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CRITICAL ANALYSIS OF COMMUNITY NOISE BOTHERS IN URUAN, NIGERIA

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ABSTRACT

The effects of noise in a community have to be critically analysed so as to create awareness for the betterment of our society and for national development. This research therefore reports on the critical analysis of community noise bothers in Uruan, Nigeria. Noise level measurements were carried out at selected locations (L_1, L_2, L_3, L_4, L_5, L_6, L_7 and L_8) in the area. The data obtained were compared with the World Health Organisation tolerant noise levels. The selected locations were further assessed through administering of copies of questionnaire (with noise sources, N_1, N_2, N_3, N_4, N_5, N_6, N_7, N_8, N_9, N_{10}, N_{11}, N_{12} and N_{13}) to relevant respondents and the data were statistically analysed using Percentage Analysis Method. It was observed that L_1 had a mean noise level of 90.35 dBA, but only 29% of the respondents were bothered by the noise of N_{10}. The results of the findings revealed that people in the area were exposed to the noise of N_3 most, while the noise of N_7 bothered them most. However, there were many sources of noise in the area.

Keywords: Airport area, critical analysis, community noise bothers, land traffic, Uruan.

I. INTRODUCTION

Nowadays, community noise has soared to the point where it is currently the most important peril to the superiority of our life. This increase in noise can be attributed to the ever increasing number of people on earth and the growing levels of economic affluence (Ekott, *et al.*, 2018). In the United States of America, the Environmental Protection Agency (EPA) identified noise as a hindrance since in the 1970s (Akpan *et al.*, 2020 and Menkiti and Ekott, 2014a). Then, the agency carried out a main study of noise and has continued to bring up to date its results. To this end, the study of noise is a continuous phenomenon. As with all pollutants, noise degrades the value of our environment and is known to produce various negative effects both on structures and on humans.

Usually, noise from neighbourhood originates from building and installations associated with the food preparation business like cafeterias, restaurant, and discotheques; from recorded or live music; from playgrounds and car parks; from sporting events including motor sports; and from household animals for example barking dogs. The most important sources of Community noise are air, rail and road traffic, neighbourhood, municipal work, and the construction plant, among others. Community noise is considered by as residential noise or environmental noise or domestic noise (WHO, 1999; Ekott *et al.*, 2020). Some major sources of indoor noises include aeration systems, home appliances; office machines, and neighbours (Ekott, 2018).

The joint impacts of noise and vibration were observed in an examination carried out in Sweden, a play ground assessment were examined on the influence of introducing vibration and noise from traffic railway (Öhrström and Skånberg, 1996; Öhrström, 1997; Condie *et al*., 2011). The study aimed at comparing the annoyance owing to noise incidence of strong vibration level with regards to vibration exposure and annoyance owing to only noise. If the vibration created by railway traffic was below 1 mms^{-1}, locations were described as possessing feeble vibration and if the vibration was above 2 mms^{-1} locations were described as possessing strong vibration. It was established that in locations where vibration was strong, a greater noise bother for a particular exposure was obtained than in locations that had feeble vibration for the exposure to similar noise. It was recommended that, for bother to be the same, exposure to noise should be 10 dBA smaller in locations where there is vibration. In a study to examine the collective impact of vibration and noise induced by railway with respect to individual reaction (Knall, 1996), an opinion poll of 1056 interviewed populations from

565 homes was carried out together with physical measurements of in-house vibration and noise. Among the most important objectives of this work was to examine how the reaction to vibration is controlled by noise. The results of this survey propose that in the existence of elevated noise contact (> 55 dBA), the vibration sensitivity threshold is greater than before. In laboratory studies (Howarth and Griffin, 1991; Paulsen and Kastka, 1995), the same relations involving exposure to vibration and noise were observed (Ekott, 2018).

Traffic noise intrusions can obstruct speech communication, interfere with sleep and relaxation and disturb the capacity to perform difficult tasks in a community (Kiely, 1998). The public opinion polls almost constantly rank noise in the list of the most bothersome community irritations. The industrial noise is one of the most annoying sources of noise complaints (Ekott, 2011). In this context, noise is defined as unpleasant sound (Schmidt, 2005). Noise can be described as the unwanted sound in the unwanted location at the unwanted occasion. The level of "unwantedness" is usually a psychological issue since the effects of noise can range from temperate irritation to everlasting hearing loss, and may be rated in a different way by special observers (Ekott, 2018). For this reason, it is often exigent to establish the benefits of dropping a specific noise. Noise does affect the inhabitants, humans, fauna and others in the natural environment. Some definite places influence noise contacts; so it is invasive that it became difficult to run away from it (Ekott and Essien, 2019).

