Cottage Industry, Road Traffic Commercial and Residential Noise Survey of Obio- Akpo, Rivers State Nigeria

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Abstract: - **The issue of noise standards has been of controversy because of associate penalties and economic interest. This paper seeks to look at the various standards as it relates to our practical field realities using the cottage industries as A the road traffic source as B, the commercial and market scenarios as C, and The residential and coastal environments as D. The study discovered a great interphase between the four on the issues of the minimum or ambient noise level which is taken as control but variance at the peak noise level which is taken as maximum in the respective blocks. This has a range of 45-65 dBA at the residential "D", 57-72 at the commercial centres "C", 55, 85 dBA at the road traffic "B" and 55 to 95 at the cottage industries, "A", in reverse order. Particularly the use of generators and pneumatic hand tools for cutting and drilling. The range exceeded the WHO standard for most instances. The details are shown in table 3.0, and 4.0 5.0, 6.0 ± results. While fig 1.0, shows the regression scatter plots. We recommend that the Nigerian 90 dBA FEPA standard be revisited by sub- dividing into the four block system for credibility, and uniformity, based on thr reduced field data by this study in the four blocks.**

I. INTRODUCTION

The study hinges on the importance of noise standard and its correlation with field realities. Thus we have the WHO stand, US standards, Japan standard, Indian standard, Australian and the FEPA, Nigerian standards reflected in table 1. The ultimate aim is to ensure the health safety of the citizenry. A lot of studies has been conducted on the impact of sound on humanity. These impact area by WHO include hearing impairment, interference with spoken communication, sleep disturbances, cardiovascular disturbances, disturbance in mental health, impaired task performance, negative social behavior and annoyance. The noise management include: reduction of noisy activities, isolation of noise source, and control of generation of noise by laws personal protective wear and acoustic barrier among others.

The contributory authors on the impact studies include Bahish (2005) Bragawa (2001) Birgitta and lind all (1995), Bond (1996), Cartor eta al (2002) Deutche (2003) Fogari et al (2001), Geary (1996), Haralabids (2008) Ising and Michalah (2004), Kapoor and Singh (1995) hieman (1997), Nagi et al (1993, 1999), Narendra and Davar (2004) Simgh and Mahajan (1990), Singh (1984) and Nte (2018), WHO (2005).

This study is to compliment the other studies by looking at the standards

Table 1: Noise level standard in some countries

	Industrial		Commercial		Residential		Silent Zone	
Countries	Day	Night	Day	Night	Day	Night	Day	Night
Australia (dB)	55	55	55	45	45	35	45	35
India (dB)	75	70	65	55	55	45	50	40
Japan (dB)	60	50	60	50	50	40	45	35
US, EPA (dB)	70	60	60	50	55	45	45	35
WHO (dB)	65	65	55	55	55	45	45	35
Nigeria	90	90	90	90	90	90	90	90

Table 2: Noise exposure limits for Nigeria (FEPA 1991)

ENVIRONMENT	CRITICAL HEALTH EFFECT	SOUND LEVEL dB(A)	TIME (HOURS)
Outdoor living areas	Annoyance	50-55	16
Indoor dwellings	Speech intelligibility	35	16
Bed rooms	Sleep disturbance	30	8
School classrooms	Disturbance of communication	35	During class
Industrial, commercial and traffic areas	Hearing impairment	70	24
Music through ear phones	Hearing impairment	85	1
Ceremonies and entertainment	Hearing impairment	100	4

Source: world health organization (WHO), 2014.

II. METHODS

The material used include a Rion NL31 Model noise meter, a Global position system GPS, and a field truck with Odometer. The meters was switched on from "ON/OFF" Button and after the display on the screen, the 'FAST' and 'slow' mode were set up through the buttons. Thereafter measurement were obtained from the four cardinal position with an averaging to get the point reading.

The mathematical computation include:

$$leg(\infty) = \frac{\sum legi}{N} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$6 = \sqrt{\sum \left(\frac{Leqi - Leq(\infty)^2}{N-1}\right)^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$Lnp = Leq + ka \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

(Owate, et al 2005).

...where Leq= Equivalent Continuous Noise Level,

Lnp= Noise Pollution level

K is a constant with a value of 2.565 for Delta kind of environment and is the standard deviation of the obtained leq values (Avwiri and Nte, 2003).

The obtained result is as shown in tables 3, 4 and 5.

III. RESULTS AND ANALYSIS

The result and analysis for the four block using regression.

