

Investigation on the magnitude of noise and its variation within Oja Oba market in Ibadan, Oyo State, Nigeria

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Abstract

This study investigates the magnitude of noise and its variation within Oja Oba market in Ibadan, Oyo State, Nigeria. The study involved the reconnaissance survey of the market to detect activities that causes noise during the working days and non-working days., Measuring the noise level and determining its variation (temporal and spatial), Statistical comparison of the noise level during working days with non-working days in the market and comparing with WHO Standard and Conducting Oral interview and distribution of questionnaires to households within the area to know their reaction towards noise pollution in the study area. From the reconnaissance survey from both social interaction and the on-spot measurements, it was discovered that the highest level of noises is generated on Saturdays and Mondays while there is a very low value on Sunday. It was revealed that point 4 (grinding section) had the highest mean noise level of (106 ± 1.5 dB). This was closely followed by point 9 (vegetable and spices line) and point 6 (off Agbeni area) with average noise level value of 103 ± 1.5 dB and 102 ± 1.5 dB, respectively. The highest noise value measured in Oja Oba market are higher than WHO guidelines (70dBA for commercial environment), especially on Monday and Saturday. It is highly recommended to organize proper awareness about noise pollution for the market workers and populace; Ear muff or ear plug should be given free of charge and enforced to be used by the market workers and regular customers in Oja Oba market.

Keywords: Magnitude; Noise; Variation; Oja-Oba market and Ibadan

1. Introduction

Noise can be described as a loud, unpleasant or unexpected sound that can affect man's quality of life. It is classified into industrial, residential and commercial type. Many people have fear for noise, which is called phonophobia or ligyrophobia (Fink, 2019). Industrial noise emanates mostly from industrial equipment sources while residential noise is mostly produced from municipal and domestic source which includes noise from all electrical and mechanical appliances used at home. Industrial noise pollution may be an undesired sound originating from industrial machines or equipment that causes menace to man and his environment (Dasarathy, 2015). Commercial activities including buying and selling, are important aspects of human endeavours and play central roles in the economic and social advancement of the people ((Ugbebor *et al.*, 2017& Singh and Davar, 2004).

However, it can impact company personnel and ecosystem of the host environment by its numerous physiological (auditory) and psychological (non-auditory) effects. Auditory or physiological noise effects include hearing impairment and other effects such as noise induced hearing loss and presbycusis (Ozdemir, 2014 ; Pthak *et al.*,2008). Research has shown that people exposed to noise level above 90 decibels are at risk of hearing loss. Non-auditory or psychological/sociological effects of noise include cardiovascular disorder, hypertension, release of adrenaline, mental

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health, interference with speech and communication, sleep disturbance, interference with learning process and annoyance (Ugbeoret *et al.*, 2017).

Noise can cause startle, annoyance and disrupt concentration, sleep and relaxation, interference with speech communication, which leads to reduction with job performance and safety (Garg *et al.*, 2007). In addition, noise can induce hearing loss or aural pains. Hearing loss can generally be divided into two categories: conductive hearing loss and sensorineural hearing loss. Conductive hearing loss refers to any condition or illness that interferes with the transmission of sound through the outer or middle ear, while sensorineural hearing loss refers to damage to the inner ear, auditory nerve, or both (Anieok, 2018). Within the inner ear is the cochlea, a structure that houses the organ of Corti which contains thousands of microscopic sensory hair-like cells. Sound transmitted to the inner ear produces vibrations and motion in the inner ear fluid that moves (stimulates) the sensory cells in the organ. These cells then send a signal to the brain via the auditory nerve, which is then interpreted as sound (Evelyn, *et al.*, 2012).

Several studies have been carried out to assess and investigate noise levels in industrial areas, road traffic and construction areas, but little has been done to assess noise levels in market places (Fada and Osisanya, 2017).. Study of noise levels in Abuja cosmopolitan in Nigeria has been carried out and the study indicated that market place is the noisiest area in Abuja cosmopolitan; it classified noise levels obtained in market places in Abuja as unsatisfactory (Oyedepo, *et al.*, 2012).

2. Materials and methods

2.1. Materials

The noise level measurement was done using SW-524 LCD Digital Sound Level Meter, which consists of a 6mm polarization capacitance microphone, electronic circuits, a readout display and Power Supply (3 pieces AAA battery). The microphone detects the small air pressure variations associated with sound and changes them into electrical signals. These signals are then processed by the electronic circuitry of the instrument. The readout displays the sound level in decibels. The Sound Level Meter takes the sound pressure level at one instant in a particular location. It satisfies the International Committee IEC 651 Type 2 and American International Standard ANSI 1.4 Type 2 specifications for laboratory grade meters. The noise meter measures noise levels in the range of 30 – 130 dBA with accuracy up to $\pm 1.5\text{dB}$ is shown in Figure 1.

