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Study of Noise Pollution at Major Intersections in Jaipur City

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Abstract

Jaipur city is a district place in state of Rajasthan, India having population of 35 lakhs. Accordingly Jaipur is the most populated industrial and commercial city of Rajasthan. Most environmental Problem is noise pollution are increased because of number of vehicles are increased and irregular transportation by others sources. The purpose of this study is to determine levels of environmental noise and its impact. In this study, continuous monitoring of noise levels Leq dB (A) during the period of April, 2014 at eleven different locations in the city. On the basis of different locations these sites were classified as commercial, residential, industrial, and silence zones. The researched data explains an enhanced pressure of noise in areas of Jaipur because of increase in number of vehicles and facilities of transportation. Results shows higher sound level in areas of Jaipur as compared with the prescribed limits of Central Pollution Control Board (CPCB).Present paper recommends how to reduce noise levels in the city significantly.

Keywords: Noise pollution, Noise equivalent, Noise Effects, Remedies.

Introduction

(i) Human Hearing Sound and Noise Pollution

Sound can be defined as atmospheric or airborne vibration perceptible to the ear. Noise is usually unwanted or undesired sound. Consequently, a particular sound can be noise to one person and not to others, or noise at one time and not at other times. Sound loud enough to be harmful is called noise without regard to its other characteristics. Noise is a form of pollution because it can cause hearing impairment and psychological stress. Noise pollution is a major environmental problem in many urban areas.

Noise pollution is recognized as a major problem for the quality of life in urban areas all over the world. Because of the increase in the number of cars and industrialization, noise pollution has also increased. Noise in cities, especially along main arteries, has reached up disturbing levels. This problem has not been properly recognized despite the fact that it is steadily growing in developing countries. According to the World Health Organization (WHO) noise pollution is now a days the third most hazardous environmental pollution and is almost one of the harmful agents which adversely affects the human health as well as environment.

Many surveys related the problem of noise pollution in many cities around the world have been conducted, and have shown the scale of discomfort that noise causes in people‘s lives .Existing evidence indicating that noise pollution may have negative impacts on human health has justified research in order to provide better understanding of noise pollution problems and control. Highway traffic noise is a major contributor to overall transportation noise. Noise level is not constant and the noise levels vary with the number, type, and speed of the vehicles. While noise in metropolitan area comes from different sources, such as: emergency vehicles, waste collection, and construction works, these activities are essential for the community and the life of inhabitants. Traffic, which is one of main sources of noise, is the movement of people and goods yet it results in undesirable noise.

The unit of noise pollution measurement is decibel (db) ie, the lograthmic ratio of noise intensity to refrence value (I). The minimum intensity of sound which can be heard by human is termed as refrence value (I).

$$Db=10 \log 10/I \qquad \text{.....(1)}$$

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(ii) Causes of Noise Pollution

Depending on the duration and volume, the effects of noise on human health and comfort are divided into four groups; physical effects, such as hearing defects; physiological effects, such as increased blood pressure, irregularity of heart rhythms and ulcers; psychological effects, such as disorders, sleeplessness and going to sleep late, irritability and stress; and finally effects on work performance, such as reduction of productivity and misunderstanding what is heard.

The major factors which influence the generation of road traffic noise are:

a) Traffic flow.
b) Traffic speed.
c) Proportion of heavy vehicles.
d) Gradient of the road.
e) Nature of the road surface.
f) Attenuation of sound waves due to distance between source and receiver and also due to ground absorption.
g) Obstruction due to noise barriers.

Noise is found almost everywhere, not only just in factories. Thunder is perhaps the loudest natural sound we hear; it sometimes reaches the threshold of discomfort. Jet aircraft takeoffs are often louder to the listener. Some industrial locations have even louder continuous noise. Community noise is largely produced by transportation sources most often airplanes and highway vehicles. Noise sources are also in public buildings and residences. Some noise sources are so intense, so widespread, or so unavoidable that they must be characterized as specific cases. Pile driving and building demolition involve violent impacts and large forces and are often done in congested urban areas.

