ASSESSMENT OF NOISE LEVEL WITHIN THE UNIVERSITY OF CALABAR ENVIRONS, CALABAR, NIGERIA

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ABSTRACT
This study analyzed noise pollution level in the University of Calabar. The objectives were to determine the level of noise pollution as well as identify the various sources of noise pollution in the study area. To perform comparative analysis of noise levels in the school, data were collected using PYLE PSPL25 Digital sound level meter. Data was collected from 12 sampled points that were randomly selected and at different timings (8-10 am, 12-2 pm and 4-6 pm). A survey questionnaire was used to elicit information from students and lecturers. Results were presented in tables and figures. The study found that levels of noise in the University was high, between 40 and 72.6 dB, exceeded the acceptable level of noise set by WHO. The major sources of noise were identified to be noise from generating sets, vehicles, and noise from students. This noise affects teaching and learning in various ways. The study proffers several measures which, if implemented, would help to reduce noise levels in the school and make them conform to WHO standards.

Keywords: Noise Level, Pollution, School Environment, Unical,

1. INTRODUCTION

Noise pollution is one of the fastest growing environmental concerns. Although in contrast with other pollutants, noise neither persists on the environment nor leaves physical scars. However, its consequences can be catastrophic (Thornton and Beckwith, 2004). In view of this, noise pollution has increasingly become a menace in the society these days. It is spreading so fast that it has started polluting the environment all over the world. Due to rapid urbanization, industrialization and advancement in science and technology, as well as the increasing rate of religious centres, the concept of noise pollution, has become one of the most serious phenomenon and challenge in most countries of the world as it endangers lives and affects the health of the public.

Noise is variously described as an unwanted sound or a sound out of place (WHO 2011 and Agbo 2020). Noise has been rated third, after gas and water, as pollution affecting human overall wellbeing (Heurique, Zannin, Vinicius, Laaconi da Cunha, Damiani, Benetti, Bianchi, Senko da Hora, Guedes, Portella, Pinto, & Ana 2013).

There has been a growing incidence of noise pollution within the tertiary institutions in Nigeria, despite the institution's positions as citadels of knowledge and intellectual discourse. Interestingly though schools, hospitals and government reserved areas are designated as noise control zones, whereby the noise levels must not exceed that stipulated in Nigeria's National Environmental (Noise Standards and Control) Regulations, 2009 (Federal Republic of Nigeria), that has not been the case. A review of studies carried out on noise pollution in Nigeria's higher education would show a trajectory for convincing the relevant authorities to implement abatement measures. Students in the university are exposed while in school to the numerous effects of noise from different sources especially from mini electric power generators, road traffics, and religious activities (Ali, Tamura 2003, Eludoyin 2016, Okeke and George 2015, Oguntoke, Tijani, Adetunji, and Obayagbona 2019, Oyedepo 2013, Usikalu and Kolawole 2018). Most of the students live in school hostels and rented apartment within the neighbourhoods. Many staff and their wards also live in schools' provided staff quarters within the school premises. In University of Calabar, academic activities are carried out within the school at both class and individual level. Classes and laboratory work, including workshop practices are usually taken between 8.00am and 6.00pm. Libraries open by 7:30am and close around 10:00pm, while individuals continue with their private studies at their rate and timing. These activities are expected to be done within a calm and serene atmosphere for maximum achievement. Nonetheless, the noise pollution in higher institutions continues to hamper the effectiveness of teaching and learning.

Noise caused by traffic is the nuisance that most often affects roadside residents. School administrations and students living in the proximity of roadways will increasingly perceived noise problems (Avsar and Gonullu, 2001). According to some of the studies, students' performance and behaviours can be changed both in high noisy ambience and quiet ambience (Sergeant Gidman, Humphreys, and Utley 1980). The higher outdoor noise causes the higher indoor noise in classrooms. Disturbance from the outdoor noise is increased in hot seasons in the classrooms (Avsar and Gonullu, 2005).

Environmental challenges vary considerably among school around the world, across countries and within communities (World Health Organization, 2004). The school environment encompasses the social, physical and biological factors. Learning in classroom is mainly facilitated through verbal and auditory communication between lecturers and students (Flexer and Long, 2003). Zannin, Zwirtes and Passero (2012) pointed out that long and arduous process of individual and collective education takes place primarily in classroom. It is here that contact is established between teachers and students and between individual students and their peers. It is here that knowledge is transmitted in its most ancient form i.e. through oral communication. The quality of this communication and ultimately of classroom education itself, is closely linked to the acoustic quality of the classroom. This acoustic quality can be characterized based on the reverberation time, speech transmission index, sound insulation and the noise level inside and outside the classroom (Zannin and Zwirtes, 2009). High noise level in the classroom impairs oral communication, causing students to easily become tired more often, and this premature fatigue tends to have a negative effect on their cognitive skills (Hagen, Huber and Kahlert, 2002).