2.2. Brief Description of Oja Oba Area, Ibadan Nigeria

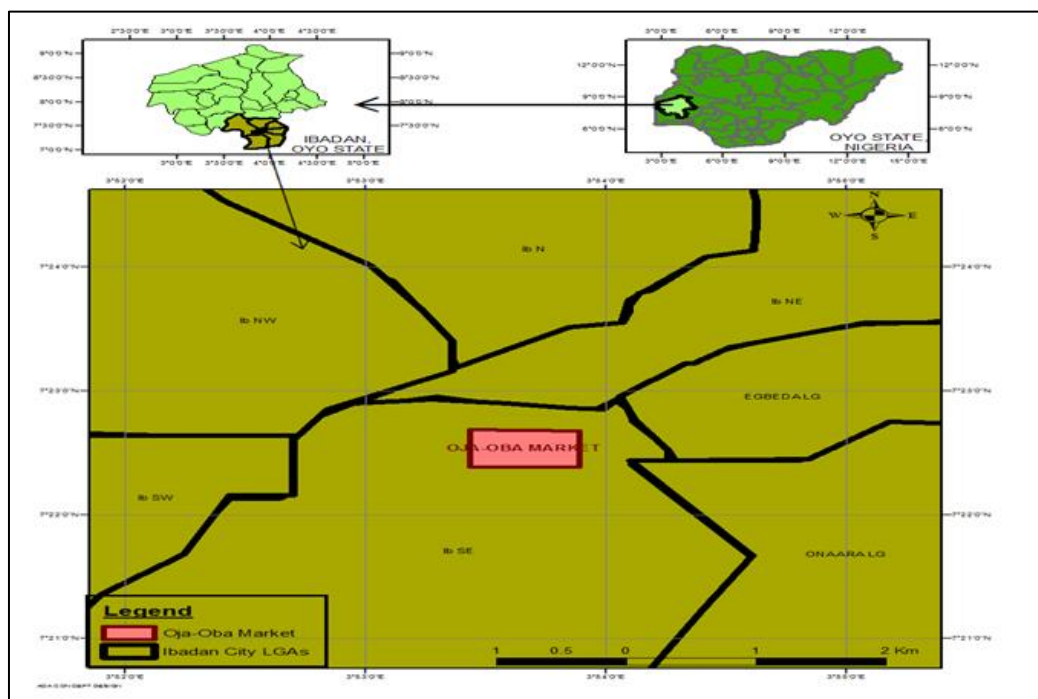


Figure 1 Base Map of Oja Oba Market Area, Ibadan

This study was conducted between August-September, 2025 at some selected points within Oja Oba Market, Ibadan. Ibadan is known to be the largest city in West Africa by land mass, characterized with increasing population and production. The principal occupation of the majority of the population is trading and factory workers. Although, the population, according to 2006 census figures consist of 5,580,894 people in which inhabitants are mostly the Yoruba. Ibadan is also recognized as one of the economic nerve centers of the country with high increasing industries and financial institutions. Oja Oba market spread from Mapo Hill where the municipal city hall is located and is one of the most popular foodstuffs markets in Ibadan. Most of the foodstuffs are raw and locally converted farm produce which include; yam tubers, yam flour, maize, millet, fruits, rice, pepper, tomatoes, vegetable oil, onions, melon seed cassava tubers, cowpeas etc

2.3. Data collection was achieved by the following means:

The data collection for the Study Area was collected using the following medium:

- Social survey
- Field investigation
- Field measurement which involve physical transient noise level measurement
As outlined by (Abah and Unah 2016 ; Berlung, 1999)

2.3.1. Social Survey

One hundred (100) questionnaires was distributed to the residents and workers of the study area. This was done to have an in-depth knowledge about the operations and activities performed in the area. The data that was collected includes the age range, job identification, average hour spent in the market per day and condition, resident perception and business of residents within the vicinity of the market location. A copy of the questionnaire is shown in Appendix A.1. Oral interview on the other hand was carried out to collect more information about the environment. Hand delivery method were adopted to distribute the questionnaires.

2.3.2. Field Investigation

This was done to actually verify the responses in the questionnaire in a bid to know if the residents are biased or not. Their responses and field investigation were compared together. This method is reliable and convenient but time consuming.

