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ENVIRONMENTAL NOISE STUDIES IN SOME AREAS OF CALABAR AND UYO, NIGERIA

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ABSTRACT

Environmental noise studies have been carried out in Calabar and Uyo, South-Eastern Nigeria, using sound level meter and questionnaires. Results of the objective measurements show that the average ambient noise level in Calabar falls between 38.0 and 48.0 dB(A) while that of Uyo falls between 39.0 and 49.3 dB(A). Noise levels as high as 80dB(A) were measured in some industrial areas and construction sites in both cities. The correlation coefficients between the objective and the subjective measures were found to be 0.33 and 0.68 for Calabar and Uyo, respectively.

KEY WORDS: Environmental noise, Objective measurement, Subjective measurement.

TRODUCTION

Noise is an unwanted sound which as a urbance interferes with useful signal during mmunication. It is a disturbance to our environment is escalating very rapidly and may soon become of the major threats to the quality of our lives.

Environmental noise pollution is not an ely new phenomenon, but rather it is a problem has grown steadily worse with time. A poem en about 1380 complains about the noise made by ksmiths; and early references to street noise in don date back to the early seventeenth century t, 1930).

Prolonged exposure to noise can produce anent hearing loss (Beranek, 1971; Bjorkam, ; Crockers and Price, 1975). Noise of muchlower s however interferes with normal conversation, ers sleep, causes irritability, and interferes with ation and recreation. Fatigue and inadequate rest ed by a noisy home environment coupled with action and impaired mental concentration of the oyees while on the job result in incalculable economic losses to employers (Griffiths and Raw, 1987; Izumi and Yamo, 1991; McNulty, 1987).

In general, the term community noise refers to the description of the outdoor environmental noise in the vicinity of inhabited areas. Given the wide range of purposes for which measurements are made, community noise studies vary widely in depth and detail. Inhabitants of Calabar and Uyo are exposed to noise from many sources. However, most of the noise originates from transportation vehicles such as automobiles, trucks, motorcycles and aircrafts.

The objectives of this study included obtaining the subjective and objective measures of community noise in Calabar and Uyo, and determining the correlation between them for comparison; getting a description of community response to noise; extracting environmental description for assessing current or future noise impacts; and identifying indoor and outdoor noise sources in Calabar and Uyo, and determining the extent of their influence so as to enlighten people living in the area on the ill-effects of noise.

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Table 1: Objective measure of noise in zones in Calabar

Zone	Zone Number	Ambient Noise Level (dB(A))
Marian/Big Qua	1	47.4
Essien Town	2	44.5
Highway/Ikot Ansa	3	40.0
Ikot Efanga Mkpa	4	38.0
Efut	5	48.0

Table 2: Objective measure of noise in zones in Uyo

Zone	Zone Number	Ambient Noise Level (dB(A))
Ewetn	1	40.5
Ikpa	2	47.6
Aka	3	47.0
Central	4	49.3
Housing	5	39.0

Table 3: Summary of respondent's noise rating in each zone in Calabar.

		Option Chosen				
Zone	% of respondent	Noisy	Moderately Noisy	Quiet	Very Quiet	Don't Know
Marian/Big Qua	34.60	94	93	47	10	02
Essien Town	19.70	42	53	40	04	01
Highway/Ikot Ansa	27.40	40	85	60	07	03
Ikot Efanga Mkpa	5.20	16	13	08	00	00
Efut	13.20	43	39	11	01	00
Total	100.00	275	283	166	22	06

Table 4: Summary of respondent's noise rating in each zone in Uyo.

		Option Chosen				
Zone	% of respondent	Noisy	Moderately Noisy	Quiet	Very Quiet	Don't Know
Ewet	8.04	16	10	08	00	00
Ikpa	22.90	42	40	10	04	01
Aka	22.60	40	50	44	01	00
Central	36.60	70	45	30	08	02
Housing	9.90	10	12	14	06	00
Total	100.00	186	157	106	19	03

Table 5: Percentage responses in each zone in Calabar.

