Original Research Article

# NOISE LEVEL EVALUATION AT MAJOR MARKETS IN CALABAR, NIGERIA.

**ABSTRACT**

The aim of this study was to determine the prevailing noise levels at major markets in Calabar, Nigeria. Data was collected by measuring noise levels in three different markets using RS232 digital sound level meter with measuring range of 32- 80 dB for low range, 50 – 100 dB for medium range and 80-130dB for high range and the analysis was done using OriginPro software. The results obtained showed that the average daily noise level value produced at Watt and Marian markets were 73.0 dB and 71.5 dB individually, which were beyond the safe limit of the World Health Organization (WHO) regulations of 65dBA for commercial areas, indicating high risk and danger to humans while noise levels produced at Goldie market was of the order of 64.6 dB which is considered moderate.

**KEYWORDS**

Traffic noise, Noise pollution, Noise level in Nigeria, Noise level in Calabar Markets, effects of noise.

## 1.0 INTRODUCUTION

Noise is an undesirable and annoying sound which come in the form of environmental pollution and it is a source of stress. When noise is loud, it becomes harmful and creates negative impact within the environment (Ganiyu, 2011; Ettah et al. 2021; Onuu, M. U. 1992; Emmanuel et al. 2023). Noise is dangerous to health and well-being on people within the community (Christopher et al., 2020). According to the World Health Organization, noise in big cities is considered the third most hazardous environmental pollution (WHO, 2005).

Major effects of noise on the individual include the following; speech interference, annoyance, headache, stress, hearing loss. Generally, individuals and traders within the market are at high risk of excess noise exposure. In Nigeria and globally, there are regulations put in place by governmental agencies to control the rate of noise pollution. Table 1 shows the World Health Organization (WHO) recommended standard of noise description for daytime and Table 2 represents the WHO guideline values which are arranged according to specific environment and criteria health effects. It considers all identified adverse health effects for the specific environment.

**Table 1: NOISE QUALITY DISCRIPTION FOR DAYTIME**

| SOUND (dB) A | NOISE QUANTITY DESCRIPTION |
|---|---|
| 55- 60 | MODERATE |
| 60-65 | MODERATE |
| 65-70 | HIGHLY RISKY |
| 70-75 | DANGEROUS |
| 75-80 | HIGHLY DANGEROUS |
| GREATER THAN 80 | EXTREMEELY DANGEROUS |

(WHO, 2005)

**Table 2 GUIDELINE VALUES FOR COMMUNITY NOISE IN SPECIFIC ENVIRONMENT**

| SPECIFIC ENVIRONMENT | CRITICAL HEALTH EFFECT(S) | AVERAGE NOISE LEVEL | TIME BASE (HOURS) | MAX. NOISE LEVEL (dB) |
|---|---|---|---|---|
| Outdoor residential area | Serious annoyance<br>Moderate annoyance | 55<br>50 | 16<br>16 | -<br>- |
| Indoor residential area<br>Inside bedrooms | Speech intelligibility and moderate annoyance, day and evening<br><br>Sleep disturbance, night | 35<br><br>30 | 16<br><br>8 | <br><br>45 |
| Outside bedrooms | Sleep disturbance, window open | 45 | 8 | 45 |
| School class room and pre- schools, indoors | Speech intelligibility, disturbance of information extraction, message communication | 35 | During class | - |
| Pre-school bedrooms, indoor | Sleep disturbance | 30 | Sleeping time | 45 |
| School playground, outdoor | Annoyance (external source) | 55 | During play | - |
| Hospital, ward rooms, indoors | Sleep disturbance, night<br><br>Sleep disturbance, day and evening | 30<br><br>30 | 8<br><br>16 | 40 |
| Hospitals, treatment rooms, indoors | Interference with rest and recovery | As low as possible | | |
| Industrial, commercial, shopping and traffic areas, indoors and outdoors | Hearing impairment | 70 | 24 | 110 |
| Ceremonies, festivals and entertainment events | Hearing impairment should be less than 5 times in a day | 100 | 4 | 110 |
| Public addresses, indoor and outdoor | Hearing impairment | 85 | 1 | 110 |
| Music and other sounds through earphones and headphones | Hearing impairment | 85 | 1 | 110 |

(WHO, 2005)

Emmanuel et al. (2023) reported the assessment of noise levels in pubs within Calabar, Nigeria. The work lasted for three consecutive months. Results obtained were compared with the permissible noise level recommended by the National Environmental Standards and Regulations Enforcement Agency (NESREA), Nigeria which showed that all the pubs under study were in excess of the permissible noise level recommended by NESREA.

