

## Comparative Analysis of the Noise Level at Ariaria International Market and Eziukwu Market, Aba, Abia State

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### Abstract

*This research focused on comparing the noise levels at Ariaria International Market and Eziukwu Market Aba, being two of the few major markets in Aba, a commercial city in Abia State. The study involves physical measurement of the noise level using mini sound level meter (PCE 4xx EKIT). The results showed that the noise level values of Ariaria International Market has highest pick of 90.3dB as measured with the sound level meter particularly in the open shades where major activities were machine operation and automobile movements. The noise levels generated from open shades of the two markets and compared with the OSHA and WHO regulatory standard showed a slightly high distribution of noise levels; with Ariaria International Market topping the list. From the results, it was observed that some individuals and traders within the markets mainly Freezone, E-line and A-line area of Ariaria International Markets and Asa Road area of Eziukwu Market are exposed to high noise pollution*

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*and may be at risk of noise induced hearing impairment as they ages. It is therefore advised that proper regulation should be put in place by both state and local government environmental protection agencies.*

**Keywords:** Environment, Noise Level, Noise Pollution and Comparative Analysis

## 1. INTRODUCTION

The word “Noise” is derived from latin word “Nausea” implying “unwanted sound” or sound that is loud, unpleasant or unexpected (Singh and Daver, 2004). It can be defined as wrong sound, in the wrong place and at the wrong time (Firdaus *et al.*, 2010). Noise pollution is a major problem in cities around the world. Environmental noise pollution, a form of air pollution, is a threat to health and well-being. It is more severe and widespread than ever before, and it will continue to increase in magnitude and severity because of population growth, urbanization, and the associated growth in the use of increasingly powerful, varied, and highly mobile sources of noise (Jariwala *et al.*, 2017) . It is a very important “pressure factor” in the environment of human beings as a result of industrial and technological progress. Although, noise pollution has become problematic, yet an unnoticed form of pollution in most developing countries (Essandoh *et al.*, 2011), but noise pollution exposure per se is not believed to produce aggressive behavior; however, in combination with provocation, pre-existing anger or hostility, alcohol or other psychoactive agents, noise may trigger aggressive behavior (Passchier *et al.*, 2010). Due to industrialization and urbanization, noise pollution has gained attention as an environmental hazard rated third to air and water pollution (Khilman, 2004; Singh and Daver, 2004).

In the present scenario, noise, is becoming an increasingly source of discomfort and danger in the vicinity of the society. The simple expression of the term noise is a complex sound that contains all frequency components, and whose instantaneous amplitude varies

randomly. In other words, it can be referred to any sound that may be unwanted or may interfere with the detection of a target or signal sound. According to Alireza (2013), a noise problem generally consists of three inter-related elements – the source, receiver and transmission path. The transmission path is usually the vacuum or atmosphere through which sound is propagated. The source could be the generator or producer of the noise while the receiver may be materials, structures including man. At present, noise pollution is considered as one of the key problem of urban communities such as Aba that has numerous hazardous effects on the urban environment and may result in a great deal of costs on the society (Martin *et al.*, 2006, Chien and Shih, 2007). Goines and Hagler (2007) population growth increases use and availability of noise sources, expansion of highways, rails and air traffic are just one of the many reasons that noise is becoming more and more of a problem in our cities. Noise levels increases with increasing density of traffic and communication between sellers of goods and services related with the human population and traffic composition, the road, slope width and surface structure distance to cross road (McCrae and Williams, 1994). This is applicable to Aba, a major commercial city in the South East of Nigeria. Important factors affecting noise values are continuity of the city centre traffic and build up of market places, cross road signal system, (Tang and Tong, 2004). Traffic can be considered as the major noise pollution in large cities, Aba inclusive (Jamarah *et al.*, 2006; Murthy *et al.*, 2007).

