

Noise Pollution Status in South-South Nigeria

Abstract

Noise pollution has gotten more significant as cities have grown more densely populated. This study aimed to assess the noise pollution level in the capital cities of Awa-Ibom, Bayelsa Calabar and Rivers State, South-South, Nigeria. Noise level measurement was conducted using Noise Level Meter (NM102). Noise level measurement for all sampling locations were conducted on working days (Monday through Friday) between February 2022 and January 2023. Results showed that noise concentration in Port Harcourt ranged between 31 and 103 db(A), 31 and 103 db(A) in Calabar, 32.1-90.1 in Uyo and 30.1-83 db(A) in Yenagoa. The noise levels in Rivers, Calabar and Uyo exceeded the WHO limit of 90 db(A). This has great consequence on the comfort and health of persons residing close to areas with high noise generation. Measure to reduce noise pollution should be put in place in these cities.

Keywords: Noise, pollution, cities, comfort, health

1.0 INTRODUCTION

Noise pollution is one of several types of pollution widely acknowledged as a serious issue affecting quality of life in urban places around the world (Oviasogie, 2020). Oguntunde et al. [2] defined noise as the spread of sound that has a negative impact on the physiological and psychological well-being of humans and animals. According to the World Health Organization (2018), noise pollution is one of the most significant environmental risks to mental health. Therefore, noise pollution has become a severe environmental issue, with studies indicating that it is even more damaging than water and air pollution [1,3,4].

Noise pollution has gotten more significant as cities have grown more densely populated (Chiedu et al., 2021). Noise pollution has essentially become an integral component of urban living in most African settings nowadays. The sounds of many types of aircrafts, automobiles, trains, cooling equipment, power plants, commercial buildings, and other sources of irritating sound are all heard by city dwellers [4]. When a sound is unpleasant, unwelcome, loud, and unexpected, it creates noise and has a negative physiological and psychological effect on humans. Due to the strength of the sound, the duration of exposure, the continuity of the sound, and its frequency, a sound can be unpleasant. Road transportation systems, railways, machinery, and air traffic, communication, neighbourhood activities, religious activities, commercial activities, building and public works, and manufacturing enterprises are all typical causes of environmental noise pollution [5]. According to a recent WHO report [6], traffic noise affects at least 100 million individuals in the European Union each year, resulting in the loss of at least 1.6 million years of healthy life. People in such noisy urban regions appear to have grown acclimated to the increased noise levels.

The fact that the urban environment is getting increasingly congested, busy, and noisy is causing pollution in large cities and constantly urbanized regions and towns. Manisalidis et al. [7] observed that while topics like solid and liquid waste disposal, flood avoidance, and fire hazards have received a lot of attention, noise as an environmental concern has not acquired nearly as much attention. Noise pollution has been an inevitable issue in cities since the 1970s, and it is often regarded as a major source of aggravation and road traffic is the primary source of noise in urban areas [8].

Nigeria is currently experiencing record levels of urbanization and pollution, which is predicted to raise noise levels in metropolitan areas. However, in Nigeria, there are ineffective noise abatement strategies in place. Despite this, Nigeria's Federal Environmental

Protection Agency (FEPA) set daily noise exposure limitations for several urban zones [9]. However, the general public appears to be unaware of these rules, as well as the health risks connected with noise in residential areas. In addition, thorough research targeted at assessing residential facilities and highlighting noise effects on occupants are scarce in Nigeria [10,18,19].

Ihemeje & Onyelowe [11] asserted that noise pollution, particularly road traffic noise, is widely acknowledged to be a serious problem in quickly expanding cities such as those in South-southern region of Nigeria, where minimal control is applied and cities are poorly planned. In these regions, there are periodic markets where buyers and sellers meet for their commercial, economic, and social transactions, these activities result in noise pollution of the environment.

This study aimed to assess the noise pollution status in capital cities in South-South Nigeria.

