SOURCES AND EFFECTS OF NOISE POLLUTION: PERCEPTION OF RESIDENTS IN SELECTED RESIDENTIAL COMMMUNITIES IN LAGOS STATE, NIGERIA

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ABSTRACT

This study sought to identify the sources and effects of noise in selected residential areas in Lagos State and also to compare the perception of the residents in the selected areas in terms of their nuisance value on the sources of noise. It will assist construction professionals to create an acoustic treatment to design changes. Quantitative research design was used and the population was the residents in the study area. The study area chosen for this study was Obalende and Oworonshoki in Lagos state, Nigeria. These areas were located in the Lagos Mainland and Island of Lagos state and they are both commercial and residential area. Base on the heterogeneous nature of the respondents from the areas, convenience sampling technique was used. A total of hundred questionnaires were distributed in Obalende and Oworonshoki (fifty respectively). From the former, 41 were received while 46 were returned from the latter. Statistical Package for Social Sciences (SPSS) 21st version was used for analysis of the data. Descriptive and inferential statistical tools were used and they include mean, frequency, percentage, Spearman rank correlation, and t- test for proportion. The findings from the study show that noise levels in the residential areas were very high thus have a negative impact on the health of the residents. Electricity generating plant and vehicle horns were the highest sources of noise nuisance in Obalende and Oworonshoki area respectively In conclusion, the noise generated in these residential areas is high and have a serious adverse impact on the health and well-being of the people residing in these residential areas leading to annoyance, stress, and fatigue, sleep disturbance, high blood pressure as well as aggression to and from neighbours. Therefore reduction of traffic density in residential areas is deemed necessary. Sound protection proof should be provided in the construction materials to reduce the impact of noise.

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Keywords: Decibel, Noise, Obalende, Oworonshoki, Residential communities

1.0 INTRODUCTION

Noise is an unwanted signal or sound that may cause psychological and physical stress to the living and non-living objects exposed to it (Hessler and Hessler, 2010; Jamir *et al,* 2014). Certain factors such as pitch irregularities, duration, and rhythm determine the impact of noise on the objects. (Ebeniro and Abumere, 1999 as cited in Otutu, 2011). The main sources of noise are due to increase in a number of vehicles, musical instruments, small scale industries, urbanization and human activities (Singh and Joshi, 2010; Kalshetty and Karalatti, 2013).

Goswami et al., (2011) opined that noise pollution has been a worldwide problem especially in developing countries, while Kalshetty and Karalatti (2013) stated that noise pollution is an environmental pollution in both urbanized and industrialized towns for instance in India

(Kalshetty and Karalatti, 2013, Jamir et al, 2014), Iran (Ehrampoush et al, 2012), Finland (Okokon et al, 2015) and Uttar (Singh and Joshi, 2010) . Even the World Health Organisation (WHO), 1995 notes that 40% of the population living in European countries are exposed to sound level above 55decibel (dB) (A) daytime and 20% of this population are exposed to noise level above 65dB (A). Jamir et al (2014) noted in WHO guidelines that 30A – weighted (dB (A)) is recommended in a bedroom at night and 40dB (A) outside the bedroom to ensure a conducive environment. While in a reading environment 35dB (A) is allowed for good teaching and listening. Thus, noise pollution is an acute problem which is growing at an alarming rate causing health issue, socio – cultural, aesthetic and economic effects.

Achieving a healthy noise environment within occupied spaces is a desirable aim for all buildings (Swift and Stead, 2008). It is a fact that constant exposure to high level of noise may lead to consequences, such as Noise-Induced Hearing Loss (NIHL), which has irreversible and insidious characteristics and causes hearing disability and psychosomatic difficulties that interfere with the quality of life of those who suffer from it. In Organization for Economic Cooperation and Development (OECD) countries, it is estimated that 16% of their population, 110 million people, are exposed to noise levels capable of causing damage (Wokocha, 2013).

