NOISE LEVEL ASSESSMENTS OF STUDENTS' ACTIVITIES CENTER IN LAGOS STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY, IKORODU, LAGOS, SOUTHWESTERN NIGERIA

[1*]Atilade, A. O., [2]Okedeyi, A. S., [3]Idowu, I. A., [3]Akinyemi, J., [4]Ogede, R. O. and [3]Taylor, J. I.
[1]*Department of Physical Sciences, Lagos State University of Science and Technology, Lagos State, Nigeria*
[2]*Department of Physics, Lagos State University of Education, Oto-Ijanikin, Lagos State, Nigeria*
[3]*Department of Mathematics and Statistics, Lagos State University of Science and Technology, Lagos State, Nigeria*
[4]*Department of Science Laboratory Technology, Federal Polytechnic, Ado-Ekiti, Ekiti State, Nigeria*
*Corresponding author email: atilade.a@mylaspotech.edu.ng; atiladeadesanya@gmail.com

ABSTRACT

Activities Centre is the location of Students' Union Government Secretariat in Lagos State University of Science and Technology (LASUSTECH) with huge populations and commercial activities around the area. This research work measures the noise level at the center and compares the results obtained with noise standards in Nigeria. Fourteen points were randomly selected at the center covering the entire area. Noise level measurements were carried at these locations using sound level meters with product numbers N826317, N759668 N878050 and N826323 from 7 am to 8 am, 11am to 12 noon, 3 pm to 4 pm and 6 pm to 7 pm at one-minute interval. P-value and f-value statistical instruments were used to analyze the data generated. The results revealed that average temperature within the period of measurements ranges from 24.30^0C to 37.41^0C while the average equivalent noise level ranges between 46.5735 dB and 85.3920 dB. The result further indicated that the P-value is 0.011 and f-value is 2.788 for the location. The rate at which noise is generated at the study area is 2.0436, which is significant and calls for serious action.

Keywords: Average Equivalent Noise Level, Statistical Instruments, LASUSTECH Lagos.

INTRODUCTION

Noise is any unwanted sound observed in an environment. In most cases, noise is adjudged unpleasant and annoying or intrusive and distracting. The difference between wanted sound (music) and noise is greatly subjective. Noise is measured in decibels (dB). Since the 1950s, the relationship between noise and hearing loss has been the focus of studies (Amakom *et al*., 2019; Burns and Robinson, 1970). In a typical school environment, noise is not only a nuisance but can also interfere in student's educational performance (Amakom *et al*., 2019; Fernandes and Barreira, 2000). It feels uncomfortable teaching in noisy classrooms, while students find it very difficult to learn. There are several national and international guidelines relating to the acoustics of different environment. These mainly take the form of recommended values for reverberation time and background noise levels in the area, together with sound insulation requirements. A good example of these guidelines is seen from the World Health Organization (WHO) guidelines for community noise; the guideline specified an appropriate background level for classrooms as 35dB during lecturing session. The executive regulations of the environmental law include values for noise levels outside schools according to the type of area of the school, which is in the range of 50-60 dB in the day period (Ana *et al*., 2009).Modernization has led to people being exposed to very large amount of noise from industrial machines like generators, compressors and articulated vehicles.

Noise is not only unpleasant, it also affects human health and overall wellbeing negatively. Harmful effects of noise on human consist of auditory and non-auditory effects. Auditory effects are physical effects of noise; examples are; hearing loss, hearing impairment, threshold shift or tinnitus. Non-auditory effects of noise are physiological effects. Examples are; interference with speech communication, sleep disturbance, psychological effects (headaches, fatigue and irritability), and performance effect (task performance, distraction and productivity), annoyance, feeling of displeasure, where tolerance vary enormously and noise impulses are more annoying than steady noise (Kamal *et al*., 2010). Exposure to loud noise from any source is the most common cause of hearing loss and impairment (Dobie, 2008; Smith, 1998). This can mean exposure to very loud noise for a short time or prolonged/repeated exposure to moderately loud noise. Reid *et al*. (2006) opined that the cumulative and non-linear nature of the

risk of hearing loss associated with noise exposure means that this risk can increase significantly with separate brief periods of exposure throughout a workday or shift.

Due to the erratic nature of electric power supply in LASUSTECH Activities Centre, most of the shops have resorted to acquiring electric generators for the smooth running of their businesses. There is always a pooled noise level within the nooks and cranny of the school environment.