		Option Chosen				
Zone	Noisy	Moderately Noisy	Quiet	Very Quiet	Don't Know	Total
Marian/Big Qua	38.2	37.8	19.1	4.1	1.8	100
Essien Town	30.0	37.9	28.6	2.9	0.7	100
Highway/Ikot Ansa	20.5	43.6	30.8	3.6	1.5	100
Ikot Efanga Mkpa	43.2	35.1	21.6	0.0	0.0	100
Efut	45.7	41.5	11.7	1.1		100
Total	177.6	197.6	111.8	11.7	3.0	500

MATERIALS AND METHOD

The objective measurement was done using the A-weighted sound level meter (B & K Type 2203) with a 1/3 octave band filter. The meter was placed on a tripod 1.2m above the ground. This level corresponds to the ear of an average human being. The A - weighted scale was used because it has been shown that it provides a single - value measure of noise level which approximately indicates the relative noisiness or annoyance of common sounds and also correlates well with loudness and annoyance (Taylor and Hall, 1979).

Each city was zoned into five and measurements were taken between 7am and 9am and 2pm and 4pm on working days (Monday to Friday). All measurements were taken without any specific noise source in mind. Fifty such random readings were taken at different locations within each zone and the intensity of each sound level was calculated using

$$I = I_0 \text{ antilog}_{10} L/10 \qquad (1)$$

Then using the average intensity for each zone, the average sound level was calculated with the equation (Beranek, 1971)

$$L_I = 10\log_{10} I/I_0 \qquad (2)$$

where I is the sound intensity in W/M^2

I_o is the reference sound intensity, generally $10^{-12}W/m^2$ and L is the sound intensity level in decibel.

The temperature during the measurements varied from 26°C to 30°C while the atmospheric pressure varied from 748mmHg to 750mmHg during the period.

Since it is not satisfactory to consider environmental noise only on the basis of measurement of the noise levels using a sound level meter only, a social survey using questionnaires was carried out also. This was necessary because of the variation of people' assessment of noise. Thus, the assessment of noise on a whole community rather than individuals or small groups was studied using questionnaires.

The questionnaire was designed to collect a comprehensive body of information on noise response, including respondents' attitude towards their neighborhood, their ratings of specific and overall noise levels and for each noise rated as disturbing, details of the time when disturbed, frequency of

occurrence, the types of activities interfered with and the perceived health effects.

The subject of noise was not introduced until the respondent had indicated the factors liked or disliked about the neighborhood. It was therefore possible to determine whether noise was mentioned prior to any prompting by the interviewer.

The rating scale developed to measure residents' assessment of noise levels in their areas was a five-point unipolar response categories as follows: (i) Noisy (ii) Moderately Noisy (iii) Quiet (iv) Very Quiet (v) Don't know.

The questionnaires were randomly distributed within the zones.

To determine how related the subjective responses, assessed by the use of questionnaire as a study instrument, were to the objective responses, measured with the sound level meter, the coefficients of correlation were calculated.

First comparism was accomplished by introducing scale value in the form of numbers to represent the respondents' noise rating of tables 1 and 2. Multiplying these numbers by their corresponding frequency of responses to obtain the corresponding weighted ratings and dividing the weighted ratings by their respective total respondents per zone. The overall average scale value which represents the overall environmental noise rating for that particular zone was calculated for each zone (Molino, 1979).

ANALYSIS AND RESULTS

(a) RESULTS OF SURVEY WITH SOUND LEVEL METER

The results of objective measurements are shown in Tables 1 and 2.

The survey showed that noise levels in Calabar lie between 38.0 and 48.0 dB(A) while those in Uyo lie between 39.0 and 49.3dB(A).

(b) RESULTS OF SURVEY WITH QUESTIONNAIRES

Out of the 1000 questionnaires sent out randomly in Uyo 712 were responded to while 423

Table 6: Percentage responses in each zone in Uyo

		Option Chosen				
Zone	Noisy	Moderately Noisy	Quiet	Very Quiet	Don't Know	Total
Ewet	47.1	29.1	23.5	0.0	0.0	100
Ikpa	43.3	41.2	10.3	4.1	1.0	100
Aka	29.6	37.0	32.6	0.7	0.0	100
Central	47.8	29.4	19.6	5.2	1.3	100
Housing	23.8	28.6	33.3	14.3	0.0	100
Total	191.6	165.3	119.3	24.3	2.3	500

Table 7.: Percentage responses in Calabar.