Occupational noise is the most frequent cause of alterations in the hearing of the population, where hearing loss was prevalent in around 77 cases in 1000, among men and in 70 cases in 1000, among women (Pankaj et al, 2009). According to Onuu and Tawo (2006), there is general agreement that exposure to sound levels less than 70dB does not produce hearing damage, regardless of the duration of exposure and also exposure for more than eight hours to sound levels in excess of 85dB is potentially hazardous. To place this in context, 85dB is roughly equivalent to the noise of heavy truck traffic on a busy road.

Though the impact that noise has on the hearing of workers is a well - known fact, measures to control noise in the workplace, especially factories and industries, are still in their early days. It has been observed that architectural projects often consider thermal, ergonomic and lighting aspects much more than aspects aimed at acoustic treatment. It can, therefore, be seen that there is a need for evaluations and monitoring of noise levels by professional teams that are involved both in the health area as well as in the civil construction and production engineering areas, in order to achieve effective solutions for controlling noise (Claudia et al., 2006).

In most developed countries like the United Kingdom and Canada, Environmental Impact assessment (EIA) laws are usually formulated to guide against the negative effect of noise pollution in industrial areas and these laws are properly enforced (Hessler and Hessler, 2010). For most developing countries like Nigeria, it is either the laws are not in existence or they are not well enforced. In Nigeria, the Federal Environmental Protection Agency (FEPA) (1991) recommends a permissible limit of 90dB(A) for a maximum of 8hrs in occupational settings. Oloruntoba et al (2012) study show that only three of the residential areas studied in Ibadan, Nigeria had low noise level in compared with that of World Health Organisation (WHO) limit. It shows that many of the residents are exposed to noise.

Due to ignorance of Nigerians on the fact that there exists a close relationship between noise pollution and climate change, little or no attention is paid to the control of noise pollution in Nigeria (Aremu et al, 2015). Even though noise pollution was part of the National policy on Environment since 1989 (Olorutoba, 2012) not much had been done to enforce the policy. The execution and implementation of the existing law as regards environmental pollution is never being enforced (Igboroje et al., 2004 cited in Oloruntoba et al, 2012). It is observed that the persistence of these problems could endanger the future stability of human health and could aggravate the human health catastrophe in the fast growing cities in Nigeria (Aremu et al, 2015). The challenges posed by noise pollution on human health and the environment have not yet received the full attention which it deserves.

In Lagos, industries keep sprawling at various places including places meant to be residential area; generating high noise from their various plants, equipment, and their big industrial generators thereby affecting the health of the community they are in negatively. Therefore, the regular increase of noise from industrial buildings in the industrial area due to heavy equipment is a source of concern to workers and people residing around the area.

Several studies have been carried out in India on the ambient sound level (Banerjee *et al*. 2008; Patel *et al*, 2008; Jamir *et al,* 2014), low-frequency noise (noise below 250Hz) sources and effects (Berglund *et al,* 1996). Huffeldt and Dabelsteen (2013) studied was on the comparison of the urban and rural area of frequency variation in the urban Danish Great Tits in Denmark. Oloruntoba et al (2012) study was on assessing of noise level using a sound level meter of selected residential area. This study measures the perception of the residents in the selected areas with regard to identification of noise and its impact on the residents. Therefore is a need to identify the sources of this noise, measure the noise levels at various operation units of residential buildings in this area as well as determine the effects of this noise on the residents. The purpose of this study is to ensure proper planning of roadways in relationship to proximity to human settlement and also to monitor and control the impact of noise pollution by the government agency.

Objectives of the study

1. To identify the sources of noises in Obalende and Oworonshoki areas in Lagos State, Nigeria.
2. To assess the effect of noise nuisance on the residents in Obalende and Oworonshoki.

