

A Study of noise pollution and impact on human health

Musbah Aissa Mohamed*

Department of Civil engineering, Ministry of Technical & Vocational Education, Faculty of Science & Technology, Umm Al-Qura University, Makkah, Saudi Arabia

Received 16 Oct 2021, Accepted 29 Nov 2021, Available online 07 Dec 2021, Vol.9 (Nov/Dec 2021 issue)

Abstract

Noise pollution is a major problem in cities around the world. Noise is defined as unwanted sound. Environmental noise consists of all the unwanted sounds in our communities except that which originates in the workplace. Environmental noise pollution, a form of air pollution, is a threat to health and well-being. It is more severe and widespread than ever before, and it will continue to increase in magnitude and severity because of population growth, urbanization, and the associated growth in the use of increasingly powerful, varied, and highly mobile sources of noise. It will also continue to grow because of sustained growth in highway, rail, and air traffic, which remain major sources of environmental noise. In factory workplace workers are exposed to high noise due to machinery in routine. The potential health effects of noise pollution are numerous, pervasive, persistent, medically and socially significant. Noise produces direct and cumulative adverse effects that impair health and that degrade residential, social and working environment with corresponding real (economic) and intangible (well-being) losses. Noise represents an important public health problem that can lead to hearing loss, sleep disruption, cardiovascular disease, social handicaps, reduced productivity, negative social behaviour, annoyance reactions, absenteeism and accidents. It can impair the ability to enjoy one's property and leisure time and increases the frequency of antisocial behavior. Noise adversely affects general health and well-being in the same way as does chronic stress. It adversely affects future generations by degrading residential, social, and learning environments with corresponding economic losses. The aim of enlightened governmental controls should be to protect citizens from the adverse effects of airborne pollution, including those produced by noise. People have the right to choose the nature of their acoustical environment; it should not be imposed by others.

Keywords: Noise, Transport Noise, environment, Occupational.

Introduction

Noise pollution is one of several environmental pollutions across the world. It can be described as the propagation of noise with a harmful impact on the physiological and psychological lives of humans or animals [1].

Noise pollution is an invisible danger. It cannot be seen, but it is present nonetheless, both on land and under the sea. Noise pollution is considered to be any unwanted or disturbing sound that affects the health and well-being of humans and other organisms.

Sound is measured in decibels. There are many sounds in the environment, from rustling leaves (20 to 30 decibels) to a thunderclap (120 decibels) to the wail of a siren (120 to 140 decibels). Sounds that reach 85 decibels or higher can harm a person's ears. Sound sources that exceed this threshold include familiar things, such as power lawn mowers (90 decibels), subway trains (90 to 115 decibels), and loud rock concerts (110 to 120 decibels).

Noise pollution impacts millions of people on a daily basis. The most common health problem it causes is Noise Induced Hearing Loss (NIHL). Exposure to loud noise can also cause high blood pressure, heart disease, sleep disturbances, and stress. These health problems can affect all age groups, especially children. Many children who live near noisy airports or streets have been found to suffer from stress and other problems, such as impairments in memory, attention level, and reading skill.

Noise pollution also impacts the health and well-being of wildlife. Studies have shown that loud noises cause caterpillars' hearts to beat faster and bluebirds to have fewer chicks. Animals use sound for a variety of reasons, including to navigate, find food, attract mates, and avoid predators. Noise pollution makes it difficult for them to accomplish these tasks, which affects their ability to survive.

Increasing noise is not only affecting animals on land, it is also a growing problem for those that live in the ocean. Ships, oil drills, sonar devices, and seismic tests have made the once tranquil marine environment loud and chaotic. Whales and dolphins are particularly impacted by noise pollution. These marine mammals rely

*Corresponding author's ORCID ID: 0000-0002-9871-2908
DOI: <https://doi.org/10.14741/ijmcr/v.9.6.3>

on echolocation to communicate, navigate, feed, and find mates, and excess noise interferes with their ability to effectively echolocate.

Some of the loudest underwater noise comes from naval sonar devices. Sonar, like echolocation, works by sending pulses of sound down into the depths of the ocean to bounce off an object and return an echo to the ship, which indicates a location for object. Sonar sounds can be as loud as 235 decibels and travel hundreds of miles under water, interfering with whales' ability to use echolocation. Research has shown that sonar can cause mass strandings of whales on beaches and alter the feeding behavior of endangered blue whales (*Balaenoptera musculus*). Environmental groups are urging the U.S. Navy to stop or reduce using sonar for military training.