2.4. Spatial and Temporal Noise Level Variation

At various designated points covering the market, sound levels was measured in the form of spot checks using a SNDWAY sound level meter (SLM), model SW-524. Calibration was carried out before and after each use with a Noise Metre Software. Data was recorded with the SLM set at the "DBA" and "slow" settings. The measurement span for all days from August – September, 2025. Also, distance from nearby structures and the market were measured. The obtained data were processed in Microsoft excel spread sheet.

3. Results and Discussions

3.1. Reconnaissance Survey

The reconnaissance survey from both social interaction and the on-spot measurements for a period of one week indicated that the noise level varies with days and the hour of the day. It was observed that the highest level of noises is generated on Saturdays and Mondays while there is a very low value on Sunday as shown in figure 2. The variation in the noise level is based on the number of buyers and sellers available in the market per time. Based on this fact, the measurements were further taken at twelve different points on Saturday, Sunday and Monday as the true representation of the highest and the lowest level of noises, which include a working day and weekend. However, the noise sources were majorly from grinding machines, presence of loudspeakers within the market, commercial activities within the market, religious house situated close to the market, from the expressway opposite it due to high traffic and vehicular movement and nature of trading at the point (on-street trading).

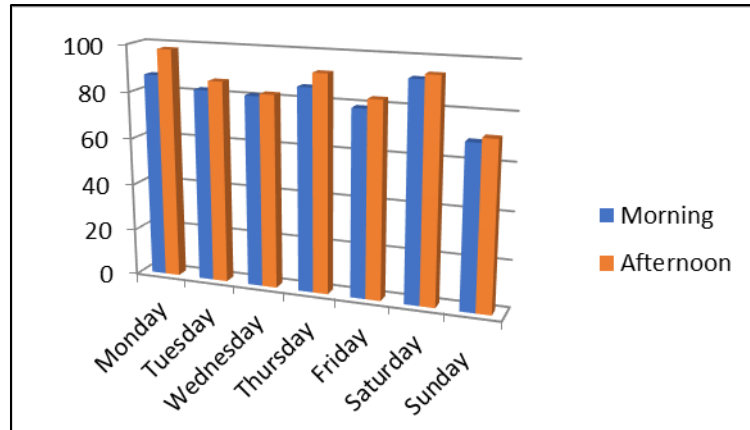


Figure 2 Level of Noise from the assessed site

3.2. Physical Transient Measurement

3.2.1. Temporal and Spatial Variation of Noise Level around Oja Oba Market

From the mean noise level measured at the twelve selected point, represented in Figure 2, it was revealed that point 4 (grinding section) had the highest mean noise level of 106 ± 1.5 dB. This was closely followed by point 9 (vegetable and spices line) and point 6 (off Agbeni area) with average noise level value of 103 ± 1.5 dB and 102 ± 1.5 dB, respectively. There was high correlation in the recorded values because the locations have nearly the same features. The noise level was due noise from grinding machines, presence of loudspeakers within the market, commercial activities within the market, religious house situated close to the market, from the expressway opposite it due to high traffic and vehicular movement and nature of trading at the point.

The average noise level, L_{eq} , obtained on working day and weekend, respectively for the morning and afternoon time, The L_{eq} values are compared with the WHO Standards for both the working day and weekend and are presented together in Figure 3.

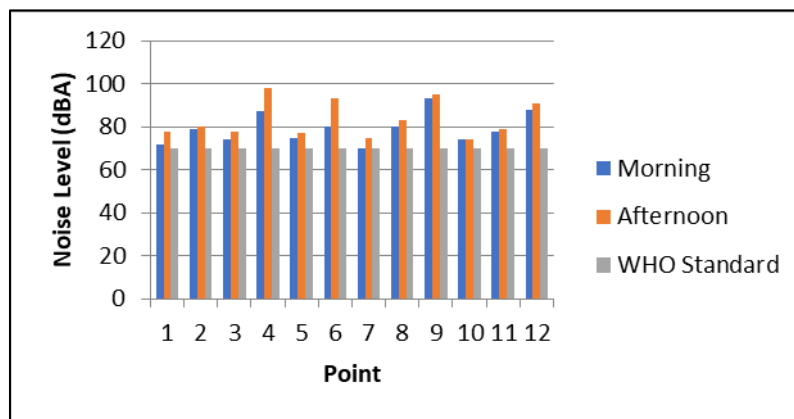


Figure 3 Average Noise Level on Working Day for Morning and Afternoon Session and Compared with the WHO Standards

3.3. Relationship between the Average Noise Levels Generated on Working Days and Weekend

Figures 3.3 and 3.4 were generated using the data obtained with the sound level metre for both morning and afternoon section, respectively for a working day (Monday) and weekend (Saturday and Sunday). These values were also related with the WHO Standards noise pollution level for a commercial environment. The highest levels of noise were generated on Saturday and Monday while Sunday has the least value and slightly higher than the WHO Standards.

