

A Comparative Analysis of Noise Level at Jaipur City

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Abstract: Noise is defined as unwanted sound. Industrialization and urbanization is the main cause for undesirable environmental noise, which makes a significant damage to human beings and environment. Industrial, commercial, residential and silence zones are the main cause of noise. To measure the impact of noise, this study was carried out at fifteen different locations of Jaipur to access the noise level for two continuous days during morning and evening time. This comparative analysis shows that the values are higher in fifteen different locations of Jaipur city as per the various standards established by the Central Pollution Control Board (CPCB) and World Health Organization (WHO).

Keywords: Noise pollution, WHO, CPCB, Health hazards, Mitigation measures, Noise Barriers.

1. INTRODUCTION

Sound is a type of vibration in the air that reaches our ears and noise is unwanted or excessive sound. In developing countries like India pollution is one of the major problems. Environment pollution includes air, water, soil, visual, light and noise pollution. Out of these, noise pollution is one of the major concern for people residing in urban areas. Traffic noise is a big problem for people residing near highways, railway stations, small or big industrial area, main roads and many others.

Jaipur the capital of Rajasthan state is one of the most populated, industrial and commercial city. The problem of noise pollution is increasing day by day because the number of vehicles is increasing. Jaipur is located at 75.78730E longitude and 26.91240N latitude in Rajasthan at an elevation of about 431 meters above mean sea level. The area of Jaipur is 484.64 square kilometers approximately. It is the tenth most populated city of India.

This study determines levels of environmental noise and its impact. In this study two days continuous monitoring of noise levels has been done at fifteen different locations of the city [1-3]. On the basis of locations, these locations have been classified as commercial, residential, industrial and silent zones. This study explains the pressure of noise in areas of Jaipur city. Result of this study shows that there are higher sound level in different

locations of Jaipur city when compared with the established standards by Central Pollution Control Board (CPCB) and World Health Organization (WHO) [4-7].

Environmental noise pollution is very serious and it will keep on increase due to urbanization. Noise levels will keep on increase with constant development of residential (loudspeakers, communication talks), commercial (vendor shouting, automobiles, airplanes, marriages, machinery) and industrial. Environmental noise pollution activities are an issue that has gradually increased with time. Main sources of noise pollution are transportation system, industrial activities, commercial and others [8,9].

2. METHODOLOGY

To study the traffic noise in Jaipur city for fifteen locations. The locations were divided into commercial, industrial, residential and silence zones. Decibel meter is used for taking reading for all the locations during morning and evening time continuously for two days. The noise standards given by the Central Pollution Control Board (CPCB) and the World Health Organization (WHO) were taken into account. The average reading of two days at all places were taken and compared with the noise standards laid by CPCB and WHO. While comparing the standards, the result concluded that the noise levels were higher than the noise standards laid by the Central Pollution Control Board (CPCB) and the World Health Organization (WHO) at each places.

3. LITERATURE SURVEY

Lucknow, India: 2006, this research was done by profile of noise pollution in Lucknow city and its impact on environment. This research was done by Environmental Monitoring Division. Lucknow to make a noise modelling study of the city during day and night time. This research is based on relating the traffic flow to the noise produced by different vehicles [10].

Springfield, Illinois: 2017, this research was done by Illinois Department of Transportation Division of Highways Bureau of Design and Environment to

prepare a Highway Traffic Noise Assessment manual. This manual describes the technique and procedure to analyze report the impacts of traffic noise. It also describes types of noise barriers and how to provide noise barriers and abatements in order to mitigate noise. It also describes the feasibility of noise barriers [11].

4. OBJECTIVE OF THE STUDY

The main objectives of the study are:

1. To quantify the levels of noise pollution in Jaipur city.
2. To draw the noise profile of different locations of Jaipur city.
3. To compare the result with CPCB and WHO standards.
4. Study of Noise Barrier.

5. METHODOLOGY WORK PLAN

This study was conducted for two days in the morning time i.e. 7:00 am to 9:30 am and evening time i.e. 6:00 pm to 8.30 pm during March 2018.

Details of the instrument used in this study and the location of the study area are provided.

5.1 Measuring Instrument

Sound Level Meter SL-4001:

Noise measurements were performed using an Average Sound Level Meter SL-4001 which was designed for sound level measurements according to the IEC (International Electrotechnical Commission) standard. It support diffuse sound field measurements and also meets standard requirements when the supplied windscreen is mounted.