Figure 1.0: Noise pollution scenario in common life

Noise pollution becomes an increasingly larger issue in big cities. Noise or sound pollution is usually not studied compared with other forms of pollution such as air [2], [3], [4], water [5], soil [6], light and radioactive. The reason is that the adverse effects of other forms of pollution on humans are more pronounced. Notwithstanding, noise pollution remains a serious health concern in the study area (Ota, Nigeria) in particular and the entire planet [7], [8]. Some of the identified sources of noise pollution are loud music from concerts, religious buildings like churches and mosques, noise emitting generators [9], political rallies, road advertisement, traffic [10] and air transportation [11], sporting events, construction and industrial activities. In all the mentioned sources, areas that have high risk of noise pollution are residential places near to major roads [12] and airports and manufacturing industries [13]; for example, small scale industries [14], [15], steel rolling industries [16], oil and gas industry [17], [18] and so on.

The health effects of noise pollution cannot be over-emphasized. This has prompted the World Health Organization (WHO) and the Federal Environment Protection Agency (FEPA) (Nigeria) to set standards and limits of allowable noise levels. Noise pollution occurs when it is observed that those standards are exceeded as seen in [19], [20].

The most common manifestation of noise pollution is hearing loss or impairment [21]. Hearing impairment is mostly classified as occupational hazards especially when the individual is affiliated with industry that propagates

loud sound or noise. Moreover, several physiological and psychological effects of noise pollution exist. The combination of noise and air pollution is associated with respiratory ailments, dizziness and tiredness in school children [22], [23]. In adults, noise pollution has been found to be associated with high blood pressure [24] and cognitive difficulties [25].

A look at the literature showed the abundance of evidence of the adverse effects of noise pollution on the general public health. The worsening situation of noise pollution is that it has not been upgraded to the level of the other forms of pollution. Also, recommendations suggested by several authors on the different strategies on tackling noise pollution has not been considered and implemented. However, noise pollution continues to impact negatively on fetal development [26], annoyance and anxiety [27], mental health crisis [28], sleep disturbance and insomnia [29], [30], cardiovascular disorders in pregnant women [31], cardio cerebrovascular diseases [32], type 2 diabetes incidence [33] and medically unexplained physical symptoms [34]. Other auditory and non-auditory effects of noise on health are myocardial infarction incidence [35], peptic ulcers [36] and disruption of communication and retentive capabilities in children [37].

Florence Nightingale recognized noise as a health hazard in 1859 when she wrote "Unnecessary noise is the most cruel abuse of care which can be inflicted on either the sick or the well" [5]. Noise pollution; an urban territorial phenomenon is assuming serious proportions in every city. The frequency and intensity of pollution has been increasing day by day [6]. Noise pollution is an annoyance to human beings. The noise is usually machine-created sound that disrupts activity or balance of human's way of life. It is a growing environmental problem that is increasingly becoming an omnipresent, yet unnoticed form of pollution not only in developed countries but also in the developing countries. The word noise is derived from Latin word "Nausea" implying "unwanted sound" or sound that is loud, unpleasant or unexpected. It can be defined as wrong sound, in the wrong place and at the wrong time when compared with those experienced by modern city dwellers; noise pollution continues to grow in extent, frequency, and severity as a result of population growth, urbanization, and technological developments [5]. Due to exposure of noise people are suffering from difference kinds of diseases like Hearing Impairment, Interference with spoken communication, Sleep disturbances, cardiovascular disturbances, Annoyance etc

This paper aims to study and analyze the noise pollution levels in major areas in Ota metropolis.

2.0 Sources / Types of Noise Pollution

Noise can be broadly classified under 4 categories

1. Transport Noise
2. Occupational /Industrial Noise
3. Neighborhood noise
4. Recreational Noise

Transport Noise: Transport noise mainly consists of traffic noise from road, rail, and aircraft. The number of automobiles on roads like motors, scooters, cars, motor cycles, buses, trucks and diesel engine vehicles has increased enormously, leading to noise pollution. *This can be subdivided into*

1. Road traffic noise
2. Air craft noise
3. Rail traffic noise

Noise levels in most residential areas in metropolitan cities are hovering around the border line due to increased vehicular noise pollution. In general, on urban roads there are distinct traffic peaks in the morning and evening as people travel to and from work.



