COMPARISON OF THE NOISE LEVEL WITHIN THE CAMPUSES OF THE NIGER DELTA UNIVERSITY (GloryLand Campus, New site Campus and College of Health Science Campus)

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Abstract

The key objective of this research was to determine the various noise level of three campuses in Niger Delta University, Wilberforce Island, Bayelsa State. The campuses include Glory land Campus, New site Campus, and the College of Health Science (CHS) Campus. A physical/Acoustic measurement was carried out using Digital Sound Meter and Global Positioning System (GPS). Data obtained was used to compare the noise level in the campuses during Academic session and vacation and as well, it is being compared to World Health Organization (WHO) standard using a line graph. For Glory land Campus, the result shows that the Auditorium 86.3 dB(A) and Lecture Theatre 85.4 dB(A) has the highest noise level in the GloryLand Campus. Locations like the New Library 57.2 dB(A), Administrative Block 65.1 dB(A) has the lowest noise level. Locations such as Faculty of Management Science 80.5 dB(A) and New Lecture Block 81.7 dB(A) has the highest noise level in the New site Campus while DOCERAD 60.2 dB(A), ICT building 62.7 dB(A) and the Postgraduate School 63.2 dB(A) has the lowest noise level in the New site Campus. Lecture Theatre 84.3dB(A), faculty of Nursing 77.5dB(A), and faculty of Pharmacy 76.4dB(A) has the highest noise level in the CHS campus. CHS Library 60.7 dB(A), Administrative building 70.8dB(A), faculty of Clinical Sciences 71.7 dB(A), and Pharmaceutical Biotechnology Laboratory 72.9dB(A) has the lowest noise level in the CHS campus.

Keyword: Noise level, sound, intensity

1.INTRODUCTION

Noise is uninvited sound refereed to be unpleasant, loud or disorderly to hearing. Noise is undifferentiated from sound, as both are vibration through a mode, such as air or water (Elert, 2016). The variance arises when the brain grasps and notices a sound. Some of the negative effects of noise on individuals where identified in (Ogobiri, 2014) as communication and hearing loss, sleep disturbances and coronary heart disease (CHD) etc. although people react to noise differently as to some a quiet sound is a loud noise as noted by Ogobiri, et al (2014).

A study has shown that continuous exposure to noise causes health challenges on individuals. In institutions, environmental noise is associated with learning problems in undergraduates which include Reading comprehension, listening capacity, Speech understanding and Memory. In the long term, noise from internal and external of the classroom, including the one caused by transportation, can affect someone academic performance. Potential effects of noise include: Attention problems, difficulty differentiating sounds, difficulty understanding what is being said, loss of motivation to learn, impaired memory, especially for complex tasks requiring understanding, reading difficulty equal to a delay of two months in learning to read, poorer results in mathematics (The Effects of Environmental Noise on Health, 2016).

According to (Physics of Hearing, 2019) states that "The significant physical quantity is sound intensity, a model that is valid for all sounds whether or not they are in the loud range".

According to (Physics of Hearing, 2019) define Intensity is defined to be the power per unit area conveyed by a wave. Power is the degree in which energy is transferred by the wave. In equation form, intensity I=P/A, where; P stands for the power through an area A. The SI unit for I is W/m2 where the intensity of a sound wave is related to its amplitude squared by the following relationship:

$$I = \frac{(\Delta p)^2}{2pv_w}$$

where Δp is the pressure variation or pressure amplitude in units of pascals (Pa) or $\mathrm{N/m^2}$. (p for pressure while power is denoted by P above.) The energy (as kinetic energy $\frac{mv^2}{2}$) of an oscillating element of air due to a traveling sound wave is proportionate to its amplitude squared. In this equation, ρ is the density of the material in which the sound wave travels, in units of kg/m3, and vw is the speed of sound in the medium, in units of m/s. (Physics of Hearing, 2019)

Sound intensity levels are cited in decibels (dB) which is very often than sound intensities in watts per meter squared (Physics of Hearing, 2019). The rationales for this choice of units are related to how we comprehend sounds. How our ears comprehend sound can be more perfectly designated by the logarithm of the intensity relatively to the intensity. The sound intensity level β in respect to decibels of a sound holding an intensity I in watts per meter squared is defined to $\beta(dB) = 10log_{10}\left(\frac{I}{I_0}\right)$, where $I_0 = \quad 10^{-12}\ \mathrm{W/m^2}$ is an indication intensity. Precisely, I0 is the lowest or tolerance intensity of sound a person with normal hearing can feel at a frequency of 1000 Hz. Sound intensity level is different from intensity itself. Since β is defined in relations of a ratio, it is a unitless quantity indicative the level of the sound relative to a fixed standard ($10^{-12}\ \mathrm{W/m^2}$, in this instance). The units of decibels (dB) are used to designate this ratio is multiplied by 10 in its definition. The bel, upon which the decibel is centered, is named Alexander Graham Bell, the creator of the telephone (Physics of Hearing, 2019).