Specifications

- SL-4001 IEC 61672 Class2
- Frequency and time weighing meet IRC 61672 Class2
- Range: 30 to 130 dB
- Size: 245 X 80 X 35 mm
- Resolution: 0.1 dB
- Frequency: 31.5 Hz to 8000 Hz
- Operating temperature: 0°C to 50°C
- Weight: 0.25 Kg



Figure 1: Sound Level Meter



Figure 2: Decibel X



Figure 3: Decibel X

In this study, an application called “Decibel X” was used instead of the sound level meter.

Table 1 : Status of Noise Levels at Various Zones in Jaipur city

S. No.	Noise Zones	Location	Sound Level (dB)			
			First Day		Second Day	
			M*	E**	M*	E**
1	Industrial	1.V.K.I	85.4	80.1	87	80.8
		2.Sitapura	82.6	78.3	80.2	79.2
2	Commercial	1.Gaurav Tower	70	79.1	74.2	80
		2.Jawahar Circle	73.4	77	71.1	78
		3.Jaipur Station (outer)	76	84	75.5	82.1
		4.Rambagh	80.4	84.6	85	83.4
		5.B2 bypass	86.6	90.1	88.4	91.6
		6.Ajmeri Gate	89	94.5	91.6	95.2
		7.Gopalpura bypass	79	86	81	84.4
		8.Statue Circle	78	82.4	73	81
3	Residential	1.Tonk Phatak	66	73	65.8	68
		2.C-scheme	62.1	67.2	64	62.8
4	Silence	1.MNIT (indoor)	61	63	60.2	64
		2.S.M.S Hospital (Indoor)	65.2	66.6	67	65
		3.Jaipuria Hospital (indoor)	59	63	61	59.5

M* - Morning, E** - Evening]

5.2 Study Area

Jaipur capital of Rajasthan is the tenth most populated city of India. 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, communications talks), commercial (vendor shouting, automobiles, airplanes, marriage,

machinery), industrial and others. The locations are selected according to their nature.

5.3 Observed Noise Levels

The present study was conducted at fifteen different locations in the Jaipur city. For this purpose four zones i.e. industrial, commercial, residential and silence zones were selected in the city. An application “Decibel X” was used. Precautions were taken to avoid echo or resonance of sound by selecting suitable distance from the source. Readings were recorded after interval of ten seconds for three minutes at every site during morning and evening time.

5.4 Central Pollution Control Board (CPCB) Standards

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

5.5 World Health Organization (WHO) Standards

World Health Organization (WHO) community has established various standards to measure noise pollution presents in the environment. These standards helps to measure the current noise level produced by the different sectors, which harms the environment and it also has critical health effect on human beings.

Table 2 : Noise Standards for Ambient Noise Level (CPCB)

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

6. RESULT AND DISCUSSION

In this study, noise levels of industrial, commercial, residential and silence zone are calculated during morning and evening.

The noise level data taken during morning are shown in fig. 4 which are also compared to CPCB

standards. Fig. 4 indicates that the noise levels at different places are within CPCB standards.

The noise level data collected during evening are plotted in fig.5 and compared with CPCB standards which are also within CPCB standards.

Fig. 6 shows the comparison between noise level measured at different places to CPCB and WHO standards. These results are also within the limits set by CPCB and WHO.

Table 3 : WHO Community Noise Guidelines

S. 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	School classrooms	Sleep Disturbance	35	During Class
4	Industrial Commercial and Traffic Areas	Disturbance of communication	70	24
5	Music Through Earphones	Hearing Impairment	85	1
6	Ceremonies and Entertainment	Hearing Impairment	100	-
7	Bedrooms	Hearing Impairment	30	8

7. CONCLUSION

In recent years there is remarkable increase in use of vehicles due to which the noise levels of Jaipur city have increased. The scarce plantation is also another factor due to widening of city roads, which noise level has increased considerably. Noise pollution affects both health and behaviour. Unwanted sound (noise) can damage physiological health. Noise pollution can cause hypertension, high disturbances, and other harmful effects. Therefore, there is a need of awareness related to noise pollution among the public and government officials.

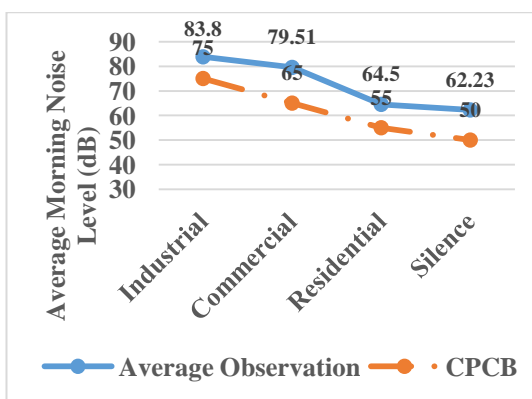


Figure 4: Morning Noise Level: Comparison between Average Observation and CPCB Standards