This study was undertaken to measure the noise levels within randomly selected points close to students' union building located at Student's Activities Center during the peak and off-peak of academic activities. These results were compare the existing acceptable noise standard.

Table 1: Noise quality description for daytime and nighttime duration (Anomohanran, 2013)

Day-time		Night-time	
L_{eq} /dB_A	Noise Quality Description	L_{eq} /dB_A)	Noise Quality Description
0 – 30	Excellent Quality	0 – 30	Excellent Quality
31 – 40	Very good quality	31 – 40	Very good quality
41 – 60	Good quality	41 – 50	Good quality
61 – 75	Satisfactory quality	51 – 65	Satisfactory quality
76 – 90	Unsatisfactory	66 – 75	Unsatisfactory
91 – 110	Hazardous quality	76 – 90	Hazardous quality
>111	Not allowed	> 90	Not allowed

STUDY AREA

Lagos State University of Science and Technology has the special position of being the only public tertiary institution in Ikorodu Local Government Area. Geographically, it is located at latitude and longitude 6.6463° N and 3.5179° E respectively.

The study area for this survey is the Students' Activities Center in Ikorodu campus of Lagos State University of Science and Technology located along Sagamu Road (figure 1) with Latitude between 3^0 31′ 27′′ E and 3^0 31′31′′ E while the Longitude is between 6^0 38′30′′N and 6^0 38′38′′N. Lagos State Polytechnic is sitting on 323.88 hectares of land.

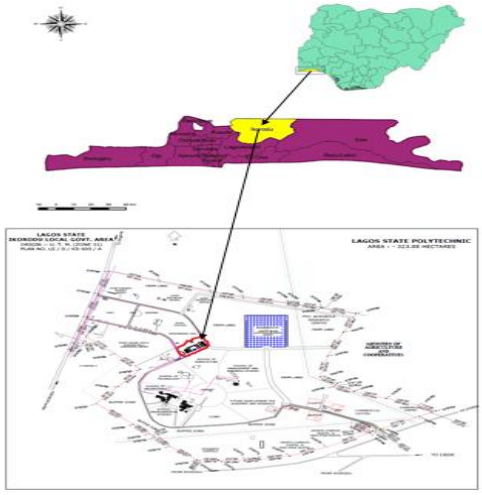

Figure 1: Map of Lagos State University of Science and Technology, Ikorodu showing the study area

MATERIALS AND METHODS

Materials

Four Multifunctional Sound Level Meter (Figure 2) SL-5868P and SL-5868BT with product numbers N826317, N759668 N878050, N826323 were employed for noise level data collection between the periods 7 am to 8 am, 11am to 12 noon, 3 pm to 4 pm and 6 pm to 7 pm at 1 minute interval. The temperature measurements were obtained simultaneously with non-contact infra-red thermometer (Figure 3) at 1 minute interval during the period of sound level measurements.

Figure 3: Non-contact Infrared thermometer

Methods

In carrying out the survey, fourteen locations were randomly selected at major blocks of the students' activities center within the campus. The locations are indicated in Table 2and were chosen based on the perceived noise level at the location and covering the study area.

The equivalent continuous sound levels L_{eq} is calculated using (Bolong*et al*., 2015)

$$Leq = 10\log\left[\frac{1}{t2-t1}\int_{t1}^{t2}\frac{p(t)^2}{p0^2}dt\right] \quad (1)$$

where p(t) is the time varying sound pressure, p_0 is the reference pressure taken as 20 μPa, t_1 and t_2 is time duration of 1 hour.

Table 2: Locations Selected for the Noise Level Measurements at Students' Activities center in Lagos State University of Science and Technology

Location	Location Description
1	Back of Block G
2	Block G
3	Back of Block F
4	Block F
5	Back of Block E
6	Block E
7	Back of Block D
8	Block D
9	Back of Block C
10	Block C
11	Back of Block B
12	Block B
13	Back of Block A
14	Block A

Noise level data collection were obtained between the periods of 7 am to 8 am, 11 am to 12 noon, 3 pm to 4 pm and 6 pm to 7 pm at 1 minute interval. The temperature measurements were obtained simultaneously at 1-minute interval during the period of sound level measurements.