It is therefore significant that the level of disturbance and annoyance caused by environmental noise within and around the Institution (Niger Delta University) be investigated. Then, an investigation of environmental noise within and around a university environment is therefore expedient as the results/data will educates and enlightens individuals on the impacts of noise. This study engages the use of noise level meter and data analysis software tools to understand the problem identified in this study.

This research work is carried out in the Campus of Niger Delta University (NDU), Amassoma, Bayelsa State. NDU is located in Wilberforce Island, Amassoma, Bayelsa State, Nigeria. NDU is a Bayelsa State Government owned University. It was established in the year 2000 and started academic activities in (2001/2002) Academic Session. The University is about 32km drive from the State Capital (Yenagoa) with Longitude $\mathrm{N}\ 04^0 58^{\mathrm{I}}\ 05.8^{\mathrm{I}}$ and Latitude $\mathrm{E}\ 006^0\ 05^{\mathrm{I}}\ 51.3^{\mathrm{I}}$. the University is currently made up of four (4) Campuses; GloryLand Campus, New Site Campus, College of Health Sciences (CHS) Campus, and the Law Campus.

This study work is centered on environmental noise and to compare the noise level in the three (3) campuses of Niger Delta University during Academic session and Vacation.

Situation	Acceptable level dB(A)	Comments
Working environment (8 hours daily)	75	No identifiable risk at this level
Bedroom at night	35	Maximum level
Indoor background level to ensure speech intelligibility	45	Desirable level to prevent significant community annoyance
Outdoor level night time	45	Maximum level
Outdoor level day time	55	Desirable level to prevent significant community annoyance.

Table 1: noise level for different working environment (WHO 2000)

Source: Ogobiri, et al (2013)

2.METHODOLOGY

This research work employs the use of noise monitoring technique and Global Positioning System (GPS). In noise monitoring, a digital sound level meter was used to ascertain the noise level at different locations within the Niger Delta University campuses, a hand held Global Positioning System (GPS) was also use to get the precise locations.

3.MEASUREMENT

Noise level measurement were taken at different locations within the three (3) campuses of the Niger Delta University. The locations include, College of Health Sciences (CHS), GloryLand Campus and the New site campus.

The digital sound level meter used in obtaining the noise levels of three Campuses and was set to A-weighting and slow response to ensure proper accuracy throughout the exercise. The A-weighting network was used because it is commonly used for industrial and environmental noise. In effects, it selects the low frequency sound energy that correlates well with the human response. Consequently, all readings were written as dB(A), where A stands for the A-weighting.

The digital sound level meter was held with its microphone at a distance of about 1.2m above the ground which is the approximate average ear ground distance for a human being.

4.RESULTS

The result obtained from the research work is shown below.

Table 2: Showing noise level for GloryLand Campus

GLORYLAND CAMPUS				
S/NO	LOCATION	G.P.S COORDINATES	NOISE LEVEL dB(A)	
			ACADEMIC SESSION	VACATION
1	Lecture Theater	N 04^0 58^1 $37.8''$ E 006^0 06^1 $18.0''$	85.4	63.2
2	VC Office	N 04^0 58^1 $44.7''$ E 006^0 06^1 $14.1''$	69.1	52.6
3	Engineering Block	N 04^0 58^1 $50.0''$ E 006^0 06^1 $08.4''$	82.8	60.3
4	Sick Bay	N 04^0 58^1 $38.0''$ E 006^0 06^1 $09.1''$	75.8	62.4
5	Auditorium	N 04^0 58^1 $27.7''$ E 006^0 06^1 $16.0''$	86.3	60.5
6	ETF Building	N 04^0 58^1 $30.1''$ E 006^0 06^1 $18.2''$	70.9	52.6
7	New Library	N 04^0 58^1 $33.1''$ E 006^0 06^1 $18.6''$	57.2	48.7
8	Lectureres Block	N 04^0 58^1 $04.2''$ E 006^0 06^1 $14.1''$	74.2	46.1
9	Girls Hostel	N 04^0 58^1 $44.6''$ E 006^0 06^1 $15.1''$	80.4	50.8
10	Boys Hostel	N 04^0 58^1 $40.9''$ E 006^0 06^1 $14.5''$	82.2	54.2