School is also an important microenvironment just like the home and workplace. The school such as the University of Calabar is important for the cognitive, creative and social development of students. Schools are therefore expected to ensure the best possible conditions for students' physical and intellectual development, including control of excess environmental noise (Ana, Shendel, Brown and Sridhar, 2009). Urbanization has led to an increase in infrastructural development and economic activities all of which constitute potential sources of environmental noise

problem within Calabar metropolis and the University of Calabar. Also the rising enrolments that have resulted in over-crowding of few available facilities in the University of Calabar is another major problem.

The WHO in 2005 revealed that noise is a dangerous agent which affects human health and the environment (Zannin, Ferreria and Szeremetta, 2006). Noise exposures have been linked to a range of non-auditory effects including annoyance, sleep disturbance cardiovascular diseases and impairment of cognitive performances in children (Basner, Babisch, Davis Brink, Clark, Jansen and Stansfield, 2014). The University of Calabar is subjected to the noise from hawkers (especially around the lecture rooms and offices), noise from buses, cars, the roars of aeroplanes, generators, students and staff themselves.

Although noise pollution is attracting attention of policy makers, not much attention has been given to noise associated with educational institutions. However, several researches on noise pollution in higher institutions of learning have been conducted (Norlander and Archer 2005; Kang and Tompsett 2011; Debnath and Barthakur 2012).

Education is the foundation of any social, economic, political and cultural development in any society. Also, in each educational system, many factors act together to ensure good academic achievement of students. Every part of the educational system should be prepared in such a way that access to optimal efficiency and target can be achieved, because if one part of the system stops the performance of other component can be reduced and damaged. This study, therefore, would be expected to bring to the fore, the status of noise pollution and its effects on teaching and learning process in the area of study.

2. The Problematic

Academic environments are designed to be centres of excellence devoid of noise and distractions (Obiefuna, 2023). However, many of these are now well known as noise factories. Unfortunately, most institutions of higher learning are not aware of their status with regards to noise generation.

University of Calabar is dynamic in terms of growth in population, structures and other economic activities that are capable of generating noise, but no one pays attention to the negative aspect of the growth which is noise generation, these calls for regular noise measurement in the institution. Several economic activities such as, generating sets etc are springing up without control.

Over the years, the academic environments of educational institutions have been characterized with noise and this has posed a serious problem to teaching and learning process. Noise has a detrimental effect on academic environment and learning behaviour of students as high levels of background noise interfere with hearing and concentration in the classroom.

Studies have shown that noise has direct negative effects on students learning, with language and reading development particularly affected. There are also problems related to attention memory and motivation. In students, noise – an induced complication hinders the lecturer – student communication and eventually, affects the learning process. Constant noise exposure in classrooms can obstruct learning. On average, students who are exposed to noisy learning environments have lower assessment scores on standardized tests. The lecturer's voice is another point of real interest when we think about speech perception, as the great task of knowledge transmission depends on it; and it must be clear, harmonious, intelligible and beyond all and any competitive noise, otherwise the students will not follow the teaching (WHO, 2015). Students perceptions of noise in University of Calabar, reported that the most difficult listening scenario was noise outside the lecture room. For example, excessive noise in corridors during exam time will be a distraction to those undertaking examinations, or it can cause interruptions to normal classroom teaching. Identified sources of noise within University of Calabar are: overcrowded class rooms due to rising

enrolment, hawking activities around lecture halls, phone calls transportation, generating sets from students and lecturers themselves.

Ikenberry (1974) analyzed some effects of noise pollution on school students and found that the students find it difficult to hear the teachers, classroom discussion and follow other activities. Klatte, Bergstrom and Lachamann (2013), in their research work showed that students can perform better under quiet environment than under noisy ones. Debnath, Nath and Bathakur (2012) stated that noise pollution produces multi – problems to the teaching and learning process and negatively affects the performance of both teachers and students. This study aims to analyze the noise pollution levels in the University of Calabar. The objectives of this study are to:

I. determine the noise level in the school environment
II. identity the various sources of noise in the school environment

3. MATERIAL AND METHOD

3.1 The Study Area

The University of Calabar (Fig1) which evolved from the University of Nigeria, Nsukka (UNN), Calabar Campus was established in October, 1975 with the appointment of its Vice Chancellor. Teaching first took place in 1973 when the University of Nigeria, Nsukka opened a campus in Calabar and admitted the first batch of 154 students.