**Table 1.1. Some noise standards developed by WHO, ILO and OSHA Organization**

Area Code	Category of Area/Zone	Limits of Leq dB(A)	
		Day Time	Night Time
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence Zone	50	40

Note. Leq: **The equivalent continuous sound level**

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**Table 1.2. Noise Levels of Representative Sounds**

REPRESENTATIVE SOUND	DECIBELS	CHARACTERISTICS
Threshold of hearing	0	Audible
Normal breathing	10	Audible
Leaves rustling in the breeze	20	Very quiet
Whispering	30	Very quiet
Library	40	Quite
Quiet restaurant	50	Quite
Conversation	60	Moderately loud
Vacuum cleaner	70	Moderately loud
Food blender	80	Very loud
Heavy traffic	90	Very loud
Train	100	Uncomfortably loud
Machine gun at close range	120	Uncomfortably loud
Jet plane engine at take off	150	Painful

Source: Noise levels of Representative Sounds (Fuller *et. al*, 2007)

## 2. METHODOLOGY

### Study Area

The Comparative analysis of noise levels was conducted at Ariaria International Market and Eziukwu Market being two of the leading markets in Aba, Abia State. Aba is a commercial center located in Abia State; which was created on the 27th of August in the year 1991 from the part of Imo State. The State Abia lies within latitude 5<sup>0</sup>25'N and 5<sup>0</sup>41'7"N and Longitude 7<sup>0</sup>30'E and 7<sup>0</sup>51'E.



**Figure 1: Map of Abia State, showing Aba, the town of the study locations.**

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### **Ariaria International Market**

Ariaria International Market is one of the largest markets in West Africa; it covers a land mass which lies within the areas of Aba South and Osisioma Ngwa Local Government of Abia State. The market is located within Latitude 7°19'57"W and Longitude 5°7'5"N of the equator. It is a crowded market where activities can only be brought to a halt by 5:00pm daily from Monday to Saturday.



**Figure 2: Some goods sold at Old Timber Line, Ariaria Market**

### **Eziukwu (Cemetery) Market**

Eziukwu Market popularly called Cemetery Market is one of the leading markets in the town of Aba. It is well known for items such as stockfish, provisions, furniture, electrical lightings, local crafts and food items, amongst others. It is a major depot for all sorts of foodstuffs arriving from the northern part of Nigeria. This market shares boundary with Aba Cemetery, hence the name Cemetery Market. If you want a one stop shopping experience within the town, come to Eziukwu Market. Eziukwu Market is a crowded market where all the daily activities are brought to a halt by 6:00pm; from Monday to Saturday.

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**Figure 3: Some of the items sold at Eziukwu Market, Aba.**

### **3. MATERIALS AND METHOD**

#### **Methods of Study**

The sound level meter PCE 4xx EKIT which has a measuring range of 35 – 135dB; Accuracy of  $\pm 2$ dB; and a frequency range of 31.5Hz – 8KHz was used to measure noise levels at each study location. The noise meter was calibrated to assure that it was within the calibration tolerance. A total of 12 sampling points were established for each market, which was divided into two, six (6) for open shades and six (6) for closed shades. This brought a total of 24 sampling points for the two markets. Measurements were done by directing the probe towards the direction of the prevailing wind and readings recorded at stability. The sound level measured were viewed from the reading on the meter's LCD.



**Figure 4: A sound level meter, an important tool in measuring sound**

## Design of the Study

This work was conducted through field studies and descriptive surveys.

For the field studies, Ariaria International Market and Eziukwu Market in Aba, Abia State were selected and surveyed during field studies. The sound level meter was used to read the noise level for intervals of five minutes each for hourly bases.

The descriptive studies are aimed at finding out, investigating, “what is” so observational and frequently used to collect descriptive data (Osuala, 2008). It shows the type of design and data analysis that will be applied to a given topic like the “*Comparative Analysis of the Noise Level at Ariaria International Market and Eziukwu Market, Aba, Abia State*”. In this study, the descriptive survey was used as a cornerstone and it also aimed at collecting data on facts about a given noise pollution.

## 4. RESULTS AND DISCUSSION

This section deals with presentation of results from the sound level meter and the analysis of the data obtained.

**Table 4.1. Measured Noise Levels at the Selected Markets in Aba, Abia State.**

Name of Market	Measured Noise Level in Lock-up Shades (dB)	Measured Noise Level in Open Shades (dB)	WHO/OSHA Regulation (dB) Standard Limits
<b>Ariaria Market</b>			0-79: Normal 80-90: Risky and Needs Attention
A-Line	75.8	82.4	
C-Line	71.7	74.5	
E-Line	68.1	87.1	
Free Zone	89.0	90.3	
Plastic Section	65.7	70.0	
Shoe Plaza	67.4	70.6	Above 90: Harmful
<b>Eziukwu (Cemetery) Market</b>			
By Railway	69.1	75.4	
Provision Section	65.0	68.8	
By Cemetery	73.0	77.3	
By Asaa Road	73.7	80.0	
Fresh Tomato Section	71.3	73.2	
Stockfish Section	51.8	69.5	

