollution. The fish/yam market and slaughter areas recorded the highest noise values due to heavy human and mechanical activities.

Cumulative data showed that all monitoring points exceeded permissible limits, confirming chronic noise exposure in the market. The elevated values of Leq, Lnp, and NEF indicated serious health risks such as hearing loss, stress, sleep disturbance, and reduced work efficiency. These findings align with previous studies in other Nigerian cities that reported similar excessive noise levels in market environments.

The study concludes that Swali Market is critically affected by high environmental noise pollution, posing significant health risks to traders and visitors. Continuous exposure to these levels can cause long-term auditory and non-auditory health effects. Strengthened enforcement of noise control regulations, public health education, and improved market planning are urgently needed to reduce exposure and protect the well-being of the market community.

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Ethical consideration is not applicable to this study because it is a conceptua paper

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Authors' Contributions

All components of the work were carried out by the author