Noise Pollution in City Damoh, Mp: A Case Study

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ABSTRACT

This study aims to analyze the noise pollution levels in significant areas in Damoh City. Noise is usually an unwanted, unpleasant or disagreeable sound that causes uneasiness. Today, one of the major causes of environmental pollution due to human-caused or influenced activities is noise pollution. The present study is concerned with assessing ambient noise levels in different locations of Damoh City in August 2024. Noise levels were studied at 10 locations in two distinct zones (commercial and silent) in Damoh City. Recorded noise data were elucidated as parameters L_{eq}, L_{10}, L_{50}, L_{90} and L_{NP}. The L_{eq} and L_{NP} Values in different hours at different locations compared with the prescribed standard of the Central Pollution Control Board were observed. The study area's sound level was much above the maximum permissible limit per hour. For commercial locations, L_{NP} was in the range of 74.0 -114.3 dB(A) and for silent locations, L_{NP} was in the range of 63.9 -76.8 dB(A). This study reveals that different areas of Damoh City are highly susceptible to noise pollution, and there is a warrant to adopt suitable control measures to reduce noise.

***Keywords*:** Noise pollution, Parameter, Commercial, Locations, susceptible

1. INTRODUCTION

Noise is any unwanted sound that varies from person to person. Noise is a form of pollution because it can cause several physiological and psychological effects on human beings [1]. One person may not like a particular loudness, whereas the same loudness may be pretty pleasant to another person. Sound is atmospheric or airborne vibration perceptible to the ear [2]. Noise pollution is a crucial problem for the quality of life and

an emerging issue in cities worldwide. Increasing urbanization, industrialization, and commercialization have caused noise pollution in urban areas. Traffic is the most dominating noise source, especially in developing countries like India [3]. Noise pollution is recognized as an environmental stressor [4]. Due to noise, the environment becomes contaminated. A contaminated environment affects a person's activity, mental ability, and health [5-7]. According to W.H.O., noise pollution is now a day the third most 66 hazardous environmental type of pollution, preceded only by air and water pollution. Migration of people from rural to urban areas, extension of urban communities, infrastructure development, population growth, and urbanization are essential factors bringing about motorization and increasing the level of different urban contamination [8]. In India, noise pollution in urban centres has risen gradually. According to past surveys, urban centres in India have disclosed that noise pollution levels are much greater than the expected and predetermined standards [9-11]. Numerous physical health effects have been seen in people exposed to noise pollution [12]. Some significant health hazards caused by excessive exposure to noise are auditory damage, high blood pressure,

headache, migraine, increased anger, insomnia, fatigue, high blood pressure, high pulse rate, greater perspiration, etc. Increasing industrialization, urbanization, and commercialization of urban areas increase noise pollution [13]. Traffic is the dominating source of noise. The effects of noise on human health are physical effects such as hearing effects, Physiological effects such as high blood pressure, abnormality and distortion of heart rhythms; psychological effects include sleeplessness, going to sleep late, irritability, annoyance, and stress [14]. The government of India has introduced the Noise Pollution (regulation and control) Rule 2000 for noise-producing and generating sources, which clearly classifies our environment into four categories and specifies the allowable limit of noise separately for day and night time for different urban environments [15].

2. STUDY AREA

Damoh district is located in Madhya Pradesh in Central India, having a population of 1.75 lakhs. The Damoh city has an area of 7306 square km. Damoh City comes in a Sagar Division. Damoh district is surrounded by Sagar, Jabalpur, Chhatarpur, and Panna. Damoh City is surrounded by Patharia, Patera, Jabera and Tendukheda blocks. Several commercial places are located in Damoh City. The Damoh City has a remarkable place where cattle, such as cows and bulls, are bought and sold.

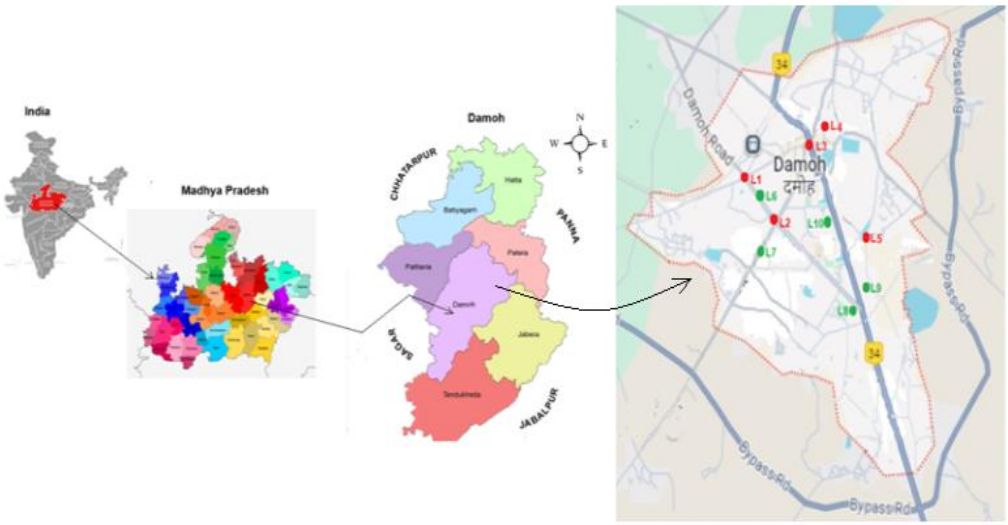

Fig-1: Map of the study area (Damoh City)