Hypothesis of the study

1. There is no level of agreement on the sources of noises on residents in Obalende and Oworonshoki.

2.0 REVIEW ON NOISE POLLUTION

Noise is a menace that could lead to health challenge to the individual. It affects the physical, psychological, and mental well-being of an individual (Jamir et al, 2014). Goswami et al (2011) identified community and industrial noise as the two main sources of noise. Community noise can also be referred to as environmental, residential or domestic noise (Lercher et al, 2013). Sources of noise from community noise are automobiles, construction work, fireworks,

loudspeakers, and recreational facilities (Oloruntoba et al, 2012; Jamir et al, 2014). Industrial noises are noises from the the workplace as a result of machinery and equipment being used. This study is on commercial and industrial noise because the study area is both a residential and commercial areas.

Noise can be measured using sound – level meters. Sound – level meters was used in the study of Ehrampoush (2012) to record the changes in noise level on the basis of sound pressure in selected areas in Yazd city in Iran. Noise measurement was taken at a distance of 3.5m from the building at the specific time of the day. All measurement was according to International Standard for assessment of Environmental noise ISO 1996. This study intends to measure noise level through the perception of the residents in the selected study area.

People are affected by noise exposure than any other environmental stressor. However, because its associated health effects are not as life-threatening as those for air, water, and hazardous waste, noise has been on the bottom of most environmental priority lists. Traditionally, much of the scientific evidence has been based on studies of occupational exposures and on industrial noise (Agbalagba et al, 2013; Wokocha, 2013). These noise exposures tend to be of greater intensity over longer periods of time as compared with exposures to community noise. In earlier research, investigators also tended to assume that noise produced direct health effects, such as hearing loss with noise exposures above 90 decibels and paid little attention to individual differences in response to noise, and noise as a stressor (Barbosa et al, 2005 as cited in Jamir et al, 2014)

Wokocha (2013) and Aremu et al (2015) carried out a research in the construction industry and reported that industrial activities create enormous noise that commences from 70 dB and extended to 140dB. This includes noise generated by air compressors, concrete mixers, scrapers, dozers, power sand, generators and rock drillers. Such noise is uncomfortable and unwanted in the society. According to Barbosa et al (2005) in Jamir et al (2014), workers expose to road traffic noise in Brazil reported 28.5% induced hearing loss on audiometric assessment. While in Bangladesh about 78% are not aware of the effect of noise on their hearing.

Noise has several adverse effects on health. Anthrop (1990) as cited in Wokocha and Sopruchi (2010) revealed that the long-run exposure to noise will result in deafness, high blood pressure and hypertension, headache, dry skin, weak eyesight, and abnormal conscience state of mind. Noise effects are both health and behavioral in nature thus, unwanted sound can damage physiological and psychological health.

Noise pollution can cause annoyance and aggression, hypertension, high-stress levels tinnitus, hearing loss, sleep disturbances, and make conversation difficult as well as leads to productivity losses due to poor concentration (Lercher et al, 2011, Soren et al, 2011 in Jamir et al, 2014). Kryter (2006) as cited in Wokocha and Sopruchi (2010) in his study explained that noise pollution leads to ecological imbalance. Noise has a detrimental effect on animals by causing stress, increasing the risk of mortality by changing the delicate balance in predator/ prey detection and avoidance. Noise affects their usage of sounds in communication especially in relation to reproduction and in navigation.

The most common outward symptom of stress building up in humans, when faced with noise, is an annoyance. Exposure to excessive noise can also induce or aggravate stress-related health outcomes, including those on the cardiovascular system, immune system, sleep, task performance, behaviour, and mental health. According to Onuu and Tawo(2006), the effects of noise pollution on cognitive task performance have been well-studied. Noise pollution impairs task performance at school and at work, increases errors, and decreases motivation. Reading attention, problem solving, and memory is most strongly affected by noise. Two types of memory deficits have been identified under experimental conditions: recall of subject content and recall of incidental details. Both are adversely influenced by noise.