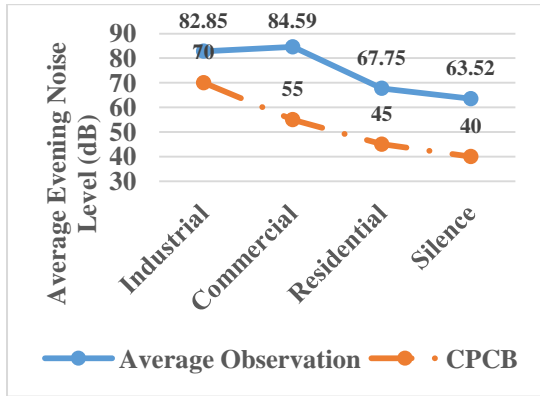


Figure 5: Evening Noise Level: Compression between Average Observation and CPCB Standards

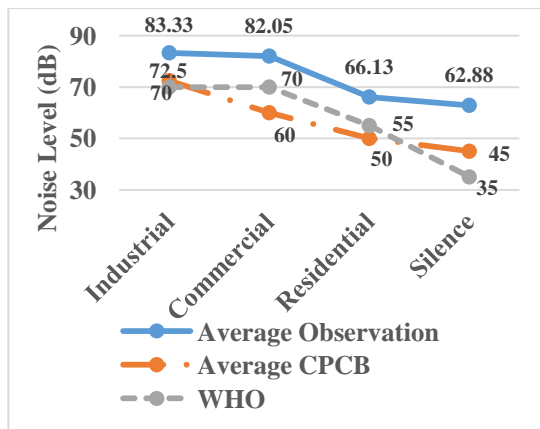


Figure 6: Noise Level: Compression between Average Observation CPCB and WHO Standards

Government and non-government organizations has to organize regular training, workshops and exhibition at various school, colleges, institutes to educate the citizens about the raising noise pollution, health impact and traffic rules and regulation [7-10].

Noise pollution can be controlled by designing and fabricating vehicles with new engines by setting a noise limit at least 5 – 10 dB (A) below the prescribed standards.

Local bodies such as “Jaipur Development Authority” may formulate its own rules and regulations to control noise nuisance.

A noise barrier also reduces the noise pollution as they obstruct the transmission path.

8. POSSIBLE MITIGATION OF NOISE POLLUTION

8.1 Design of Noise Barriers

While designing the noise barriers the following two things should be considered

1. Acoustics

2. Structural and aesthetic consideration



Figure 7: Aesthetic Appeal of Barrier

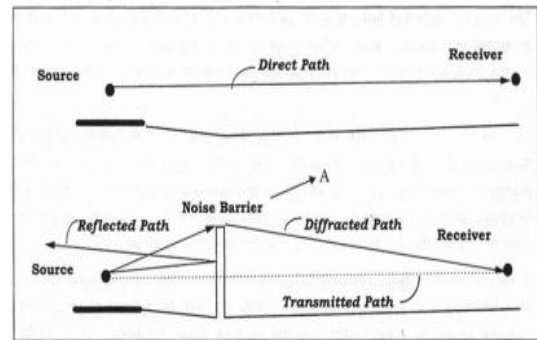


Figure 8: Alteration of Noise paths by Noise Bar

DON'T	DO
Gap at Lamp Post	No Gap at Lamp Post
Gap at Gantry	Barrier continues at Gantry
Gap at bottom edge	Gap at bottom edge filled with sealant and concrete

Figure 9: Examples of Gaps

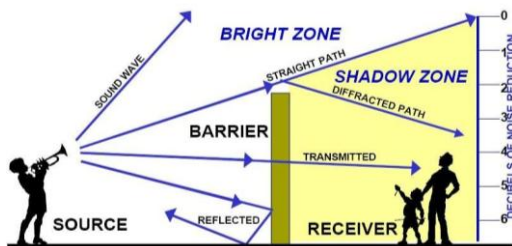
8.2 Reduction in Noise Barrier Performance

The reduction in the performance of the noise barrier is mainly due to holes, slits or gaps. The sound leaks due to holes, slits or gaps is mainly through or beneath the noise barrier and can considerably reduce the performance of the noise barrier [12].

Gaps should only be provided in case of long barriers where gates are needed for the maintenance purpose.

8.3 Shapes of Barriers

There are different shapes of barriers used to control the noise pollution.



THE EFFECT OF A BARRIER ON SOUND WAVES
Figure 10 : Noise Barrier Performances



Figure 11: Curved Barrier



Figure 12: Vegetated Barrier



Figure 13: Vegetated Barrier

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