RESULTS AND DISCUSSION

Data Analysis

Tables 3: Data of temperature, time and noise level of the study area

LOCATION	7AM - 8AM		11AM - 12PM		3PM - 4PM		6PM - 7PM	
	TEMP/^{0}C	L_{AEQ}/Db	TEMP/^{0}C	L_{AEQ}/dB	TEMP/^{0}C	L_{AEQ}/dB	TEMP/^{0}C	L_{AEQ}/dB
1	24.30	53.6028	31.80	65.5120	31.81	65.3933	29.86	67.2567
2	27.05	46.5735	33.30	59.3800	33.97	61.3433	30.07	59.9183
3	26.31	51.7357	33.08	60.0950	33.91	61.6117	30.67	63.3400
4	24.74	47.3823	32.22	59.3370	33.21	68.9583	30.20	76.0117
5	26.69	75.9600	35.08	79.9900	34.48	77.7833	30.50	53.8050
6	26.56	62.4200	32.46	73.7800	34.38	73.3633	30.94	60.7633
7	27.40	74.1350	35.30	76.9030	34.39	74.5267	30.61	63.6917
8	26.80	56.3783	34.30	79.6780	34.08	71.5533	30.42	61.7933
9	28.78	61.9470	35.38	85.3920	36.31	84.5183	32.31	68.7933
10	30.77	57.6850	34.94	85.1630	35.49	84.7917	33.05	71.8300
11	28.22	63.7467	37.41	61.1820	35.59	77.0017	32.07	71.2617
12	30.77	57.6850	34.94	85.1630	35.49	84.7917	33.05	71.8300
13	27.56	63.5880	33.03	70.0130	35.10	71.6420	30.18	64.3430
14	27.40	63.2950	31.50	73.5470	33.17	73.7733	29.07	60.8620

Table 4: ANOVA Summary Table for Noise Level Dependent Variable: NOISE

Source	Type III Sum of Squares	Df	Mean Square	F	P-value
TIME	1386.005	3	462.002	9.305	0.000
LOCATION	1522.600	13	138.418	2.788	0.011
Error	1638.454	39	49.650		
Total	221733.032	55			

R Squared = 0.993 (Adjusted R Squared = 0.989)

Table 5: DUNCAN post-hoc test for noise level

LOCATION	7AM - 8AM	11AM - 12PM	3PM - 4PM	6PM - 7PM	Mean ± SD
1	53.6028	65.5120	65.3933	67.2567	62.94 ± 6.28^{ac}
2	46.5735	59.3800	61.3433	59.9183	56.8 ± 6.87^{c}
3	51.7357	60.0950	61.6117	63.3400	59.19 ± 5.15^{c}
4	47.3823	59.3370	68.9583	76.0117	62.92 ± 12.41^{ac}
5	75.9600	79.9900	77.7833	53.8050	71.88 ± 12.17^{ab}
6	62.4200	73.7800	73.3633	60.7633	67.58 ± 6.95^{abc}
7	74.1350	76.9030	74.5267	63.6917	72.31 ± 5.88^{ab}
8	56.3783	79.6780	71.5533	61.7933	67.35 ± 10.34^{abc}
9	61.9470	85.3920	84.5183	68.7933	75.16 ± 11.65^{a}
10	57.6850	85.1630	84.7917	71.8300	74.87 ± 13.03^{a}
11	63.7467	61.1820	77.0017	71.2617	68.29 ± 7.21^{abc}
12	57.6850	85.1630	84.7917	71.8300	74.87 ± 13.03^{a}
13	63.588	70.013	71.642	64.343	67.40 ± 4.03^{abc}
14	63.2950	73.5470	73.7733	60.8620	67.87 ± 6.8^{abc}
Mean ± SD	59.57 ± 9.3^{b}	71.66 ± 10.1^{a}	72.88 ± 7.7^{b}	64.94 ± 6.2^{a}	

REGRESSION MODEL

The model showing the relationship between noise level (Y) and temperature (X) is given by:

$$y_i = \beta_0 + \beta_1 x_i + e_i \quad (2)$$

Table 6: Model Estimation

	Estimates	Std Error	t-statistic	P-value
Intercept	3.1346	10.0214	0.313	0.756
X	2.0436	0.3151	6.487	0.000

R^2 = 0.4379 and Adjusted R^2 = 0.4275. The model estimate is $y_i = 3.1346 + 2.0436x_i$