2.0 Materials and Methods

2.1 Study Area

The study area is located in Nigeria's southern region, between latitudes 4° 21' 43.2" N and 7° 40' 52.8" N, and longitudes 5° 8' 42" E and 9° 30' 7.2" E, and covers an area of about 84,640km². It includes the following states: Bayelsa, Rivers, Cross River and Akwa Ibom states (Figure 1). The Niger Delta is crisscrossed by creeks, estuaries, and rivers, and it gets its name from its location near the mouth of the Niger River, which eventually finishes at the Atlantic Ocean's edge. The topography of the south-south region consists of a gently sloping lowland with an average slope of less than 10 degrees in most areas, and the highest part of the lowland, which is well drained, forms a mosaic with an altitude of 15 to 25 meters; and a flat monotonous low relief interspersed by several wetlands.

Rainfall is the most important climate variable in the study area, and it varies spatially. Thus, as in the rest of the country, there are two seasons: rainy and dry. The area's vegetation at the time of its founding was dominated by high rainforest, mangrove forest, and brackish swamp forest. The area is heavily inhabited with about 30 million people, the most of whom live in metropolitan areas. It is home to over forty ethnic groups, including the Ijaw, Ikwerre, Calabari, and Annang who speak over 150 languages. The area of study in which the research was carried out was Calabar, Port Harcourt, Uyo, and Yenagoa, South-South, Nigeria. Yenagoa City is located between 4° 51' N and 5° 22' N, and 6° 12' E and 6° 33' E longitudes. The relative humidity is high all year and only marginally lowers in the dry season.

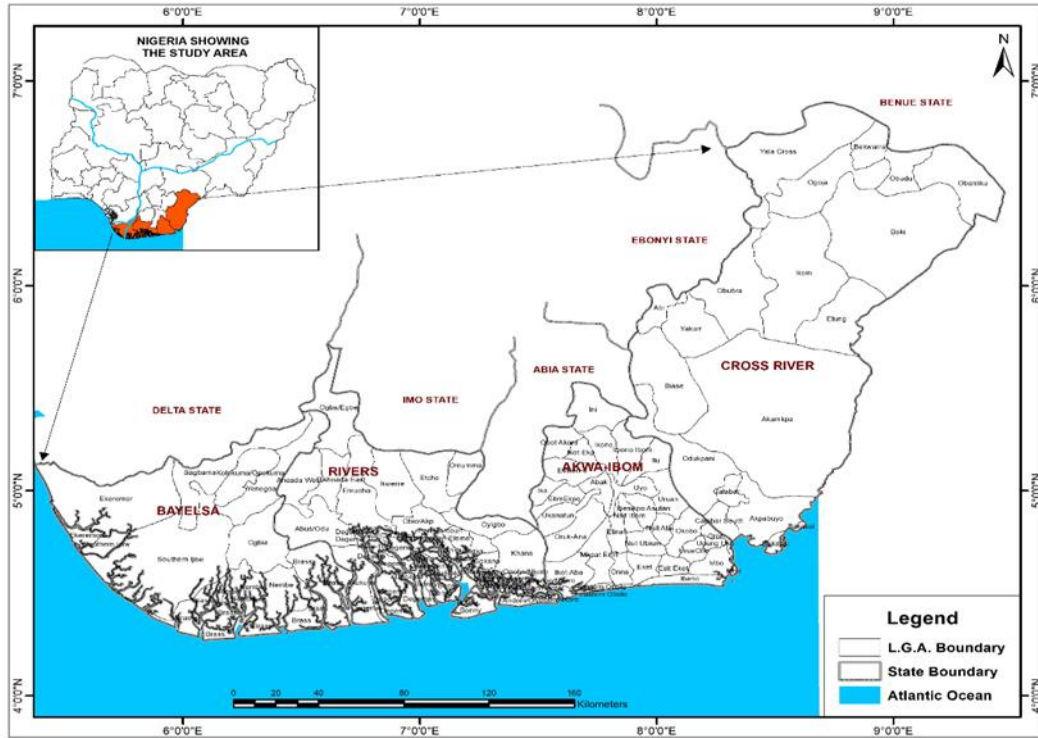


Figure 1: Location Map of the Study Area

Table 1: Population Figures for selected South-South Capital Cities used for Sample Size Determination

