

Public Perception about the Environmental Effects of Urban Noise Pollution in Jos Metropolis, Nigeria

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Abstract

Urbanization, transport and economic development are agents of noise-pollution, affecting the environment and air quality in metropolitan areas. The study investigated the sources and perceived effects of noise pollution on human health and property value in Jos metropolis. Random and purposive sampling techniques were employed to select 10 areas and 198 participants for the study respectively. A semi-structured questionnaire was constructed and used to collect data. Simple descriptive statistics, with the aid of SPSS version 22.0 software was used to analyze the data while Pearson Product Moment Coefficient (r) was applied to test the hypothesis. Results indicated that 49.0% of noise pollution emanated from traffic, power generating plants and construction; nearly 81.0% of the respondents were aware of the concept of noise pollution; 71.0% admitted being victims of the menace; while 54.5% were aware of the adverse effects of noise on property value. The peak period for exposure to noise pollution is 3pm – 6pm (34.0%). Over 80.0% of the respondents rated the intensity of noise as moderate-high but 59.1% rated the frequency as continuous. About 50.0% of the interviewees attributed sleeplessness and hearing loss to the effects of noise. Over 62.0% advocated for massive awareness campaigns and legislative action to control the menace, while majority (44.0%) preferred government to enforce compliance. The correlation analysis (r) value 0.97 shows a strong relationship between noise intensity and decline in the value of property while the R^2 value of 94.28% obtained implies that noise is responsible for decline in the value of property in Jos. The paper recommended the need for environmental education, creation of green belts along route-ways, improved silencers in motor vehicles, the use of noise protective devices and compliance with pollution abatement measures in order to safeguard the environment from nuisance.

Keywords: Property Value; Noise Pollution; Environmental Effects; Control

Introduction

The high concentration of people in small unit of land is causing unbearable environmental stress. The global cities, being the hub of socio-economic activities, centres of industry and commerce, are growing at alarming rate. Urbanization has risen from 13% in 1900 to 29% in 1950, 49% in 2005 and is approaching 60% by the year 2030 [1]. In Africa, urban population is growing at the rate of 5% per year and nearly 36.8 million people lived in cities in 1950, but as at 2000, urban population had reached 370 million, which is a tenfold increase in 50 years [3]. Globally, an estimated 600 million people lived in the cities in the year 1950, the number rose to 3.14 billion in 1980s and nearly 90% of the growth occurs in the third world countries, where the annual growth rate is 3.6%, more than three times that of the industrialized countries. The quality of the urban environment has attracted the interest of researchers due to the growing urban sprawl. Air quality in cities is the result of a complex interaction between natural and anthropogenic environmental conditions. The constant roar of over 1.2 billion vehicular traffic, incessant construction, piercing sirens, honking horns, shrieking loudspeakers from religious, marketing, periodic electioneering campaigns and other social events are clearly causing nuisance to the inhabitants of the world's cities.

The word noise is derived from the Latin word 'nausea', which etymologically means sea of sickness. Therefore, noise is an unwanted, unpleasant and annoying sound in the wrong place at the wrong time which made the world Health Organization (WHO) to declare noise in 1972 as a pollutant due to its negative effects on humans, animals and property value. Noise is usually

described in terms of its intensity and frequency while the exposure to it is determined with the aid of logarithmic decibel (dB) which gives a threshold limit for tolerable noise as 45-65 dB. Sound is a special kind of wave action which is usually transmitted through the air in the form of electrical impulses, and carried to the brain so we can hear, but in excess, sound becomes Noise pollution. Noise pollution can cause, hypertension, headache, high stress levels, tinnitus, hearing loss, sleep disturbances, and other harmful effects. Noise can have a detrimental effect on wild animals, increasing the risk of death by changing the delicate balance in predator or prey detection (Rosen and Olin, 1965) [11]. The report of Oyenike, (2016) [8] reveals that sound above 120dB will cause pain to the ear. In a similar note, the London Health Organization (LHO) reported that the threshold levels for stress-related health effect performance is 55dB, cardiovascular effects 65dB while hypertension, heart diseases and hearing loss is 70dB; and that changes above these levels could be of serious health challenge to both human and wildlife [2]. Studies have indicated that the endangered Sonoran pronghorn avoids noisy areas frequented by military jets; female frogs exposed to traffic noise have more difficulty locating the male's signal; and gleaning bats avoid hunting in areas with road noise [12].

The high level of persistent and intermittent noise of the ever-increasing urban areas is posing threat to the environment, causing loss of near and dear ones, generating tension and anxiety in the neighbourhood, including animals. The WHO [5] estimated that more than 80 million people in the European Union countries are exposed to outdoor noise levels higher than 65dB (A), which produces hearing damages and aggravates the problem of cardiovascular system, digestive system, endocrine system and behavioral disorder. Noise pollution in thickly populated, poverty-stricken third world countries is majorly arising from industrial and non-industrial sources, such as automobiles, industrial units, demolition and construction works, low flying air crafts, domestic appliances and loudspeakers [14].