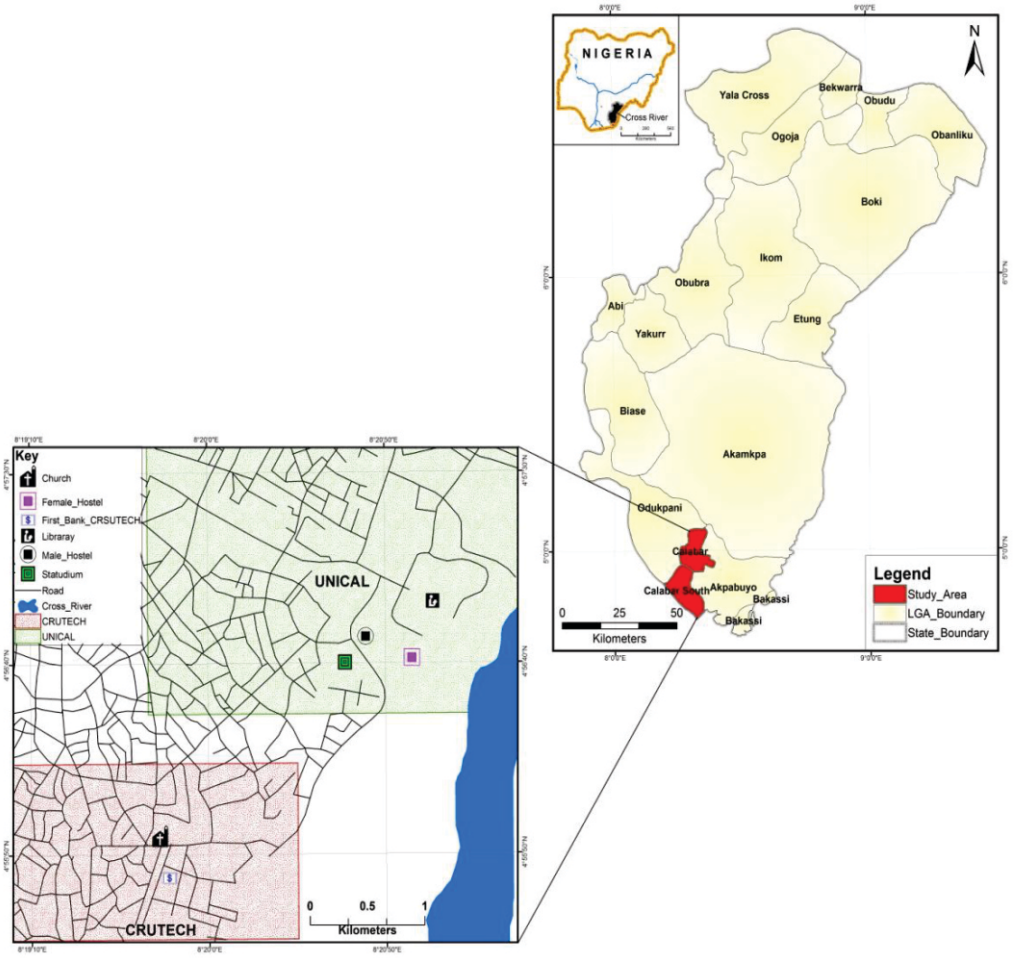

Figure 1: Cross River State map showing University of Calabar (Unical)
Source: Author's field work, 2022.

In April 1975, The Federal Military Government of Nigeria announced that as part of the National Development Plan, seven new Universities were to be established at various locations in the country. The University of Calabar was one of the seven universities set up under this programme. Located in Calabar Municipal, an ancient city with a long tradition of culture and contact with western civilization, the already developed area of the University occupies 17 hectares site on the eastern side of the town; between the Great Qua River and the Calabar River. Additional land has been acquired on both sides of the Great Qua River for the development of the university.

Academic activities actually commenced in the 1973/74 session, in what was then a campus of the University of Nigeria, Nsukka (UNN).

However, the new autonomous institution started academic work with the faculties of Arts, Sciences and Social Sciences in October 1976 with an initial enrollment of 896 students. Of the number, 406 students were carried over from the University of Nigeria. The teaching administrative and technical staff either transferred from the University of Nigeria or newly recruited, numbered about 156.

At the beginning of the 1977/78 academic year, the Department of Education, formerly a part of Faculty of Arts was upgraded to the Faculty of Education. In 1978/79 academic year, the College of Medical Science was added, while the Faculty of Law, established during the 1979/80 academic year began offering courses in October 1980. The Faculty of Agriculture was established during the 1980/81 academic year. Since then the University has been experiencing impressive growth. The University has one Graduate school, ten Faculties, and three institutes. Academic programmes of the University aim at laying a sound and broad undergraduate foundation upon which further intellectual and professional pursuits can be based at the Graduate School level. As any other University in the country, the University of Calabar places great premium not only on learning, but also on character.

From its nucleus on the Duke Town Campus, the University rapidly expanded into a busy academic community that is housed in a vast constellation of modern academic blocks, students' residential halls and staff quarters. The student population rose from 896 in 1976, spread in the Faculties of Arts, Science and Social Sciences. Currently, the student population stands at 40, 645. (www.unical.edu.ng).

