Network for Research and Development in Africa
International Journal of Pure and Applied Science Research
ISSN: 2384-5918, Volume 11, Issue 10
PP 104-113 (December, 2023)
DOI: 4572-771-1-111010
arcnjournals@gmail.com
https://arcnjournals.org

Assessment of Noise Pollution in Aba North Local Government Area, Abia State, Nigeria

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Abstract: *This article provides an in-depth analysis of noise pollution in Aba North Local Government Area, Abia State, Nigeria. The study's goal was to assess noise levels in various places and compare them to both Nigerian Environmental Agency Noise Standards and foreign standards. Extensive measurements were taken on Immaculate Avenue, Umuatako Road, and Eziama Street in the morning, afternoon, and evening. The findings found that noise levels in these places routinely surpassed Nigeria's Maximum Permissible Noise Levels for the General Environment. Commercial activity and heavy traffic flow on Immaculate Avenue, particularly at intersection A1, resulted in extraordinarily high noise levels of up to 113.61 dBA. Due to heavy commercial activity and vehicular traffic, Umuatako Road had substantial noise pollution, with B1 recording an equivalent noise level ofEziama Street has lesser noise pollution, however places like C1 exceeded industrial noise requirements. The findings highlight the critical need for noise reduction measures in these regions. The study emphasizes the importance of governmental interventions and urban planning in reducing noise pollution and assuring citizens' well-being and health. It is critical to address these concerns in order to provide a safer and healthier environment for the local community.*

Keywords: *Health, Urbanization, Environmental Assessment, Urban setting, Noise Pollution.*

Introduction

One of the main physical environmental issues affecting human health in the modern world is noise. According to Berivan (2014), noise is any unwelcome sound or sound that is loud, unpleasant, or unexpected that disturbs people physically and physiologically and pollutes the environment by destroying natural features (Bragdon, 1968). According to Eleftheriou (2002), noise is any outdoor sound produced by human activity. Examples of such sounds include those produced by trains, automobiles, homes, electrical appliances, TVs, music players, public address systems, railroads, power plants, airports, and industrial sites are all examples of electronic devices. Sound is a type of energy emitted by a vibrating body that, when it reaches the ear, causes the sensation of hearing via nerves. All vibrating bodies produce no audible sounds. The audible frequency ranges from 20 to 20,000 hertz. Because noise is also a sound, the terms noise and sound are interchangeable, but noise is harmful to human health. Despite the fact that noise pollution is a slow and delicate killer, little effort has been made to alleviate it. The negative impact of environmental noise and stress on human health has been well documented (Khaiwal *et al*., 2016). Children's cognitive development may be hampered by noise, and it may also raise blood pressure. According to Molesworth *et al*. (2013), extreme noise exposure can have a range of effects on people, from emotional to physiological and psychological. It can even be so bad as to cause a psychiatric disorder or irreversible memory loss.

For many years, scientists have debated the general effect of noise on the hearing of workers (Jansen, 1992). Many places have implemented noise-reduction regulations for industrial workers. In Nigeria, for example, the basis of environmental policy is contained in the Federal Republic of Nigeria's 1999 Constitution. Section 20 of the Constitution empowers the state to protect and improve the environment, as well as to safeguard Nigeria's water, air, and land, forest, and wildlife. Furthermore, Section 2 of the Environmental Impact Assessment (EIA) Act of 1992 states that neither the public nor private sectors of the economy shall undertake, embark on, or authorize projects or activities without first considering the environmental impact. According to the Occupational Noise Exposure Regulation in the United States, industrial employers are required to restrict their employees' noise exposure to 90dBA for a maximum of eight hours each day (Eleftheriou, 2002). This is comparable to the Turkey Standard (Atmaca *et al*., 2005), which is less than 75 dBA for 7.5 hours.