It is observed from the findings (Ekott *et al.*, 2018) that the equivalent continuous noise level (L_{eq}) which is a measure of the energy content of a noise decreases as the distance from the noise source increases and that the maximum noise level of a 500 kVA power generator is (97.44±0.37) dBA. The results of the findings also indicated that the distances, x_c in metres at which the adverse effects of the generator covered in the residential areas are $0 \leq x_c \leq 87$, while the corresponding distances, x_s in metres in which it can be sited from the residential areas are $88 \leq x_s \leq \infty$. In a non-work place and for health and safety purposes, 55 dBA is set as a safety noise level for outside and 45 dBA inside. Hospital and school permissible levels of noise are 35 dBA (WHO, 1999).The results of various researches have shown that constant noise above 55 dBA causes serious annoyance and above 50 dBA moderate annoyance at home (WHO, 2007). From findings, the noise exposure limits for industrial workers in Nigeria are as shown on Table 1 (FEPA, 1991).

Table 1: Noise exposure limits for industrial worker in Nigeria

Exposure time (h/day)	Permissible exposure limits (dB)
0.25 or less	115
0.5	110
1	105
1.5	102
2	100
3	97
4	95
6	92
8	90

Among others, noise beyond harmless levels leads to numerous health impacts which include high blood pressure, annoyance, sleep loss, stress, hearing impairment, loss of productivity and the inability to concentrate. Studies have recommended that noise level of 50 dB(A) at night may also increase the risks of myocardial infarction by constantly enhancing production of cortisol (Ekott, *et al.*, 2018). A study carried out by Cornell University indicated that children exposed to noise during classes experienced problem with various cognitive developmental delays in addition to words discrimination. Specifically, the writing learning mutilation called dysgraphic is usually related to stress on environment during classes (Stansfeld *et al*., 2005 and Clark *et al*., 2013). The WHO drew a conclusion that the existing evidence shown predicted a weak relationship between hypertension and long term exposure to noise beyond 67 – 70 dBA (Ising, *et al*., 1999). The British Columbia Work's Compensation Board sets 85 dB as its highest tolerant level in the work place. Above this limit hearing protection should be used. It states that the threshold of pain is attained at 120 dB and it classifies 140 dB as excessive hazard level. The WHO safety noise levels are similar, while EPA of Nigeria has even a stricter standard of 70 dBA as a maximum safe level of noise in work place. The safe level around home is 50 – 55 dB (Ekott and Menkiti, 2015).

The study of community noise is therefore very important so as to create more awareness on the adverse effects of noise in the community for the betterment of our society and for national development. In this research, the critical analysis of community noise bothers in uruan, Nigeria shall be carried out.

II. MATERIALS AND METHODS

2.1 Noise Level Measurements

The noise level measurements were carried out at various locations around homes and offices. These were sites that occupied sources that generated or appeared likely to generate noise. The locations included Akwa Ibom international airport area (L_1), churches (L_2), markets (L_3), roads/streets (L_4), road junctions/parks (L_5), schools (L_6), workshops/factories (L_7) and compact disk selling shops (L_8). All the noise measurements were made using the sound level meter (SLM), model WensnWS1361 with ½ inch Electret condenser microphone. This model has A weighting with a measuring range 30 to 130 dBA, C weighting with measuring range 35 to 130 dBC and 0.1dB resolution with fast/slow response. It is equipped with a built in calibration check (94.0 dB) and tripod moving. It has an accuracy of ± 1.5 dB. It has AC and DC outputs for frequency analyser level recorder, Fast Fourier Transform (FFT) analyzer, graphic recorder and others. It also has electronic circuit and readout display and a weight of 308 g. The microphone senses the small air pressure variations related to sound and converts them into electrical forms. These signals are then passed to the electronic circuitry of the instrument for processing. The readout displays the processed sound levels in dB. The sound level meter picks the sound pressure level at one instance in a certain location. Measurements were taken by adjusting the sound level meter to A-weighting network in all the sampling locations. During the noise level measurements, the microphone of the sound level meter was positioned at a distance of above 1 m from the main source at a height of 1.2 m above the ground and windshield was always used for accuracy. Work place noise level measurements were taken on slow response. Here, the response rate is the time period over which the instrument averages the sound level before displaying it on the readout. Fast response was used for fast varying noise. Measurement of workplace sound pressure was made in an uninterrupted noise field in the workplace, with the microphone located at the position normally occupied by the ear exposed to the highest value of exposure (Ekott, *et al.*, 2018). Then, the data obtained from the noise level measurements were compared with the WHO and other standard values.