The intra relationship between the four blocks ABCD are shown in table 1.0 using Pearson correlation. Thus A= cottage in industrial noise, B= road Traffic noise, C= commercial areas "market" and D= "Residential". The maximum (MAX) is the peak noise. While the minimum (MIN) is the ambient in this context.

The regression and correlation analysis was done between the Min and Max measurement. The result is summarized in table 3 and 4, and a graph of the regress of Mii and Max is shown in Figure 1.0 below. This is using the characterization reported by Ogoke. et al. (2013)which range as follows; 0.00 to 0.20 (Slight), 0.21 to 0.40 (Fair), 0.41 to 0.60 (Moderate),0.61 to 0.80 (Substantial), 0.81 to 1.00 (Almost Perfect), also called Level of reliability.

Table 3.0: Correlation Analysis and t-test Statistics of Min and Max

Variables	Mean ±Std. Error	Sample size	Correlation coefficient (p-value)	Level of reliability	t-test Statistics (p-value)	Remark
Min and Max	55.84±0.6967	83	0.535 (0.000***)	Moderate	-18.555 (0.000***)	Sig.

Footnote: sig. at *=10%, **=5% and ***=1%

From the Table 3.0, it is observed that there is significance difference with the p-value (0.000), which is less than critical value of 0.05. The level of reliability between the minimum and maximum is moderate. Next: the regression of min and max was done to determine how the minimum explained the maximum industrial noise measurement.

Table 4.0: Regression and correlation analysis of Min and Max from A to D

Models	Coefficients ± Std. Error (p-value)	R^2 (%)	ANOVA F-test (p-value)	Remark
Min and Max	Constants: 29.280± 7.494 (0.000***) Coeff.(Min): 0.759±0.133 (0.000***)	28.5	32.401 (0.000***)	Low

Footnote: sig. at *=10%, **=5% and ***=1%

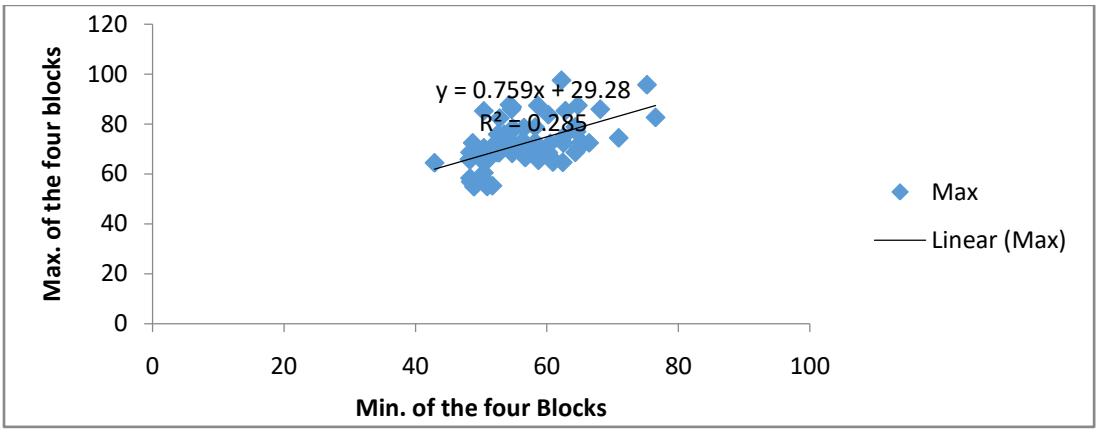

Figure 1.0: Scatter plot and trend analysis of Max and Min

The results in Table 2.0 and Figure 1.0 show a slight variability between min and max industrial noise evaluation. It implies that the min explained only 28.5% of its Max.

In addition, in Table 5.0 and 8.0, the significant between the communities (ABCD) were done using one-way ANOVA for minimum measurement and maximum measurement.