States	Capital Cities	Sampling Point
Akwa Ibom	Uyo	45
Bayelsa	Yenagoa	32
Cross River	Calabar	80
Rivers	Port Harcourt	40
Total		

2.2 Noise level measurements

Noise Level Meter (NM102) was used for the determination of the level of noise. noise level measurement for all sampling locations were conducted on working days (Monday through Friday) between February 2022 and January 2023, a period of 12 months. Three distinct times throughout the day were used to take measurements. Morning readings were taken from 7 a.m. to 9 a.m., afternoon readings from 1 p.m. to 3 p.m., and evening readings from 5 p.m. to 7 p.m. The sampling was performed in the open air, on the pavements nearest to the roads, at a height of 1 meter.

The average sound level is represented by $L_{A eq}$, the minimum sound level is represented by $L_{A min}$, and the maximum sound level is represented by $L_{A max}$. The measurements were taken by occupying each measurement station for 2 minutes and recording the instantaneous minimum and maximum noise levels detected over the period, as well as the instantaneous noise levels at the slow response time. These were manually recorded, and the $L_{A eq}$ values were calculated as well as the arithmetic mean, which is the average of $L_{A eq}$ measurements per station over the days.

3.0 Results

3.1 Analysis of Noise Dispersion across the Study Area

Figure 2 shows the noise concentration in Port Harcourt which ranges between 31 and 103 db(A).

Figure 3 shows dispersion of noise in Calabar, which ranges between 31 and 103 db(A).

Figure 4 shows dispersion of noise in Uyo, which ranges from 32.1-90.1 with an average concentration of 60.2 db(A) which slightly exceed WHO limits.

Figure 5 shows noise concentration in Yenagoa, which ranges from 30.1-83 db(A) with an average of 63.04 db(A).