Table 3: Showing noise level for New Site Campus

NEWSITE CAMPUS				
S/NO	LOCATION	G.P.S COORDINATES	NOISE LEVEL dB(A)	
			ACADEMIC SESSION	VACATION
1	ICT Block	N 04^0 58^1 12.6''	62.7	48.2
		E 006^0 06^1 53.4''		
2	Post Graduate Block	N 04^0 59^1 26.8''	63.2	68.8
		E 006^0 06^1 27.1''		
3	Faculty of Mgt Sci	N 04^0 59^1 27.6''	80.5	48.5
		E 006^0 06^1 24.9''		
4	DOCERAD	N 04^0 59^1 29.5''	60.2	64.2
		E 006^0 06^1 44.0''		
5	New Lecture Block	N 04^0 59^1 30.3''	81.7	48.1
		E 006^0 06^1 29.8''		
6	Faculty of Science	N 04^0 59^1 29.5''	68.4	46.7
		E 006^0 06^1 22.3''		
7	Physics Laboratory	N 04^0 59^1 05.0''	73.8	54.6
		E 006^0 06^1 43.3''		
8	Chemistry Laboratory	N 04^0 59^1 25.4''	72.1	46.8
		E 006^0 06^1 24.4''		
9	Biology Laboratory	N 04^0 59^1 23.4''	74.3	40.3
		E 006^0 06^1 23.3''		
10	Old Faculty of Social Sci.	N 04^0 59^1 30.5''	80.6	58.7
		E 006^0 06^1 24.1''		

Table 4: Showing noise level for CHS Campus

CHS CAMPUS				
S/NO	LOCATION	G.P.S COORDINATES	NOISE LEVEL dB(A)	
			ACADEMIC SESSION	VACATION
1	CHS Library	N 04^0 58^1 05.0''	66.7	41.6
		E 006^0 05^1 47.1''		
2	Lecture Theater	N 04^0 58^1 03.9''	64.3	50.1
		E 006^0 05^1 45.7''		
3	Faculty of Pharmacy	N 04^0 58^1 07.8''	78.4	50.1
		E 005^0 05^1 41.4''		
4	Faculty of Nursing	N 04^0 58^1 03.7''	77.5	53.6
		E 005^0 05^1 35.3''		
5	Medical Surgical Block	N 04^0 58^1 05.9''	79.6	52.8
		E 005^0 05^1 34.6''		
6	Administrative Block	N 04^0 58^1 46.20''	78.8	42.9
		E 005^0 05^1 09.7''		
7	Faculty of Clinical Science	N 04^0 58^1 07.6''	70.7	49.2
		E 005^0 05^1 48.9''		
8	CHS Auditorium	N 04^0 58^1 04.2''	80.3	58.3
		E 005^0 05^1 45.6''		
9	Chemical Laboratory	N 04^0 58^1 09.0''	74.8	50.8
		E 005^0 05^1 35.0''		
10	Pharm & Biotechnology Lab	N 04^0 58^1 10.3''	82.9	46.4
		E 005^0 05^1 49.3''		

5.DISCUSSION

The results obtained from the Glory Land Campus as indicated in figure (1.1) shows that Auditorium and Lecture theatre has the highest noise level of 86.30 dB(A) and 85.40 dB(A) respectively during 8 hours of working time. The Auditorium has a high noise value because of its proximity to the University school gate, due to vehicular movement and business owners near the school gate operating with very loud generator sets. Also, the Lecture theatre has enormous noise due to business owners clustering round and using noisy generator. There is a general noise disturbance from University Generator House, which also contribute to the noise level of the university campus in general. Location like Sick Bay, and other locations which are not listed in the table 2 above e.g. Shopping complex, Hostel A, Sport complex tends to have high noise level because of their proximity to the University generator House.

The New Library, Administrative Block and the ETF building has the lowest noise level of 57.2 dB(A), 69.1 dB(A) and 70.9 dB(A) as indicated in table 2 above which is in conformity with WHO noise level Standard of 8 hours working time.

