A Survey of Causes and Psychological Effects Of Noise in Some Selected Areas of Kano Metropolis

Engineering

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ABSTRACT

The growing noise pollution is seen as one of the major environmental concern in major cities of the world. This study examines noise level and surveys the remote causes of noise pollution and its adverse effects in some industrial, business and residential areas in Kano metropolis. Measurement of noise level and survey were carried-out in Sharada phase I, Kofar Ruwa, Sabon gari, Kurna and Dorayi using CR: 306 sound meter and questionnaires. Simple percentages were used to analyse the data/ results shows that high percentages from Kurna, Dorayi, Sabon gari and Kofar ruwa residential and business areas reveal that the sources of noise are from transportation and human activities, while respondents from Sharada phase I reveal that the major source of noise are from industrial machines. The analysis of the survey also shows that 44% of the residents expose to noise suffer from headache, 31% annoyance, 15% feeling fatigue and 10% feeling sleepy. The measured noise level taken reveals that Sharada phase I recorded the highest average of 78.38dB(A), Kofar ruwa 78.04dB(A), Kurna 76.50dB(A), Sabon gari 74.04dB(A) and Dorayi 72.84dB(A) at mean average noise level.

1. INTRODUCTION

The alarming rise of noise pollution is seen as major environmental concern in densely populated cities of the world. Such is the case of Nigeria where sources of noise in communities, residential dwellings, offices and industries are numerous. They range from moderately intrusive sounds of children, pets, household electronic appliances, commercial activities, automobiles and industrial machines (Cohen & Weinstein, 1982).

Noise is an unwanted sound. "Sound which is disagreeable, discordant or which interferes with the reception of wanted sound becomes noise" (Cantrell, 1975). This definition is usually applicable to sounds or noises that are unnatural in either their volume or their production. Our environment is such that it has become difficult to escape noise. Even electrical appliances at home have a constant hum or beeping sound. By and large, lack of urban planning increases the exposure to unwanted sounds. This is why understanding noise pollution is necessary to curb it in time (Conserve Energy Future, 2015).

In 2009, the World Health Organization (WHO) states that "noise is an underestimated threat that can cause a number of short-term and long-term health problems, such as for example sleep disturbance, cardiovascular effects, poorer work and school performance, hearing impairment, etc". The 1999 guideline by WHO recommends "community noise of less than 30 A-weighted decibels (dB(A) in bedrooms during the night for a sleep of good quality and less than 35 dB(A) in classrooms to allow good teaching and learning conditions and 40 dB(A) of annual average (night) outside of bedrooms to prevent adverse health effects from night noise".

This research however is focused on:
- identifying the causes of noise pollution in some selected business, industrial and residential areas of Kano Metropolis.
- assessment of noise exposure level.
- determine the level of awareness of noise pollution.
- identifying the possible measures that could be used to control and reduce noise pollution.

2. NOISE POLLUTION IN NIGERIA

In 2012, Oyedepo published a paper in which he highlighted that noise pollution in urban centers has been found to increase with increase in population, commercial activities and road traffic volume (Oyedepo, 2012). Some studies also revealed that in Nigeria, noise pollution also arise from loudspeakers of religious institutions such as churches and mosques, bells rung incessantly by peddlers, hawkers, and other salesmen to advertise their wares, highly amplified music from record shops, private electricity-generating plants and grinding machines. Among the stated noise sources, the ones from religious institutions is most common due to existence of several religious activities that are not checked by the government (Oloruntoba, et al., 2012).

In Nigeria, the Lagos state Commissioner for environment and Managing Director Lagos State Environmental Protection Agency (LASEPA), in an interview with Vanguard newspaper lamented that noise pollution generally and daily in the state was increasing and the government has embark on the measure to reduce it. They revealed that in 2014, thirteen industries and twenty-four religious outfits were shut down and that religious outfits contributed about 50% of the noise (Vanguard , 2015).

In a recent development on controlling noise pollution within Lagos metropolis, the government of Lagos state through LASEPA shut-down several religious houses, industries and clubs. In addition, ten factories, night-clubs and other business outfits who violate the laws on noise pollution have been sealed by the agency. The agency has also called on other states in Nigeria to fully implement the laws on public disturbances (DailyTrust, 2015).

3. PSYCHOLOGICAL EFFECTS of NOISE POLLUTION

The World Health Organization defines health as "a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity" (WHO, 1946). Health effects of noise from long-lasting exposure to higher levels of community noise creates major health risk. The impacts of noise on human health could depend on the intensity of noise, on the duration of exposure and the context of exposure. Below are the threshold adopted by some authoritative agencies (Bhatia, 2014).