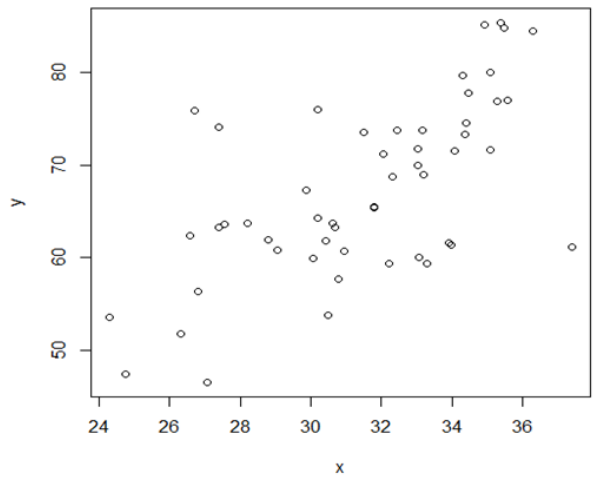

Figure 4: Scatter plot of the study area

DISCUSSION

The effects of noise and time are tested on different locations in Lagos State Polytechnic Students' Activities Center, Ikorodu campus. The results showed that, the effect of time on noise level is significant at 5% level of significance level that is they are significantly different. Different location with their noise levels are also correlated that is location plays an important role in noise level. Table 3 revealed that average temperature within the period of measurements ranges from 24.30 ^{0}C to 37.41 ^{0}C while the Average equivalent noise level ranges between 46.5735 dB and 85.3920 dB.

In the analysis, noise levels at times 7am-8am and 3pm-4pm are the same while those at 11am-12pm and 6pm-7pm are not different at locations 1 and 4. Locations 2 and 3 produced the same noise level, also, locations 9 and 10. At time between 3pm and 4pm, the noise level at location 5 and 7 are the same at 95% confidence level while at times 11am-12pm and 6pm-7pm, the noise levels are the same.

The fitted model for the data collected at different locations and time is

$$Y_i = 3.1346 + 2.0436X_i \quad (3)$$

This signifies the rate at which the noise is being generated at the location is 2.0436 which is significant and call for serious action. The scatter plot shows that different locations and time are closely related with the noise level.

CONCLUSION

In this work, noise level assessment of Students' Activities Center was carried out. The results revealed that average temperature within the period of measurements ranges from 24.30^0C to 37.41^0C while the average equivalent noise level ranges between 46.5735 dB and 85.3920 dB. 85.392 dB is unsatisfactory according to the standard noise level set by various regulatory bodies. Statistical analysis also showed that the P-value is 0.011 and f-value is 2.788 for the locations while the fitted model for the data collected at different locations and time is $Y_i = 3.1346 + 2.0436X_i$. These results signify that there is significant noise in the study area which calls for serious action.

REFERENCES

Amakom M. Chijioke, Ukewuihe U. Mathias, Nwokolo V. Ifeanyi, Igbo C. George (2019). Noise in a Nigerian University. *Journal of Environment Pollution and Human Health,* 7(2), 53-61.

Anomohanran, Ochuko (2013), Evaluation of Environmental Noise Pollution in Abuja, The Capital City of Nigeria. *IJRRAS*14(2), 470-476.

Ana G. R., Shendell D. G., Brown G. E., Sridhar M. K. (2009). Assessment of noise and associated health impacts at selected secondary schools in Ibadan, Nigeria. *Journal of environmental and public health*.

Bolong, O.,Ramli, R. and Saad, I. (2015).Noise assessment in Student Centres of Universiti Malaysia Sabah Main Campus. BIMP Journal of Regional Development. ISSN 2232-1055, 1(1).

Burns W., Robinson D. W. (1970).Hearing and noise in industry. *Hearing and noise in industry*.

Dobie R. A. (2008).The burdens of age-related and occupational noise-induced hearing loss in the United States. *Ear and hearing*, 29(4), 565-77.

Fernandes J. C. and Barreira C. S. (2000) Speech recognition obtained with the use of sound field FM system in hearing impaired children. *InAnais da Annual Convention & Exposition of American Academy of Audiology*. 144-153.

Kamal M., El-Rahman R. A., Tawfiq S. (2010). Evaluation of noise levels affecting schools in Cairo-Egypt. *Proceedings of* ISMA2010.1811-1820.

Reid N, Thorne P, Ameratunga S, Williams W, Purdy S, Dodd G. (2006). Best practice in noise-induced hearing loss management and prevention: A review of literature, practices and policies for the New Zealand context. Accident Compensation Corporation of New Zealand.

Smith A. W. (1998). The World Health Organisation and the prevention of deafness and hearing impairment caused by noise. *Noise and Health*.1(1), 6.