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Evaluation of the impacts of community noise pollution in Okobo Local Government Area, Nigeria

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Abstract: *Community noise creates negative impacts both on humans and on structures. As a result of the strong biased factor in the sensitivity of noise, physical measurements of noise give only partial interpretation of the real problem. Public view is one of the most dependable indices of the problem. This paper therefore presents the evaluation of the impacts of community noise pollution in Okobo Local Government Area, Nigeria. From the results of physical measurement, some major locations in the Local Government Area were chosen as interview centres. Sources of noise such as aircrafts, tricycles/motor cycles, cars, churches, children, animals, workshops/factories, lorries, compact disk sellers, traders and ships/engine boats, power generator and night clubs were presented to the interviewees. The interviewees were then asked to tick the type(s) of noise they were exposed to and to indicate how the noise type(s) affect them. The data obtained were analysed by using Percentage Analysis Method (PAM). The results reveal that noise has negative effects on the people of the area. The results also indicate there are many sources of noise in the area.*

Keywords*- Community noise, evaluation, , impacts, Okobo Local Government Area, pollution.*

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I. Introduction

Noise has escalated to the point where it is currently the most important peril to the superiority of our existence. This increase in noise can be attributed to the ever increasing number of people in the globe and the growing levels of economic affluence [1]. World Health Organisation (WHO) describes environmental noise as community noise or residential noise or domestic noise [2]. The most important sources of community noise comprise air, rail and road traffic, neighbourhood, municipal work, and the construction plant, among others. Usually, noise from neighbourhood originates from building and installations associated with the food preparation businesslike 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 major sources of indoor noises include aeration systems, home appliances; office machines, and neighbours. In the United States of America, the Environmental Protection Agency (EPA) identified noise as a hindrance since in the 1970s [3]. Then, the agency carried out a main study of noise and has continued to bring up to date its results. This means that the study of noise is a continuous phenomenon. As with all pollutants, noise demeans the value of our environment and is known to produce various negative effects both on structures and on humans. In this context, noise is defined as unpleasant sound [4]. However, noise can be described as the unwanted sound in the unwanted location at the unwanted occasion. The degree 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 [5]. For this reason, it is often exigent to establish the benefits of dropping a specific noise. Noise does affect the inhabitants, humans, fauna, etc, in the natural environment. Some definite places influence noise contacts; so it is invasive that it became difficult to run away from it. The public opinion polls almost constantly rank noise in the list of the most bother some residential irritations. General noise sources are industry, neighbourhoods and traffic. The industrial noise is one of the most annoying sources of noise complaints [6]. Elevated noise levels of adequate exposure time can result in short-term or permanent hearing damage. This is generally related to those working in industrial plants or operating machinery but can also take place at discotheques or near to aircraft on the ground if the duration is long enough. However, measurable hearing loss from many industrial sounds involves daily exposure for a number of years. On the other hand, community noise intrusions like traffic noise can obstruct speech communication, interfere with sleep and relaxation and disturb the capacity to perform difficult tasks [7].The protection of workers from the risks related to exposure to noise at work is contained in the European Union (EU) Directive (86/188/EEC). The objective of the directive is to reduce the level of noise experienced at work by taking action at the noise source. Two exposure levels are used [7]:-Daily personal noise exposure of a worker is presented in equation (1).

$$L_{EP,d} = L_{Aeq,}T_c + 10\log_{10}\frac{T_c}{T_0} \quad 1$$

where,

$$L_{Aeq,}T_c = 10\log_{10}\{\frac{1}{T_c}\int_0^{T_c}[\frac{P(t)_A}{P(0)}]^2 dt\} \quad 2$$

T_c = daily duration of a worker's exposure to noise.