Mankind has, for a long time been plagued by noise pollution throughout recorded history. Record has shown that in Medieval Europe, in the days of Julius Caesar, the horse-drawn chariots on cobblestone street roads of the ancient Rome caused noise pollution, annoyance and quarrels among neighborhoods. As a result, city authorities took measures by banning the use of such noise-producing vehicles on the cobblestone streets at night so that residents could enjoy peaceful sleep. With the growing number of machineries in the 1820s, a German Philosopher, Schopenhauers complained that street noise was disruptive to his mental concentration hence, the use of all noise-generating objects at night were either banned or cobblestone street roads covered with straw to avoid causing annoyance to nearby residents. In Philadelphia, USA, there was provision in the constitution to cover nearby cobblestone roads with earthen-materials to prevent noise-induced interruptions in their important work [9].

In Europe, as many more petitions to the British Parliament were received about excessive noise, including street musicians of the time in London, the menace gradually started gaining more serious recognition socio-politically and legislatively which ushered in the introduction of noise control measures and regulations to curtail the urban noise. Despite the efforts to control noise pollution, SWECO's report of August 28, 2018 indicates that not less than 75 million residents of European cities are exposed to road traffic noise exceeding the amount recommended by the WHO; causing 10,000 cases of premature deaths and 43,000 cases of heart-related diseases every year (<https://www.sweto.gmbh.de/en/new/press/2018/air-and-noise-pollution-every-growing-problems>).

In many Nigerian cities, including Jos metropolis, noise pollution is a typical feature and is becoming a norm. This is probably because of poor awareness and poor public education. The acoustical environmental quality in Jos is threatened by several audible sources such as traffic, industrial facilities, generators, civil construction work as well as social activities like parties, fairs, open air marketing, electioneering, religious events and residential appliances. The establishment of the National Environmental Standards, Regulation and Enforcement Agency (NESREA) in 2007, was to control noise pollution and other environmental problems yet, noisy urban scape is still with us today. It is worrisome that in spite of the campaigns and concerted efforts being made by individuals and government agencies, at local and international levels towards achieving a pollution-free environment, noise pollution still persists and is relatively neglected in Nigeria. Therefore, the study is aimed at investigating the sources and perceived effects of urban noise pollution on human health and property value in Jos metropolis. The study is guided by the following thought-provoking questions:

- i. What are the major sources of noise pollution in Jos metropolis?
- ii. Are the respondents aware of and often disturbed by noise pollution?
- iii. What time of the day are residents mostly exposed to noise pollution?
- iv. How do the respondents rate the intensity and frequency of noise emission?
- v. How does noise pollution affect human health and property value?
- vi. How best can noise pollution be managed in Jos Metropolis?

Methodology

The Study Area

Jos Metropolis is located approximately between latitudes 9°45'00" N and 9°55'00" N of the Equator, and between longitudes 8°45'00" E and 8°58'00" E of the Greenwich Meridian (see map of study area, Figure 1). It has an average elevation of 1,200m, dissected by River Delimi, flowing from South to Northwest before curving Northward to empty its contents into Lake Chad through River Yobe. Jos Plateau experiences a near temperate climate with an annual average temperature of 22° C and the rainfall total reaches 1,450mm per year.