Table 5.0: One-way ANOVA for minimum measurement of the four communities (LSD)

Multiple Comparisons							
Dependent Variable: Min							
ANOVA F –statistic (p-value)		**7.868 (0.000)**					
	community	communities	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
LSD	1.00	2.00	7.81147*	1.73116	**0.000**	4.3657	11.2573
		3.00	6.56409*	1.75316	**0.000**	3.0745	10.0537
		4.00	4.39909*	1.75316	**0.014**	.9095	7.8887
	2.00	1.00	-7.81147*	1.73116	**0.000**	-11.2573	-4.3657
		3.00	-1.24738	1.77292	0.484	-4.7763	2.2815
		4.00	-3.41238	1.77292	0.058	-6.9413	.1165
	3.00	1.00	-6.56409*	1.75316	**0.000**	-10.0537	-3.0745
		2.00	1.24738	1.77292	0.484	-2.2815	4.7763
		4.00	-2.16500	1.79442	0.231	-5.7367	1.4067
	4.00	1.00	-4.39909*	1.75316	**0.014**	-7.8887	-.9095
		2.00	3.41238	1.77292	0.058	-.1165	6.9413
		3.00	2.16500	1.79442	0.231	-1.4067	5.7367
*. The mean difference is significant at the 0.05 level.							

Footnote: 1= A, 2=B, 3=C, 4=D.

From the Table 5.0 above it is observed that community A is significant from others. However, the others communities (B, C and D) are not significant from each other at 5% level.

Table 6.0: Means for groups in homogeneous (min)

Min				
	Community	N	Subset for alpha = 0.05	
			1	2
Duncan[a,b]	2.00	21	52.6476	
	3.00	20	53.8950	
	4.00	20	56.0600	
	1.00	22		60.4591
	Sig.		.070	1.000
Means for groups in homogeneous subsets are displayed.				
a. Uses Harmonic Mean Sample Size = 20.717.				
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.				

Footnote: 1= A, 2=B, 3=C, 4=D.

Table 6.0, it is observed that the groups are split into two subgroups in which it is observed that block B, C and D are together and community A stands alone at 5% level, which confirm the result in Table 5.0 for the min which implies the industrial noise.

Table 7.0: One-way ANOVA for maximum measurement of the four communities (LSD)

Multiple Comparisons							
Dependent Variable: Max							
ANOVA F –statistic (p-value)			**11.075 (0.000)**				
	community	communities	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
LSD	1.00	2.00	5.67792*	2.35054	**0.018**	.9993	10.3566
		3.00	4.55364	2.38041	0.059	-.1845	9.2917
		4.00	13.54864*	2.38041	**0.000**	8.8105	18.2867
	2.00	1.00	-5.67792*	2.35054	**0.018**	-10.3566	-.9993
		3.00	-1.12429	2.40725	0.642	-5.9158	3.6672
		4.00	7.87071*	2.40725	**0.002**	3.0792	12.6622
	3.00	1.00	-4.55364	2.38041	0.059	-9.2917	.1845
		2.00	1.12429	2.40725	0.642	-3.6672	5.9158
		4.00	8.99500*	2.43643	**0.000**	4.1454	13.8446
	4.00	1.00	-13.54864*	2.38041	**.000**	-18.2867	-8.8105
		2.00	-7.87071*	2.40725	**.002**	-12.6622	-3.0792
		3.00	-8.99500*	2.43643	**.000**	-13.8446	-4.1454
*. The mean difference is significant at the 0.05 level.							

Footnote: 1= A, 2=B, 3=C, 4=D.

Similarly in table 7.0 above, it is observed that communities A, B and C are significant. But the cottage industrial noise top the level.

Table 8.0: Means for groups in homogeneous (max)

Max					
	VAR00035	N	Subset for alpha = 0.05		
			1	2	3
Duncan[a,b]	4.00	20	63.9150		
	2.00	21		71.7857	
	3.00	20		72.9100	72.9100
	1.00	22			77.4636
	Sig.		1.000	.640	.061
Means for groups in homogeneous subsets are displayed.					
a. Uses Harmonic Mean Sample Size = 20.717.					
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.					

Footnote: 1= A, 2=B, 3=C, 4=D.

Table 7.0, we observe that at 5% level of significance, that the groups are split into three from which it can be seen that A and C are together, also B and C are together but D is on its own which confirm the result in Table 7.0 for max.

IV. SUMMARY AND CONCLUSION

The importance of guidelines and standards in any nation cannot be over emphasized as an index to work safety. This study tries to look at the available standards vis a vis the field realities. The minimum is taken to be the ambient or base line while the maximum is presumed to be peak of activities. The regression and correlation analysis was done between the minimum and maximum readings, furthermore the table shows that there is significance difference with P- value (0.000) which is less than critical value of 0.05. The level of relationship between the maximum and minimum is moderate. We recommend that the Nigerian government evolve a means of breaking down the standards in to segment

to avoid any form of abuse on the part of health safety and digression from the noise standards across the world, based on the result of the field survey by this study from the abstract.

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