Cognitive and language development and reading achievement are diminished in noisy homes, even though the children's schools may be noisier than average. Cognitive development is impaired when homes or schools are near sources of noise such as highways and airport (Omubo –Pepple et al, 2010; Shield and Dockrell, 2003). Noise produces negative after-effects on performance, particularly in children. Children from noisy areas have been found to have heightened sympathetic arousal indicated by increased levels of stress-related hormones and elevated resting and blood pressure. There is good evidence, largely from laboratory studies, that noise exposure impairs performance. Performance may be impaired if speech is played while a subject reads and remembers verbal material, although this effect is not found with non-speech noise. The effects of irrelevant speech are independent of the intensity and meaning of the speech. The susceptibility of complex mental-tasks to disruption by irrelevant noise suggests that reading with its reliance on memory may be impaired by noise.

Noise exposure may also slow rehearsal in memory, influence processes of selectivity in memory, and choice of strategies for carrying out tasks (Olokooba et al, 2002; Witte, 2004; Pankaj et al, 2009). Table 1 shows the assessment of reported responses to occupational noise exposure. There is also evidence that noise may reduce helping behaviour and increase aggression.

Table 1: Assessment of reported responses to occupational noise exposure

Outcome	Observation threshold evidence	dB(A)
Performance	Limited	
Biochemical effects	Limited	
Immune effects	Limited	
Birth weight	Limited	
Annoyance	sufficient	< 55 (office) < 85(industry)
Hypertension	sufficient	55 - 116
Hearing loss (adult)	sufficient	75
Hearing loss (unborn children)	sufficient	< 85

Source: Adapted from HCN (1999) and DeHollander et al, (2004) as cited in WHO (2004)

3.0 RESEARCH METHOD

Quantitative research design was used and the population was the residents in the study area. The study areas were Obalende and Oworonshoki in Lagos Mainland and Lagos Island in Lagos

State, Nigeria. Lagos state is located in the southwest of Nigeria and bordered by Ogun state to the north and east, the Atlantic Ocean to the south and the republic of Benin to the west with geographical coordinates given as 6°27'11"N 3°23'45"E.

The suitability of the selected residential areas in Lagos state for this research follows from the fact that there are sprawling residential areas with a sizeable number of residential buildings involved in different types of activities. These residential areas are very active and the emission of noise can occur for a significant part of the day as well as during late hours of the day. These residential areas have provided this research an avenue for identifying the different sources of residential noise, and effects of this noise on occupants and environs in line with the objectives of this research. Base on the heterogeneous nature of the respondents from the areas, convenience sampling technique was used.

A total of hundred questionnaires were distributed in Obalende and Oworonshoki (fifty respectively) by hand. From the former, 41 were received while 46 were returned from the latter. Statistical Package for Social Sciences (SPSS) 21st version was used for analysis of the data. The objectives of the study which is to identify the sources of noise and to assess the effect of noise on the residents of the study areas were analysed using frequency, percentage and mean. The hypothesis, to show the significant difference in the level of agreement between the residents in Obalende and Oworonshoki on the sources of noise was analysed using Spearman rank correlation and t- test for proportion statistical tool. For identified sources of noise; the respondents were told to rank the frequency of the noises. The respondents were also told to rank the effect of noise nuisance on the selected area using a Likert scale of low impact (1) to highly impact (5) and the mean was calculated accordingly.

4.0 ANALYSIS OF DATA AND DISCUSSION OF FINDINGS

Sources of Noise

Table 2 indicates the sources of noise in the study selected areas. The results show that in Obalende, the most ranks identified sources of noise were activities/voices in neighboring houses (98%), electricity plant (95%), music from neighbours (95%), traffics (95%) and traffic (motor bicycles) (88%). It was followed by commercial blender (85%), mosque (81%), night club beer parlour (81%) and record shop (76%).The least ranks sources of noise were a market (15%), factory/ industry (15%) and pet (13%). This finding shows that Obalende is a combination of the commercial and residential area.