Ugwoha et al. (2016) evaluated noise level at Trans-Amadi market in Obio/Akpor Local Government Area of Rivers State. The measurement lasted for three weeks at four different stations, starting from 9am to 7pm daily. A sound level meter was placed at a height of 1.2 m to get a weighted noise level at the selected locations with readings taken at 2 hours' intervals. Noise indices such as peak noise level, background noise level, equivalent noise level and noise pollution level were calculated, and values obtained were compared with regulatory standards. It was found that the calculated noise indices were all above the recommended 65 dBA for commercial areas.

Anjorin et al., (2015) assessed pollution from industrial noise (machine and human generated) at two selected processing and manufacturing industries namely: Denki Wire and Cable Nigeria Limited and Wanwood Nigeria Limited, both in Akure, Ondo State, Nigeria. A precision grade sound level meter was used, which had facilities to determine the various pressure levels of sound at thirty minutes interval for five days. The research observed that noise limit values were exceeded for almost all the machines considered based on the regulation criteria and international standard. The study showed that noise control measures were not put in place.

Usikalu, (2016) reported the growing level of noise pollution in Ota, Ogun State, Nigeria. Sound level meter was used to conducted measurements in five different areas in Ota and three locations inside Covenant University to serve as control. The study showed that the noise pollution levels measured exceeded the limits set by the World Health Organization (WHO), Federal Environment Protection Agency (FEPA). Reasons for noise increases was due to vehicular activities.

The study ascertained the noise level at a wheat processing mill in Ilorin, Nigeria. A digital sound level meter HD600 manufactured by Extech Inc., USA was used to determine the noise level around various machines, sections and offices in the factory at pre-determined distances. The result of the study showed that the average noise produced was 99.4 dBA which was beyond the standard of hearing. The research further recommended that room acoustics should be upgraded for workers on the shop floor to absorb sound transmitted to offices (Ibrahim, 2016).

Christopher et al. (2020) assessed traffic noise pollution and a survey on residents' health at Alimosho local government Lagos, Nigeria. The result of volumetric analysis indicated that more commercial vehicles produced higher noise levels than private vehicles. Furthermore, the traffic noise level produced by vehicular activities was about 71.70 dB which was beyond the recommended outdoor standard of 55dB during daytime in a residential area and as such lead to effects such as; headache, annoyance, speech interference and lack of concentration to the residents living in the study area.

Sources of environmental noise and impact on market women was examined by Osisanya et al. (2022). Six markets (Bodija, Ogunpa, Sango, Dugbe, Mokola and Ojoo) were sampled within Ibadan metropolis, and two hundred and fifty (250) market women participated in the study. Three (3) research questions were raised and answered. Data collected were analyzed using frequency counts and percentages. The results of the findings revealed that sources of noise in the markets were from; vehicles, people, religious centres/activities, machines, generators, public address system for product advertisement and incessant loud shouts/calls on intending buyers/customers towards calling for sales. Result also revealed that there is high level of noise generally in the selected markets, as Bodija, Dugbe and Sango markets ranked the high category of markets with higher noise level, compared to the low noise making category of markets; which are Ogunpa, Ojoo and Mokola markets. Although, Bodija market has the highest noise level, while Mokola market has the lowest noise level. The study further revealed that exposure to noise in the markets sampled significantly affected the auditory performance of the market women while most of them had reduction in hearing perception and reduced productivity due to auditory fatigue and noise-related stress.