T_0 = 8h

P_A = A – weighted instantaneous sound pressure in Pascal (Pa)

-Weekly average of the daily values, $L_{EP,w}$ is presented in equation (3).

$$L_{EP,w} = 10\log_{10}\{\frac{1}{5}\sum_{k=1}^{m} 10^{0.1(L_{EP,d})K}\} \quad 3$$

where, $(L_{Ep,d})_k$ = the values of $L_{EP,d}$for each of the m working days in the week being considered. The EU directive specifies that when the daily exposure level exceeds 85 dBA, the worker is to be advised of the risks and trained to use ear protectors. If the daily exposure level exceeds 90 dBA, a programme to reduce levels should be put in place. The British Columbia Work's Compensation Board (WCB) has set 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. WHO safety noise levels are similar while EPA of Nigeria tends to have even a stricter standard of 70 dB as a maximum safe level of noise in work place. They gave the safe level around home to be 50 – 55 dB [8]. Researchers have shown that constant noise above 55 dBA causes serious annoyance and above 50 dBA moderate annoyance at home [9]. 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 [2]. In Britain, the current and advanced Ministry of Agriculture regulations established in January 2002 state that propane cannons can be no closer than 150 metres from residential areas, and 100 metres from other kinds of noise makers. These machines generate noise at levels between 115 and 130 dB. At 100 meters the noise generated is above 80 dB, and greater than 75 dB at 150 metres, which is much greater than specified safe levels for around the residence. In fact, beyond 80 dB is near to the level at which ear protection should be used [3]. 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 ability to concentrate, among others.A study by [10] shows that sleep interference by noise causes great annoyance to many people. A study by [11] shows that sleep is an important modulator of cardiovascular function. Intermittent or impulsive noises are particularly disturbing. Because of differences between locations and people, it is not easy to establish the level of noise which will not cause sleep interference [12]; [7]. When work does not involve spoken communication it is taxing to determine the impacts of levels of noise on performance. High noise levels may reduce the accuracy of the work being undertaken rather than the quantity. Steady noises appear to have little effect on work performance unless the A-weighted noise level exceeds about 90 dB [13]. However, irregular noises, such as bangs or clicks, may interfere with performance at lower noise levels. Consequently, it is desirable to remove such features from the background noise. In 1993, 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 [14]; [15]. Studies show that excessive noise can cause hearing impairment, that certain levels and types of noise can cause heart attack, that body tissue resonances can be adversely affected by noise and that noise generally causes discomfort and annoyance to people exposed to it [16]. In addition, the consequence of elevated levels of noise on small children has been found to be related to physical health damage [17]. According to a WHO task group, in the day levels of noise of below 50 dBA outdoors generate moderate bother in the residence [18].

Noise has been connected to vital cardiovascular health risks. In 1999, 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 [19]. More current studies have recommended that noise levels of 50 dB(A) at night may also increase the risks of myocardial infarction by constantly enhancing production of cortisol [20]. Researches on the noise impacts on children in the classroom show strong association between speech intelligibility and problems with absence of self-confidence, fatigue, irritation, uncertainty and concentration, among others [14]; [21; [15]. Fairly characteristic road levels of noise are adequate to reduce arterial blood flow and cause elevated blood pressures; in this situation it seems that a specific part of the populace is more vulnerable to vasoconstriction. This may occur because the noise bother leads to high adrenaline intensity to activate vasoconstriction (a reduction of the blood vessels) or separately through reactions from medical stress. Additional impacts of elevated levels of sound are high rate of vertigo fatigue, stomach ulcer and headaches.Exposure to unpleasant sound is considered to be predominantly insidious when it takes place at the range of 15 - 60 days after conception, when central nervous system and the main internal organs are developed. Soon after, developmental effects take place as vasoconstriction in the mother decreases flow of blood and therefore nutrition and oxygen to the foetus. Reduced weights at birth and high sound level were also related to reduced levels of certain hormone in the mother. These hormones are assumed to be a good sign of protein