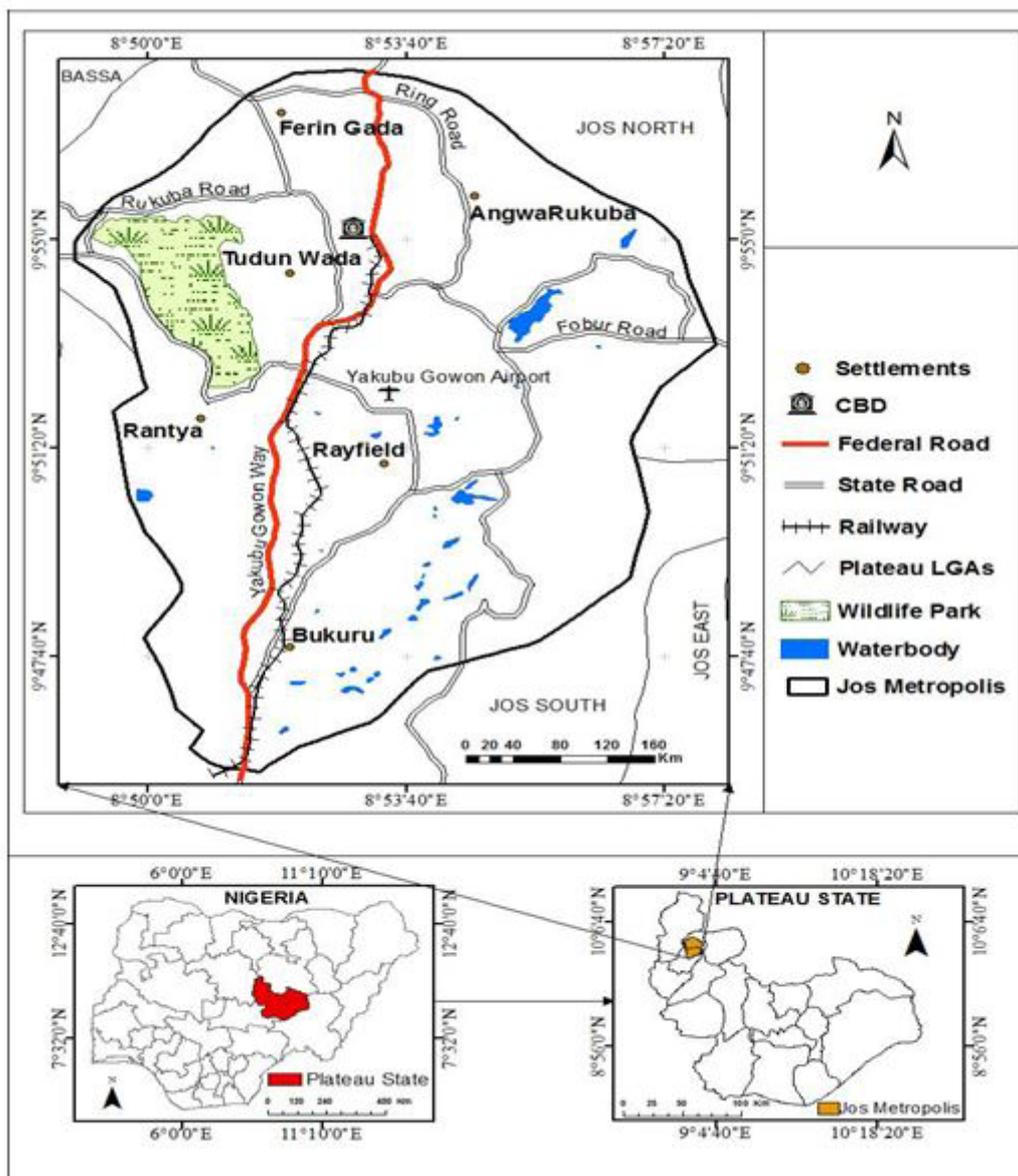


Figure 1: Jos Metropolis Source: National Centre for Remote Sensing, Jos

Jos Metropolis comprises major towns in Jos North and Jos South LGAs of Plateau State. Jos is the capital city of Plateau State in North Central Nigeria. Being a cosmopolitan settlement, Jos is inhabited by virtually all the different ethnic groups of Nigeria and foreign nationals. The discovery of tin ore and columbite in the early 1900s led to its rapid growth, rising from: 8,000 in 1920 to 11,000 in 1931; to 80,000 in 1960; to 637,036 in 1991; (Ihemegbulem and Nyong, 2002) [6]; and reached 748,609 in 2006 (NPC, 2006). The residents are engaged mainly in secondary, tertiary and quaternary activities of the economy for livelihood. The city is rapidly growing at an alarming rate due to rural-urban drift, consisting mainly of young people who are pursuing education, job fortunes or safe haven away from conflict-ridden rural areas of the State and neighbouring States. However, many of these youthful population do not always possess the requisite qualifications to fit into the employment system of the city hence, some of them resort to noise-generating activities like driving commercial vehicles, metal fabrication work, operating musical studios and entertainment.

Sample Size and Data Collection

The study design employed is the quantitative survey type, involving the selection of a sample to represent the entire population. Using table of random numbers, ten locations within Jos metropolis were selected as follows: Jos Terminus (N09°55'18"/E008°53'23"), Old Bukuru Park (N09°55'29"/E008°53'17"), Nasarawa Gwong (N09°55'46"/E008°54'13"), Bauchi Road (N09°55'25"/E008°53'28"), Farin Gada (N09°57'33"/E008°51'59"), Giring-Abattoir (N09°53'39"/E008°53'19"), Dadin Kowa (N09°51'22"/E008°51'51"), Zarmaganda (N09°50'58"/E008°52'02"), Rayfield (N09°51'10"/E008°54'08"), and Gyel-A (N09°52'48"/E008°52'58"). Thereafter, purposive sampling technique was applied in the selection of 200 households, within a radius of 300 meters of each of the choose locations. The use of randomization and purposive techniques in selecting the target locations and the respondents was because of the convenience of their application in an urban setting. The decision of sample size was

based on the suggestion by Seymour (1976) [13], as quoted in Meekya (1992) [7] who recommended 200-500 elements for households and regional survey studies for social sciences. Consequent upon this, a questionnaire instrument was constructed, structured into open and closed and twenty copies were first administered to twenty household-heads in the neighborhood with the intention of testing the reliability and validity of the tool before administering to the respondents. The questionnaire sought for information about age, educational level and income levels of the respondents. Other information sought was mainly on the effects of noise pollution on health and property value located within the noise-generating areas as perceived by the residents. Respondents were allowed to choose appropriate answers to the questions from the options and could freely make their own comments as well.