Some piles can be sunk with less noisy methods, but sometimes the noise and vibration must simply be tolerated; however, these effects can be minimized and the working hours adjusted to cause the least disturbance. Blasting for such construction can be controlled by the size of charges and protective mats. Some steel mill operations and scrap-handling operations are equally noisy and produce vibration but are normally not found near residential areas. Sonic booms from aircraft extend over wide areas and affect many people. These noises are impulsive, and people respond to them as to other impulsive noises; the pressure levels are not high enough to be especially hazardous to hearing but they can produce large total forces on large areas. Some special industrial processes, such as explosion forming, shot-pinning, and flame-coating, are so noisy that they must be performed in remote locations or behind walls. Many mining, ore-dressing, and other mineral-processing operations are performed in remote locations, but those employees who must be present must be protected.

(iii) Physiological Effects of Noise Pollution

Human response to noise displays a systematic qualitative pattern, but quantitative responses vary from one individual to another because of age, health, temperament, and the like. Even with the same individual, they vary from time to time because of change in health, fatigue, and other factors. Variation is greatest at low to moderately high sound levels; at high levels, almost everyone feels discomfort. A detailed investigation of the physiological damage to human ears is difficult, but controlled tests on animals indicate the probable type of physiological damage produced by excessively high noise levels.

(iv) Psychological Effects of Noise Pollution

- Speech interference and concentration of mind
- Annoyance
- Sleep disturbance and disorder
- Effects on performance and efficiency
- Acoustic privacy
- Irritation

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Table 1-WHO Community Noise Guidelines

Sr. no	Environment	Critical health effect	Sound level dB	Time Limits(hours)
1	Outdoor living areas	Annoyance	50-55	16
2	Indoor Dwellings	Speech Intelligibility	35	16
3	Bedrooms	Sleep Disturbance	30	8
4	Schools Classrooms	Disturbance of Communication	35	During Class
5	Industrial,Commercial,and Traffic Areas	Hearing Impairment	70	24
6	Music Through Earphones	Hearing Impairment	85	1
7	Ceremonies and Entertainment	Hearing Impairment	100	-

Where dB= Decibels

Methodology

The present study was conducted at eleven different locations in the Jaipur city. For this purpose four zones i.e. industrial, commercial, residential and silence zone were selected in the city. For this a standard noise level (Model 1900 Meter) which is the simplest instrument available to determine sound level. The Quest Models 1900 is advanced sound level meter which perform a wide variety of acoustical measurements. Both exponential averaged and time integrated measurements may be made, with the capability of either internal or external data logging. The output of an independently weighted peak detector may also be displayed or logged. Applications include laboratory, industrial, community and audiometric measurement and analysis.

The ambient noise level was monitored with the help of Sound Level Meter during day time and evening time. L_{eq} noise rating system was used to calculate the noise level as there is higher fluctuation in the ambient noise level during the working days. Precaution was taken to avoid echo or resonance of sound by selecting suitable distance from the source. Readings were recorded after interval of ten seconds for six minutes at every site during day and evening time.

Table 2- Change in Sound level (dB) in Apparent Loudness

Change in Sound Level dB	Changes in Apparent Loudness
1	Almost Imperceptible
3	Just Imperceptible
5-6	Clearly Noticeable
10	Twice (or half) as Loud

Ambient sound levels were compared with that of the standards prescribed in Environmental Protection Act, 1986 and standards of CPCB. The Noise Pollution (Regulations & Control) Rules, 2000 has given noise limits for different areas and the Noise Pollution (Regulations & Control) Rules, 2000 is an amendment made by Govt. of India in the year 2010. These limits were used to compare the noise levels in respective areas under study.