3.2 Permissible Noise Levels

In order to protect the health of the public, various standards have been designed by World Health Organization WHO (Table 1) and National Environmental Standards and Regulations Enforcement Agency (NESREA) Table 2 (2009).

Table 1. WHO community noise guidelines values

Environment	Critical Effect	L_{aq} (dBA)	Timebase(h)	L_{max}(dBA)
Bedroom	Sleep disturbance	30	8	45
Dwelling room	Annoyance, Speech Interference	50	16	-
Outdoor (day)	Serious Annoyance	55	16	-
School classroom	Speech Interference	35	6	-
School courtyard	Serious Annoyance	55	Playtime	-
Hospital	Sleep disturbance	30	8	45
Patient/ward rooms	Communication interference	30	16	40
Concert hall	Hearing Impairment	100	4	110
Discos Headphones		85	1	110
Public addresses		85	1	110
Impulse sounds	hearing deficits	-	-	140

Source: World Health Organization (WHO) 1999

Table 2. Maximum permissible noise levels for the general environment in Nigeria (NESREA, 2009)

Column 1	Column2	
Facility	Max permissible noise limit dB(A) (L_{aq})	
	Day	Night
A. Any building used as a hospital, convalescence Home, home for the aged, sanatorium and institutes of higher learning, conference rooms, public library, environmental or recreational sites	45	35
B. Residential buildings	50	35
C. Mixed residential (with some commercial and entertainment)	55	45
D. Residential + industry or small-scale production + Commerce	60	50
E. Industrial (Outside perimeter fence)	70	60

Source: NESREA, 2009)

3.3 Sampling Technique

The sampling technique used for this study is the simple random sampling technique so as to randomly select locations from among the identified noise prone zones. Levels of sound intensity were measured using a sound level meter (SLM). The start – up time of this SLM depends on the state the instrument was in when last switched off and it may take up to 2 minutes from a cold start, or up to 10 seconds if the instrument is already in standby mode (i.e. from a warm start). The study sample locations were given equal opportunity of being selected.

A total of 36 noise prone zones were identified. While 12 locations representing 30 percent were selected for the study. The 30 percent selected is in conformity with some authorities such as Udofia, E. P. (2011); which states that, any study considering 10 percent sample coverage is ideal for any physical research. Selection was done using the table of random numbers.

3.4 Procedure for data collection/instrumentation

PYLE PSPL25 Digital Sound Level Meter is the experimental apparatus used in the recording of noise levels. It is a hand – held instrument and consists of a condenser microphone, an octave filter and four digits Liquid Crystal Display (LCD). When taking measurements, the microphone was positioned in such a way as not to be in acoustic shadow of any obstacle in the field of the reflected waves. It has an update cycle of 0.5 second and a resolution of 0.1dB. The system provides 30 to 130dB capability in three convenient measurement ranges. The ranges are low (30 to 80dB), with an accuracy of ±1.5dB. The meter meets the International Electro – technical Commission (IEC) 651 Type II standards, and includes frequency weighting of A and C and fast and slow time weighting.

Table 3. Study Locations and their GPS Coordinates.

LOC NO.	LOCATION NAME	ACTIVITY TYPE	GPS CORFDINATES	
			LATITUDE	LONGITUDE
1.	Nat Building	Lecture halls, Offices	4.952873	8.340038
2.	Social Science Building	Offices	4.954297	8.30440
3.	Environmental Science Building	Offices	4.95343	8.34101
4.	New Library Block/Building	Library, Offices	4.949193	8.350512
5.	Faulty of Physical Sciences Block	Offices	4.950483	8.350163
6.	Geology/Math Building	Offices, Lecture Rooms, Lab	4.950667	8.3506
7.	Biological Sciences	Offices	4.94977	8.352123
8.	NSLT 5	Lecture Hall	4.950085	8.349773
9.	Female Hostel	Hostel	4.949027	8.348652
10.	Post Graduate School	Office s,	4.950318	8.347368
11.	Medical School/	Offices, Labs, Lecture halls	4.951512	8.340065
12.	History and Intl. Studies`	Offices, Halls	4.94913	8.349027

Source: Author's field work, 2022

4. Results and Discussion

In order to achieve the set objectives, noise level data within the study location being the University of Calabar campus was acquired from 12 (twelve) sampled points that were randomly selected from 32 points (representing 37.5 per cent), after observations were made across the various noise prone zones. This is above the recommendation of Udofia (2011), which states that which states that a sample fraction of 10 percent is deemed adequate as no serious research can progress with a sample fraction less than 10 percent. Reading were obtained using the PYLE PSPL25 sound level meter (SLM) and below are various noise distribution within the study locations for a period considered. Data collection started on Monday, herein known as day one (Day 1). Data collection lasted for 30 days.