Twenty copies of questionnaire were distributed to the ten settlements to generate data that would enable the researchers to analyze and answer the questions posed earlier. Two field assistants who were very fluent in both Hausa and English languages were trained to help in the collection of data. The questionnaire was administered to each household-head or any mature member of the household. Where nobody was around, the next household head was given the questionnaire to fill. Although, 200 copies of questionnaire were distributed to the 200 respondents, only 198 were duly completed correctly and returned, while the remaining 2 copies were partially filled hence, could not be used for the analysis. Meanwhile, the 198 copies of the questionnaire returned represent 99.0% response rate. Data collated from 198 copies of the questionnaire were summarized and analyzed with the use of Statistical Package for Social Sciences (SPSS) version 22.0 software. While descriptive statistics was used to present the results, Pearson Product Moment Coefficient was employed to test the hypothesis, "There is no positive association between noise intensity and decline in value of property in Jos metropolis". The formula is denoted by the symbol:

$$r = \frac{\sum xy - \bar{x} \bar{y}}{S_x S_y} \dots\dots\dots 1$$

where n = the number of pairs of scores.

$\sum xy$ = The sum of the products of each pair of scores.

\bar{x} = The mean of the X distribution.

\bar{y} = The mean of the Y distribution

S_x = The standard deviation of the X distribution.

S_y = The standard deviation of the Y distribution.

Results

The aggregate data collated from 198 subjects on the sources and perception on the environmental effects of noise pollution in Jos Metropolis have been analyzed through simple descriptive statistics. Pearson Product Moment Coefficient (r) was useful in testing the stated hypothesis. Results have been presented in frequency tables in this section.

Sources of Environmental Noise Pollution in Jos Metropolis

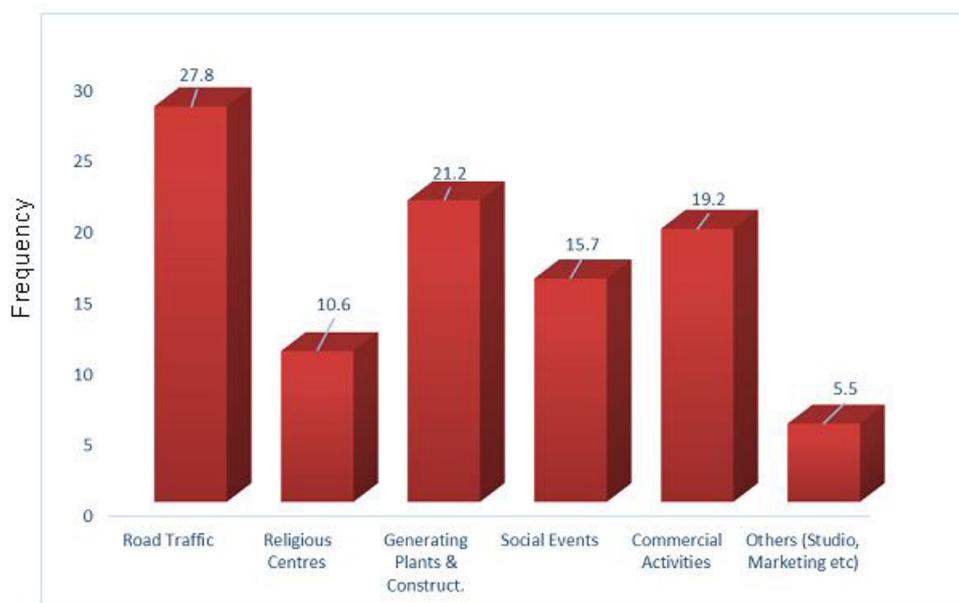


Figure 2: Sources of Environmental Noise Pollution in Jos Metropolis

Source: Field Survey

Figure 2 shows the various sources of noise pollution identified in Jos metropolis by the interviewees. Results indicated that road traffic and generating plants, account for nearly half (49.0%) of all the sources of noise pollution in the study area. The remaining 51.0% are accounted for by commercial activities (19.2%), social events, religious activities and other unclassified noise- generating activities.

Extent of Knowledge about Noise Pollution and Effects

Figure is the presentation of extent of awareness of the respondents about the concept of noise pollution, its disturbance and effects on property value. Findings indicate that the respondents have high awareness level of the concept of noise pollution (80.8 %), its disturbance (70.7%) and its adverse effect on property value (54.5%) located near the noise-generating sources. This implies that with little mobilization of the people in the study area, noise pollution can be minimized since they are aware of its adverse effects on lives and property.