		Option Chosen				
Zone	Noisy	Moderately Noisy	Quiet	Very Quiet	Don't Know	% of total respondent
Marian/Big Qua	13.2	13.2	6.6	1.5	0.3	36.4
Essien Town	6.0	7.4	5.6	0.5	0.1	19.7
Highway/Ikot Ansa	5.6	11.4	8.4	0.4	0.4	26.9
Ikot Efanga Mkpa	2.2	1.8	1.1	0.0	0.0	5.1
Efut	6.0	5.5	1.6	0.1	0.0	13.2
Total	33.0	39.8	23.3	3.0	0.8	100.0

Table 8: Percentage responses in Uyo

		Option Chosen				
Zone	Noisy	Moderately Noisy	Quiet	Very Quiet	Don't Know	% of total respondent
Ewet	3.8	2.4	1.9	0.0	0.0	8.1
Ikpa	9.9	9.5	2.4	0.9	0.2	22.9
Aka	9.5	11.8	10.4	0.2	0.0	31.9
Central	16.5	10.6	7.1	1.9	0.5	36.6
Housing	2.4	2.8	3.3	1.4	0.0	9.9
Total	42.1	37.1	25.1	4.4	0.7	100.0

Table 9: Community Noisy rating in Calabar

	Option Chosen							
Zone	Noisy	Moderately Noisy	Quiet	Very Quiet	Don't Know	Response Per zone	Weighting rating	Average value per zone
	4	3	2	1	0	(n)	(nx)	(nx/n)
Marian/Big Qua	94	93	47	10	02	246	769	3.1
Essien Town	42	53	40	04	01	140	411	2.4
Highway/Ikot Ansa	40	85	60	07	03	195	542	2.8
Ikot Efanga Mkpa	16	13	08	00	00	37	119	3.2
Efut	43	39	11	01	00	94	312	3.3
						Σn = 712	Σnx=215	Σnx/n=15.3

Table 10: Community noise rating in Uyo

	Option Chosen							
Zone	Noisy	Moderately Noisy	Quiet	Very Quiet	Don't Know	Response Per zone	Weight rating	Average value per zone (nx/n)
	4	3	2	1	0	(n)	(nx)	
Ewet	16	10	08	00	00	34	110	3.2
Ikpa	42	40	10	04	01	97	312	3.1
Aka	40	50	44	01	00	135	399	2.9
Central	70	45	30	08	02	153	483	3.2
Housing	10	12	14	06	00	42	110	2.6
						Σ(n) = 461	Σnx=146	Σnx/n=15.0

questionnaires were responded to in Calabar out of 650 sent out giving response rates of 71% and 65% respectively. The respondents cut across all strata of the inhabitants: males and females; married and singles; workers and students; those who have stayed in their neighborhood for years and those who have just moved in.

Their responses to the key question - assessing noise in their neighborhood is summarised in Tables 3 and 4. The responses were converted to percentage responses for each noise rating at a particular neighborhood (Table 5 and 6). In order to compare the percentage response in a zone with another in any other zone(s), Calabar and Uyo respectively, Tables 7 and 8 were drawn.

Finally, using the objective responses as the x - variate and the subjective responses, represented by the average scale value per zone of Tables 9 and 10, the coefficients of correlation were found to be 0.33 in Calabar and 0.68 in Uyo.