4.1.1 Noise Level for the sample Points Across the University.

Table 4: **Mean sound level for the study locations for morning, afternoon and evening**

LOCATION NAME	MORNING (x)	AFTERNOON(X)	EVENING(x)	MEAN
Nat Building	**42.6**	**51.5**	**42.6**	45.6
Social Sci. Building	52.5	56.98	55.14	54.9
Envt. Sci. Building	**49.91**	**51.14**	**51.71**	50.9
New Library Building	**47.48**	**52.54**	**51.08**	50.4
Faulty of Physical Sci.	43.34	50.26	49.98	47.9
Geology/Math Building	44.04	54.37	55.16	51.2
Biological Sciences	50.98	54.24	53.66	53
NSLT 5	51.05	56.98	54.64	54.2
Female Hostel	43.34	50.52	58.14	50.7
Post Graduate School	45.06	52.02	57.52	51.5
Medical School/	**40.75**	**54.18**	**51.05**	48.7
History and Intl. Studies`	**48.04**	**55.24**	**50.15**	51.1

Source: Author's field work, 2022

Table.4 shows mean noise levels for the entire study locations at the University of Calabar. This has been clearly depicted on the figure 2 below. From the chart, noise level was lowest in the morning represented by the blue bars. It has been observed that afternoon and evening noise levels are almost a par.

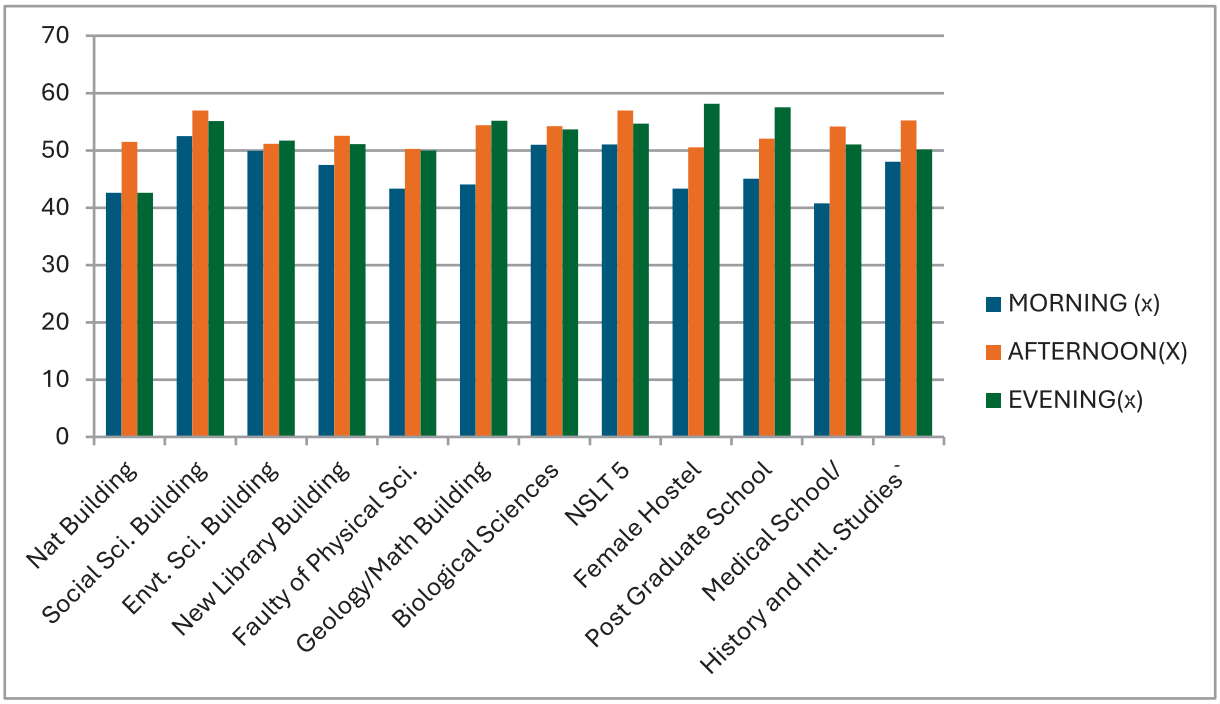

Figure 2: Mean Noise level for the three temporal periods for all locations
Source: Author's analysis, 2022

Table 5: Mean noise level for the moaning period.

LOCATION NAME	MORNING
Nat Building	**42.6**
Social Sci. Building	52.5
Envt. Sci. Building	**49.91**
New Library Building	**47.48**
Faulty of Physical Sci.	43.34
Geology/Math Building	44.04
Biological Sciences	50.98
NSLT 5	51.05
Female Hostel	43.34
Post Graduate School	45.06
Medical School/	**40.75**
History and Intl. Studies`	**48.04**

Source: Author's field work, 2022

Table.5 shows mean noise levels from all the locations for the morning period. This has been separated for clarity and has been clearly graphically depicted on the figure 3 below.