TABLE – 1

HEALTH PROTECTIVE NOISE THRESHOLDS ADOPTED by AUTHORITATIVE AGENCIES

Agency	Measure	Health Protective Threshold Value
USEPA	L_{dn}, Indoors	45 dbA
WHO	L_{eq}(16h), Outdoors	55 dbA
WHO	L_{night}, Outdoor	40 dbA
State of California	L_{dn}, Indoor	45 dbA

L_{dn} = Day-night average sound level; L_{eq} = Equivalent Continuous Sound Level; L_{night} = Average nighttime noise level; dB = decibels;

dbA = A-weighted decibels

Source: Earth journalism network
Environmental pollution is the biggest hazard which is faced by today's human being. Air, water, noise, light and temperature conditions, crops, grassland, forests and other animals are the major constituent of the human environment. Of the sources of pollution, noise has been observed to have several effects such annoyance, speech interference, sleep disturbance and work performance (WHO-Europe, 2011). Meanwhile, there are other cases of physical effects of noise which the health risks caused by the noise exposure are high blood pressure, coronary heart disease, ulcer, colitis, and migraine headache. It is proven by research that there is a relation between the noise exposure and increasing ratio of health problems (Muhammad & Huma, 2013).

4. THE SURVEY AREAS
Kano State of the Federal Republic of Nigeria lies between latitude 130 North in the North and 110 North in the South and longitude 80 W in the West and 100 in the East. With a population of 9,383,682 based on the official 2006 National Population and Housing Census (Kano-State, 2011).

From the trans-Saharan trades, Kano, over the years, became the centre of distribution of goods in Northern Nigeria and some parts of West Africa. Emerging Industrialization influenced the pattern of activities in the city, industrial estates and commercial centers started evolving within the city. Hence, named as center of commerce (Bichi, 2013).

The research studied areas are some selected industrial, business and residential areas of Kano metropolis. These are:
- Sharada – industrial area (the phase I).
- Kofar-Ruwa – a business area (has the largest iron and steel markets in northern Nigeria).
- Sabon-Gari – a business area.
- Kurna – residential area (not far from sharada phase I due to industrial development).
- Dorayi – mainly a residential area.

These five areas were selected for the survey because major causes of noise pollution ranging from human, industrial and commercial activities are currently existing there.

Figure 1: sabon gari area of Kano State
Source: www.googleimages .com/ kano city

Figure 2: sharada industrial area phase I
Source: http://www.wikimapia.org

5. METHODOLOGY
The research presented here was conducted using: Survey (questionnaires and interview) Instrument (sound meter). Kano city was chosen for the study because of its population and also one of the commercial centers, and has industrial areas. The city reflects both the modern and traditional infrastructure roads locality, buildings etc. Moreover the residents represent a cross-section of Nigerian culture.

A. SURVEY (QUESTIONNAIRES and INTERVIEW)
The data was collected by using a structured questionnaires combined with suitable open-ended questions. These two approaches were chosen for the survey in order to identify the possible causes of noise pollution, psychological/health effects and level of awareness of effects of noise pollution. Though, the open-ended questions or personal interview used was to give chance to respondents with no formal education to participate. A 10-question questionnaire was applied in the context of the study.

100 hundred respondents were randomly interviewed personally. The survey involves different age groups, sex, place and educational levels across the residents of the metropolis. However, the number respondents were restricted to 100 because of the expected difficulty of obtaining consent of respondents at the time which the survey was carried-out. The details is shown in tables 7 and 8.

C. INSTRUMENT (CR:306 CLASS 2 SOUND LEVEL METER)
The research would not be complete without measurement of noise levels of the studied areas. To measure noise levels at different periods of the day, a CR:306 Class 2 sound level meter was used. According to International Electrotechnical Commission (IEC) requirements, the instrument is one of the ideal and general purpose sound level meters that could be used for basic noise surveys and measurement of sounds. The instrument has two measurement ranges, and can measure from 35dB(A) to 130dB (A). The maximum hold function allows the unit to freeze the display showing the highest level measured (Cirrus Research Plc, 2015). However, there was no readings taken during peak hours because of the insurgence at the period which the survey was carried out.

B. MEASUREMENT OF NOISE LEVEL
An important part of any successful measurement is the selection of the quantities to be measured. In the case of noise measurements, this selection could be quite difficult. For example, man's reaction to sound may be determined by varied factors as time of the day, his physical comfort or discomfort, characteristics of the sound, and attitude towards the person the person or device generating the sound. However, our concern is the sound that could cause health effects (Starr & Bolt, 2009).

This measurement was then repeated for all other days of the week. The results we obtained are shown in tables 2, 3, 4, 5 and 6.