Olumuyiwa, (2020) examined the noise level in selected areas within Akure Metropolis, Nigeria with a view to generate noise maps using ArcGIS to identify high impact areas and support environmental management in the study area. Selected areas such as; Oja-oba Market (commercial Land use), Ijoka (Residential land use), and the Federal University of Technology, Akure (Futa as an Educational Land Use) were considered. The digital sound level meter of the type (IEC651 Type 2) was used to measure noise level in the morning (8:00am-9:00am), afternoon (1:00pm-2:00pm) and evening (4:00pm-5:00pm) for a period of 7days in each of the selected areas. The compiled data were imported into the ArcGIS Software for analysis and geo-referencing whereby transforming the data and presenting it on noise contour maps. The study revealed that Sunday bus stop has the highest mean noise level with 64.3 decibel (A) while the lowest noise level was found in Olowookere street with 38.1 dB(A) for the Residential area. Ijomu recorded the highest noise level with 78.6 dB(A) and Erekesan market has the lowest noise level of 61.5 dB(A) for the commercial area. Northgate had the highest noise level, which recorded 76.3 dB(A) and the lowest noise level was recorded at Library area with 41.0 dB(A) for the Institutional area. 80% of the commercial area was exposed to the highest risk of noise pollution. The residential area was exposed to 18.7% noise pollution which makes the area suitable for housing. The institutional land use recorded 36.6% for total area exposed to noise pollution.

The prevailing noise level and its implication on individuals and traders were determined at major markets in Aba, Abia State Nigeria. Noise levels at outspread distances in the markets was measured using mini sound level meter (NEDA model) and administration of questionnaires. The results showed that noise levels values at open shade apartments were higher than those in the lock-up shops. The result further revealed that Ariaria International Market had the highest noise limit of 90.0dB as the minimum value and 92.3dB as the maximum value respectively) which exceed the limit of the World Health Organization WHO regulation. It was also observed that major effects on individuals includes annoyance, speech interference and hearing loss. The publication suggested that proper regulation should be put in place by both state and local government environmental protection agencies to reduce noise pollution in the markets and improve the health of the market operators (Umunnakwe, 2018).

Onuu, (2000) considered measurement of road noise and psychological survey of approximately 60 sites in 8 cities in South-Eastern Nigeria. Instantaneous and 24 h noise measurements were made at the noisiest points, near the frontage, of the houses. Maximum measured values were as high as 105 dB (A) while residents were exposed to instantaneous levels of road traffic noise of the order 110 dB (A).

Ganiyu (2011) research aim was to identify major sources of noise and its impact in the built environment of a typical housing estate in Akure, capital of Ondo State. A survey method was adopted for the research. It was observed that noises from vehicular traffic, pedestrian traffic and religious buildings, were the major sources of external noise, having very serious negative effects on the residents. Generating sets, telephone/mobile phones, radio and television sets were listed as major sources of internal noise with very serious negative effects on the residents of the study area. The result confirmed that noise level beyond 65dB could result in health effects such as; annoyance, mental and physical fatigue. The research work further recommended good design and building orientation, adequate set back, reduction in the opening sizes and reduction of noise from sources as some of the ways to minimize the problems of noise pollution in built environment.

Induatrial noise with sound level meter and subjective assessment of industrial workers response using questionaires was carried out in Akwa Ibom State, Nigeria. It was observed that workers were exposed to 115 dBA after measurements were taken. It was clear that the industries were not accustically safe to its workers and further called on the government to make and enforce necessary laws to control industrial noise pollution (Akpan et al.,2003).

## 2.0 MATERIALS AND METHODS

### 2.1 MATERIALS

A RS232 digital sound level meter with measuring range of 32- 80 dB for low range, 50 – 100 dB for medium range and 80-130dB for high range was used.

### 2.2 METHOD

Three Markets within Calabar South local government area of Cross River State were considered for the study. The markets include; Goldie market (G), Marian market (M) and Watt market (W) specifically. The study lasted for 8 weeks. The experiment was done for 5 days in each week starting from Monday to Friday. The time for the studies was; 8-10 am in the morning, 12-2 pm in the afternoon and 4-7 pm in the evening. Measurement was taken at different locations around the market environment and codes were assigned to those locations as shown: G1, G2, G3, M1, M2, M3, M4 W1, W2, W3, W4, W5. The average value for all measurements made in the morning, afternoon and evening for each market was taken and then daily values were averaged to obtain; G, M, W which is the total daily average for all the measurements.

