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Noise mapping around the host communities of the university of port harcourt, Nigeria

Abstract

Noise pollution arising from traffic emissions coupled with other emissions from other sources pose a serious health challenge to people. Noise pollution has the capacity to cause alterations in the psychological functioning of individuals and this may have some serious social implications as noise pollution may affect the overall well-being and functionality of people living in the urban centre. This impairment of functionality may cause a reduction in the quality of life available to people living in any given area. This study looked at the problem of noise pollution around the host communities of the University of Port Harcourt. A cross sectional and experimental design was adopted. Noise values were measured and the values were beyond threshold limits for acceptable noise levels across the study area. This becomes very disturbing when viewed against the backdrop that the study area hosts an institution of higher learning in Nigeria. The study was able to identify the noisiest areas and concluded by suggesting appropriate measures to manage the menace.

Keywords: noise mapping, noise pollution; rivers state, Nigeria

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Introduction

The quality of life enjoyed by the people living in any given place is influenced by different factors that interplay at any given time. Various scholars and researchers have noted that pollution has become a major problem to both developed and developing countries in recent times due to increase in industrialization, population and commercial activities. There has been a growing awareness about possible side effects of various pollutants in the environment[1,2] Pollution is a major environmental risk to health both to humans and the environment.

Obaidat[2] contends that noise pollution arising from traffic emissions coupled with other emissions from other sources pose a serious health challenge to people living in urban centres. Water, hazardous waste air and noise pollution have been identified as a source of serious concern in many nations today.[3] Noise pollution has the capacity to cause alterations in the psychological functioning of individuals and this may have some serious social implications as noise pollution may affect the overall well-being and functionality of people living in the urban centre. This may cause a drastic reduction in the quality of life of life enjoyed by the people living in this affected areas.[3]

Obafemi and Ofundu[4] argue that one of the most persistent and unavoidable menace that is facing the contemporary society today is that of noise pollution. This can be due attributed to the rapid urbanization and industrialization of our society in which the number of automobiles, generating plants, industries and other noise generating sources are ever increasing.

Kanjo[5] opines that sound is essential for the normal functioning of human society on a day to day basis. However, sound becomes noise when it goes beyond a certain threshold. The National Institute for Occupational Safety and Health (NIOSH) contend that "ambient noise level also affect people's health by increasing general stress or related conditions such as high blood pressure, coronary artery disease, peptic ulcer and migraine head ache".[4,6]

Loud noises are, annoying and harmful to the ear as they become a source of irritation and stress for many people and can even damage hearing if it is loud enough. Many people are exposed to stressful levels of indoor and outdoor environmental noise emanating from different sources. Alluding to this claim, Obaidat[7] stated that "noise disturbance may cause people in urban areas to move or consider moving from cities of high population density in search of a quieter environment"

In the same vein, Onu,[8] submitted that in developed countries, it is a challenge to get access to quiet places while in Africa; noise is seen as a way of life and a necessary consequence of urbanization. Noise contributes greatly to diminishing city dwellers' quality of life. In particular, exposure of people to noise levels above 65 dBA can cause severe health problems.[5] Road traffic is a main source of noise in urban areas, accounting for about 80% of total noise pollution.[9]

In the European Union, about 40% of the population is exposed to road traffic noise with an equivalent sound pressure level exceeding 55dB(A) daytime, and 20% are exposed to levels exceeding 65 dB(A).[10] Noise is subjective and different people react to it in different ways. What can cause annoyance to some people may be barely noticeable by others. Noise can have the effect of causing people to feel annoyed simply because the noise is audible. Noise pollution is one of the problems addressed by the 1989 Nigerian National Policy on the Environment. This policy recognized the adverse effects of noise on human health, and went ahead to set up noise standards and noise limits. The host communities of the University of Port Harcourt, Alakahia, Aluu and Choba are characterized with various socio-economic activities such as trading, bars and transportation which all generate noise. An appreciable number of students and members of staff of the University make their homes in these host communities and therefore an understanding of the noise levels in these areas will show the distribution and levels of noise in these areas; as previous literature has shown that noise has an impact on human health and productivity. Emanating from this assertion, this study is an attempt to map noise levels around the host communities of the University of Port Harcourt as there is an existing lacuna in this area of research and knowledge in the study area.