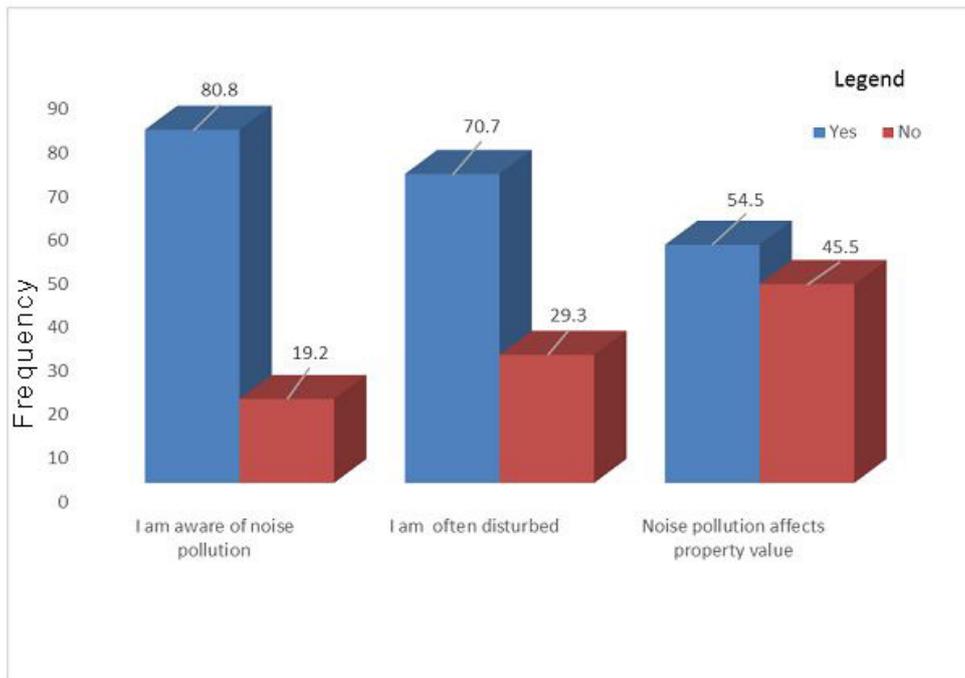


Figure 3: Extent of Knowledge about Noise Pollution and Effects
Source: Field Survey

Peak Period of Exposure to Noise Pollution

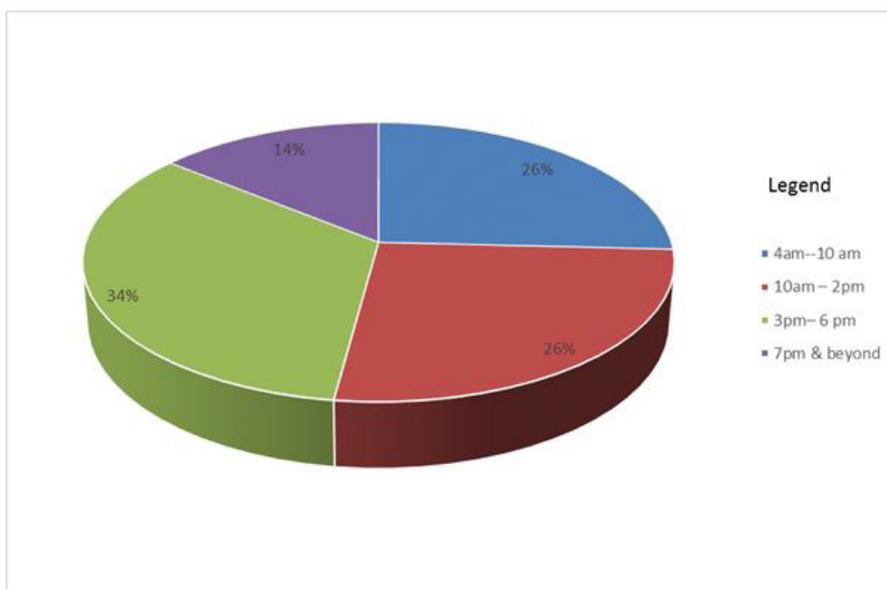


Figure 4: Peak Period of Exposure to Noise Pollution
Source: Field Survey

Figure 4 presents the frequently mentioned peak period for exposure to noise pollution in Jos metropolis. It can be deduced from the table that noise pollution is usually at its peak from 3pm - 6pm, accounting for about 34.0%. However, the least noise disturbing period is 7pm and beyond (14.1%), when most business people, customers and vehicular traffic retire from the streets for the regular nights' rest.

Rating of Noise Intensity and Frequency Levels

Responses of the interviewees on the intensity and frequency levels of noise pollution have been presented in table 1. With regards to the intensity of noise pollution, about 42.0% of the respondents adjudged the menace as high, followed by moderate (38.9%) while less than 20.0% (19.2%) of the respondents regarded the intensity of noise pollution in Jos as being low hence, not very much a problem. About the frequency of the noise, nearly two third (59.1%) of the interviewees regarded noise pollution in Jos as continuous, while the remaining 40.9% considered the frequency as intermittent in occurrence.