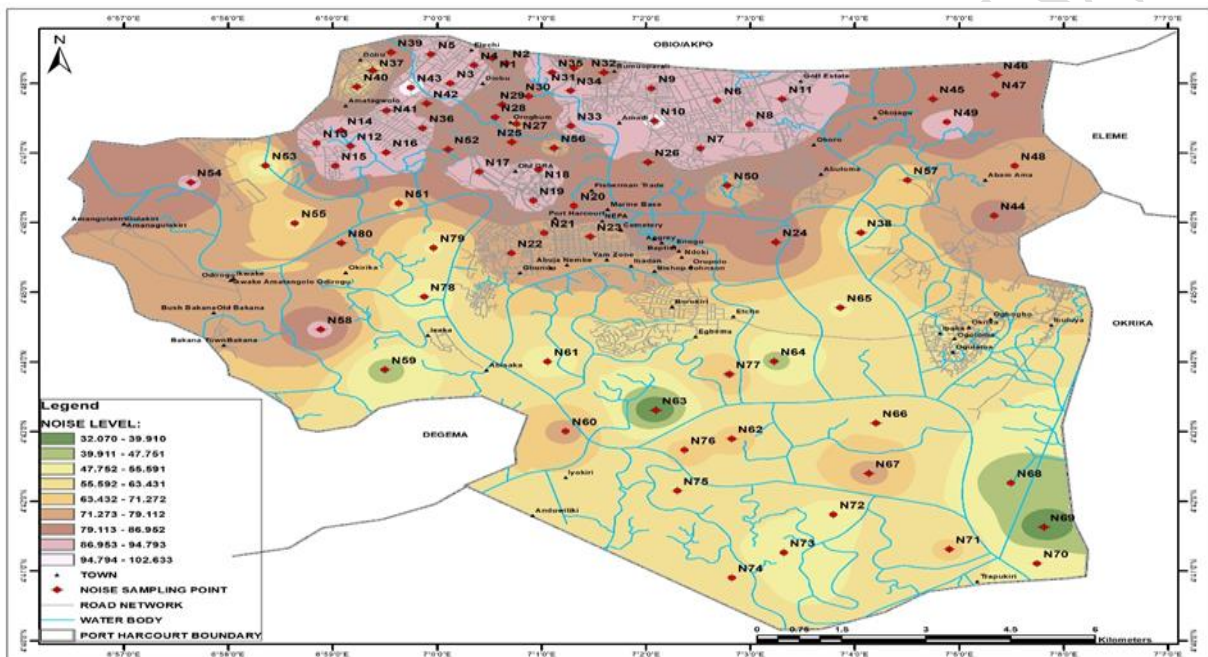


Figure 2: Noise dispersion model for Port Harcourt

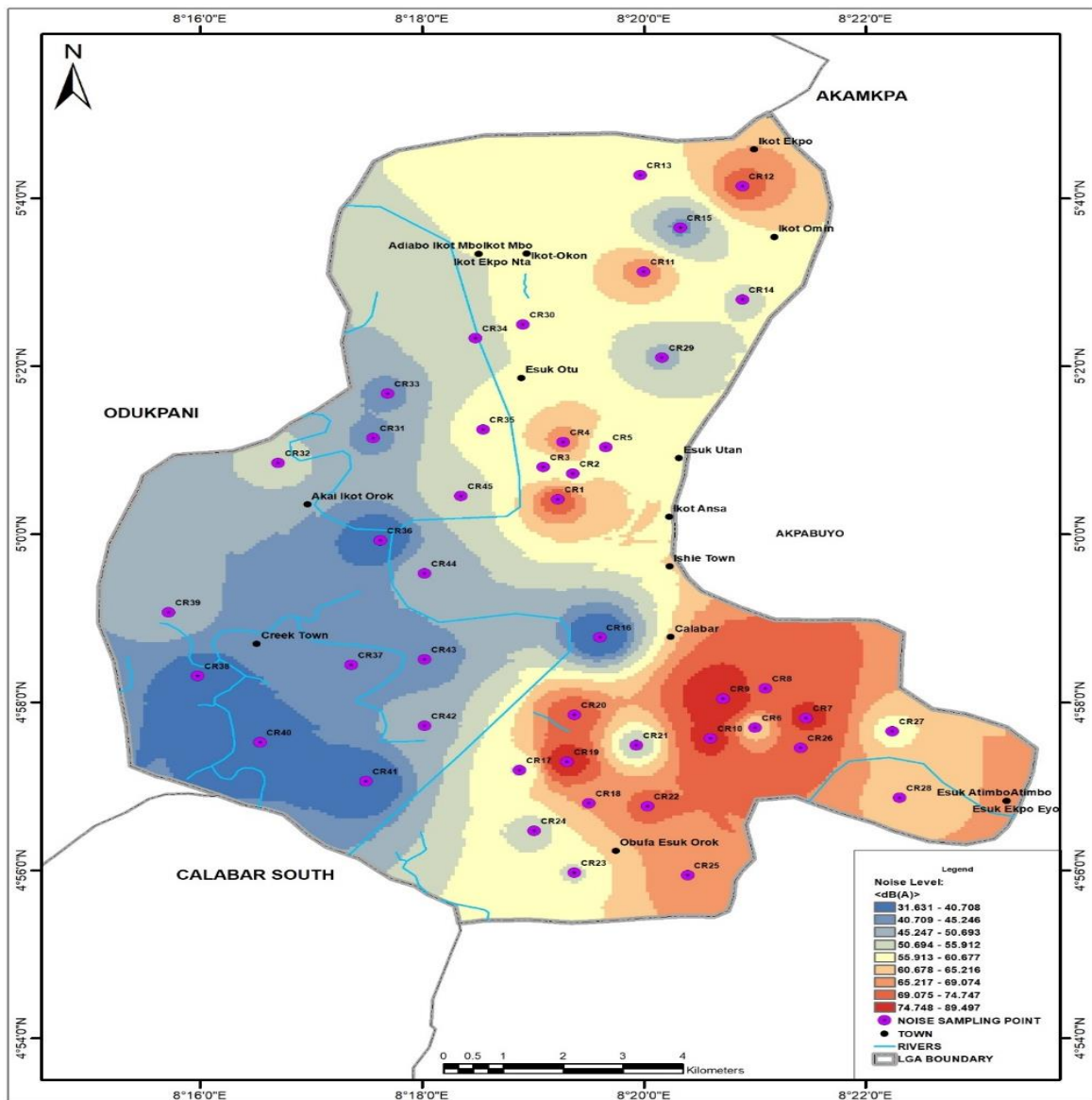