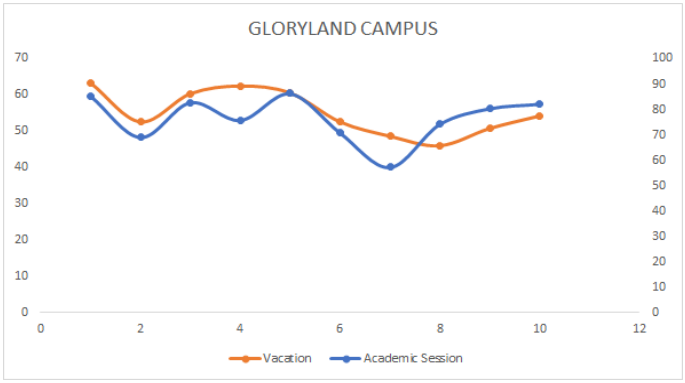

figure 1.1: Graph of the Noise Level within Niger Delta University GloryLand Campus

New Site Campus: New site campus has a moderate noise level as indicated in figure 1.2 below and table 3 above, faculty of Management Science block 80.5 dB(A), New Lecture Block 81.7 dB(A) and Old Faculty of Social Science 80.6 dB(A) have the highest noise level in the campus due to it rowdiness and students clustering around the faculty block which is common in a university setting. Locations like the DOCERAD 60.2 dB(A), ICT building 62.7 dB(A), Postgraduate School 63.2 dB(A),

and Faculty of Science 68.4 dB(A) has the lowest noise level in the New site Campus.

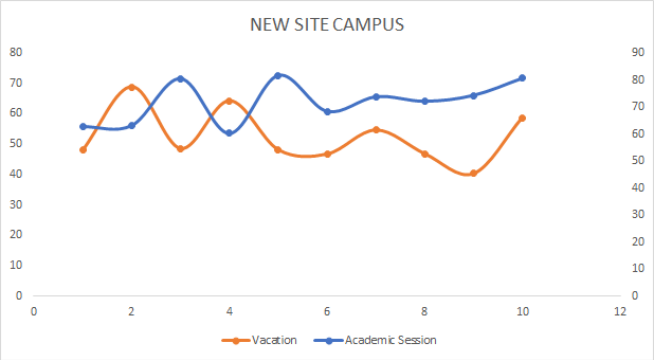

figure 1.2: Graph of the Noise Level within Niger Delta University New site Campus

CHS Campus comprises of locations such as the CHS Library, faculty of Nursing, Pharmacy, Basic Medical Science, Administrative Building, as indicated in table 4 above. In figure 1.3, CHS Library 60.7 dB(A), Administrative building 70.8dB(A), faculty of Clinical Sciences 71.7 dB(A), and Pharmaceutical Biotechnology Laboratory 72.9dB(A) has the lowest noise level in the campus. The Lecture Theatre 84.3dB(A), faculty of Nursing 77.5dB(A), and faculty of Pharmacy 76.4dB(A) has the highest noise level in the campus.

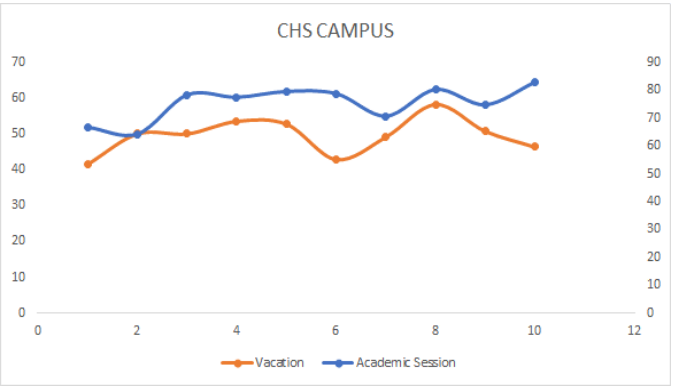

figure 1.2: Graph of the Noise Level within Niger Delta University CHS Campus

6.CONCLUSION

An extensive study on environmental noise level within the Niger Delta University campuses was carried out. The study employed the use of physical measurement as a method to collate noise data and the impact of this environmental noise. The research shows the level of noise dB(A) in three (3) campuses of the University which are the Glory land Campus, New site campus and the CHS campus. Glory land Campus has the highest noise level in all the three campuses covered in this research work. New site Campus and the CHS Campus have a low noise level in the University.

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