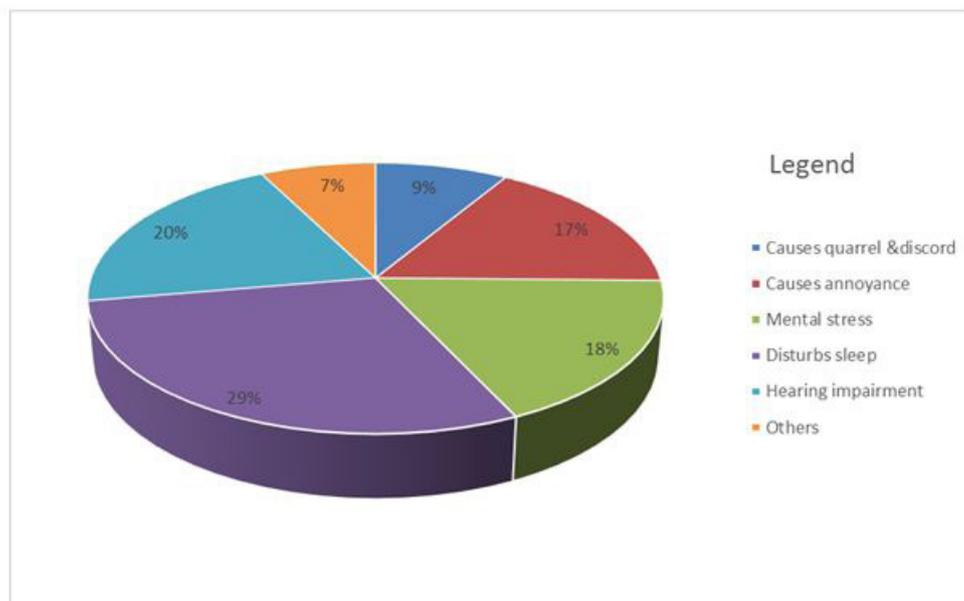
Variable	Frequency	%
Intensity		
Low	38	19.2
moderate	77	38.9
high	83	41.9
Very High	00	00.0
Total	198	100
Frequency		
Continuous	117	59.1
Intermittent	81	40.9
Total	198	100

Source: Field Survey

Table 1: Rating of Noise Intensity and Frequency Levels

Perceived Health Effects of Noise Pollution

The perceived health effects of noise pollution in Jos metropolis have been presented in figure 5. Results show, in order of increasing magnitude that noise pollution adversely affect sleep (29.3%), hearing loss (20.2%), causes mental stress (17.7%), annoyance (16.7%), discord (8.6%) while are unclassified health effects accounted for 7.5%.



Source: Field Survey

Figure 5: Perceived Health Effects of Noise Pollution

Perceived Effects of Noise on Property Value

Figure 6 shows the effects of noise pollution on property value, perceived by the respondents in Jos metropolis. Nearly, 37.0% and 33.0% of the respondents stated that shops at the vicinity of noise-generating sources have less rental value and landed property have low demand respectively. However, 19.2% of the respondents perceived low patronage for business outfits located near noise-generating sources.

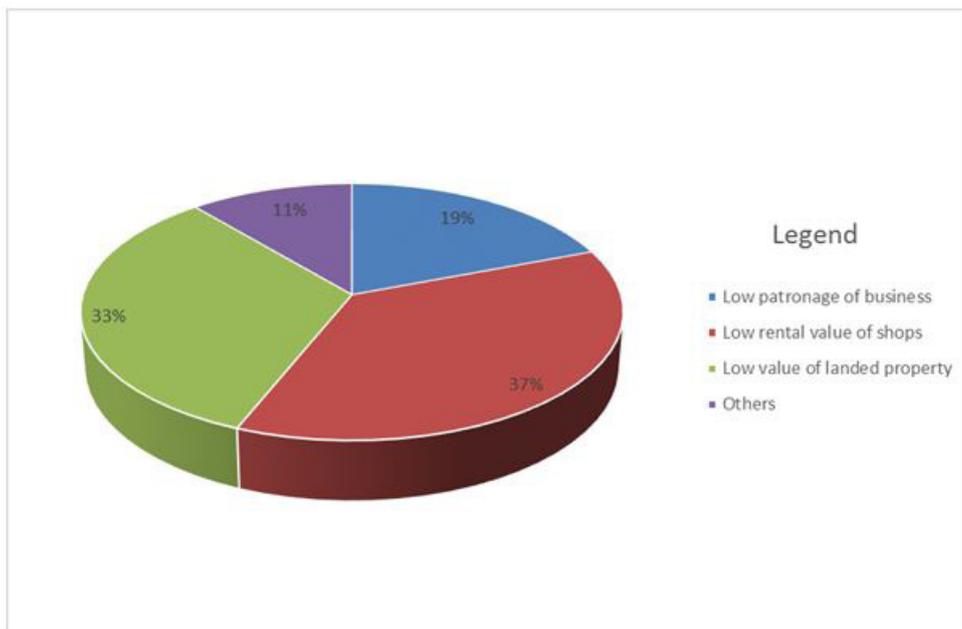


Figure 6: Perceived Effects of Noise on Property Value
Source: Field Survey

Noise Pollution Abatement Measures

Table 2 presents responses of the interviewees on how they felt noise pollution could be controlled in Jos metropolis. Majority of the respondents (62.2%) advocated the need for massive awareness campaigns and enactment of legislation as effective measures for controlling noise pollution. With regard to noise pollution enforcement 44.0% of the respondents considered government as the enforcing body while 29.3% see the enforcement of noise pollution laws in the study area as every body’s business.