## 3.0 RESULTS AND DISCUSSION

### 3.1 RESULTS

**TABLE 3 DAILY AVERAGED VALUE OF NOISE LEVEL**

| S/N | Market Name | Location with code | Morning (7-10 Am) | Afternoon (12-3 Pm) | Evening (4-7 Pm) | Daily averaged values | Recommended standard by WHO |
|---|---|---|---|---|---|---|---|
| | | | Average sound level (dB) | Average sound level (dB) | Average sound level (dB) | Sound level (dB) | (dB) |
| 1 | Goldie (G) | G1 | 64.0 | 64.7 | 70.0 | | |
| | | G2 | 61.3 | 57.2 | 68.9 | | |
| | | G3 | 55.4 | 68.2 | 68.0 | | |
| | | G | 61.52 | 63.30 | 68.90 | 64.6 | 65.0 |
| 2 | Watt (W) | W1 | 84.7 | 77.9 | 69.5 | | |
| | | W2 | 77.3 | 74.7 | 67.8 | | |
| | | W3 | 67.8 | 75.7 | 71.0 | | |
| | | W4 | 67.2 | 69.6 | 60.8 | | |
| | | W5 | 82.1 | 74.6 | 70.3 | | |
| | | W | 75.8 | 75.0 | 68.1 | 73.0 | 65.0 |
| 3 | Marian (M) | M1 | 81.4 | 76.3 | 70.8 | | |
| | | M2 | 68.4 | 71.8 | 65.4 | | |
| | | M3 | 76.6 | 68.2 | 60.6 | | |
| | | M4 | 81.1 | 69.2 | 63.0 | | |
| | | M | 76.9 | 72.8 | 64.9 | 71.5 | 65.0 |

