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NOISE LEVELS AND DISTRIBUTION PATTERN IN KEN SARO-WIWA POLYTECHNIC BORI, RIVERS STATE

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ABSTRACT
Noise level distribution pattern was carried out in Ken Saro-Wiwa Polytechnic Bori, using a digital sound level meter designed according to the 1 EC 651, Type 2 and ANSI SI.4 Type 2 standard, with accuracy of ±1.5 dB and a measurement range of 30 dB(A) to 130 dB(A). Ten locations were selected in the Bori Polytechnic Institution and surveyed, the results were used to model the noise equivalent continuous noise and noise pollution level. Neekwanu eatery had the highest $L_{max}$with 119.5 dB(A) at 5m with noise climate (NC) of 34.3 dB(A) and noise pollution index of 58.1 dB(A) followed by the generating plant zone with 101 dB(A), location 10 and 5 had 94 dB(A) and 91.5 dB(A) respectively. The Noise level and equivalent continuous noise at Neekwanu were high at 5m and hence predictive while that of library was less predictive. Noise climate was high at locations 1, 2, 3, 4, 5 and 10. Generally there was a regular sinusoidal noise climate which depended on its continuity in transmission given the equivalent continuous noise level. The locations showed a high level of noise on the campus with effect on teaching and other administrative jobs as identified here in terms of health as shown by this work.

Key Words: Highest noise level, lowest noise level, sound, noise pollution.

1. INTRODUCTION

Noise is a sound of irregular frequency. It is an irritating and undesired sound, loud and disorderly to hearing which can result to communication and hearing loss (Ogobiri etal 2014). Noise pollution is an environmental problem often associated with anthropogenic activities such as industrial, commercial, institutional and recreational activities with diverse effects on a person (Akpan 2018, Ugbebor etal 2017). Exposure to noise for a long duration according to occupational safety and health act (OSHA) may result to physical, physiological and even psychological problems (Akpan et al 2018).

Noise can be categorized into domestic, commercial and industrial while it is possible to place noise in school environment under commercialnoise, polytechnic institutions are likely to be placed under industrial or at least it seems to betray the threshold of commercial and industrial noise. Ogobiri etal (2019) noted that institutions environmental noise is associated with learning

problems in undergraduates in areas of reading, comprehension, listening capacity, speech and memory leading to problems of academic performance arising from issues of attention, loss of motivation to learning and impaired memory.

Research work have been carried out in area of noise. Ugbeboretal (2017) evaluated noise level in oil mill market and its environs, Port Harcourt, Nigeria. The work submitted that high noise pollution prevails within the market environment with potential health effects on traders and the public. Olayinka (2012) studied environmental noise pollution in Ilorin metropolis, Nigeria. There was noise exposure at the nucleus of the metropolis where there were commercial activities. Ogobiri etal (2019) compared the noise level within the campus of the Niger Delta University (Glory Land Campus, New site Campus and College of Health Science campus) they observed that the Auditorium and Lecture theatre had the highest noise level in the Glory Land Campus with noise levels of 86.3 dB(A) and 85.4 dB(A) respectively. The lowest noise level was reported for New Library with 57.2 dB(A). Other works include; Georgiadou et al 2004, Murthy etal 2007, and Ahamad etal 2006. This current work focused on the noise level and distribution pattern in KenSaro-Wiwa Polytechnic Bori, Rivers State, Nigeria.

2. MATERIALS AND METHODS

Materials used are a digital sound level meter and a GPS.

The primary focus was the Ken Saro-Wiwa Polytechnic Campus at Bori metropolis with selected locations. A total of ten (10) locations were identified and selected. The equipment used mainly was a digital sound level meter, which is designed to meet the measurement requirement of safety Engineers, health, industrial safety offices, Research Scientist, Sound quality control in various environment, which include factory, office, traffic, institution of learning, family and audio systems. It is designed according to the IEC 651 Type 2 and ANSI S1.4 TYPE 2 standard.

The sound level meter is a modern compact portable design with accuracy up to ±1.5 dB and a measurement range of 30dbA – 130 dBA. Operation environment condition of the equipment is below 2000 meters in height with humidity of 80% RH and operating temperature of approximately 40^{0C}. it is an A frequency weighting of frequency range of 31.5 Hz – 8.5 KHz and 0.1dB resolution. It was held at height of 1.2m above the ground in accordance with the European Union (EU) directive 86|188|EEC for purpose of measurement in this work.