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Table 3-Noise Standards for Ambient Noise Level(CPCB)

Area Code	Category of Area	Limits in dB	
		Day time	Night time
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence Zone	50	40

Study Area

Some locations are selected in order to compute the noise pollution. A detailed survey has been done in order to know the correct results. The sources of noise can vary according to daily activities. The sources may be residential (loudspeakers, communication talks), commercial (vendor shouts, automobiles. Airplanes, marriages, machinery, industrial these locations are selected according to their nature. Ajmeri gate is considered as most conjucted place in Jaipur and it is grouped in commercial zone. Others locations are listed below.

Table 4-List of Locations Which have to Survey

Zone	Location Taken
Industrial	1.Gopalpura 2.Sitapura
Commercial	1.Ajmeri Gate 2.Rambagh 3.O.T.S 4.B2B Bye Pass
Residential	1.Tonk Phatak 2.Sanganer Thana
Silence	1.S.M.S Hospital 2.M.N.I.T 3.Fortis Hospital

*Table 5-Status of Noise Levels at Various Zones in Jaipur City**

Sr.No	Noise Zones	Location	Sound level dB (A) Leq			
			First Day		Second Day	
			Day	Night	Day	Night
1	Industrial	1.Gopalpura	76.1	70.2	79.2	70.1
		2.Sitapura	75.3	71.0	77.8	72.0

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2	Commercial	1.Ajmeri Gate	78.0	70.0	79.0	70.2
		2.Rambagh	70.1	67.1	71.2	66.2
		3.O T S	68.2	66.3	70.3	66.1
		4. B2 Bye Pass	66.4	57.9	68.3	58.1
3	Residential	1.Tonk Phatak	55.3	49.8	58.4	50.0
		2.Sanaganer Thana	58.3	50.0	60.1	49.1
4	Silence	1.SMS Hospital	55.0	49.2	53.1	49.3
		2.M N I T	56.3	50.0	55.1	48.3
		3.Fortis Hospital	59.2	49.8	58.1	49.9

*Data obtained in month of April 2014

Table-6 Day and Night time Average of the Noise Levels at Various Locations in Jaipur City

Sr. No	**Area**	**Day Time** (in dB)	**Night Time** (in dB)
1	Gopalpura	77.65	70.15
2	Sitapura	76.55	71.50
3	Ajmeri Gate	78.5	70.1
4	Rambagh	70.65	66.65
5	O T S	69.25	66.2
6	B2 Bye Pass	67.35	58.0
7	Tonk phatak	56.85	49.95
8	Sanagner Thana	59.2	49.55
9	S M S Hospital	54.05	49.25
10	M N I T	55.7	49.15
11	Fortis Hospital	58.65	49.85

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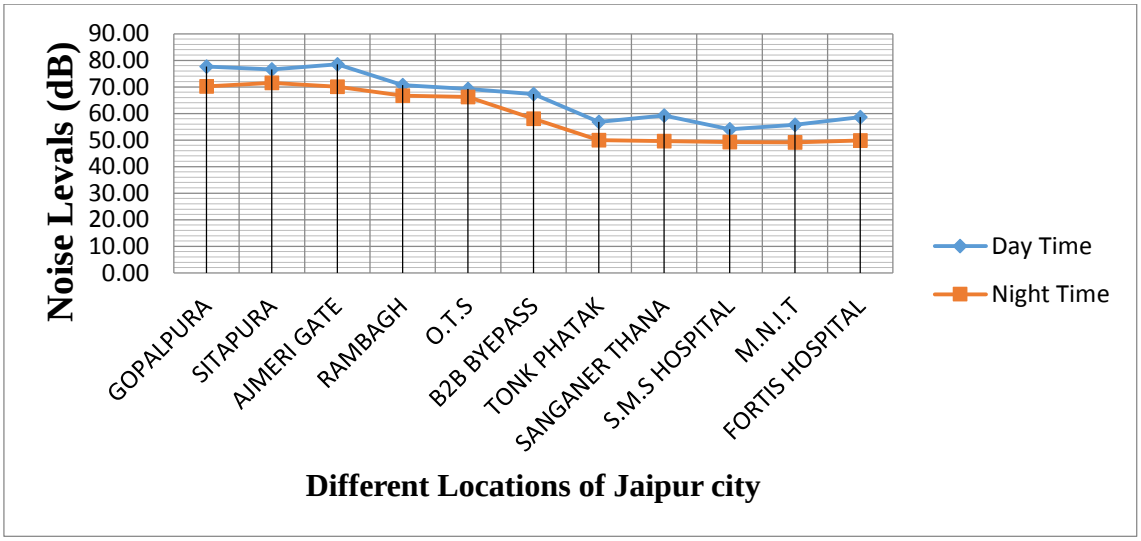