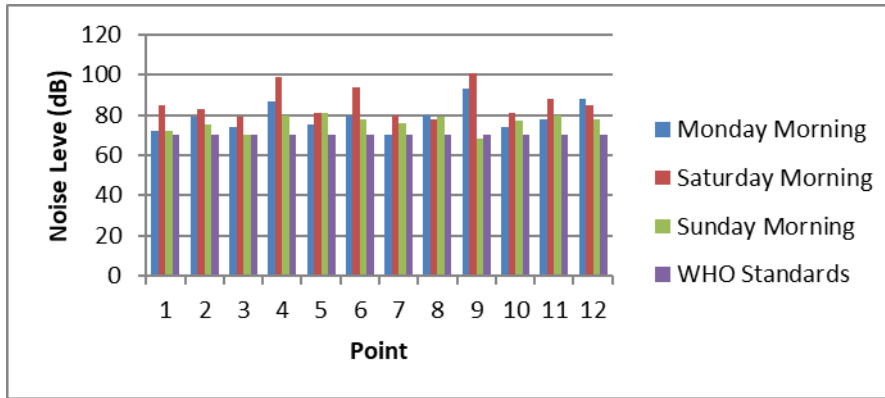


Figure 4 Working Days and Weekend Statistical Relationship for Morning Section

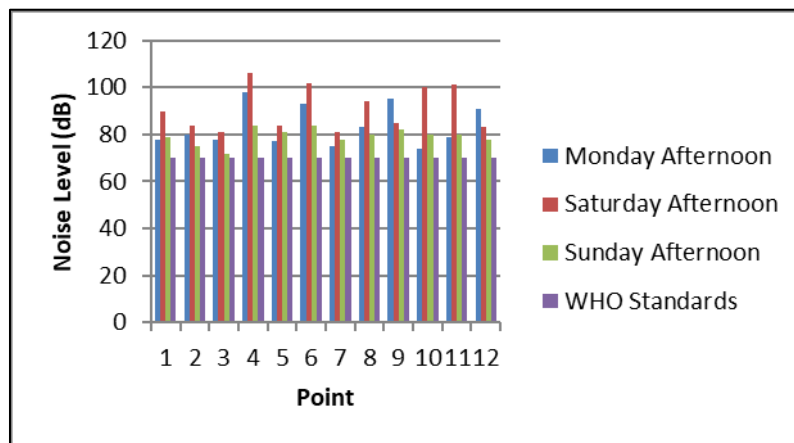


Figure 5 Working Days and Weekend Statistical Relationship for Afternoon Section

3.4. Questionnaire Survey

Social survey was also conducted in the case study nearby residents and the workers in the market as part of the overall assessment, using questionnaires. Questionnaire which was designed to cover age, job identification, average hour spent in the market per day and condition, resident perception and business of residents within the vicinity of the market location. From the social interaction, we concluded that majority of residents were also workers in the market and majority of the houses within the axes of the market are old structures and up to 80 percent of the houses had been converted to shops and warehouses to harbour goods being sold in the market. Figure 6 is a chart showing the agreement of presence of noise pollution in the market by the workers. About 75% of the market workers agreed to the presence of noise in the market, while 8% disagreed and 17% were not even aware of the noise pollution around them.

Majority of the residents considered the noise level from the market as bearable since they are not usually at home during the day and that the siting of the market in the area has brought employment opportunity to them and positive impact in general while very few numbers of people considered it annoying as presented in Figure 4.8. However, about 60% of the respondent wish the market is more established to reduce the impact of noise pollution and traffic congestion along the axes of the market as presented in Figure 6. A total of 100 questionnaires were also served, completed and returned, to the workers and the nearby residents which form the basic data analysis and discussion. We deduced that an average worker spent at least 8 hours per day in the market meaning majority of them are exposed to noise level above 80dBA per day which has a great adverse effect on their health. Also, based on the administered questionnaires, none of the workers is using any form of protective device neither had any gone for an auditory checkup before this time. This is similar to previous work of Dursun et al., 2006.