For Oworonshoki, the most identified sources of noise were an electricity generating plant (80%), activities/voices in neighbouring houses (76%), mosque (74%), vehicle horns (74%) and music from neighbor (74%). It was followed by commercial blender (70%), night club beer parlour (70%) and street party traffic (67%). The least sources of noise were a construction site and air- condition from neighbor (28%), air (17%) and rail traffic (13%).

The Spearman rank correlation was calculated using the difference in the ranking of Obalende and Oworonshoki. It shows a positive correlation. It implies that there is a strong correlation between the identified sources of noise from Obalende and Oworonshoki.

Table 2: Sources of Noise in Selected Residential Areas in Lagos State

Sources of Noise	Obalende				Oworonshoki				`d (R_1-R_2)	d^2
	N	F	%	R_1	N	F	%	R_2		
Electricity generating plant	41	39	95	2	46	37	80	1	1	1
Activities/voices in neighbouring Houses	41	40	98	1	46	35	76	2	-1	1
Vehicle horns	41	34	74	4	46	34	74	3	1	1
Music from neighbours	41	39	95	2	46	34	74	3	-1	1
Mosque	41	33	81	6	46	34	74	3	3	9
Commercial Blender	41	35	85	5	46	32	70	4	1	1
Traffic (Motor Bicycles)	41	36	88	4	46	32	70	4	0	0
Street party	41	27	66	8	46	31	67	5	3	9
Traffic (cabs, lorries, heavy trucks)	41	39	95	2	46	30	65	6	-4	16
Church	41	25	61	9	46	30	65	6	3	9
Night club/beer parlour	41	38	81	6	46	30	65	6	-3	9
Bus Stop	41	19	46	11	46	29	63	7	4	16
Carpentry/welding workshop	41	24	59	10	46	25	54	8	2	4
Record Shop	41	31	76	7	46	25	54	8	1	1
Motor park	41	9	22	14	46	23	50	9	5	25
School	41	13	32	12	46	21	46	10	2	4
Market	41	6	15	15	46	19	41	11	4	16
Pets (e.g dogs, goats)	41	4	10	16	46	19	41	11	4	16
Factory/Industry	41	6	15	15	46	15	33	12	3	9
Construction site	41	11	27	13	46	13	28	13	0	0
Air-conditioner of neighbours	41	13	32	12	46	13	28	13	-1	1
Air traffic	41	27	5	8	46	8	17	14	6	36
Rail traffic	41	13	15	12	46	6	13	15	3	9

N= Number of respondents; F =Frequency; R =Rank

Hypothesis 1: The null hypothesis that there is no level of agreement between residents of Obalende and Oworonshoki on sources of the noise was tested by using a t-test for proportion to compare two proportions or percentage (Kasumu, 2000). From the Table 3, there is an agreement between sources of noise in Obalende and sources of noise in Oworonshoki because t-test calculated (t_{cal}) for sources of noises (t_{cal}= 11.0) is greater than t-test tabulated (t_{tab}) with a confidence level of 95%. Thus, the alternate hypothesis (H_1) is accepted. The Spearman rank

correlation (r) between the two residential areas (Obalende and Oworonshoki) as indicated in Table 3 shows a positive correlation among the variable.

Table 3: T-test for proportion on sources of noise

Variables	r	t_{tab}	t_{cal}	Sig.	Remark
Sources of noise	0.92	1.782	11.0	0.001	H_1 accepted

r = Spearman Rank Correlation

Effects of noise nuisance

Table 4 indicates the effects of noise nuisance on the residents at Obalende and Oworonshoki. From the results, annoyance (mean = 3.37), aggression to neighbours (mean = 3.32), aggression from neighbours (mean = 3.12) and sleep disturbance (mean = 3.05) are the most noise nuisance on the residents from Obalende. The least ranks effect of noise nuisance from Obalende respondents were forgetfulness (mean = 1.59), high blood pressure (mean = 1.37) and accidents (mean = 1.17).