2.2 Calculation of noise bothers

The levels of noise measured identified the locations that needed study. Therefore, a series of interviews of different sectors of the population of the area was considered. The idea was to have an insight into what types of sources people identify as noise and how they are bothered by the noise. This section addressed the impact of noise on environment. A heard and bothered questionnaire was developed and used. Different sources of noise included in the questionnaire were traders (N_1), tricycles/motor cycles (N_2), cars (N_3), churches (N_4), children (N_5), animals (N_6), workshops/factories (N_7), lorries (N_8), compact disk sellers (N_9), aircrafts (N_{10}) and ships/engine boats (N_{11}), power generator (N_{12}) and night clubs (N_{13}). Here, the interviewees were asked to tick the type(s) of noise they were exposed to and to indicate how the noise type(s) affect them. In the survey, 112 copies of the questionnaire were distributed but 87 copies of it were collected and used. Finally, the Percentage Analysis Method was adopted by using the following equations (Menkiti and Ekott, 2014b):

$$\%H = \frac{100H_N}{T_R} \quad 1$$

$$\%B = \frac{100B_N}{T_R} \quad 2$$

Where, %H = percentage heard, H_N = number of heard, B_N = number bothered and T_R = total number of respondents.

III. RESULTS AND DISCUSSION

3.1 Noise level measurements

The results of the noise level measurements are presented on Tables 2-3 and Figures 1-2. The results of the findings indicate that L_1 had a mean noise level of 90.35 dBA. Using the noise exposure limits for industrial workers in Nigeria (Table 1), workers are advised not to be exposed to these levels of noise beyond 6 – 8 hours per day. The results of the survey show that L_2 generated a mean noise level of 79.52 dBA. In the area, L_3 produced a mean noise level of 71.36 dBA. The annoying mean noise levels of L_4 and L_5 were 73.84 dBA and 76.28 dBA respectively. These values are above the WHO tolerant level of 55 dBA for outdoor living areas. Hence, these values with exposure time base of 16 and 24 hours can cause annoyance and hearing impairment respectively. L_6 had a mean noise level of 60.32 dBA instead of the WHO tolerant level of 35 dBA. This can have adverse effects on speech intelligibility, information extraction and message communication during classes (WHO, 1999). L_7 mean noise value was 83.60 dBA. In this case, the workers should be advised to wear ear protectors and the workshops/factories should not be sited around the residential areas. L_8 had an annoying mean community sound level of 70.00 dBA, which is 15.00 dBA greater than the WHO safe level of 55 dBA for a non-work area. The results of the finding agree with the results of many previous findings (Ekott and Menkiti, 2015; Essiett *et al.*, 2010). Copies of the questionnaire were distributed in these areas in order to determine how people were affected by different sources of noise that they were exposed to.

Table 1: Mean noise level of the selected locations

Location	Mean noise level (dBA)
L_1	90.35
L_2	79.52
L_3	71.36
L_4	73.84
L_5	76.28
L_6	60.32
L_7	83.60
L_8	70,00