Figure 3: Noise dispersion model for Calabar

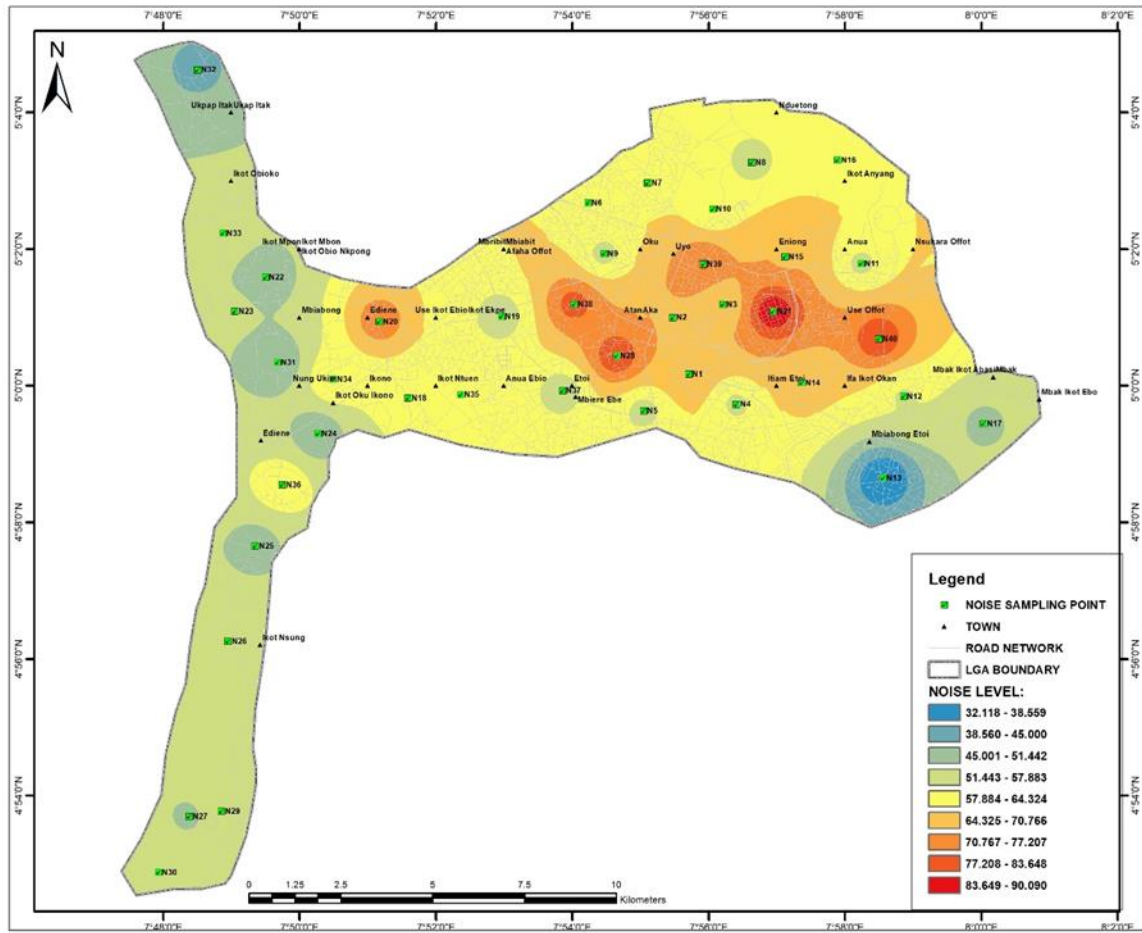