Figure 1-Graph Showing Average Day and Night time

Results and discussion

In the present study the average noise level at all locations was found to be above the prescribed limits of CPCB during the survey days. The noise level showed a significant variation at different sites which gradually increased or decreased on the basis of location of the site. On the two monitoring days, average noise level during the day time were 77.10 dB (A) (industrial), 71.40 dB (A) (commercial), 58.0 dB (A) (residential) and 56.13 dB (A) (silence zone) which is 2.1, 6.4, 3.0 and 6.13 dB more respectively as compared to CPCB standards. Similarly during Night time 70.82 dB (A) (industrial), 65.23 dB (A) (commercial), 49.75 dB (A) (residential), 49.41 (silence zone) which is 0.82 , 10.23 , 4.75 and 9.41 dB more respectively for Industrial ,commercial, residential and silence zone as compared to CPCB standards.

All residential areas experienced noise levels above the prescribed limits. Interestingly, the noise levels at S.M.S hospital, Malviya institute of technology, and Fortis hospital which are silent zones were also above the given standards. One of the major causes for this increased level is increased number of vehicles and the enhanced transportation activities. Many studies suggested related to noise level in the Jaipur city during Diwali festival (2010) and reported that the noise levels are continuously increasing. The focus was on five selected areas as commercial centers, road junctions/busy roads, passengers loading parks, high-density residential areas, and low density residential areas and found that the transportation is the main cause of noise pollution. Increasing number of vehicles in the Jaipur city increases the number of noise sources, road construction at various parts of the Jaipur city, road jams are observed at several parts of the city, people are not following traffic rules, the mismanagement of traffic and infrastructure of the city is not as good as it should be and therefore majority of the places noise levels are well above the CPCB standards.

Remedial Measure for Management of Noise

Since the fact that public health has been matter of great concern for us control of noise pollution is necessary. The techniques employed for remedial measure for noise pollution can be broadly classified as control at source, control in the transmission path and using protective equipment. The noise pollution can be controlled at the source of generation itself by reducing the noise levels from domestic sectors, Maintenance of automobiles, Control over vibrations, Low voice speaking, Prohibition on usage of loud speakers and optimum selection of machinery, tools or equipment reduces excess noise levels. The change in the transmission path will increase the length of travel for the wave and get absorbed/refracted/radiated in the surrounding environment.

The noise pollution can be reduced during transmission path by Vegetation, Installation of barriers and design of the building incorporating the use of suitable noise absorbing material for wall/door/window/ceiling will reduce the noise levels. Protective equipment usage is the ultimate step in noise control technology i.e., after noise reduction at source and after diversion or engineer control of transmission path of road. The usage of protective equipment and the worker's exposure to the high noise

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levels can be minimized by Job rotation, Exposure reduction, Hearing protection, use of Equipment like earmuffs, ear plugs etc. are the commonly used devices for hearing protection. Attenuation provided by earmuffs varies widely in respect to their size, shape, seal material etc.

Conclusion

Above Present study,concludes there is remarkable increase in use of vehicals by which noise level of Jaipur city is increased. Other reasons are less quantity of plantation nearby roadside, further public entertainment and heavy machineries are used. Therefore, there is severe need of awareness related to noise pollution among public including government officers to prevent public form long term health risks related to noise pollution.

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