Materials and method

The study area encompasses locations in and around Alakahia, Choba and Aluu axis, in the urban fringes of Port Harcourt Metropolis of Rivers State. The coordinates of the study area are given as: 4°50'00"N, 5°00'00"N and 6.50' 00''E; 007.00' 00E.

The study area follows the general climatic type of Port Harcourt and its environs. The study area features a tropical monsoon climate with lengthy and heavy rainy seasons and very short dry seasons. Only the months of December and January truly qualifies as dry season months. The harmattan, which climatically influences many cities in West Africa, is less pronounced in the study area. The study area's heaviest precipitation occurs during September with an average of 370mm of rain. December on average is the driest month of the year; with an average rainfall of 20mm. Temperatures throughout the year in the city is relatively constant, showing little variation throughout the course of the year. Average temperatures are typically between 25-28degree Celsius.[11]

The study area combined hosts the University of Port Harcourt. The people engage in trading farming, fishing and other economic activities. A considerable number of the people engage in white collar jobs with changes in life style and income. However, other land use types are evident in the study area. A large percentage of the built-up land area is dedicated to the development of residential quarters for staff, students' halls of residence, lecture halls and classrooms. Some portion of the land is also dedicated to commercial and recreational uses.

Data

All the data used in the study was obtained from primary sources. It involved field work to collect raw data. The data was generated using a combination of near surface point of impact sampling and measurement; this was achieved with the aid of an Extech handheld noise level metre (model 407732). This sound metre was used to generate the sound levels at designated sample locations within the study area.

All the locations from which measurements were taken were marked with a portable hand held global positioning system (GPS). The model of GPS used for collecting the point information was the Garmin 76handheld GPS. The coordinates were recorded and used to build an attribute table for sound and noise information within the study area. This information was fed into a geographic information system, so that the data can be queried. Questionnaires would also be administered to respondents to elicit information on sources of noise and likely solutions to these problems.

Sampling technique

Sound and noise levels were measured using portable field equipment. The equipment used for the field measurement was an Extech 407730sound level metre. Measurements were taken at designated points within the study area at busy streets and major business hubs. A total of 150questionnaires were administered to respondents across the study area with each community getting 50copies of the questionnaire. A total of 146copies of the questionnaire were retrieved and analyzed. Hence the sample size was 146.

Data analysis

The noise data generated was analyzed with descriptive statistics, while the noise data was plotted as continous surface maps using kriging as the spatial interpolation technique in GIS. Eludoyin & Wekpe have opined that GIS is a very powerful tool to present geographic based data.

Results and discussion

Presentation of results

Noise measurement and determination

A cole-Parmer Extech Model 407730 sound level metre was used as the sampling collection instrument to collect sound/noise levels within the study area. The 407730 measures and displays sound pressure levels in dB from 40 to 130dB. The metre was powered, held away from the body and with the windscreen placed over a microphone; sound level readings were then taken from the display monitor in decibels (dB).

The USEPA, stipulates that exposure to noise level over 70 decibels could lead to hearing impairments for those exposed to such noise level while levels ranging around 55 decibels could lead to preventing actions leading to interference and annoyance. Also consistent exposure to noise levels above the threshold of annoyance can overtime lead to mental problem where the individual is naturally predisposed to an "angered personality" or simply an angry man persona. In a recent PhD research work in 2011 it was found that militants in a post amnesty camp concluded that ex-militants had an "unruly behavioural lifestyle, were very erratic and scream when they are supposed to be talking with their trainers".[12]

Discussion of findings

Noise level over 70 decibels could lead to hearing impairments for those exposed to such noise level while levels ranging around 55 decibels could lead to actions resulting to interference and annoyance. Noise levels where beyond the impairment and annoyance threshold at all the locations sampled.