Figure 4: Noise dispersion model for Uyo

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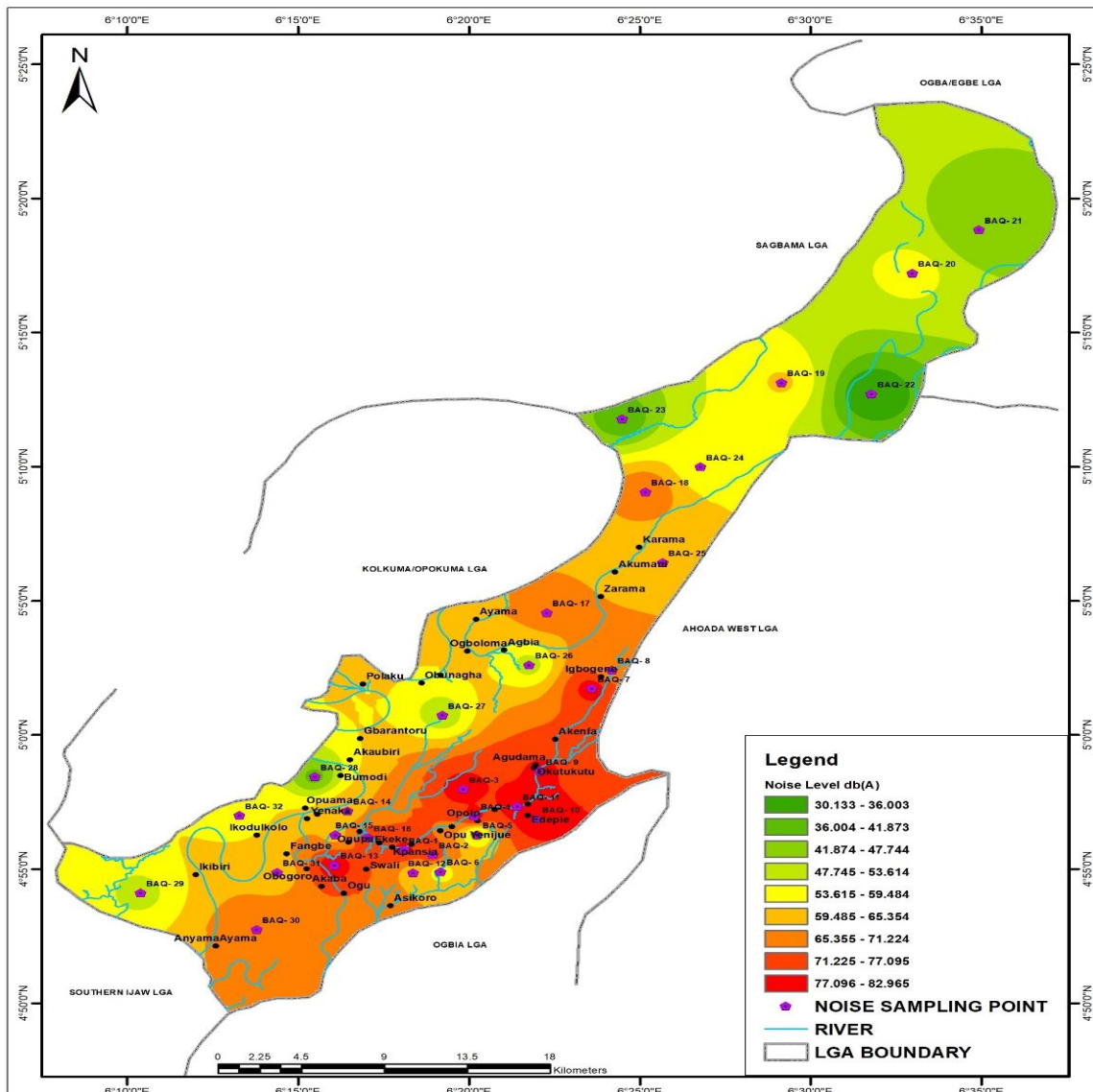