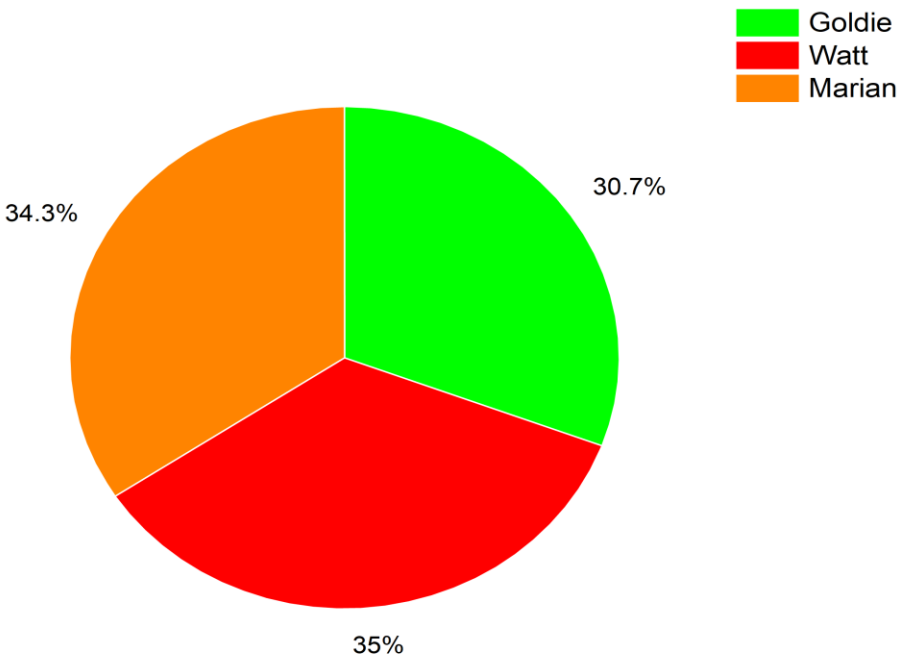


**Figure 1** A PIE CHART REPRESENTING THE THREE MARKETS IN CONSIDERATION. THE GOLDIE , MARIAN AND WATT MARKET.

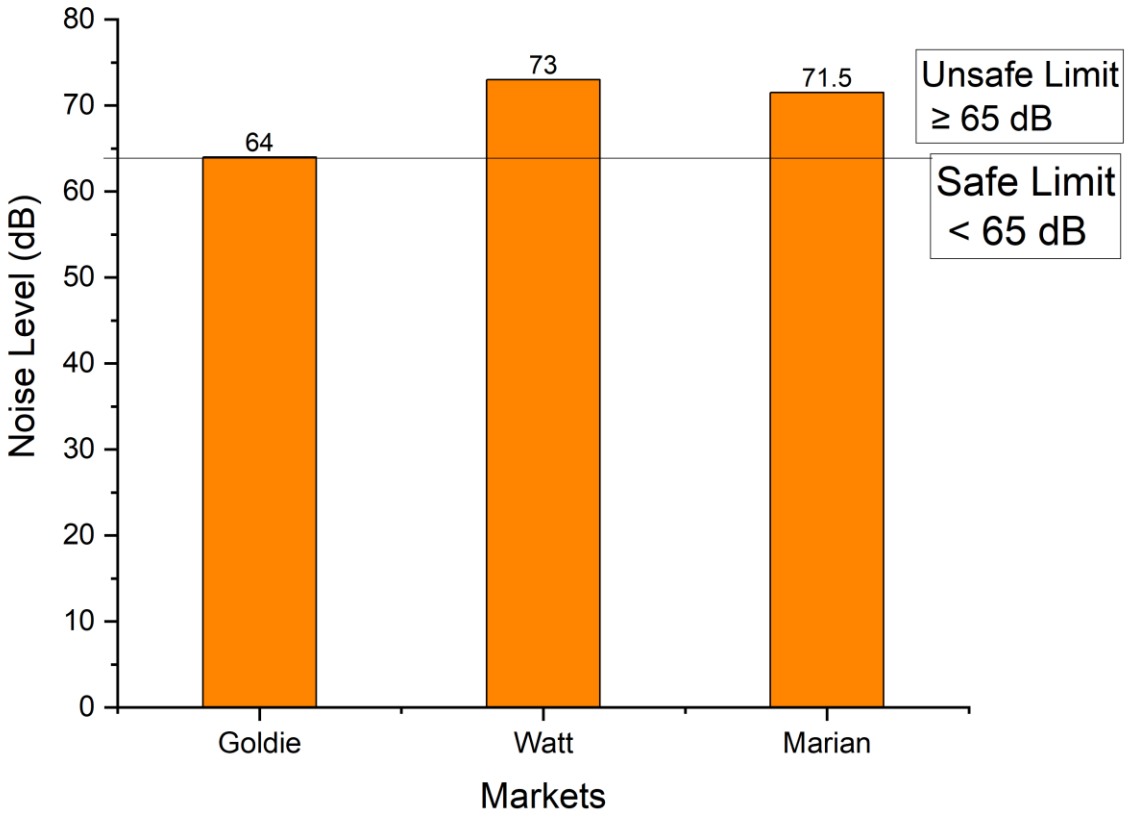


Figure 2 DAILY AVERAGES OF NOISE LEVELS MEASURED FOR EACH MARKET

### 3.2 DISCUSSION

Figure 1 Shows that Watt market produced 35 % of noise level which was the highest percentage of noise when compared with other markets. It was seconded by Marian market with 34.4%. Goldie market produced the least percentage which was 30.7%. These was because sources of noise within Watt market and Marian markets were due to more vehicular activities such as; buses, bikes, lorries, trucks. Other sources of noise were loud speakers for public address systems and playing of music, grinding machines, knife sharpening machines and electrical generators to produce power, the sirens of government vehicles. Sources of noise at Goldie market were mainly human speech and verbal conversation. They were less vehicular activities because the market location was far from the road, they were no public address systems and no machineries for grinding.

Figure 2 Represents daily averages of noise levels measured for each market considered under the study. Noise level was found to be highest in watt market with an average daily noise level of 73dB then following by Marian Market with daily average of 71.5 dB. The least noise level was at Goldie market with noise level of 64dB. Result shows that Watt market and Marian market had produced noise level beyond the safety limit for humans while noise produced at Goldie market was below the safety limit. Table 1 and 2, it shows noise level below 65 dB were moderate while those equal to and above 65dB were risky and dangerous. From the result, it was found that Watt and Marian market had 73 dB and 71.5 dB respectively which can possibly cause hearing impairment, annoyance, mental and physical fatigue, if one is exposed to such amount of noise for about 24 hours. Goldie market had average daily value of 64.6 dB which was at a moderate amount.

### 4.1 CONCLUSION

The objectives of this study were to estimate the noise level emission in Calabar markets, Nigeria and to find out whether the noise level produced are within the threshold limits as recommended by World Health Organization WHO. Results of the research shows that some markets (Watt and Marian) were above the level of comfort and safety while Goldie market was within a safe range.

### 4.2 RECOMMENDATION

Firstly, we recommend that the marketers should make use of hearing protection, Secondly, the Nigerian government should ensure compliance with the activities of the WHO and other standards to control noise emission within and around the markets and our environment.

### 4.3 REFERENCES

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