Figure 2: Transport noise

Occupational /Industrial Noise: It is the sound having high intensity, mainly caused by industrial machines. Sources of such noise pollution are various factories’ machines, industries, and mills. Noise from mechanical saws and pneumatic drills is unbearable and a nuisance to the public. It also includes noise from domestic gadgets e.g. washing machines, vacuum cleaner etc. Industrial workers who are exposed to noise for 8 hours per day and 6 days per week suffer from occupational noise pollution.



Figure 3: Occupational and industrial noise

Neighborhood noise: This implies variety of sources of noise which disturb and annoy the general public by interfering with their comfort and welfare. This type of noise includes disturbance from household gadgets and community. Common sources include musical instruments, TV, VCR, radios, transistors, telephones, music in public functions, and loudspeakers etc.

Recreational Noise: Harmful noise exposure is not only limited to the workplace. Some recreational activities are also dangerously loud and cause permanent damage to hearing. Additionally, many recreational activities create loud noises which interfere with the peace and quiet of the community. These activities may include sound at music concerts, firecrackers, sound at aerobic studios, personal stereo systems, children’s toys, hunting, target shooting, motor boating, waterskiing, snowmobiling, woodworking, listening music, motorcycle riding etc. Movie theatres, home entertainment centers, car stereo systems, health clubs, dance clubs, bars, and amusement centers also pose serious risk to hearing.

Adverse Health Effects of Noise

The WHO has documented seven categories of adverse health effects of noise pollution on humans. Much of the following comes from the WHO Guideline on Community Noise and follows its format. The guideline provides an excellent, reasonably up-to-date, and comprehensive overview of noise-related issues, as do the other recent reviews on this subject.

Sleep Disturbances

Uninterrupted sleep is known to be a prerequisite for good physiologic and mental functioning in healthy individuals. Environmental noise is one of the major causes of disturbed sleep. When sleep disruption becomes chronic, the results are mood changes, decrements in performance, and other long-term effects on health and well-being. Much recent research has focused on noise from aircraft, roadways, and trains. It is known, for example, that continuous noise in excess of 30 dB disturbs sleep. For intermittent noise, the probability of being awakened increases with the number of noise events per night

Negative Social Behaviour and Annoyance

Annoyance is defined as a feeling of displeasure associated with any agent or condition believed by an individual to adversely affect him or her. Perhaps a better description of this response would be aversion or distress. Noise has been used as a noxious stimulus in a variety of studies because it produces the same kinds of effects as other stressors. Annoyance increases significantly when noise is accompanied by vibration or by low frequency components [1]. The term annoyance does not begin to

cover the wide range of negative reactions associated with noise pollution; these include anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation, or exhaustion. Lack of perceived control over the noise intensifies these effects [4]. Social and behavioral effects of noise exposure are complex, subtle, and indirect. These effects include changes in everyday behavior (eg, closing windows and doors to eliminate outside noises; avoiding the use of balconies, patios and yards; and turning up the volume of radios and television sets); changes in social behavior.

Interference with Spoken Communication

Noise pollution interferes with the ability to comprehend normal speech and may lead to a number of personal disabilities, handicaps, and behavioral changes [1]. These include problems with concentration, fatigue, uncertainty, lack of

Self-confidence, irritation, misunderstandings, decreased working capacity, disturbed interpersonal relationships, and stress reactions. Some of these effects may lead to increased accidents, disruption of communication in the classroom, and impaired academic performance. Particularly vulnerable groups include children, the elderly, and those not familiar with the spoken language [6].