Figure 5: Noise dispersion model for Yenagoa

4.0 Discussion

The rapid growth of the population in Nigeria's cities has created an uncontrollable challenge of noise pollution. It is expected that as the economy, social progress, and population grow, the avenues to generate more noise grow. Analysis of noise dispersion across the Port Harcourt revealed that that noise concentration exceeded WHO limit of 90 db(A) in the northward while it decreases below the limit southward. This variability may be attributed to the land use characteristics of Port Harcourt. Thus, northward is basically built-up and commercial centre which is subjected to high influx of noise from traffic, business premises, churches, clubs, and industrial activities, among others. On the other hand, the south is low in noise concentration which can be related to being occupied by water and less traffic. This is in agreement with results from an earlier study by Nwaerema et al. [12] that showed that the

northern area of Port Harcourt produced the most vehicular noise compared to the southern region portions.

The dispersion of noise in Calabar is similar to what was observed in Port Harcourt with the riverine area having low noise concentration. The concentration was observed to be highest westward in areas with high road network, traffic concentration, high economic activities, industrial activities, among others. Nevertheless, the concentration of noise did not exceed WHO limit and thus the area is safe from noise pollution.

In Uyo the capital city of Akwa Ibom State, the centre of the city (Ibom Plaza) was the only section across the city that noise level exceeds 90 db(A) followed by the major Itam market axis. This is not unconnected to the fact that these places are the major commercial points within the city. However, noise level decreases with increases in distance away from the city hub.

The dispersion of noise in Yenagoa was observed not to have exceeded the WHO limit of 90 db(A). Compared to other cities in the study area, Yenagoa has lesser anthropogenic activities owing to fewer human population [13]. Mehdi et al. [14]; Abbaspour et al. [15] reported that there is a relationship between land use and noise. Anomohanran [16] reported that big cities in Nigeria such as Abuja and Lagos have unusually high noise pollution due to rapid expansion and large influx of people.

The Federal Environmental Protection Agency (FEPA) of Nigeria set daily noise exposure restrictions for industry workers at 90 decibels (A) during an 8-hour period. The National Environmental Noise Standards and Control Regulations [17] in Nigeria establishes the maximum noise level that can be tolerated in residential buildings for daytime (6:00 a.m.-10:00 p.m.) to be 43 dB and for night-time (10:00 pm-6:00 a.m.) to be 35 dB, daytime noise levels at educational institutions should be 60 dB, while night-time noise levels should be 50 dB, for mixed residential (with some commercial and entertainment), maximum daytime noise levels is 55 dB, while for night-time is 45 dB, for residential plus industry or small scale production plus commerce maximum daytime noise levels is 60 dB, while for night-time is 50 dB and for industrial (outside perimeter fencing), maximum daytime noise levels is 70 dB, while for night-time is 60 dB [17]. These benchmarks are equivalent to those set by other nations.

Noise is currently a criminal offense in Nigeria, according to the National Environmental Standards and Regulation Enforcement Agency (NESREA), punishable by jail, fines, or both. However, in Nigeria, compliance to regulation and regulatory enforcement are other issues of their own. Thus, it is not a surprise that noise level in 75% of the sampled cities exceeded the WHO limit of 90 db(A).

Conclusion

The noise levels in some areas of Port Harcourt, Calabar and Uyo exceeded the WHO limit of 90 db(A). This has great consequence of comfort and health of persons residing close to areas with high noise generation. Measures to reduce noise pollution should be put in place in the cities.

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