Hearing loss can occur from prolonged exposure to loud noise that is louder than 85 dBA. Individual differences exist in the degree, frequency, and duration of noise exposure that cause continuous hearing loss (USEPA, 1974). Among the physiological effects, hearing loss is the most prevalent. Melamed *et al*. (2001) classified the effects of noise on ears into three categories: acoustic trauma, temporary hearing loss, and permanent hearing loss. Other physiological effects include elevations in blood pressure, heart rate acceleration, the emergence of muscle reflexes, and disturbances in sleep patterns. The Environmental Protection Act stipulates that noise levels in residential, institutional, and educational settings cannot exceed 55 dBA between 7 a.m. and 11 p.m., and 45 dBA between 11 p.m. and 7 a.m. Additionally, noise levels in commercial and industrial settings cannot exceed 70 dBA at any time (Singh & Davar, 2004). These norms are not always followed in metropolitan areas, where people are amenable to noise levels that are higher than usual. As a result, the study looks at Aba's commercial city's noise level to see if it complies with national and international standard.

Materials and Method

Study Area

This research was conducted in Aba, Abia State. It is located at the latitude 5°7'0''N, 7°22'0''E and longitude 5.177°N, 7.367°E (WGS84). Aba is divided into two local government areas: Aba South and Aba North. It consists of the following villages: Umuokpoji Aba, Eziukwu-Aba, Obuda-Aba, Aba Ukwu, and Ohazu. Aba's administrative head is Ohazu. It has an area of approximately 72.507 square kilometers, or 1.5 percent of Abia State's total land area. Aba's population was estimated to be 534,265 according to the 2006 NPC. Aba is the South East, Nigeria, and Japan of Africa. Since 1903, Aba has been a hub of human activity; the city is teeming with businesspeople, and all citizens are dedicated to their work. Today, traders come from all over the continent to buy Aba-made goods for resale, including Ghana, Cameroon, Liberia, Togo, the Democratic Republic of the Congo, Equatorial Guinea, and the Ivory Coast. The artisan and tradesmen's creativity, as well as their profound skill in developing local content for all products, became a story that crossed many borders. As a result, a large number of people, particularly craftsmen, have moved to Aba, as have many industries.