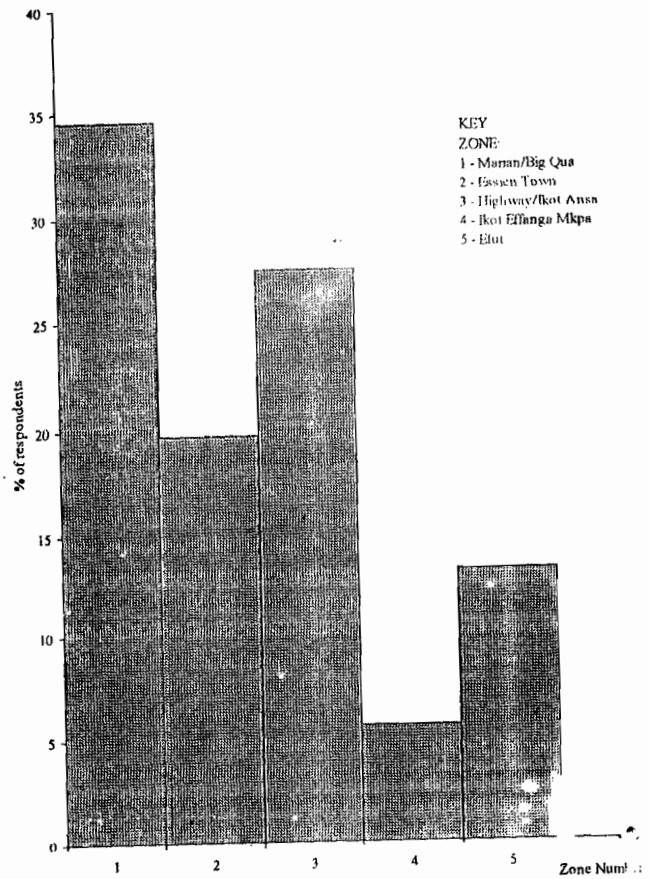

Fig 1: Percentage of respondents in each zone in Calaba

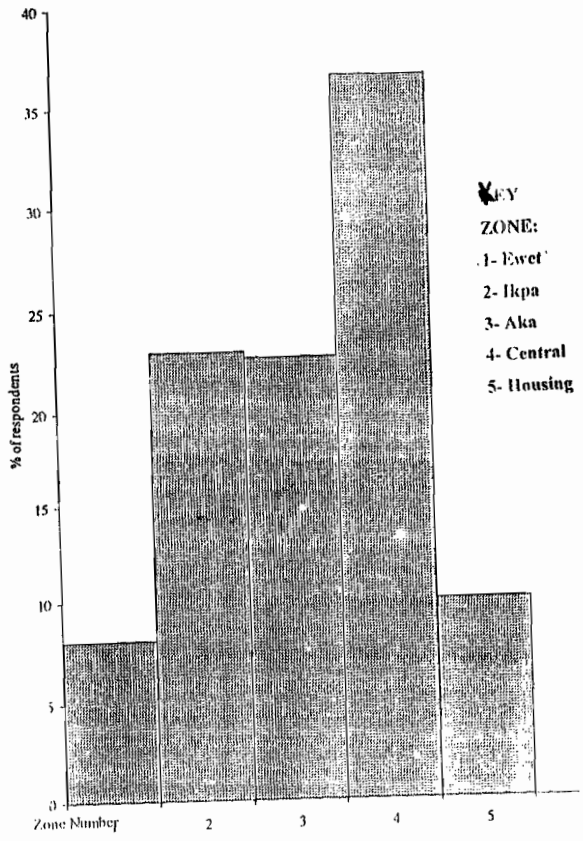

Fig 2: Percentage of respondents in each zone in Uyo

Figures 1 and 2 show the percentage of respondents in each zone in Calabar and Uyo respectively while figures 3 and 4 show the percentage of total respondents and their noise rating in each zone in Calabar and Uyo respectively.

DISCUSSION AND CONCLUSION

One can say that the average ambient noise levels in Calabar and Uyo are relatively low -below 50dB(A), although there were high noise levels in some areas within the zones, especially in industrial and construction sites where noise levels were up to 80dB(A) in some cases. These results agree with earlier work done in this areas (Onuu and Menkiti 1993, 1996; Onuu et al 1996).

The data thus justify one of the objectives of the study which is obtaining description of environmental noise for assessing current/or future noise impacts.