Considering doppler effects noise measurement were taken out 20m away from source and 5m towards the noise source, with 10m and 15m distances at the center. Noise pollution indices were determined by the use of formula, using Gaussian positional technique adopted from (Akinyemi etal 2015)

$$NC = L_{max} - L_{min} \quad [1]$$

$$L_{eq} = L_x + \left[\frac{(NC)^2}{60}\right] \quad [2]$$

$$L_{np} = L_{eq} + NC \quad [3]$$

Where NC is the noise climate, Leq is the Equivalent Continuous Noise Level, Lnp is Noise Pollution Level and Lx the Positions Obtained from sampling data.

Fig. 1 Digital Sound Level Meter

3. RESULT AND ANALYSIS

GPS results: $4^{0}39^{1}57{,}7N$

$7^{0}22120^{0}C$

Table 1
Measured Noise Levels at various locations in Ken Saro-Wiwa Polytechnic Bori

Table 2
Measured Noise Levels at various locations in Ken Saro-Wiwa Polytechnic Bori

Location	15M		20M	
	L_{MAX} dB(A)	L_{MIN} dB(A)	L_{MIN} dB(A)	L_{MIN} dB(A)
Neekwanu Eatery	81	74	72.1	66.5
Love Garden	76.2	68.5	59	53.9
Glass blowing lab	70.9	61.5	57.4	48.6
Generating plant zone	73.6	65.8	68.7	62.5
Mechanical "Umbrella Tree Point"	74	66.6	59.8	52.8
Biochemistry HND 1 class area	68	61.2	54.7	46.8
Mass Comm. ND 2 Zone	62	57.6	54	48.3
ICT	80	75	77.3	68
Library	75	65.7	58.3	53.6
Three storeyTetfund project building environment	74.6	69.3	60	56.1