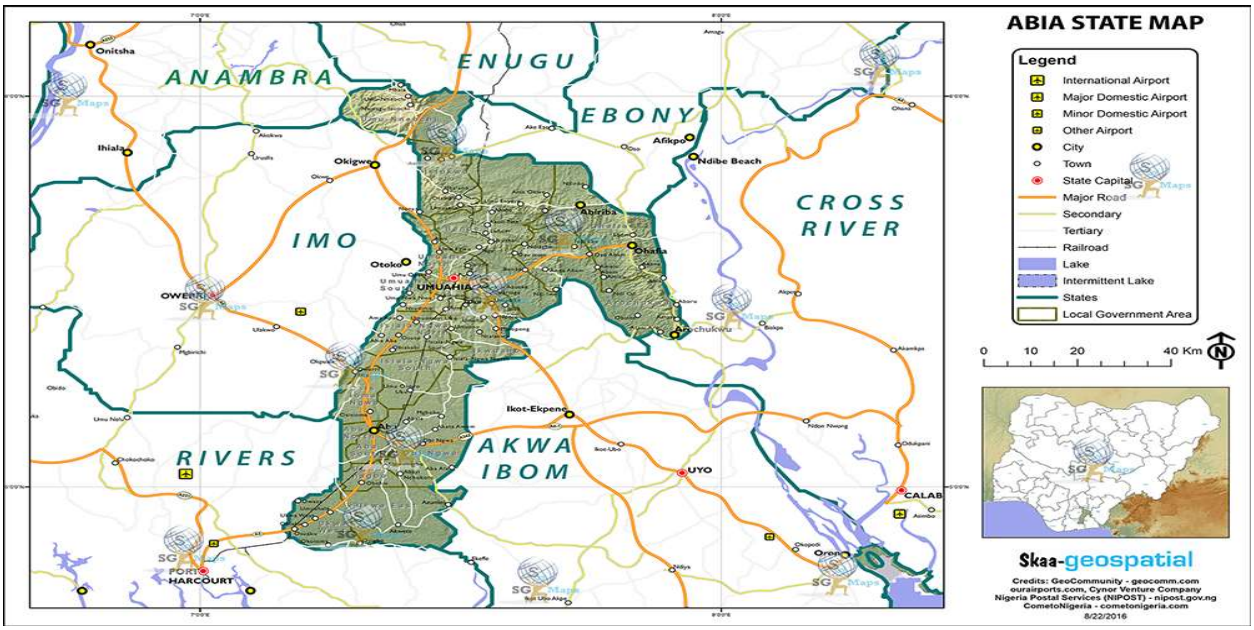

Figure 1: Map of Abia State showing the Study Area

Method

The noise levels in the study area were measured using a weighted sound level meter, designated as "A". The measurement of outdoor sound levels at nine distinct locations (streets, busy roads, and junctions) in the Aba North Local Government area of Abia State served as the basis for this study. Three primary areas were created out of these areas. Immaculate Avenue, Umuatako Road, and Eziama Street are the three principal thoroughfares. Three locations within these domains were chosen for the measurement. The locations chosen for Immaculate Avenue are Immaculate Junction, Udegwu Junction, and Ubani Junction. The intersections of Umuatako Road are New Heaven Junction, Nwangiri Junction, and Umuatako Junction. The Eziama Industrial area, Eziama School area, and Eziama Residential area are the locations for Eziama Street as well. The majority of the areas along Umuatako Road and Immaculate Avenue are residential in nature, with less commercial space. Eziama Street is primarily a residential and school district in addition to the Eziama Industrial area. The several study locations were represented by alphanumeric characters. The letters "A," "B," and "C" stand for Immaculate Avenue, Umuatako Road, and Eziama Street, respectively. The symbols "A1," "A2," and "A3" stand for Ubani Junction, Udegwu Junction, and Immaculate Junction, respectively. Umuatako Junction, Nwangiri Junction, and New Heaven Junction were labeled as 'B1', 'B2', and 'B3', respectively, while Eziama Industrial Area, Eziama School Area, and Eziama Residential Area were labeled as 'C1', 'C2', and 'C3'. The research was carried out in December, which is typically the winter season. During a period of high activity in the area, measurements were taken in the morning, afternoon, and at night for three days. The measurement was then used to calculate the equivalent noise level based on the measured noise level.

Result and Discussion

The focus of this study is to evaluate and investigate the noise levels in the study areas and to compare it with the Nigerian and International standards. Table 1 show the Nigerian Environmental Agency Noise Standard.

Figures 2, 3, and 4 depict the noise levels at Immaculate Avenue in the morning, afternoon, and nighttime, respectively. The morning noise levels suggest that A3 has the highest noise levels, followed by A2 and finally A1. The same pattern may be seen in the afternoon noise levels. Evening noise levels in this region are nearly same, however A3 still has a greater level than A2 and A1.

Table 1: Maximum Permissible Noise Levels for General Environment

Facility	**Noise level limit dBA (Leq)**	
	Day	Night
Any building used as hospital, convalescence home, home for the aged, sanatorium and institutes of higher learning, conference rooms, public library, environmental or recreational sites.	45	35
Residential buildings	50	35
Mixed residential (with some commercial and entertainment	55	45
Residential + industry or small-scale production + commerce	60	50
Industrial	70	60