The study showed a good correlation between

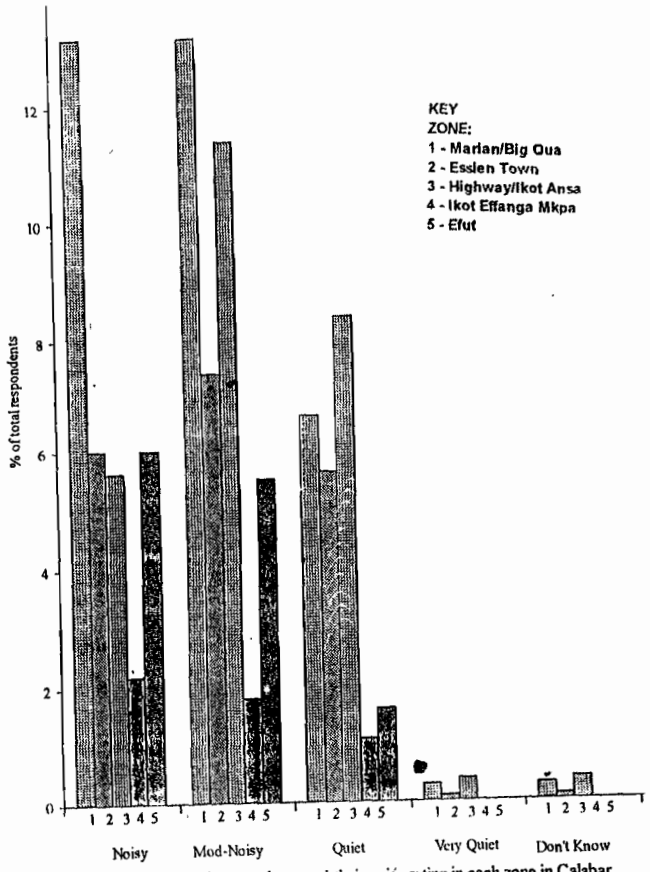

Fig 3: Percentage of total respondents and their noise rating in each zone in Calabar

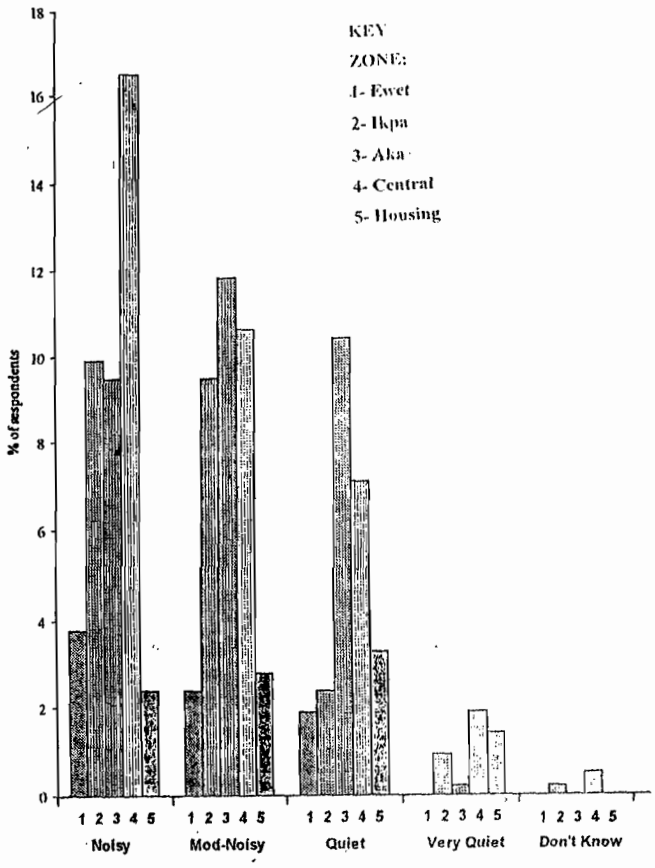

Fig 4: Percentage of total respondents and their noise rating in each zone in Uyo

physical and subjective measurements. Results showed that the objective and the subjective measures were about 0.33 correlated in Calabar and about 0.68 correlated in Uyo. The high correlation coefficient in Uyo may be because respondents in the area are more aware of noise and its effects than their counterparts in Calabar. Objective noise measurements in Uyo were comparatively high. Another reason maybe due to the variation in socioeconomic status of residents in the two cities. Earlier works revealed that variation in socioeconomic status affects respondent's response to noise (Taylor and Hall, 1977, Osada, 1991; Onuu, 2000; Namba et al 1991; Weinstein, 1982; Relster, 1975 and Sato et al 1991).

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