production and to have an effect on the growth of the foetus. As birth approaches, the difference between the hormones levels of the pregnant women in boisterous against quiet areas increases. Children residing in boisterous areas have been found to possess high intensity of nervous tension induced hormones and high blood pressures. Studies also proposed that when pregnant women are exposed to 76.5 dBA noise of airplane, a little decline in birth weight takes place [20]. Also, noise has adverse effects on children's cognition and health [22]; [23]; [24]. According to Sontag, Lesser W. of the Fels Research Institute (as stated in the pamphlet authored by the United States Environmental Protection Agency in 1978); "there is ample evidence that environment has a role in shaping the physique, behaviour and function of animals including man from conception and not merely from birth. The foetus is capable of perceiving sounds and responding to them by motor activity and cardiac rate change".Exposure to high noise levels for a short period of time can result in a temporary loss of hearing (temporary threshold shift) which may last for several hours depending on the duration and noise level. A ringing in the ears (tinnitus) may also occur. Repeated exposure to high sound pressure levels may result in permanent hearing damage (permanent threshold shift). Permanent hearing damage can occur before the individual becomes aware of difficulties in communication. However, sounds that do not result in temporary hearing loss after two to eight hours of exposure tend not to produce permanent hearing loss if continued longer [6]. Population studies have recommended associations between noise and mental-health indicators, such as mental-hospital admission rates, rating of well-being, the use of psychoactive drugs and sleeping pills, and symptom profiles. The elderly, children, and those with underlying dejection may be mostly exposed to these sound effects because they may lack sufficient surviving methods. Children in boisterous vicinities find noise annoying and report a reduced value of life [15]. The analysis [1] was carried out in six cities in Nigeria. The cities included Lagos, Ibadan, Port Harcourt, Enugu, Kaduna and Calabar and it was concluded that the major source of noise that bothers people most is the traffic. It was reported that cars top the list of the sources of noise that people are exposed to in the Port Harcourt survey, averaging 92% with 81% bothered by it. Lorries come next with corresponding 90% and 65% while trains have 90% exposed to their noise with 42% bothered by it. Noise levels greater than 80 dB are connected with both increase in destructive behaviour and decrease in behaviour useful to others. This simply means that the study of noise is very necessary so as to create awareness on the adverse effect of noise on the environment. In this research work, the impacts of community noise on people in Okobo Local Government Area, Nigeria shall be carried out.

II. Materials and Methods

Noise level measurements were made around people's offices and homes by using the sound level meter (SLM), model WensnWS1361. Based on the results of the physical measurements, some major locations in the area were chosen as interview centres. A heard and bothered questionnaire was developed for the interview. Different sources of noise included in the questionnaire were aircrafts (AC), tricycles/motor cycles (T/MC), cars (CA), churches (CH), children (CD), animals (AN), workshops/factories (WKS/FAC), lorries (LO), compact disk sellers (CDS), traders (TD) and ships/engine boats (S/EB), power generator (PG) and night clubs (NC). Then, a series of interviews of different sectors of the population of the area was conducted. The idea was to have an insight into what types of sources people identify as noise and how they are bothered or adversely affected by these. This addressed the impact of noise on environment. Therefore, 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 this Area, 142 copies of the questionnaire were distributed but 134 copies of it were collected. Nine (9) out of the 134 were wrongly filled while 125 copies of it were used. These were stratified to reflect the heavy noise areas. Then the Percentage Analysis Method (PAM) was used.

III. Results and Discussion

The results are presented on Table 1 and Figure 1.

Table 3.1: Response on noise bothers survey in Okobo Local Government Area (2018)

Noise Source	% Heard	% Bothered
AC	63	61
AN	62	40
CA	80	68
CH	71	70
CD	85	50
CDS	82	78
LO	76	55
TD	86	63
T/M	90	66
NC	36	34
PG	82	74
S/EB	48	38
WKS/FAC	22	20