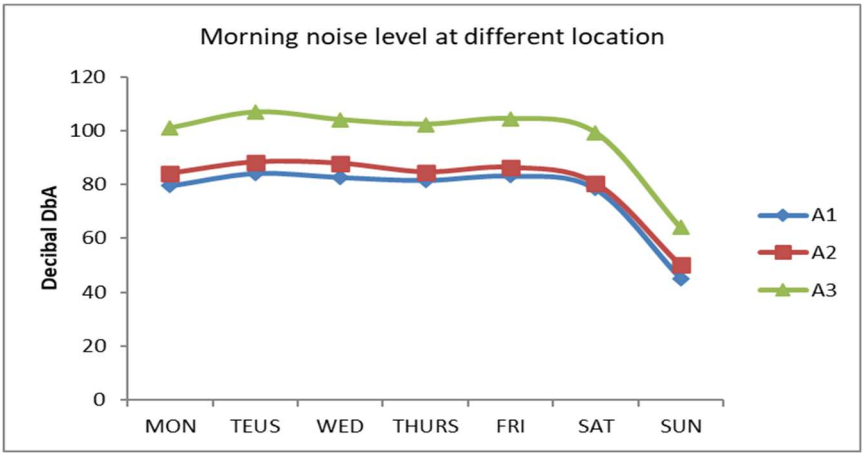

Figure 2: Morning noise level at *Immaculate Avenue*

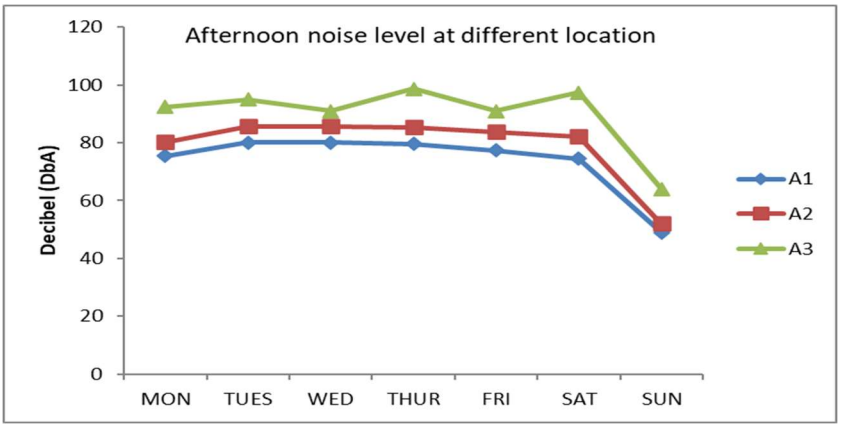

Figure 3: Afternoon noise level at Immaculate Avenue

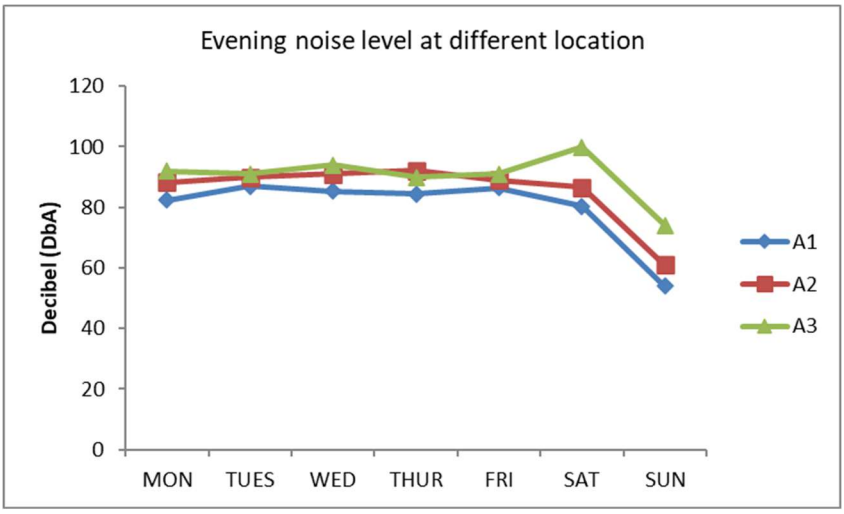

Figure 4: Evening noise level at *Immaculate Avenue*

Figures 5, 6, and 7 depict the noise levels at *Umuatako Road* in the morning, afternoon, and nighttime, respectively. The morning noise levels suggest that B1 has the highest noise levels at all times, followed by B2 and finally B3. The same pattern may be seen in the afternoon and evening noise levels.

Figures 8, 9, and 10 depict the noise levels at Eziama Street in the morning, afternoon, and nighttime, respectively. The morning noise levels suggest that C1 has the highest noise levels at all times while C2 and C3 have almost the same noise level.