TABLE 2: RECORDED NOISE LEVEL dB(A) FOR SABON GARI AREA

Days of the week	10am	02pm	06pm	Mean level
M	69.73	77.47	75.47	74.22
T	73.16	70.00	79.51	74.22
W	80.73	68.30	79.31	76.11
TH	78.64	70.13	74.42	74.39

F	68.69	77.83	77.19	74.57
SA	72.01	74.84	76.88	74.58
Su	72.65	72.67	65.34	70.22
Average Mean	73.65	83.46	86.22	74.04

M,Monday;T,Tuesday;W,Wednesday;TH,Thursday;F,Friday;SA,Saturday;SU,Sunday.

TABLE – 3
RECORDED NOISE LEVEL dB(A) FOR SHARADA AREA

Days of the week	10AM	02 PM	06PM	Mean level
M	81.83	50.47	80.62	70.97
T	76.47	66.97	87.79	77.08
W	81.77	72.40	79.88	78.02
TH	79.73	78.06	88.38	82.06
F	78.13	77.19	86.83	80.71
SA	85.23	77.50	78.88	80.54
SU	76.97	78.67	82.19	79.28
Average mean	80.02	71.60	83.51	78.38

M,Monday;T,Tuesday;W,Wednesday;TH,Thursday;F,Friday;SA,Saturday;SU,Sunday

TABLE – 4
RECORDED NOISE LEVEL dB(A) FOR KURNA AREA

Days of the week	10am	02pm	06pm	Mean level
M	71.42	75.87	78.57	75.29
T	79.00	71.82	75.87	75.56
W	76.38	74.87	74.16	75.14
TH	78.12	76.38	75.87	76.79
F	78.57	73.53	79.53	77.21
SA	75.69	71.43	76.89	74.67
SU	89.18	78.57	74.87	80.87
Average mean	78.33	74.63	76.53	76.50

M,Monday;T,Tuesday;W,Wednesday;TH,Thursday;F,Friday;SA,Saturday;SU,Sunday

TABLE – 5
RECORDED NOISE LEVEL dB(A)FOR KOFAR RUWA AREA

Days of the week	10am	02pm	06pm	Mean level
M	79.20	72.87	81.77	77.95
T	75.87	74.87	79.53	76.76
W	77.87	74.43	82.53	78.28
TH	79.97	76.77	78.77	78.50
F	81.53	76.20	83.16	80.29
SA	75.69	71.43	80.89	76.00
SU	82.53	74.53	78.53	78.53
Average mean	78.95	74.44	80.31	78.04

M,Monday;T,Tuesday;W,Wednesday;TH,Thursday;F,Friday;SA,Saturday;SU,Sunday

TABLE – 6
RECORDED NOISE LEVEL dB(A) FOR DORAYI AREA

Days of the week	10am	02pm	06pm	Mean level
M	74.71	69.85	73.80	72.79
T	76.03	66.50	73.70	72.07
W	75.63	70.50	75.57	73.9
TH	74.35	70.89	70.60	71.95
F	75.53	69.47	73.87	72.95

SA	74,55	67.78	75.86	72.73
SU	77.43	70.87	72.26	73.52
Average mean	75.46	69.40.	73.66	72.84

M,Monday;T,Tuesday;W,Wednesday;TH,Thursday;F,Friday;SA,Saturday;SU,Sunday

TABLE – 7
GENDER DISTRIBUTION OF PEOPLE STAYING IN THE SURVEYED AREAS (YEARS)

Age	20-35	36-50	51-65	66-80
Male	42	11	9	8
Female	6	15	6	3
Total	48	26	15	11

TABLE – 8
EDUCATIONAL STATUS

Age (Years)	20-35	36-50	51-65	66-80
Primary	10	0	0	0
Secondary	17	2	0	0
Tertiary	12	14	3	0
No-Formal Education	9	10	12	11
Total	48	26	15	11

TABLE – 9
AWARENESS LEVEL OF EFFECTS OF NOISE POLLUTION

Surveyed Areas	Awareness Level				Total
	Yes		No		
	N_Resp.	Percentage (%)	N_Resp	Percentage (%)	
Sabon Gari	8	40	12	60	20
Sharada	7	35	13	65	20
Kurna	6	30	14	70	20
Kofar Ruwa	5	25	15	75	20
Dorayi	11	55	9	45	20
Total	37		63		100

N_Resp: number of response

6. RESULT ANALYSIS AND DISCUSSION

The analysis has been carried out with help of percentages and cross-classifications on causes of noise pollution, recorded noise level, health effects and level of awareness.

A. MEASURED NOISE LEVEL

One of the goals of this research was to determine the noise level in the studied areas. As shown in tables 4 and 6, the average mean noise level recorded for Dorayi at 10am-75.46dB (A), 2pm-69.40dB (A), 6pm-73.66dB (A). For Kurna at 10am-78.33dB (A), 2pm-74.63dB (A) and 6pm-76.53dB (A). The results for these two areas are likely to be related since both are mainly residential areas with noise sources majorly from human activities such as external loudspeakers of religious outfits, traffic and street-hawkers. However, Kurna is at proximity to small markets and the Aminu Kano international airport which contributed to its high mean noise level than Dorayi.