Findings from personal observation during the course of investigation for this work show that the places that were designated as residential areas are no longer so. A large proportion of the residential area has been converted to commercial and artisanal activities thereby contributing to the noise problem in the study area. The major sources of noise identified include; loud noises from mobile advertisement vans, mobile vendors, especially those that sell compact disks. Significant noise is also generated from household activities, such as use of blenders, music and sounds from high volume radio and television sets. Churches and other religious activities also contribute to the noise problem as so many churches are found within the study areas. Sound from the church public address systems contribute significantly as the proliferation of churches into residential areas means that different churches have different programs at different time and therefore contribute noise at different days and different times.

Noise from traffic is another major source of noise pollution. The interlinking and intertwining of the residential areas, juxtaposed with commercial activities ensures a constant flow of vehicular traffic. Some sections in the residential areas have been found to accommodate ware houses for the goods sold in the nearby market places. This ensures that the steady flow of traffic and breeds noise as the drivers of both commercial and private cars compete for limited

road space and in the process blare their horns indiscriminately in other to get the attention of other road users.

The distribution of noise across the sample areas show that the noisiest places in the study area are found around places at the Choba junction market, Alakahia junction, opposite UPTH gate, Alakahia-Rumualogu junction and Owhipa in Choba Village. The noise/sound readings obtained at Alakahia-Rumualogu Junction showed readings of over 80db. These readings are closely followed by Choba junction and Alakahia Junctions opposite the UPTH gate where readings and measurements were above 70db. The least noisy place is the residential around the University of Port Harcourt Demonstration Secondary School (UDSS) and the students residential hostels around Pretaso in Aluu with average noise measurements of about 70db (Figures 1). However, what is common to the sample locations is that measurements from all the locations exceed the maximum permissible limits for noise impairment thresholds and far well beyond the annoyance thresholds (Figures 2–4). This finding is in agreement with the works and findings of Singh and Davar,[13] who maintained that noise from urban centres if not closely monitored usually exceeded the permissible limits. As shown in Tables 1–3. It becomes evidently clear that all the sampled locations do not meet up to international standards for noise adherence for both residential and commercial areas. All the areas sampled exceed the day time permissible limits of 55db. The average noise values measured within the study area go beyond 70db with some areas around the Alakahia-Rumualogu junction, Choba junction and Alakahia junction having values of over 80db. The implication of this is that continous exposure to these noises may cause hearing impairments. This problem is further aggravated because a lot of the supposedly residential areas have been converted to commercial residences, thus it becomes very difficult to distinguish between commercial and residential areas as they have inadvertently become one and the same.

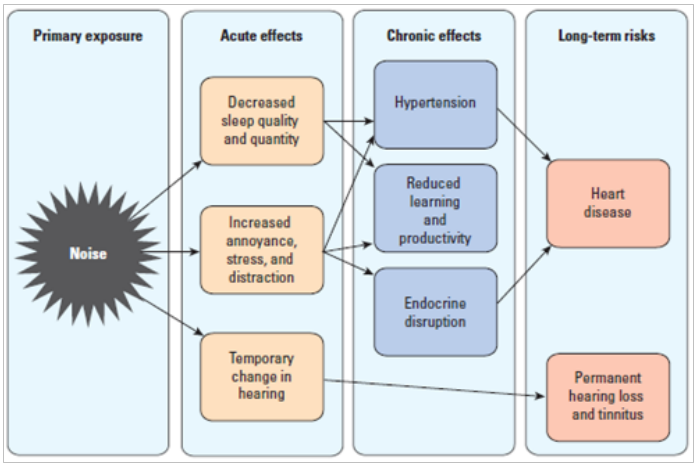

Figure 1 Summary of the effects of noise pollution.[16]