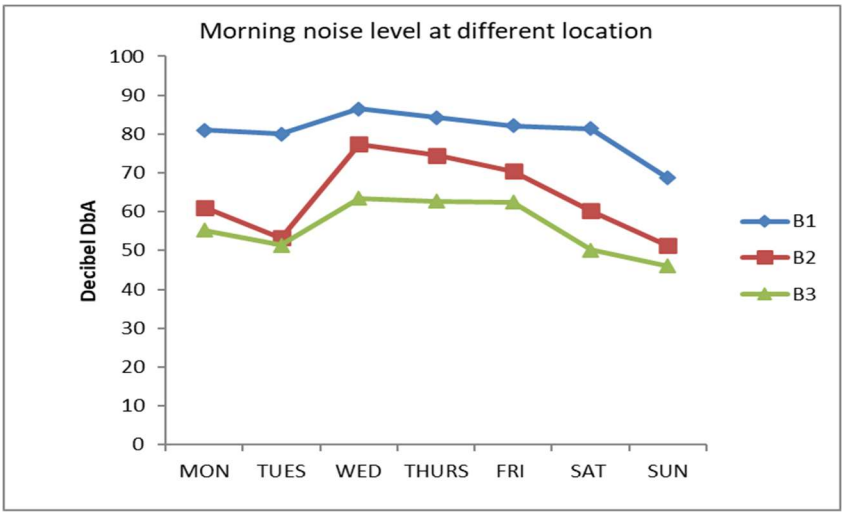

Figure 5: Morning noise level at *Umuatako Road*

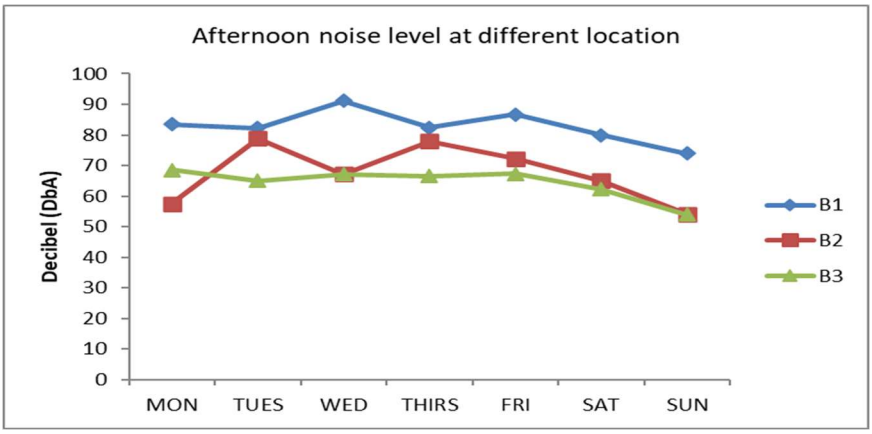

Figure 6: Afternoon noise level at *Umuatako Road*

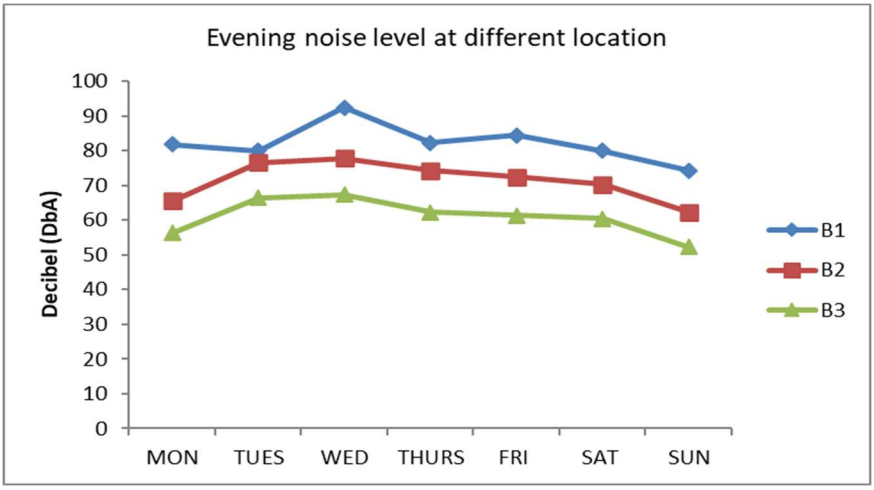

Figure 7: Evening noise level at *Umuatako Road*

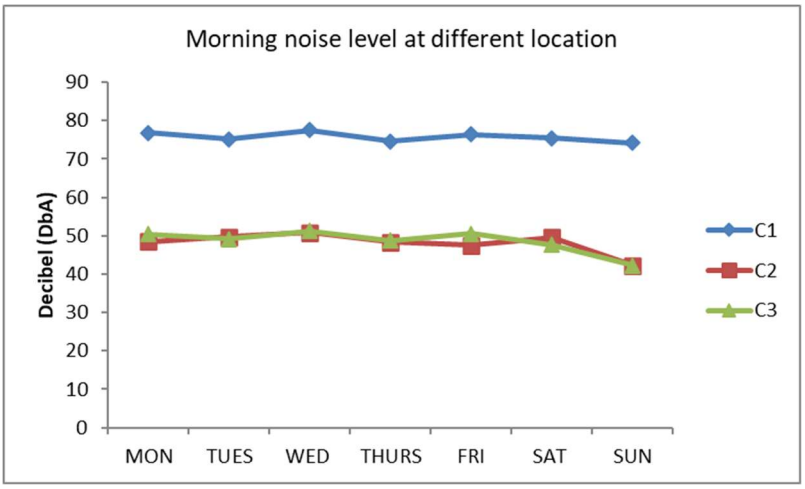

Figure 8: Morning noise level at EZIAMA STREET

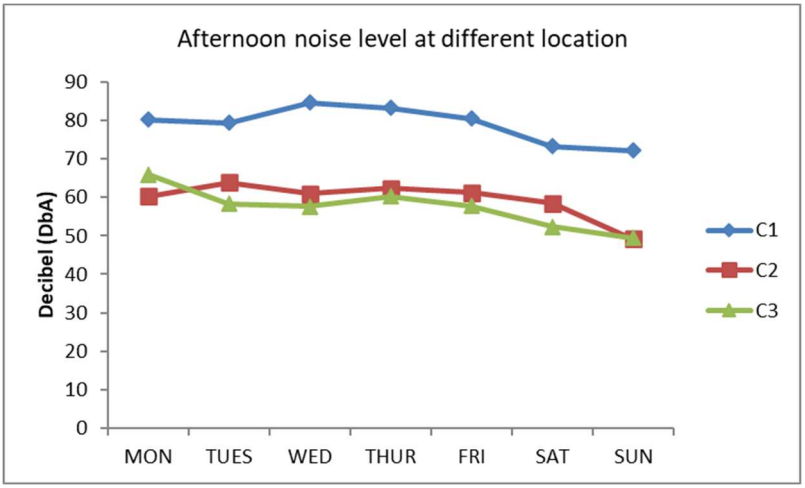

Figure 9: Afternoon noise level at EZIAMA STREET

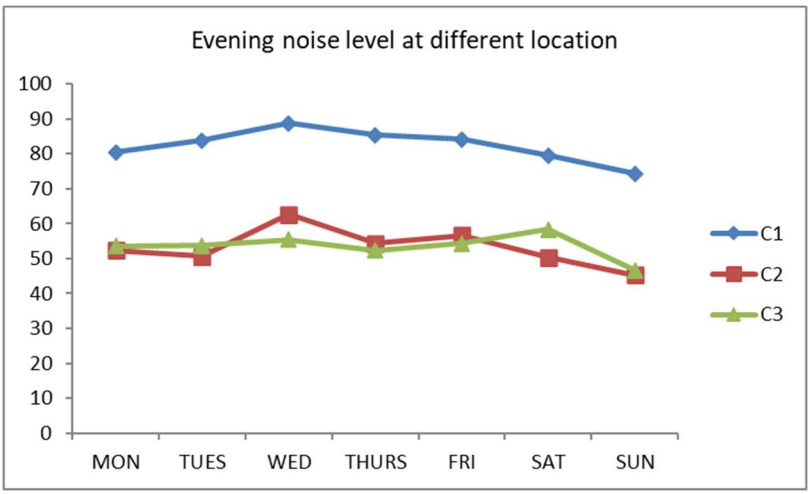

Figure 10: Evening noise level at EZIAMA STREET

Figure 11 shows the noise level (Leq) at Immaculate Avenue. From the graph, it can be observed that there are variations in the noise levels measurements at the different locations with A1 having noise level more than A2 and A3. Also among the three sites A3 has the highest noise level which is as high as 113 dBA. The lowest noise level recorded in the area is 80 dBA which is very much higher than maximum permissible level for residential + commercial + small scale production area.

Figure 12 shows the noise level measurement (Leq) at those three selected locations. The chart shows that there are variations in the noise levels in the different locations with B1 having the highest noise level while B3 has the lowest noise level. But these areas still has noise levels greater than maximum permissible noise level shown in table 1.

Figure 13 shows the noise level measurement (Leq) at those three selected locations. The chart shows that there are variations in the noise levels in the different locations with C1 having the highest noise level while C3 has the lowest noise level. The high noise level at C1 is because of the industries located in that area. But these areas still have noise levels greater than maximum permissible noise level shown in table 1.