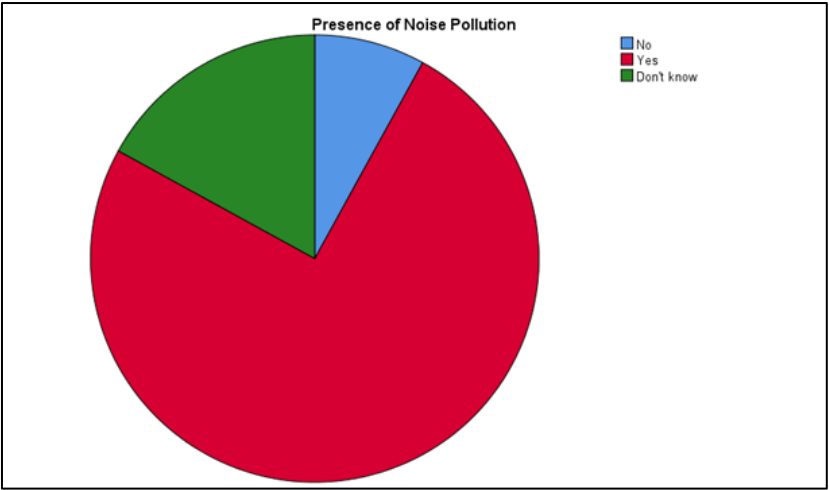


Figure 6 Statistical Perspective of the Workers on the Presence of Noise Pollution in the Market

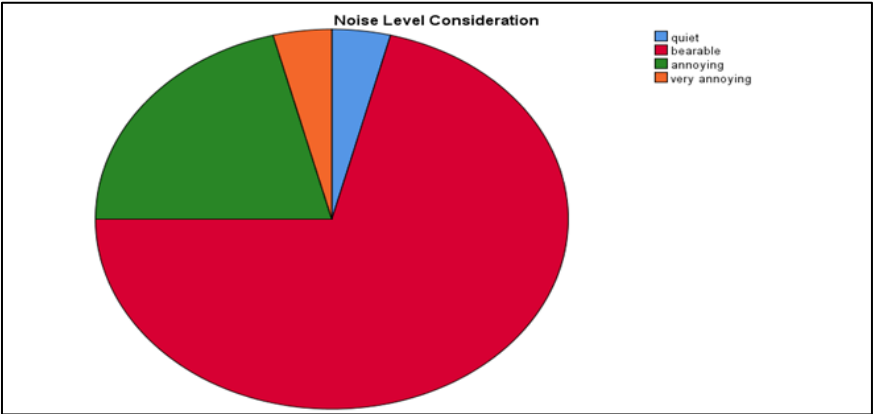


Figure 7 Statistical Perspective of the Resident on their Noise Consideration Level

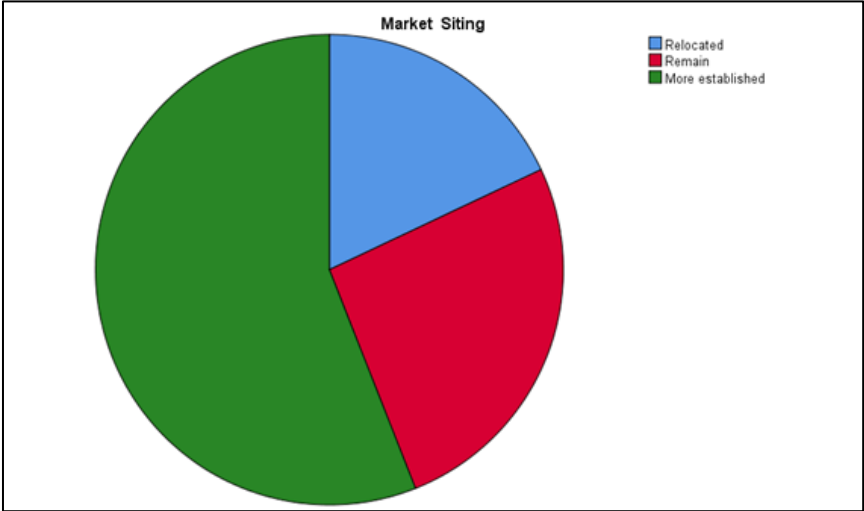


Figure 8 Statistical Perspective of the Resident on the Future of the Market

4. Conclusions

The following conclusions were made based on results obtained from this study;

The highest noise value measured in Oja Oba market are higher than WHO guidelines (70dBA for commercial environment), especially on Monday and Saturday.

Proper awareness about noise pollution should be made available to market workers and populace and proper planning such as the location, minimum distance from the residents should be encouraged

Compliance with ethical standards

Disclosure of conflict of interest

The Authors proclaim no conflict of interest.

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