The experiment was conducted at ten different testing locations (L1- L10) within Damoh City, as shown in Table 1 and Figure 1. Testing locations were based on perceived loudness and noise. The habitation in Damoh City is highly diversified. Besides the general requirement of calamity, some areas are highly noisy, whereas some areas are reasonably calm. Noise level measurements will be conducted in commercial and silent zones, as per the guidelines set by the Central Pollution Control Board (CPCB) India, to assess the intensity of noise pollution.

Table -1: Locations for the Current Study.

S.No.	Location Symbol	Name	Zone/ Area
1	L1	Teen Gulli Square	Commercial
2	L2	Kallai Naka Square	
3	L3	Ghantaghar Square	
4	L4	Vishal Mega Mart	
5	L5	Jatashankar Temple	
6	L6	Govt. PG College	Silent
7	L7	Central School	
8	L8	District Office	
9	L9	Govt. Polytechnic College	
10	L10	District Hospital	

3. METHODOLOGY

The sound level will be measured by following the standard procedure prescribed by CPCB using a calibrated sound level meter Lurton SL-4023SD with a measuring range from 30-180 dB(A) between 8 AM to 10 PM during the working day. The standard noise level for different locations during the day and night is followed according to CPCB guidelines. Our monitoring period comprises 14 hr (i.e. 8 AM to 10 PM). The reading will be taken at concern hours for a 10-minute duration at fixed intervals of 10 seconds, so 60 readings are taken for each observation hour. Ambient sound levels are being compared with the prescribed standards of CPCB India. The national ambient air quality standard with respect to noise, as specified under the Noise Pollution (regulation and control) Rule 2000, is referred in the present study. Various noise descriptors are shown in Table 2.

Table -2: Various Noise Descriptors/ Parameters

S. No.	Noise Descriptors/ Parameters	
1	L_{eq}	Energy mean of the noise level over a specified period
2	L_{10}	Level exceeded 10% of the time in a recorded noise level for a given interval. (Higher Sound Pressure)
3	L_{50}	Level exceeded 50% of the time in a recorded noise level for a given interval. (Medium Sound Pressure)
4	L_{90}	Level exceeded 90% of the time in a recorded noise level for a given interval. (Lower Sound Pressure)
5	L_{NP}	Noise pollution level

Noise pollution level can be calculated by the formula given below:

$$L_{eq} = L_{50} + [(L_{10} - L_{90})\ 2/60] \quad (1)$$

$$L_{NP} = L_{eq} + (L_{10} - L_{90}) \quad (2)$$

Table -3: Noise pollution level Standards concerning noise given by CPCB

Zone	Limits in dB(A)	
	Day Time	Night Time
Commercial	65	55
Silent	50	40

*dB(A) denotes the time-weighted average of the sound level in decibels on scale A, which is relatable to human hearing. "A", in dB(A), denotes the frequency weighting in the noise measurement and corresponds to the human ear's frequency response characteristics.

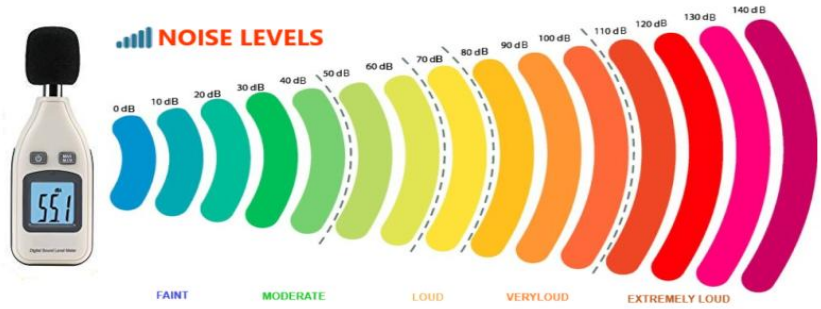

Fig -2: Decibel Scale: Measuring Sound using a sound level meter

4. RESULT AND DISCUSSION

4.1 Commercial Area

The equivalent noise levels (L_{eq}) and noise pollution levels (L_{NP}) in different commercial areas of Damoh City have been shown in Table 4, Figure 3 and Figure 4. Minimum and Maximum equivalent sound pressure level (L_{eq}) ranges between 68.9 dB(A) to 97.3 dB(A). Noise pollution levels in all commercial areas exceeded the standard values of 65 dB(A) during the daytime and 55 dB(A) at nighttime. The maximum noise pollution level observed during 6 to 10 PM at Ghantaghar Square is 114.3 dB(A). L_{eq} and L_{NP} values at all locations exceeded the allowable limits in August 2024. The main reasons for noise in commercial areas are traffic movement, crowd of people, vehicular horns, business equipment and marketing.