Disturbances in Mental Health Noise pollution is not believed to be a cause of mental illness, but it is assumed to accelerate and intensify the development of latent mental disorders. Noise pollution may cause or contribute to the following adverse effects: anxiety, stress, nervousness, nausea, headache, emotional instability, argumentativeness, and sexual impotence, changes in mood, increase in social conflicts, neurosis, hysteria, and psychosis [2]. Population studies have suggested associations between noise and mental-health indicators, such as rating of well-being, symptom profiles, the use of psychoactive drugs and sleeping pills, and mental hospital admission rates. Children, the elderly, and those with underlying depression may be particularly vulnerable to these effects because they may lack adequate coping mechanisms. Children in noisy environments find the noise annoying and report a diminished quality of life [1]. Noise levels above 80 dB are associated with both an increase in aggressive behavior and a decrease in behavior helpful to others. The news media regularly report violent behavior arising out of disputes over noise; in many cases these disputes ended in injury or death. The aforementioned effects of noise may help explain some of the dehumanization seen in the modern, congested, and noisy urban environment [4].

Perceptions of the respondents on sources/places of noise and associated effects.

The results of the survey on perceptions of residents on noisy locations, sources of noise, period of noise

nuisance, health effect and effect on job performance are shown in Tables 2-6. Out of the 341 questionnaire administered, 245 (71.9%) were retrieved. However, some of the respondents did not respond to some questions as shown in Tables 2-5; this brought the total number down. About 35% of the respondents in the three residential neighborhoods reported that the major source of noise pollution was vehicular (Table 2) followed by generator sets (12.3%). However, the sources vary in the different neighborhood type.

Table 1: Perception of respondents about sources of noise in the selected neighborhoods

Location	Moving vehicle	Market place	Motor park	Traffic	Generator set	Grinding machine	Music system	Religious worship	Others	None	No response	Total
High	30 (51.7%)	-	-	-	6 (10.3%)	3 (5.2%)	8 (13.8%)	4 (6.9%)	-	3 (5.2%)	4 (6.9%)	58
Medium	39 (28.7%)	6 (4.4%)	2 (1.5%)	3 (2.2%)	12 (8.8%)	13 (9.6%)	14 (10.3%)	18 (13.2%)	4 (2.9%)	7 (5.2%)	18 (13.2%)	136
Low	17 (33.3%)	-	-	-	12 (23.5%)	-	2 (3.9%)	1 (2.0%)	1 (2.0%)	6 (11.8%)	12 (23.5%)	51
Total	86 (35.1%)	6 (2.5%)	2 (0.8%)	3 (1.2%)	30 (12.3%)	16 (6.5%)	24 (9.8%)	23 (9.4%)	5 (2.0%)	16 (6.5%)	34 (13.9%)	245

Table 2: Health Effects of Noise pollution

Location	Headache	Hearing difficulty	Lack of concentration	Irritability	Tiredness	Any other	No response	Total
High	26 (44.8%)	4 (6.9%)	14 (24.1%)	-	4 (6.9%)	4 (6.9%)	6 (10.4%)	58 (100%)
Medium	38 (27.9%)	16 (11.8%)	33 (24.3%)	21 (15.4%)	5 (3.7%)	2 (1.5%)	21 (15.4%)	136
Low	10 (19.6%)	6 (11.8%)	11 (21.6%)	9 (17.6%)	6 (11.8%)	3 (5.9%)	6 (11.7%)	51
Total	74 (30.2%)	26 (10.6%)	58 (23.7%)	30 (12.2%)	15 (6.1%)	9 (3.7%)	33 (13.5%)	245

The dataset contained in this research paper is a theoretical approach and depend on current scenario traffic in city. Datasets contained in this article are noise level measurement carried out. It represents the noise level in city. These major areas include industrial areas, commercial areas, and passenger loading parks, busy roads and junctions. The readings were taken using the SLM (Sound Level Meter). Measurements were taken three different times of the day; morning (9 am to 12 am) and evening (5 pm to 8 pm). Particularly, the noise pollution level (NLP) was considered and analyzed in this present research. The analysis was based on the noise descriptors LAeq, L20, L80, LD, TNI and NEI. Results from the study reflects that the highest and lowest equivalent noise levels (LAeq) were recorded at commercial areas (98 dB (A)) and residential areas (54 dB (A)), respectively, the background noise level (L92) has the highest and lowest values at commercial areas (79 dB (A)) and residential areas (44 dB (A)), respectively and the peak value (L10) has the highest value and lowest value at the commercial areas (96 dB (A)) and residential areas (56 dB (A)). Based on the WHO recommendations and standards, only 2 out of the 25 locations considered are under normally acceptable situation while the noise levels of other areas are not acceptable. Noise map developed in this study provides enough information for technical controls and interim legislation against environmental noise pollution in the metropolis. Moreover, considering the noise emission standards, planning and promoting the citizens awareness about the high noise risk could help to mitigate the effect of noise in Ota, Metropolis. The noise data in this study are useful as reference and guideline for

future regulations on noise limit to be implemented for urban areas in Nigeria and developing countries at large.