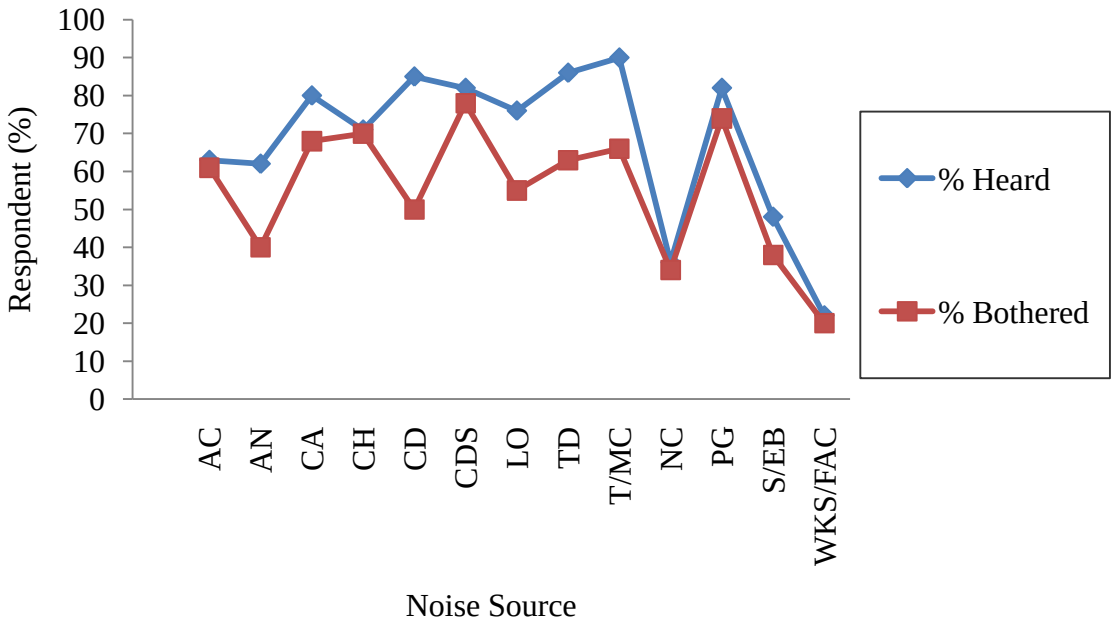

Figure 3.1: Response on noise bothers survey in Okobo Local Government Area

3.1 Survey of noise bother in Okobo Local Government Area

The results of the social survey in Okobo Local Government Area, as presented in Table 3.1 and Fig. 3.1, show that 63% of those interviewed were exposed to aircraft noise and 61% were bothered by it. In this survey, the percentages of respondent heard and bothered by the noise of aircrafts are mostly farmers and those who are doing business around the airport area. This is because during the field work, it was observed that the Akwa Ibom international airport is located a far distance from the residential areas. Animal noise bothered 40% of the respondents. Noise of cars was heard by 80 % of the respondents while 68% were bothered by it. Church noise was heard by 71% of those interviewed while only 1% was not bothered by it. Noise of churches ranks third in the list of noise sources that bother the people in Okobo Local Government Area. Children noise bothered 50% of the respondents while 85% were exposed to it. Children are the third in the list of noise source heard.

It is shown that noise of compact disk sellers bothered 78% of the 85% exposed to it. In Okobo, compact disk seller noise bothered the people most. The result is not unexpected. Compact disk sellers always play music at very high levels in order to attract customers. Some are using cars to advertise their goods (that is mobile music vendors). Lorry noise bothered only 55% of the 76% exposed to it. Trader noise comes second in the list of noise sources heard with 86% of those interviewed while 62% were bothered by it. Tricycle/motor cycle noise was heard by 90% of the respondents while only 66% were bothered by it. Night club noise bothered 34% of the 36% exposed to it. Noise of power generators was heard by 82% of the respondents and 74% were bothered by it. Noise of ships/engine boats was heard by 48% of the respondents and 38% were bothered by it, while noise of workshops/factories bothered 20% of the 22% exposed to it.

In Okobo however, noise of compact disk sellers bother the people most, while they are being exposed to tricycle/motor cycle noise most. This result is in line with many earlier studies [3]. The only difference here is that instead of the traffic, noise of compact disk sellers bothers the people most. This result can be due to the fact that many people are dealing on compact disk selling and there are less number of cars in the area.

IV. Conclusion

It is concluded from the findings that noise creates adverse impact on the people in Okobo Local Government Area, Nigeria. Hence, there are many sources of noise in the area.

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