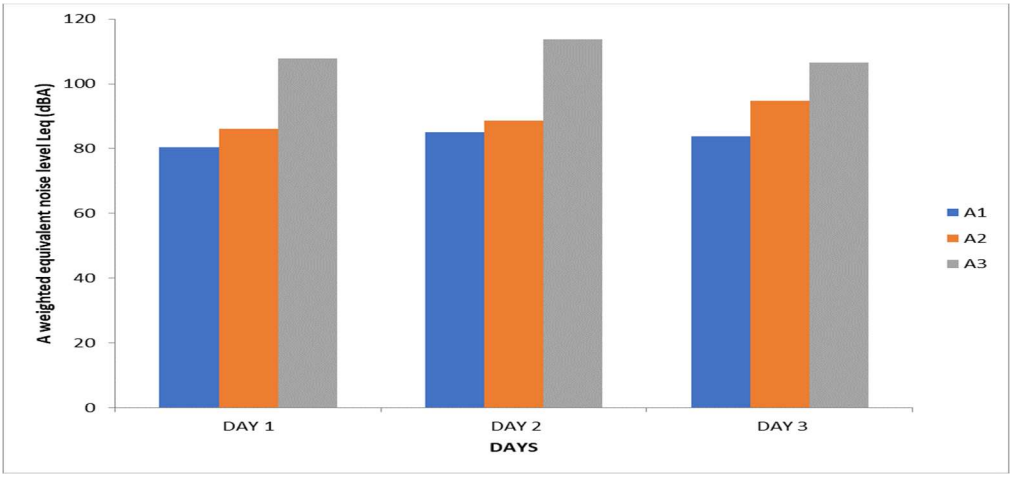

Figure 11:Chart of noise level (Leq) for Immaculate Avenue

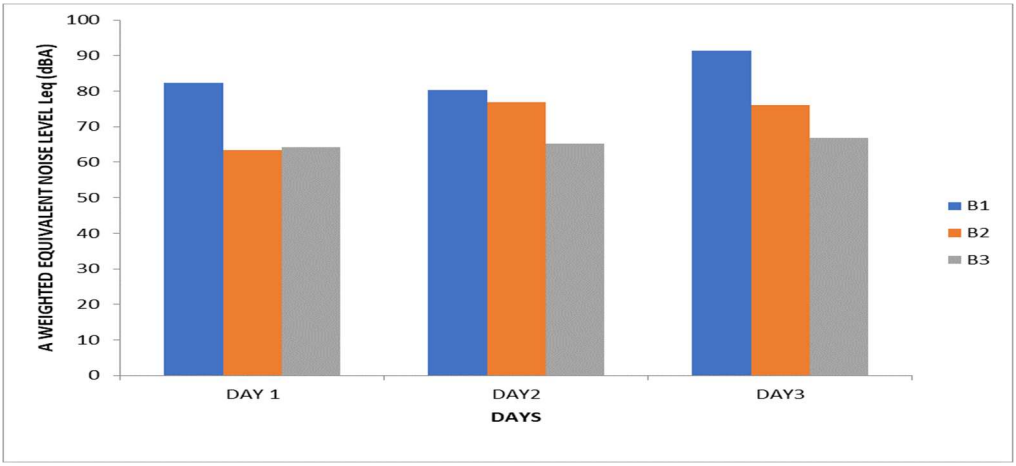

Figure 12: Chart of noise level (Leq) for Umuatako Road

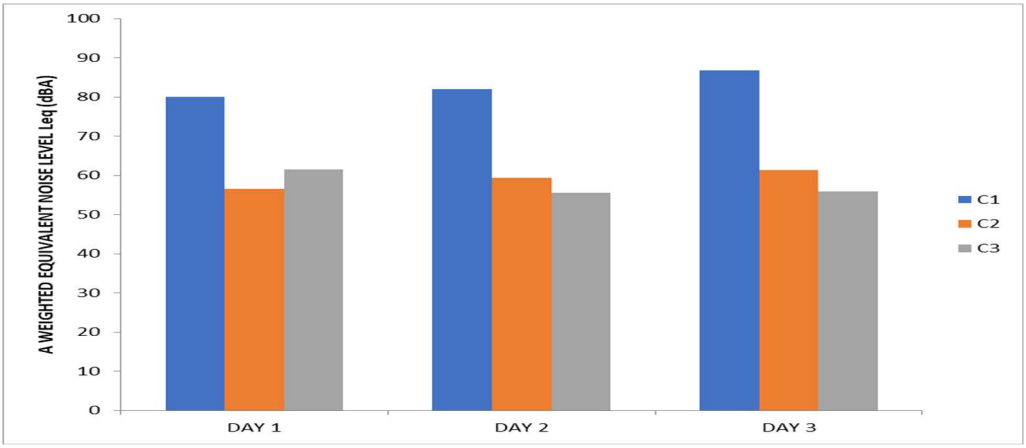

Figure 13: Chart of noise level (Leq) for Eziama Street

Discussion of Result

The results show that the noise levels in the study areas are higher than the Nigerian Environmental Agency Noise Standard. The morning noise levels suggest that A3 has the highest noise levels, followed by A2 and finally A1. The same pattern may be seen in the afternoon noise levels. Evening noise levels in this region are nearly the same, however A3 still has a greater level than A2 and A1. The morning noise levels suggest that B1 has the highest noise levels at all times, followed by B2 and finally B3. The same pattern may be seen in the afternoon and evening noise levels. The morning noise levels suggest that C1 has the highest noise levels at all times while C2 and C3 have almost the same noise level.

The result gotten from Immaculate Avenue shows that A3, with equivalent noise level as high as 113.61 dBA, has an equivalent noise level higher than A1 and A2 which have the measured equivalent noise level of 83.688 dBA and 94.63 dBA respectively. The whole area has equivalent noise level greater than the Maximum Permissible Noise Levels for General Environment in Nigeria. The high level of noise pollution is because of the commercial activities in the area and high level of traffic in the area especially at A1 which is basically a junction that leads to other streets and roads. This makes the area to be unsafe for people to be at that area for a long time since it might affect their health.

The result gotten at Umuatako Road shows that the noise level in the area is higher than the Maximum Permissible Noise Levels for General Environment in Nigeria. From the result B1 has equivalent noise level of 91.37 dBA which greater than that measured at B2 with equivalent noise level of 76.13 dBA and B3 with equivalent noise level of 66.63 dBA. The reason for the high noise level is because the serious commercial activities in the area and also because of the high level of vehicular traffic passing through the area.