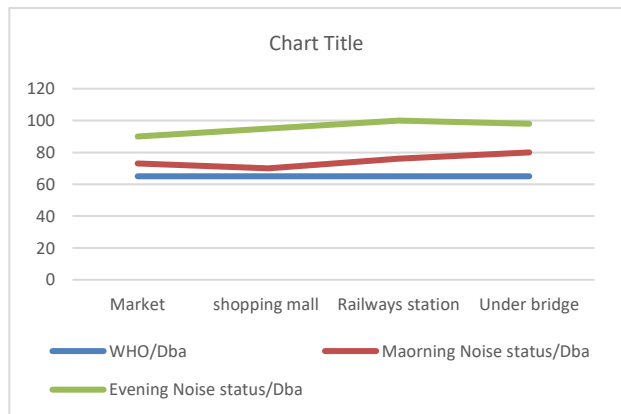


Figure 4: Real time survey on location based

From above figure as per survey on morning and evening time it’s clear that noise level in evening time is much more than morning time due to crowd. Noise in under bridge is high than due to echo and noise by surrounding vehicle sound

Conclusion

In conclusion, the study has shown that noise levels, sources and effects vary with neighborhood type. The level of noise in high density areas is significantly different from that of low-density area. However, the levels in both medium and high-density areas were similar. Generally, action to reduce environmental noise has had a lower priority than that taken to address other environmental problems such as air and water pollution. Therefore, in order to tame the invisible pollutant of environmental noise and improve quality of life of people in Ibadan metropolis, there is a need to pay adequate attention to noise management in the residential neighborhoods because of its adverse effect on the populace.

This will require formulation and enforcement of permissible noise levels/standards for residential neighborhoods by the Ministry of Environment (former known as Federal Environmental Protection Agency, FEPA) as against the current 8-hour standard of 90dB which is for industrial settings.

The World Health Organization (WHO) standards were used as limits for noise assessment. The research carried out in the various land use reveals that 80% of the commercial area is exposed to the highest risk of noise pollution. Hence, results records that the highest noise was recorded in the morning and afternoon. The residential area was exposed to 18.7% noise pollution which makes the area suitable for housing.

References

[1]. World Health Organization, (2005). United Nations Road Safety Collaboration: A Handbook of Partner Profiles (Geneva: World Health Organization).
 [2]. Oyedepo, S. O., Adeyemi, G. A., Fayomi, O. S. I., Fagbemi, O. K., Solomon, R., Adekeye, T., Babalola, O. P., Akinyemi, M. L., Olawole, O. C., Joel, E. S., & Nwanya, S. C. (2019). Dataset on noise level measurement in Ota metropolis, Nigeria. Data in Brief,22,762 <https://doi.org/10.1016/j.dib.2018.12.049>.
 [3] Karthik, K., Partheeban, P., Prasad Raju, H., Anuradha., (2015). Development of Noise Prediction Models Using GIS for Chennai City. International journal of emerging engineering, 5(10), 245-250 Kaushik, & Kaushik. (2008). Environmental Studies (As Per Mysore University Syllabus), T
 [4]. Berglund B, Lindvall T. (eds.) Community Noise. Archives of the Center for Sensory Research. 1995; 2:1-195. This document is an updated version of the document published by the World Health Organization in 1995, (January 6, 2007).
 [5]. Firdaus, G., Ahmad, A., Noise Pollution and Human Health: A Case Study of Municipal Corporation of Delhi, Indoor and Built Environment, Sage Publications (2010).
 [6]. Goines, L., Hagler, L., Noise Pollution: A Modern Plague: Southern Medical Journal 2007, 100(3): 287-294
 [7]. Hsu, T., Ryherd, E., Wage, K., Ackerman, J., and Noise Pollution in Hospitals: Impact to patients, Clinical Review.