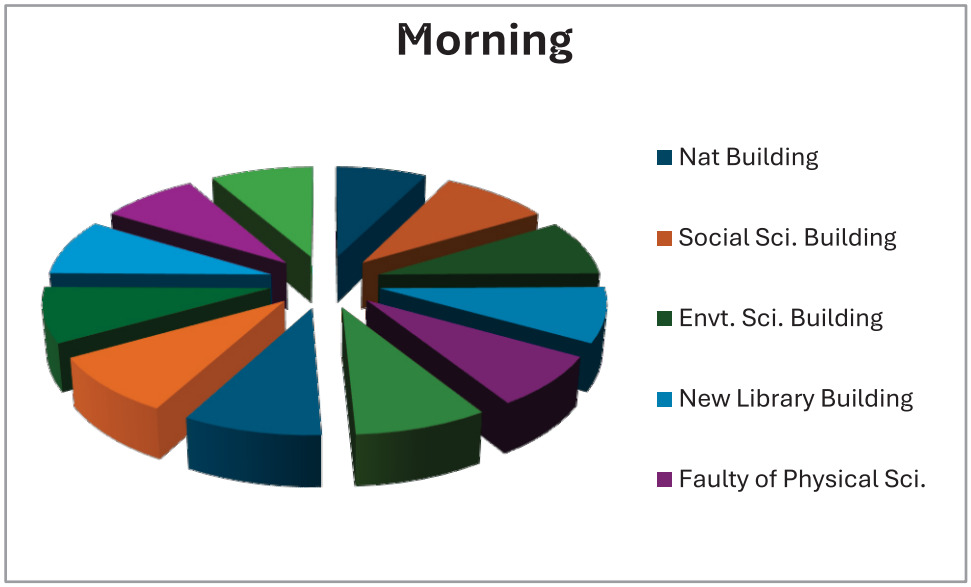

Figure 3: Noise levels from all the locations for the morning period
Source: Author's analysis, 2022

Table.6 Mean noise levels from all the locations for the afternoon period

LOCATION NAME	AFTERNOON
Nat Building	**51.5**
Social Sci. Building	56.98
Envt. Sci. Building	**51.14**
New Library Building	**52.54**
Faulty of Physical Sci.	50.26
Geology/Math Building	54.37
Biological Sciences	54.24
NSLT 5	56.98
Female Hostel	50.52
Post Graduate School	52.02
Medical School/	**54.18**
History and Intl. Studies`	**55.24**

Source: Author's field work, 2022

Table.6 shows mean noise levels from all the locations for the morning period. This has been separated for clarity and has been clearly depicted on the figure 4 below.

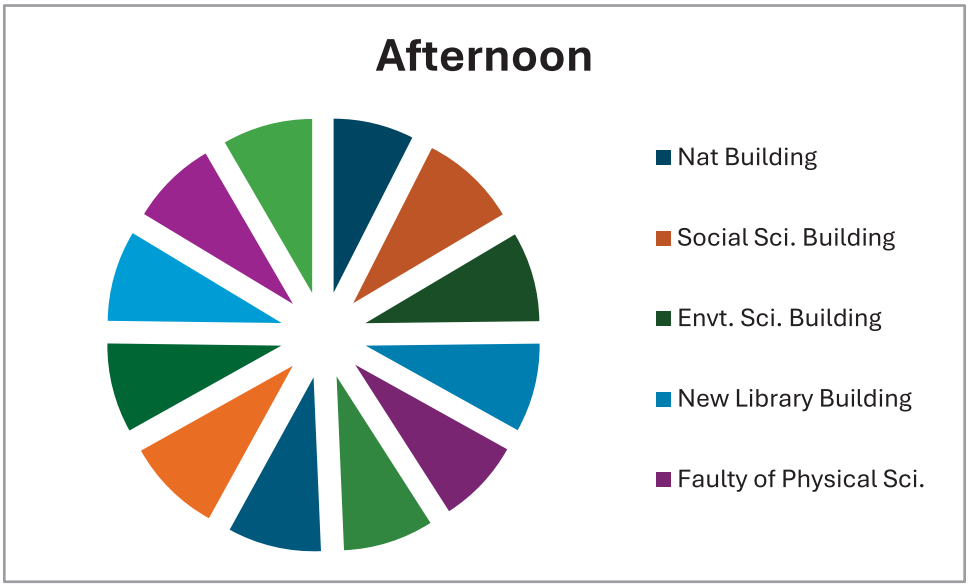

Figure 4: Noise levels from all the locations for the afternoon period
Source: Author's analysis, 2022

Table.7 Mean noise levels from all the locations for the evening period

LOCATION NAME	EVENING
Nat Building	**42.6**
Social Sci. Building	55.14
Envt. Sci. Building	**51.71**
New Library Building	**51.08**
Faulty of Physical Sci.	49.98
Geology/Math Building	55.16
Biological Sciences	53.66
NSLT 5	54.64
Female Hostel	58.14
Post Graduate School	57.52
Medical School/	**51.05**
History and Intl. Studies`	**50.15**

Source: Author's field work, 2022

Table.7 shows mean noise levels from all the locations for the evening period. This has been separated for clarity and has been clearly depicted on the figure 5 below.