The realization that noise may have severe consequences for human health and therefore have a significant impact on the quality of life of people that are exposed to noise therefore calls for efforts and measures to combat the menace of noise in the study area. Solutions to provide amelioration to the problem is not singular, instead it is multifaceted in its outlook. This means that there is no singular solution to the problem of noise pollution. For a start, for noise to be controlled, it must be understood and known. That means that noise must be mapped. It is only when noise is mapped that adequate and far reaching solutions can be reached. There should be a strong enforcement of the regulatory requirement for noise abatement in residential areas. Also, education and enlightenment should be encouraged as suggested by.[4,13] Some scholars have suggested empowering civil authorities and enforcement agencies as a way to provide a solution for controlling noise pollution.[14] However, this measure is not recommended as it may be quite expensive and time consuming, taking into account the current state of the Nigerian economy (Figures 5–8).[15–17]

Table 1 Noise levels across different sample locations in the study area

Sample points	Noise level		
	Morning peak		
	(dB)A	Max. hold	Min. hold
Choba Junction	81.62	70.92	76.64
Owhipa	77.2	81.74	75.08
By Pretaso Hostel	76.6	79.86	74.04
Alakahia Junction	75.56	78.74	74.38
Alakahia Rumualogu Junction	80.92	82.24	78.24
Beside UDSS Aluu	72.46	76.02	71.16
Mean	77.39	78.25	74.92
Evening peak			
Choba Junction	81.14	83.74	79.82
Owhipa	79.38	80.94	78.14
By Pretaso Hostel	78.72	81.08	75.42
Alakahia Junction	77.72	81.18	75.42
Alakahia Rumualogu Junction	79.24	81.181	75.12
Beside UDSS Aluu	72.78	79.24	72.56
Mean	78.12	81.34	76.06
Off peak			
Choba Junction	79.5	84.02	77.7
Owhipa	72.46	76.94	72.2
By Pretaso Hostel	71.28	77.58	67.88
Alakahia Junction	78.16	80.34	74.98
Alakahia Rumualogu Junction	76.22	79.96	74.04
Beside UDSS Aluu	74.98	77.9	72.98
Mean	75.43	79.46	73.3

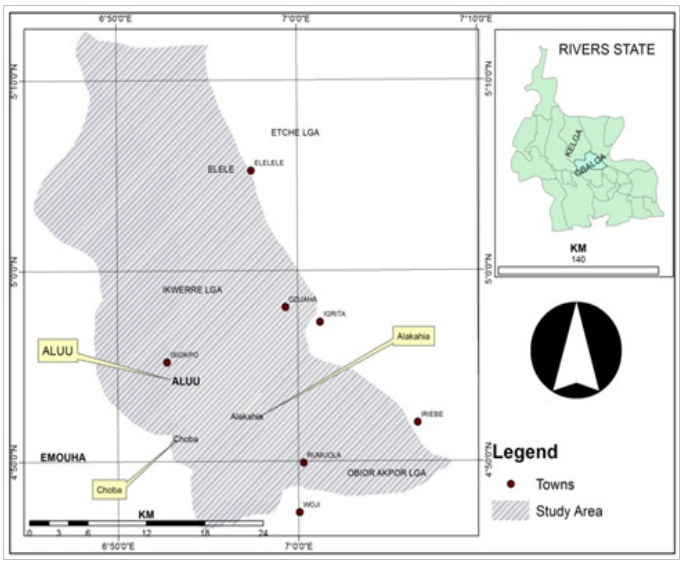

Figure 2 Study area.