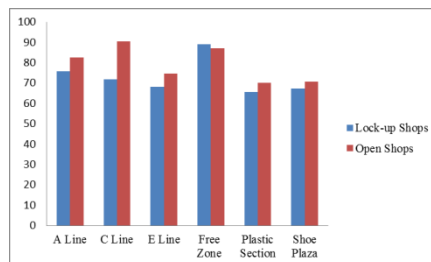
*Source: Fieldwork, 2020*

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Table 4.1 above shows the results obtained from fieldwork at the study locations. From the table, it was observed that most of the sampling points falls within 0 – 79dB, which is regarded as the normal limit for sound exposure according to WHO and OSHA Standard. Results obtained from the study locations shows a range of 65.7 – 89.0 and 51.8 – 73.7 for lock-up shades at Ariaria International Market and Eziukwu Market respectively, and 70.0 – 90.3 and 68.8 – 80.0 for open shades accordingly; with Ariaria Market recording the highest noise level of 90.3dB.

From the table, it would be observed that open shades of both markets shows slightly high distribution in noise levels, although results from open shades and lockup shades at Ariaria International Market shows to be slightly above the results from both open shades and lockup shades at Eziukwu Market. This can be attributed to numerous activities that take place at Ariaria as an International Market, and also the free movement of automobiles within the perimeter of the market. It can also be observed that there are more sampling points which are slightly above WHO and OSHA standards at Ariaria International Market compared to Eziukwu Market.

According to WHO and OSHA regulatory standard, the depth for permissible exposure level (PEL) is set at threshold of 80dB and 90dB for minimum and maximum respectively. Any level above the stated, it is advised that hearing fortification device should be worn. From the table 4.1, the noise level at the various markets that exceeds 80dB are no longer audible for hearing, this requires that the traders needs to protect their ears. Figure 5 and 6 below shows graphical comparison of noise levels at both markets.



**Figure 5: Graphical Distribution of Noise Levels at Ariaria International Market**

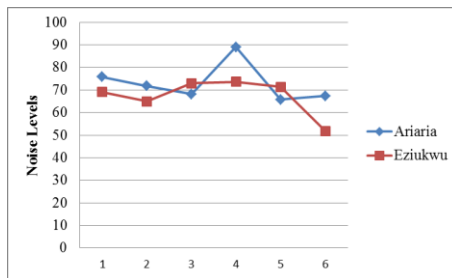


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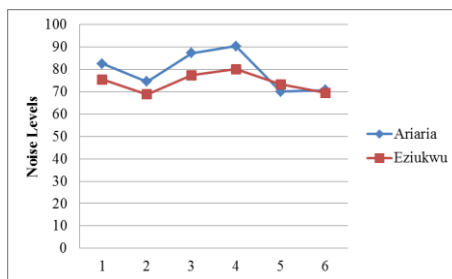


**Figure 6: Graphical Distribution of Noise Levels at Eziukwu Market**

Figure 7 below compares graphically the noise levels of lockup shades of both markets, while figure 8 compares the noise levels of open shades of both markets.



**Figure 7: Noise Levels of Lockup Shades of both markets**



**Figure 8: Noise Levels of Open Shades of both markets**

## 5. CONCLUSIONS

The findings of the study as summarized in table 4.1 shows that Ariaria International Market has highest pick of noise level of 90.3dB as measured with sound level meter particularly in the open shades

were major activities were machine operation and automobile movements, followed by Eziukwu Market with the highest noise level of 80.0dB.

From the result in table 4.1, comparing the noise level with the OSHA and WHO compliance, the individual and traders within Ariaria International Market precisely Free Zone area and A-line area have noise levels considered to be risky and needs attention; because the levels were above the hearing conservation (HC) of 0 - 79dB. The measured noise levels at Ariaria International Market is classified as very high on a rating scale (CPCB, 2006). This indicated that the individuals and traders are exposed to high noise pollution and may be at risk of accelerated presbycusis process or noise induced hearing impairment with age. This study therefore suggests that to maintain a healthy living; health education, proper environmental planning and management, regular check on noise levels, improvement of installations, use of noise absorbents and planting of trees remain key factors to eradicating the problem of noise pollution.

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