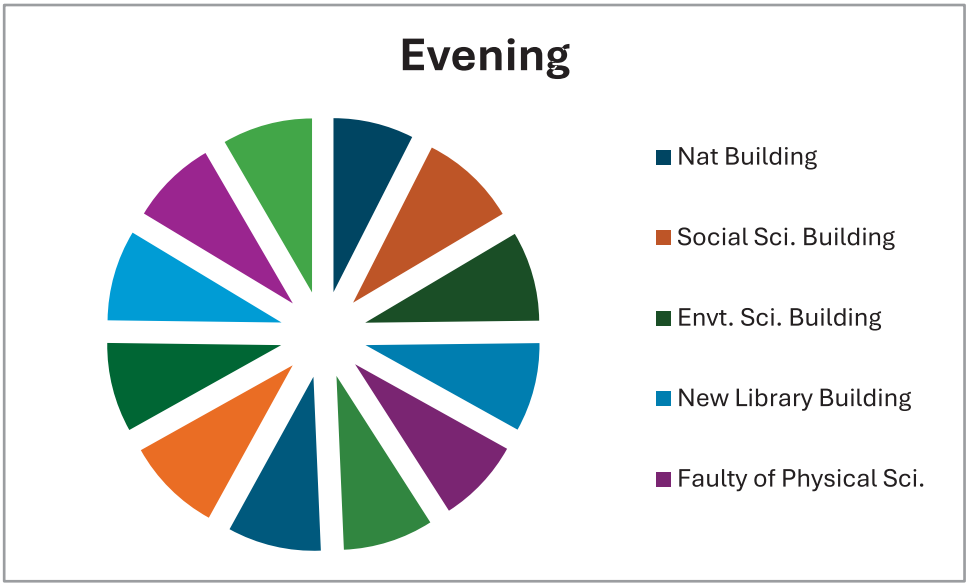

Figure 5: Noise levels from all the locations for the evening period
Source: Author's analysis, 2022

Table.8 shows grouped mean noise levels from all the locations

LOCATION NAME	Group Mean
Nat Building	45.6
Social Sci. Building	54.9
Envt. Sci. Building	50.9
New Library Building	50.4
Faulty of Physical Sci.	47.9
Geology/Math Building	51.2
Biological Sciences	53
NSLT 5	54.2
Female Hostel	50.7
Post Graduate School	51.5
Medical School/	48.7
History and Intl. Studies`	51.1

Source: Author's field work, 2022

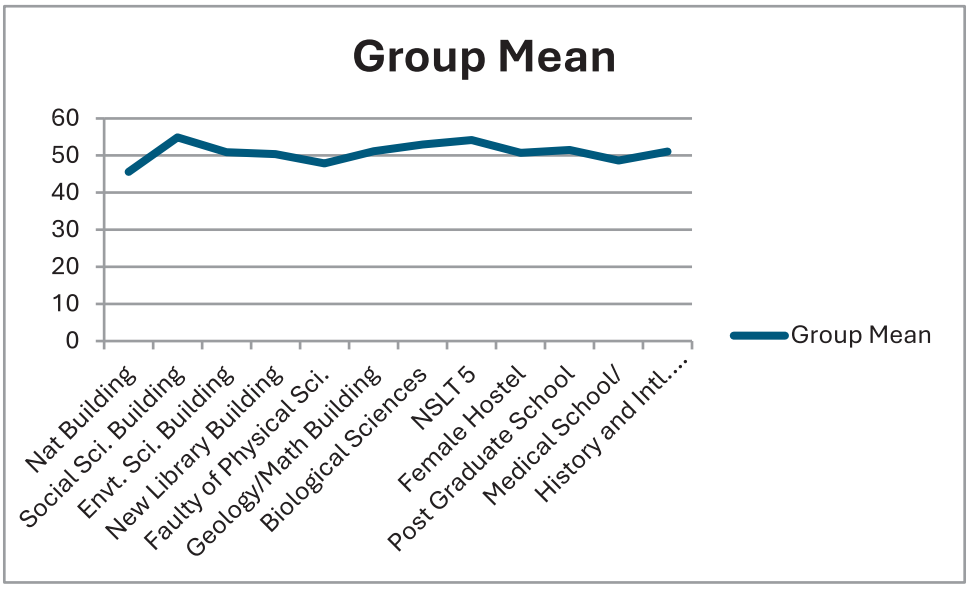

Figure 6. Grouped mean noise levels from all the locations
Source: Author's analysis, 2022