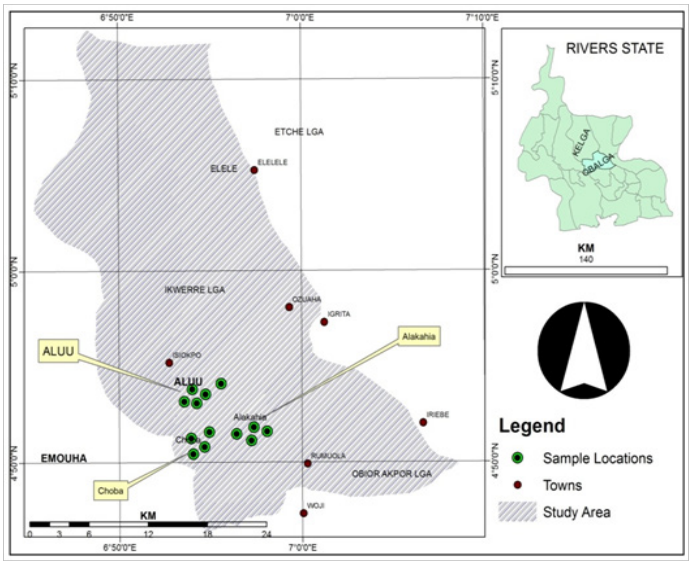

Figure 3 Study area showing sample locations.

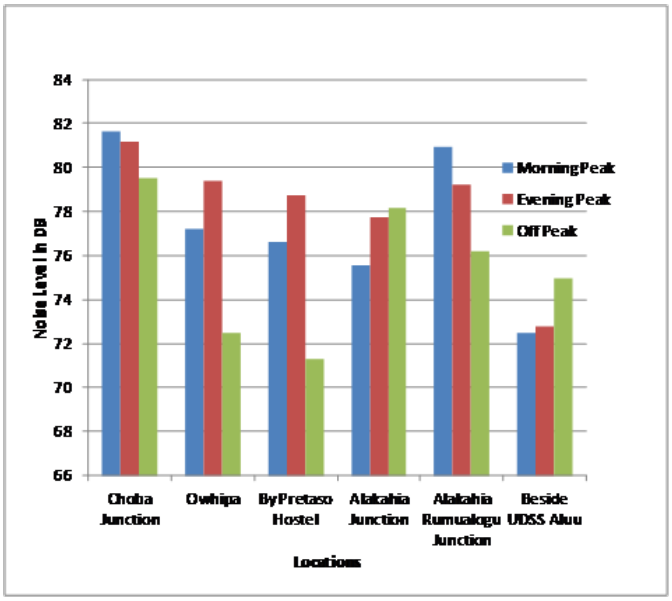

Figure 4 Temporal noise measurement.

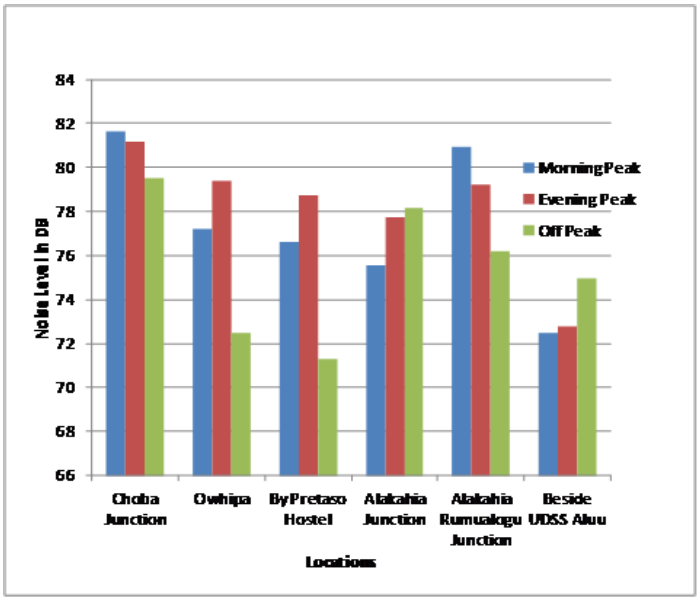

Figure 5 Mean temporal noise readings across the study area.