For Oworonshoki respondents, the most noise nuisance effects were sleep disturbance (mean = 3.46), hearing (mean = 3.17), aggression from neighbours (mean = 3.09) and annoyance (mean = 3.00). The least ranks noise nuisance effects were high blood pressure (mean = 1.80), accidents (mean = 1.89) and forgetfulness (mean = 2.07).

Table 4: Effects of Noise Nuisance on the Residents in Obalende and Oworonshoki

Noise Effects	Obalende		Oworonshoki	
	Mean	Rank	Mean	Rank
Annoyance	3.37	1	3.00	4
Aggression to neighbours	3.32	2	2.87	6
Aggression from neighbours	3.12	3	3.09	3
Sleep disturbance	3.05	4	3.46	1
Stress level and setting in of fatigue	2.76	5	2.83	7
Headache	2.63	6	2.59	9
Hearing	2.59	7	3.17	2
Concentration	2.29	8	2.93	5
Task performance	2.22	9	2.46	10
Shock and panic	2.20	10	2.72	8
State of mind	1.83	11	2.41	11
Forgetfulness	1.59	12	2.07	12
High blood pressure	1.37	13	1.80	14
Accidents	1.17	14	1.89	13

5.0 DISCUSSION OF FINDINGS

The results shown indicated that for the source of noise in selected residential areas; in Obalende area, activities/voices in neighbouring houses, electricity generating plant, night club/beer parlour were the most identified sources of noise, while air traffic was the least sources of noise in that area.

In Oworonshoki area, electricity generating plant, activities/voices in neighbouring houses, vehicle horns, music from neighbours, mosque were the most identified sources of noise. Oloruntoba et al (2012) in Ibadan shows that the most significant sources of noise were from vehicular and generating set. They also find out that the source of noise varies from one neighbour area to another in terms of the density of the area and the peak period. The effects of noise nuisance on the residents from Obalende are an annoyance, aggression to neighbours and aggression from neighbours.

While in Oworonshoki area, sleep disturbance, hearing and aggression from neighbours are identified as the most noise nuisance. This finding is in support with the study of Jamir et al (2014) that noise effect on human health includes hypertension and aggression. While Joshi et al (2003) and Oloruntoba et al (2012) identified headache, lack of concentration, irritation, and fatigue as the factors affecting the impact of noise pollution on the residents. There is a significant difference in the level of agreement between the identified sources of noise in Obalende and Oworonshoki.

6.0 CONCLUSION AND RECOMMENDATIONS

From the results of the research, it could be concluded that there are so many sources of noise in the two residential areas in Lagos State. These sources of noise generated vary from residential area to residential area. The noise generated in these residential areas is high and have a serious adverse impact on the health and well-being of the people residing in these residential areas leading to annoyance, stress, and fatigue, sleep disturbance, high blood pressure as well as aggression to and from neighbours. In addition these sources of noise affects the comfort of the residents in the areas, although some residents concluded that they were comfortable with the high level of noise generated in the area because they had little or no control over it, a large majority of the residents were not comfortable with the noise level in the area.

In view of the findings above, the following recommendations are made to find a lasting solution to the issue of noise pollution in the selected residential areas. It is important that residents, as well as business owners, find a way of reducing the noise generated by electricity generating plant by using noise attenuation materials, adequate silencers for industrial generators. It is very important to construct the walls of residential buildings with materials that will reduce the level of noise generated in the building thus, preventing the transmission outside and also with materials that will not reflect the sound produced in the building. Finally, there are legislations guiding against noise pollution in Lagos State, these laws are there but not really enforced by the government. Therefore, the government should set up an organization to enforce these laws. This organization should have similar responsibilities similar to Kick Against Indiscipline (KAI) which will ensure orderly and rational behavior of individuals in Lagos State. Any individual found not complying with the laws regarding the control of noise pollution should be sanctioned.

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