Table 9: Major Sources of Noise across the Study Locations

LOC NO.	LOCATION NAME	ACTIVITY TYPE	NOISE SOURCES
1.	Nat Building	Lecture halls, Offices	Etta Agbor traffic, generators, students, other surrounding economic activities
2.	Social Science Building	Offices	Generators, Moving vehicles, other surrounding economic activities
3.	Environmental Science Building	Offices	Generators, vehicles
4.	New Library Block/Building	Library, Offices	Generators. Vehicles, other surrounding economic activities
5.	Faulty of Physical Sciences Block	Offices	Generators, Others activities
6.	Geology/Math Building	Offices, Lecture Rooms, Lab	Generators, other surrounding economic activities
7.	Biological Sciences	Offices	Generators, other surrounding economic activities
8.	NSLT 5	Lecture Hall	Generators, other surrounding economic activities
9.	Female Hostel	Hostel	Generators, Buying and selling/ other surrounding economic activities
10.	Post Graduate School	Office s,	Generators, vehicles,
11.	Medical School/	Offices, Labs, Lecture halls	Generators, vehicles, Lectures, other surrounding economic activities
12.	History and Intl. Studies`	Offices, Halls	Generators, surrounding business, other surrounding economic activities

Source: Author's field work, 2022

Table 9 shows the study locations, and their major sources of noise. From observation, the major sources of noise as identified are generators, moving vehicles, car horns, surrounding economic activities and human noise. Since the research was purely based on observation, no questionnaire was given to elicit information on the sources of noise.

Generally, analysis of noise polluting in University of Calabar has been investigated. From findings, it was discovered that there exist high noise level all through the locations studies. In some locations, noise level exceed 70dB while in some moderately noisy areas, sound level exceed 50dB. These noise levels exceed WHO stipulated thresholds of 30-35 decibels for education facilities. Most of the high noise level appears to have emanated from moving vehicles, recurring and non-compliance economic activities, noise from people, vehicle horns, and generators.

With regards to the sources of noise in the revered academic institution, it was observed that, the major sources of noise identified are official generators, business generators, moving vehicles, car horns, and other surrounding economic activities which engage in buying and selling of all sorts as well as human noise.

In summary, the study aimed to analyze the noise pollution level in University of Calabar. Chapter one of the study deals with the introduction, definition of noise by several scholars and its effects on human health and academics. This chapter is also concerned with the description of the study area, significance of the study and as well as aim and objectives of the study.

The second chapter is concerned with the review of related literature and acknowledgement of different authors. It also contains table showing the permissible noise levels by WHO and National Environmental Standard and Regulation Enforcement Agency (NESREA). The third chapter explains the method of study: procedures for data collection/instrumentation as a table showing study location and their GPS coordinates. Data presentation and discussion of findings were carried out in chapter four.

From the study, it is shows that the noise level in University of Calabar is not in accordance with the WHO permissible noise level for an academic environment, which if nothing is done it would continue to hinder the effectiveness of teaching and learning.

5 Recommendations

From the findings of the research, it is therefore recommended that in order to reduce sound/noise level in the institution, efforts have to be made to reduce inflow of vehicles into the purely academic and sensitive areas such as conference rooms, classrooms, labs and offices. Vehicles should be parked at designated point far from these sensitive areas and lecture theatres.

Secondary, a mini market should be erected far from sensitive zones and all the non-complying economic activities should be relocated. Again, it would be advised to have sound proof system installed in major classrooms in order to reduce noise level penetrating into these classrooms.

Furthermore, speed bumps should be installed all through the campus to reduce high engine raves, which leads to high noise level from vehicles.

Finally, there is need for adequate and repeated monitoring of noise level on campus in order to help identify defaulters and possibly imposed sanctions towards general noise reduction in the campus.

6. Conclusion

Noise pollution is the spread of unwanted sounds into the environment. Noise is almost always around us, whether natural such as birdsong, or from human activity, such as vehicle traffic. Sources of noise have been identified to include generating sets, noise from students, vehicular noise or motorized vehicles etc. these noise affects academic activities in various ways. It poses health challenges inhibit overall academic performance and disrupts effective communication flow. Efforts should be made by the school management to ensure centralized electricity power supply since most

of the noise was as a result of the individual electric power generators.

It is an inclusive recommendation of this research therefore, that the school management should adhere strictly to the measures (recommendations) listed above in order to provide an acceptable conducive teaching and learning environment devoid of noise pollution.

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