Conclusions

Noise in the study area emanates from a number of sources such as; noise from domestic activities, transportation activities, entertainment centres and bars sounds from public address systems, churches and other religious activities. The impacts of Noise may be far reaching as it can affect individuals in both physical and psychological ways, as it may cause disruption in human communication as well as have a debilitating effect on the physiological functioning of humans arising from disruptions in sleep patterns. Measures to control noise include; education and public enlightenment, which can be manifested in the forms of environmental education and advocacy. Noise levels over 70decibels could lead to hearing impairments for those exposed to such noise level while levels ranging around 55decibels could lead to interference and annoyance. This study found that in all the locations sampled, noise levels were beyond both the annoyance and hearing impairment thresholds. Some locations around Choba junction, Alakahia-Rumualogu junction and Alakahia junction had noise values of over 80db. The calmest location within the study area, is the area around the University of Port Harcourt Demonstration Secondary School (UDSS) However, this area still had values that were beyond the values international standards recommend as average values recorded were more than 70db. The study also discovered that a very pertinent and salient reason why there is so much noise in residential areas within the study area, is that a large section of residential areas within the study area have been converted to commercial uses (bars,

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entertainment centres, game centres, fast food outlets, markets, bus stops and private power holding companies, generating noise from generators) thereby bringing commercial activities to areas designated as residential areas.

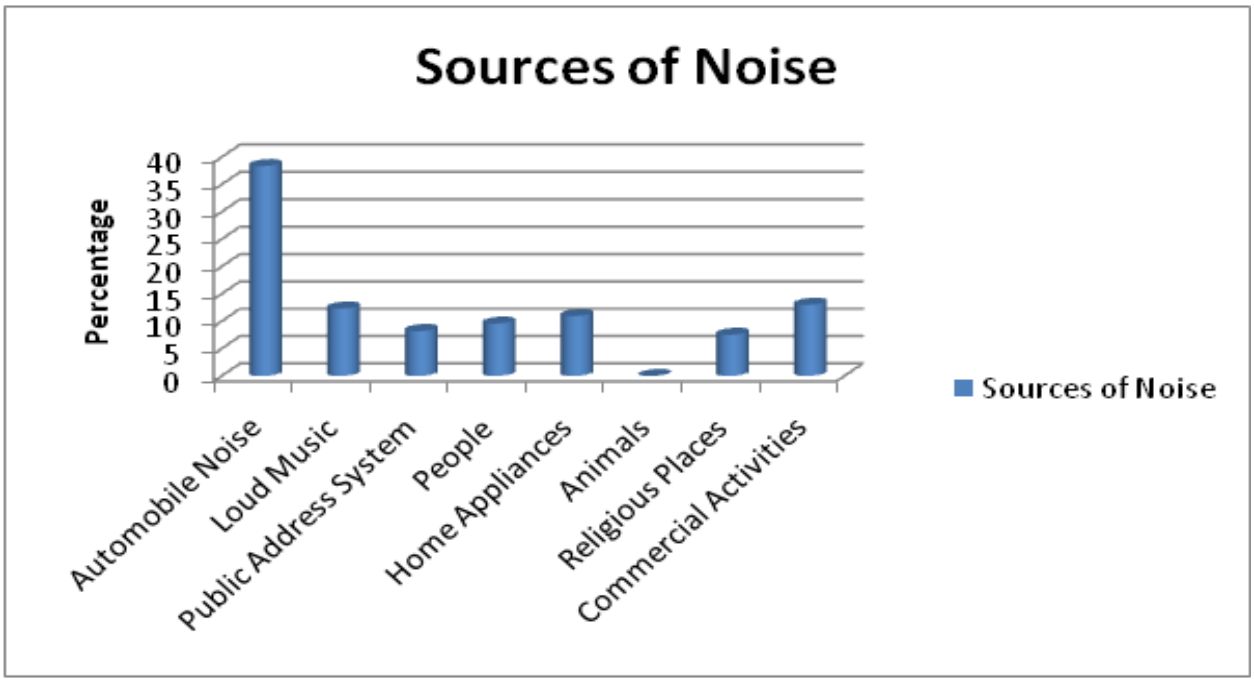

Figure 6 Percentage contribution of noise from different sources.