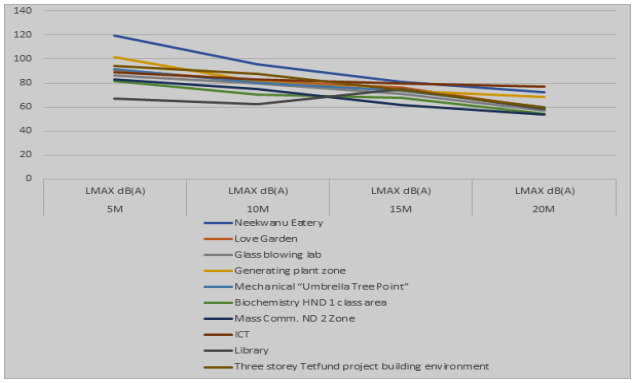

Fig.2Lmax against Distance

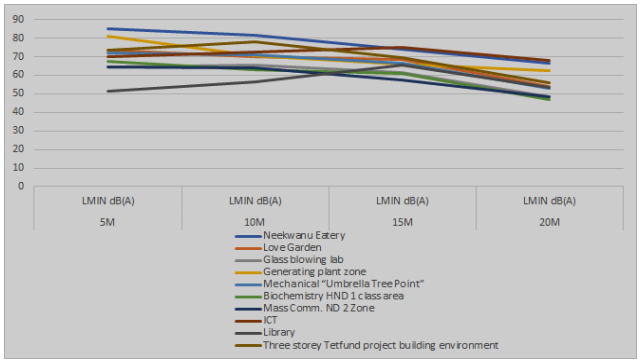

Fig.3Lmin against Distance

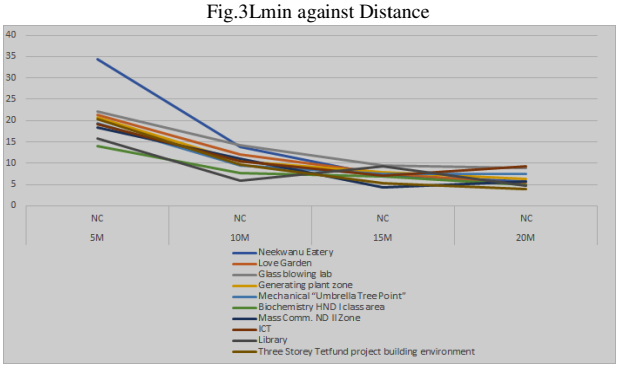

Fig.4NC against Distance

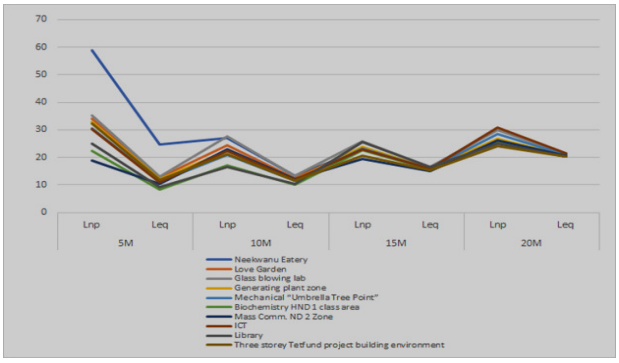

Fig.5Lnp and Leq against distance

The results of the noise level and distribution from the sampled locations in the polytechnic institution are presented in Tables 1, 2 and figures 2 to 5. The locations considered are;

Location	5M		10M	
	L_{MAX} dB(A)	L_{MIN} dB(A)	L_{MAX} dB(A)	L_{MIN} dB(A)
Neekwanu Eatery	119.5	85.2	95.4	81.6
Love Garden	90.9	73.5	82	70
Glass blowing lab	86.4	64.3	79.9	65.7
Generating plant zone	101.6	80.8	81.1	70.6
Mechanical "Umbrella Tree Point"	91.5	72.1	80.6	71.1
Biochemistry HND 1 class area	81.7	67.7	70.5	62.8
Mass Comm. ND 2 Zone	83	64.7	75	64
ICT	89.2	70	83	72.6
Library	67	51.2	62.4	56.5
Three storeyTetfund project building environment	94	73.6	87.8	78.1

Neekwanu eatery, Love garden, glass blowing laboratory, generating plant zone, mechanical classroom block "Umbrella tree point" biochemistry HND I class area, Mass communication ND II zone, ICT, Library and Tetfund project, three storey building environment, the highest noise level and noise climate was record at location I (Neekwanu eatery) with noise L_{max} at 5m of 119.5 dB(A) and noise climate of 34.3 dB(A). it equally registered the highest L_{np} of 58.1 dB(A) also at 10m, it reported a level of 95.4 dB(A). Location 4 (Generating plant) report L_{max} of 101 dB(A) and high noise climate of 20.8 dB(A). Others are; location 10 (Tetfund project), Location 5 (Mechanical) and Location 2 (Love Garden) with 94 dB(A), 91.5 dB(A) and 90.9 dB(A) respectively and noise climates of 20.4 dB(A), 19.4 dB(A) and 21.4 dB(A) respectively too.

These observed noise levels are relatively high and constitute serious health risk in terms of hearing loss, communication problem, cardiovascular issues, inhibition teaching and learning and memory loss. This submission is supported by works of (Akinyemi etal, 2015) and (Ogobiri etal, 2019). Analysis of the noise level values along the distance for10 locations showed that acoustic noise level decreases exponentially showing a doppler effect, this means that the noise level was sharper as the ear was closer to the source.

There was a sinusoidal noise climate and noise level at Neekwanu was predictive from fig. 5.

Generally, the lowest Lmax were recorded at locations; Mass communication ND II class, Biochemistry HND II class, Love garden and glass blowing laboratory with values of 54 dB(A), 54.7 dB(A), 59 dB(A), and 57.4 dB(A) respectively.

4. CONCLUSION

The study of the determination of noise level and its distribution pattern in Ken Saro-Wiwa Polytechnic has been conducted. The reported noise levels showed that neekwanu eatery had the highest noise level. The class room block location 5 (mechanic "Umbrella tree") and location 10 (three storeyTetfund project building) had noise levels of 91.5 dB(A) and 94 dB(A) respectively that are impacting on teaching and learning. We suggest that the noise level on the campus should be regularly monitor and efforts made to reduce it.

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