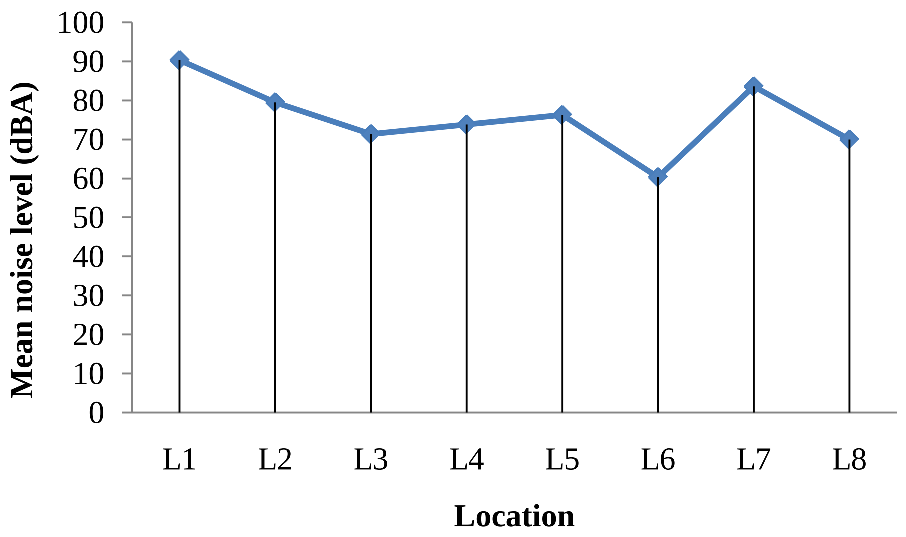

Figure1: Mean noise levels of the selected locations

3.2 Survey of noise bothers

Results of the survey are presented in Table 3 and Figure 2. From the survey, noise of N_1 was heard by 68% of the respondents exposed to it and 57% were bothered by it. In the area, noise of N_1 is third in the list of the noises that bothered the people most. Noise of N_2 bothered 47% of the 69% exposed to it. The noise of N_3 is the first in the list of the noises heard with 77%, but only 56% of the respondents were bothered by it. The annoying sound of N_4 had 66% of the respondents exposed to it while 47% were bothered by it. Noise of N_5 bothered 41% of the 60% exposed to it. The elevated sound of N_6 bothered 24% of the 55% exposed to it. In a nutshell, N_7 tops the list of sources of noise that bothered the people in the area. Noise of N_7 bothered 63% of the 76% exposed to it. The unwanted sound of N_8 bothered 59% of the respondents while 64% were exposed to it. Here, noise of N_8 is second in the list of the noises that bothered the people most. The results show that the noise of N_9 was heard by 39% of the respondents; only 16% were bothered by it. It is observed that 29% of the respondents were bothered by the N_{10} noise while 47% were exposed to it. In the physical measurement, L_1 had a mean noise level of 90.35 dBA. Therefore, the results of the findings reveal that L_1 is not located in the residential areas as only 29% of the respondents were bothered by the noise of N_{10}. Noise of N_{11} bothered 22% of the 37% exposed to it, while the corresponding percentages of N_{12} noise are 54 and 68. It is shown that the noise of N_{13} bothered only 18% of the respondents while 48% were exposed to it.

Table3: Survey of noise bothers

Noise Source	% H	%B
N_1	68	57
N_2	69	47
N_3	77	56
N_4	66	47
N_5	60	41
N_6	55	24
N_7	76	63
N_8	64	59
N_9	39	16
N_{10}	47	29
N_{11}	37	22
N_{12}	68	54
N_{13}	46	18

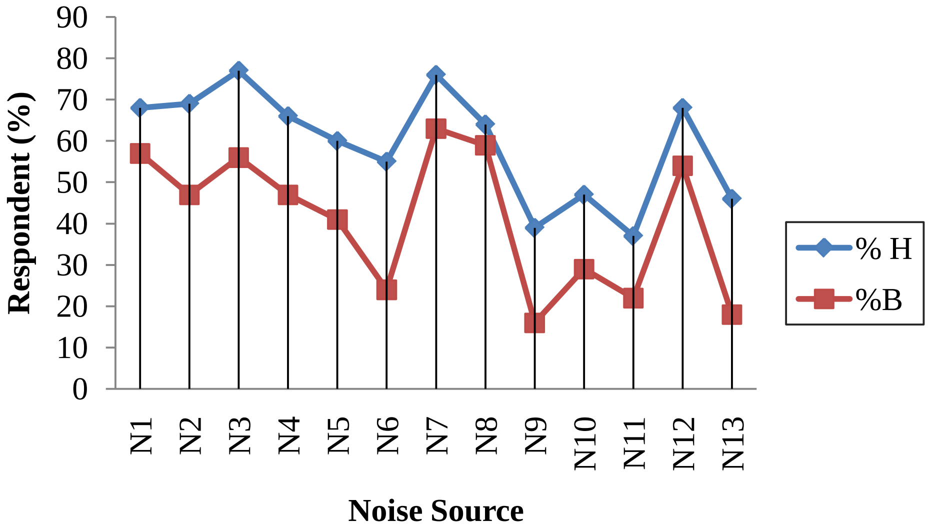

Figure2: Survey of noise bothers

IV. Conclusion

The results of the findings reveal that L_1 with a mean noise level of 90.35 dBA is not located in the residential areas as only 29% of the respondents were bothered by the noise of N_{10}. The results show that the selected locations had noise levels greater than the tolerant values. It is also concluded that people in the area were exposed to the noise of N_3 most, while the noise of N_7 bothered them most. However, the people were exposed to many sources of noise.

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