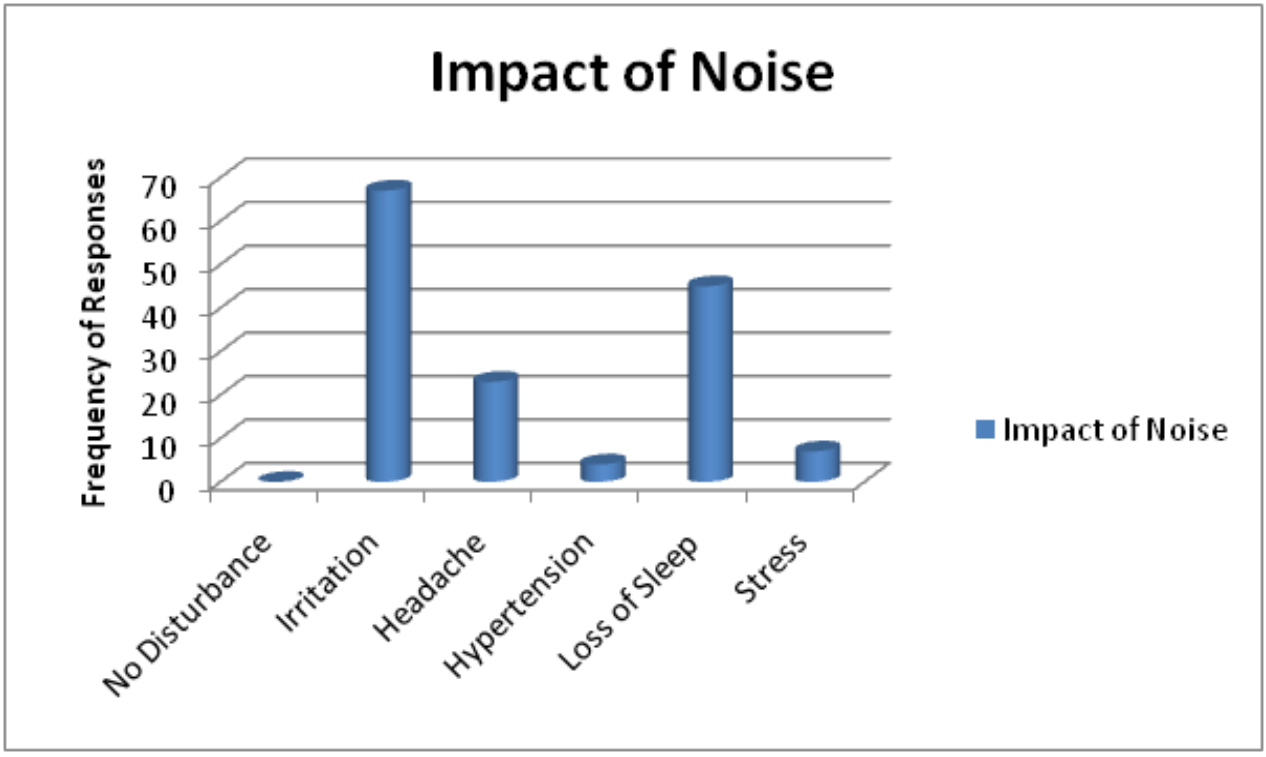

Figure 7 Perceived impact of noise by the respondents.

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Table 2 Sound/noise permissible limits

Area code	Category of area/zone	Limits in dB*	
		Day time	Night time
A	Industrail area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence zone	50	40

Table 3 Sex distribution of respondents

Respondents	Frequency	Percentage
Male	106	72.60274
Female	40	27.39726
Total	146	100

*The limit in dB denotes the time-weighted average of the level of sound in decibels on Scale A which is relatable to human hearing. *Adapted after: US* Environment (Protection) Act, 1986 as amended in 2002.

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None.

Conflicts of interest

The authors declare that there is no conflict of interest.

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