Recorded average mean noise level for Sabon-gari at 10am-73.65dB(A), 2pm-83.46dB(A) and 6pm-86.22dB(A), while Kofar-ruwa at 10am-78.95dB(A), 2pm-74.44dB(A) and 6pm-80.31dB(A). These two places are mainly business areas with much commercial activities. In fact, Kofar-ruwa has mentioned, is known for

the largest iron and steel markets in northern Nigeria.

Compare to the other studied areas, sharada phase-I is well known industrial centre in Kano metropolis. As expected, this area recorded an unexpected average mean noise level of 80.02dB (A), 71.60dB (A) and 83.51dB (A). However, the chart in figure-3 shows contrary. Because the highest level recorded was in Sabon-gari. Possibly, this could be attributed to the recent insurgency which has led to the shut-down of some industries in Kano. Also, less industrial activities at the time the noise reading was taken could be an additional factor.
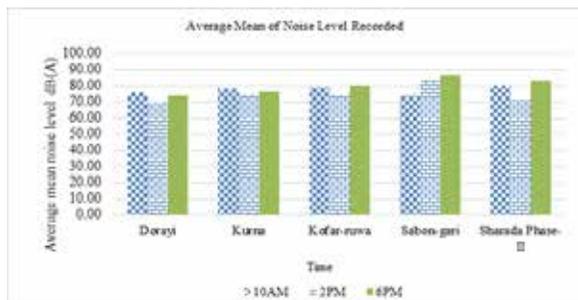

Figure 3: Chart showing the average mean noise level for Dorayi, Kurna, Sabon-Gari and Kofar Ruwa for different periods of the day.

B. CAUSES OF NOISE POLLUTION
It is apparent from table-10 that the major causes of noise pollution are from industrial machines, transportation and human activities. However, it could observed that number of responses for noise from industrial machines is high in sharada Phase-I because of it been an industrial area.

TABLE – 10
CAUSES OF NOISE POLLUTION BASED ON THE SURVEY CARRIED-OUT

Surveyed Areas of Kano Metropolis	Industrial machines		Transportation		Human activity		Total
	N_Resp	Percentage (%)	N_Resp	Percentage (%)	N_Resp	Percentage (%)	
Sabon Gari	3	15	7	35	10	45	20
Sharada Phase-I	14	70	3	15	3	15	20
Kurna	1	5	13	65	6	30	20
Kofar Ruwa	11	55	2	10	7	35	20
Dorayi	1	5	13	65	6	30	20
Total	30		48		23		100
N_Resp: number of response							

X. PSYCHOLOGICAL EFFECTS OF NOISE POLLUTION OBSERVED
Comparing the results shown in (tables 3-6) of the measured noise levels from the five areas studied, as shown in table-1, there is some evidence that long exposure to noise pollution may affect the health-being of the people in these areas. Most likely, since the advisable protective threshold is been exceeded.

TABLE – 11
PSYCHOLOGICAL EFFECTS OF NOISE POLLUTION OBSERVED

Age (Years)	20-35	36-50	51-65	66-80
Headaches	23	13	4	4
Annoyance	12	7	8	4
Feeling Sleepy	5	2	1	2
Fatigue	8	4	2	1
Total	48	26	15	11

7. CONCLUSION
The alarming increase of noise pollution in urban cities such as Kano has become a major concern in Nigeria. This study has identified that the major causes of noise pollution in Kano metropolis, are from industrial, business and human activities. At a particular period, Sabon-gari which is more of a business area recorded a higher average mean noise level than Sharada Phase-I which is an industrial area.

The data from Kurna and Dorayi, which are mostly residential areas shows the noise causes are mainly as a result of human and airport activities. The survey shows that most people living the studied area are not aware of the psychological effects of noise pollution. At the time this survey was carried, there no known research or investigation on effects of noise pollution related to Kano metropolis, and therefore no comparison could be made. Meanwhile, it is believed that this study will serve as base for future studies. Moreover, a limitation to this study is there are certain industrials areas not covered in the survey.

8. RECOMMENDATIONS
- The problem of noise should be taken into consideration during the establishment phases (construction of the building, allocation of the machinery, etc.).
- Use of the latest technology such as noise absorbent should be provided in business and residence areas to avoid noise as much as possible.
- Government should create a program so that awareness of noise effect would be known.
- Better urban planning can help in creating 'No-Noise' zones, where honking and industrial noise are not tolerated
- Whoever will work at noisy workplaces should be subject to hearing tests and other tests regarding related illnesses.

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