Variable	Frequency	%
Control:		
Zoning land use	34	17.2
Awareness campaign & Legislation	123	62.2
Muff protection device	19	9.6
Concrete barriers	4	2.0
Polluter pays policy	18	9.0
Total	198	100
Enforcement:		
Government	87	43.9
Public	58	29.3
Manufacturers	37	18.7
Others	16	8.1
Total	198	100

Source: Field Survey

Table 2: Noise Pollution Abatement Measures

INTENSITY (X)	PROPERTY (Y)	X ²	Y ²	XY
38				
38	1444	1444	1444	
77	73	5929	5329	5621
83	65	6889	4225	5395
0	22	0	484	0
Σ 198	Σ 198	14262	11482	12460
X= 66 = 49.5	Y= 49.5	r=0.971; R ² =94.28%		

Source: Authors' Computation

Table 3: Correlation Between Noise Intensity and Effects Decline Value of Property

By applying the Pearson Product Moment Correlation formula to the computation in Table 2 above, a correlation coefficient (r) of 0.971 was obtained that indicated a strong positive correlation between noise intensity and its effects on property value in Jos metropolis. From the result, a coefficient of determination (R^2) of 94.28% was obtained, indicating that noise intensity was responsible for 94.28% decline in property value in the area of the study.

Discussion

Noise pollution has always been with humans since from time immemorial. The study investigated the main sources and perceived effects of noise pollution in Jos metropolis and the findings are discussed in this section. The study identified the main sources of noise pollution to be from traffic, power generating plants and construction, which accounted for 49.0% (Figure 2). Nigeria's poor and erratic power supply has led to the upsurge in the demand and use of electric generating plants with all its attendant noise pollution on the environment and human health. The finding corroborates Savale's (2014) assertion that the continuous movement of vehicular traffic (1.2 billion vehicles worldwide) is the main source of noise pollution in metropolitan and urban areas, through honking horns, brake squeals, slamming of doors and booths. He further stated that since the rising urbanization and growing width of each town involves construction and engineering works, noise pollution from this source also rank high and affects nearby residents adversely.

The study discovered that, far above half of the interviewees in Jos Metropolis were very much aware of the concept of noise pollution and its adverse environmental effects (Figure 3). Their high level of awareness probably stemmed from the fact that they were once victims of unpleasant sound in loading parks, road junctions, open air trading and social events at intensity higher than 65dB, as reported in the previous work done in Jos metropolis (Peter, 2016). The respondents have always been victims of noise pollution because the acoustic environment in which most of them dwell in Jos has been reported previously to be 70- 86dB being higher than the recommended 65dB by NESREA. Consequently, they might have been in high health risk, such as sleeplessness, psychological and behavioral disorder. Finding on the respondents' knowledge on the adverse effects of noise pollution on property indicated high awareness level of 54.5% (Figure 3). This is probably because some of them had witnessed the several bomb explosions that rocked the city of Jos in 2014, at noise intensity higher than 140dB, which killed and maimed hundreds of residents besides, destruction of their hard-earned property. In line with this result obtained in Jos, Savale (2014) asserts that high intensity of noise vibrations emanating from heavy machinery can even shatter window glasses, loose plaster of house walls, crack walls and break crockery while the infra-sonic and ultra-sonic waves can cause buildings to collapse.

In the study of the respondents' period of exposure to noise pollution in Jos, it was noted that the noisiness moment is 3pm–6pm daily, accounting for 34%. This period can be attributed to the rush hours of picking children and students back home from schools, open air marketing, music system, social events, especially religious ceremonies and parties. Therefore, residents are exposed to noise intensity highest in the afternoon which coincides with the time when commercial activities are high, students and workers closing for the day thereby, causing traffic built-up and noise. The findings on the intensity or loudness of sound generated in Jos indicated that majority of the interviewees considered the noise pollution as moderately high, accounting for nearly 81.0% of all the responses. This result corroborates the study carried out in Jos metropolis where the noise intensity found ranged between 70dB and 86dB, which is for above the WHO recommended permissible noise levels for industrial (65-75dB), commercial (55-65dB), and institutional (35-45dB) (Peter, 2016; Asthana and Asthana, 2012). Discovery in Jos also indicated that two-thirds (132) of the respondents rate the frequency of noise as continuous, which signifies that noise pollution emanates mostly from rotating parts of machinery like generator, factory or continuous movement of vehicles.