The measurement at Eziama Street shows a noise level that is nearer to the Maximum Permissible Noise Levels for General Environment in Nigeria than the other two locations. C1 has equivalent noise level of 86.77 dBA which is above the Maximum Permissible Noise Levels for General Environment in Nigeria for industrial areas. C2 has an equivalent noise of 61.34 dBA which is also higher for the Maximum Permissible Noise Levels for General Environment in Nigeria for learning environment. C3 has equivalent noise level of 55.88 dBA which is slightly higher than Maximum Permissible Noise Levels for General Environment in Nigeria for residential area.

Looking at the three areas under study, Immaculate junction has the highest noise pollution when compared to Umuatako which is the second highest and Eziama Street. The measurement gotten from

these areas shows that something should be done either to reduce the noise pollution in these areas or protect the people in that area from noise pollution.

Conclusion

The study examined the noise level of a typical commercial area of Aba, three different locations in Aba North local government area of Abia State, Nigeria were observed, these areas where divided into three separate sub-areas: industrial, school and residential area. The result shows that these areas have a high traffic noise level equivalent as high as 85.87dBA, 94.6dBA, and 113.6dBA for Ubani junction, Udeagwu junction, and Immaculate junction respectively. In Eziama Street, noise equivalent level was as high as 86.7dBA, 61.3dBA and 61.6dBA for the Industrial area, School area, and Residential area. The results show that Immaculate Avenue has a very high noise level when compared to Eziama Street. The result when compare with the International Financial Agency and Nigeria Environmental Protection Agency noise thresholds of 55decibles for residential and 70 decibels for industrial and commercial areas were high shows that the noise level were high in the areas investigated. Therefore we recommend: awareness, civic enlightenment is a major option to control noise pollution and authorization of regulatory agency can solve the problem.Encourage the design of noise proof doors and windows with sound insulation. The air spaces of the edges of such panes should be filled with sound absorbing materials.

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