The result obtained on the effects of noise pollution on health indicated that the menace has adverse effects on sleep (29.0%), aggravates hearing loss (20.0%), causes mental stress (18.0%), annoyance (17.0%) and quarrels (9.0%). This result is not different from findings reported from other parts of the world. Studies revealed that chronic exposure to noise negate cognitive functioning and hinders children's comprehension compared to students from quieter schools. Hagler (cited in Anees, et al. 2014) reported that 340 children aged 8-11 years in London exposed to traffic noise pollution led to annoyance, poor reading and less comprehension, and at 55dB, there was low attention, less social adaptability and had negative behavior towards others, compared to undisturbed children. Oni Femi (cited in the Guardian, July 8, 2015), reported findings from studies that exposures to noise pollution in excess of about 100dB can lead to adverse effects on fetus, headache, dizziness, dilatoriness in intestine, stomach problems as well as affect eye sights to the extent that they become incurable. The result obtained in Jos metropolis on how best to manage noise pollution have indicated that 62.2% of the respondents preferred massive campaigns and use of legislation to abate the menace. For effectiveness, government, through its relevant organ and agencies, should take the lead (44.0%) and mobilize the general public (29.3%) to join in the fight against noise pollution. It was also discovered that manufacturers (19.0%) are expected to contribute their own quota to the fight against noise pollution by improving and upgrading the engine of machinery to make them quieter and make the environment pollution-free. This signifies that research activities should be intensified to actualize the production of electric motor vehicles en masse, as they are noise-free and environment-friendly.

Conclusion and Recommendations

It has been discovered in this study that pollution is a known phenomenon in Jos and is adversely affecting life quality and property. The study investigated the sources and perceived efforts of noise pollution on human health and property in the study area. Despite efforts to curb environmental problems by government through its agency NESREA, noise pollution still persists. Failure to effectively manage noise pollution in the country probably has stemmed from the fact that Nigeria does not have exclusive legal system specially for controlling noise pollution. Therefore, in the light of this, the paper recommends the following possible remedies to solve urban noise pollution:

1. Government should put in place regulatory agency to assist NESREA in the measurement, control and enforcement of environmental laws to safeguard the environment from nuisance.
2. Plantations and greenbelts should be established along route ways in order to reduce urban noise pollution.
3. Manufacturers of machinery should introduce improved silencers in motor vehicles and industrial machinery to reduce noise pollution.
4. Users of motor vehicles should limit honking of horns arbitrarily and instead; they should use visual stimulus like the flashing headlights which is environmental friendly.
5. Individuals should use noise-proof gadgets such as insulators in doors, windows, ceilings and walls to reduce noise pollution in their homes.
6. There is need to create public awareness to educate the general public about the harmful effects of noise pollution.
7. Factory workers should be mandated by law to always put-on noise protective device like muffs.
8. Users of megaphones and loudspeakers should operate them at low volumes to avoid causing noise pollution.

References

1. Aliyu A, Lawal, Amadu (2017) Urbanization, Cities and Health: The Challenges of Nigeria—A Review. *Ann Afr Med* 16: 149-58.
2. Anees M, Qasim M, Bashir, A (2014) Physiological and Physical Impact of Noise Pollution on Environmental. *Asian J Environ Earth Sci* 1: 25- 31.
3. Asthana DK, Asthana M (2012) A Textbook of Environmental Studies. Second Edition. Ram Nagar, New Delhi, Chand & Company Ltd.
4. Barber CF, Jorquera RA, Melom JE, Littleton JT (2009) Postsynaptic Regulation of Synaptic Plasticity by Synaptotagmin 4 Requires Both C2 Domains. *J Cell Biol* 187: 295-310.
5. Fabio A, Roberto B, Shumbusho SM, Diego S, Gio Vanni Z (2017) The Noise Pollution Perception in the city of Milan: Analysis of Registered complaints by the population. 12th ICBEN Congress on Noise as a Public Health Problem 10- 2.
6. Ithemgbulem VC, Nyong AO (2002) Jos Atlas of Nigeria. First Edition. Abuja Les Editions 142-3.
7. Meekya UJ (1992) The Preparation and Presentation of Research Projects. First Edition. Jos, Planning Research Publications.
8. Oyenike ME (2016) Perceptions on Noise Pollution Among the Residents of a Medium – Size Settlement in Southwestern Nigeria – A Preliminary Study. *J Pollut Effects Control* 4: 1-4.
9. Peter JD (2016) Environmental Noise Pollution and Management in Jos Metropolis. Unpublished, MSc Thesis, Department of Geography and Planning, University of Jos
10. Rosen, Olin P (1965) Hearing Loss and Coronary Heart Disease. *Archives of Otolaryngology* 82: 236.
11. Savale PA (1965) Effects of Noise Pollution on Human Beings: Its Prevention and Control. *Journal of Environmental Research and Development*, 8: 1062-136.
12. Shannon G, Crooks KR, Whittemyer G, Fristrup KM, Angeloni LM (2016) Road Noise Causes Earlier Predator Detection and Flight Response in a Free-ranging Mammal. *Behavioral Ecology* 27: 1370-5.
13. Seymour S (1976) Sample Size: Applied Sampling. London Academic Press.
14. Tripathy SN, Panda S (1999) Fundamental of Environmental Studies, First edition. Delhi, Vrinda Publication Ltd.