Table - 4: Noise parameters (L_{eq}, L_{10}, L_{50}, L_{90}, and L_{NP}) at the different monitored locations of the Commercial zone at various time intervals.

DATE	LOCATION	TIME	L_{10}	L_{50}	L_{90}	Leq	L_{NP}
01/08/2024	Teen Gulli Square #L1	8 AM-12 PM	72.2	68.7	65.2	68.9	75.9
		1 PM-5 PM	76.5	72.0	67.5	72.3	81.3
		6 PM-10 PM	78.3	73.3	68.3	73.6	83.6
05/08/2024	Kallai Naka Square #L2	8AM-12PM	73.9	70.4	66.9	70.6	77.6
		1 PM-5 PM	79.9	74.4	68.9	74.8	85.8
		6 PM-10 PM	83.1	76.1	69.1	76.6	90.6
9/08/2024	Ghantaghar Square #L3	8 AM-12 PM	74.3	71.3	68.3	71.5	77.5
		1 PM-5 PM	85.5	80.5	75.5	80.8	90.8
		6 PM-10 PM	105.3	96.8	88.3	97.3	114.3
13/08/2024	Vishal Mega Mart #L4	8 AM-12 PM	71.4	68.9	66.4	69.0	74.0
		1 PM-5 PM	82.8	76.3	69.8	76.7	89.7
		6 PM-10 PM	103.5	96.5	89.5	96.9	110.9
17/08/2024	Jatashankar Temple #L5	8 AM-12 PM	86.5	76.2	65.8	76.9	97.6
		1 PM-5 PM	77.9	72.0	66.1	72.4	84.2
		6 PM-10 PM	99.8	89.0	78.2	89.7	111.3

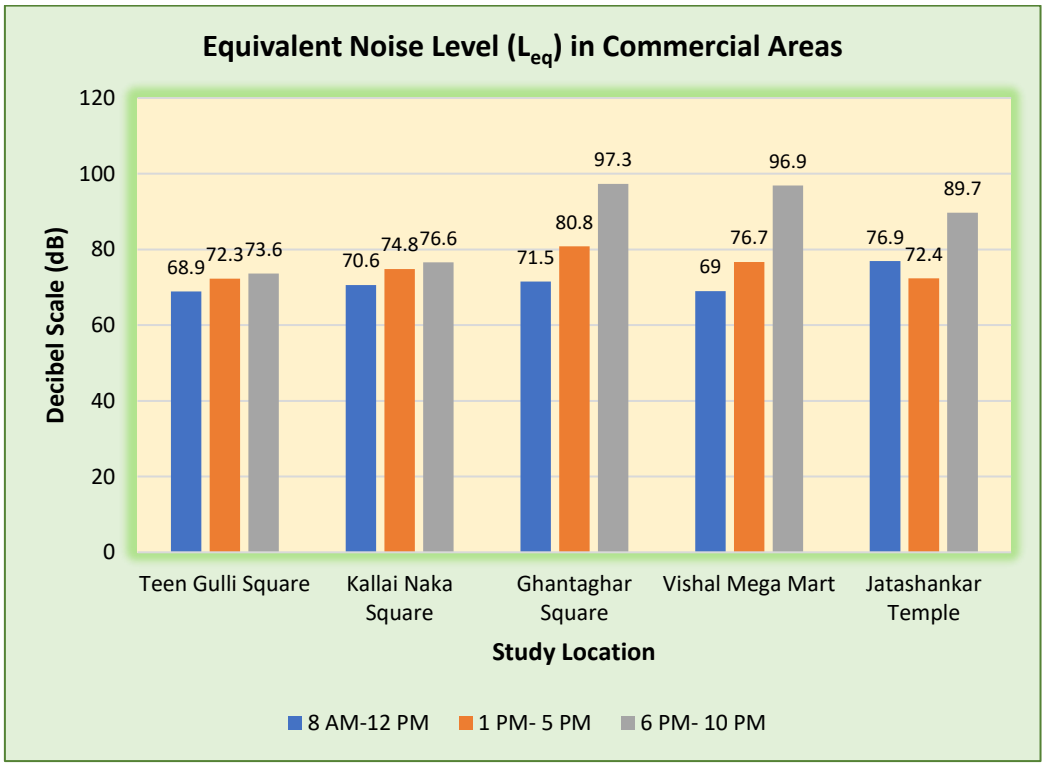

Fig - 3: Temporal Variation of Equivalent Noise Level (L_{eq}) in Commercial Areas

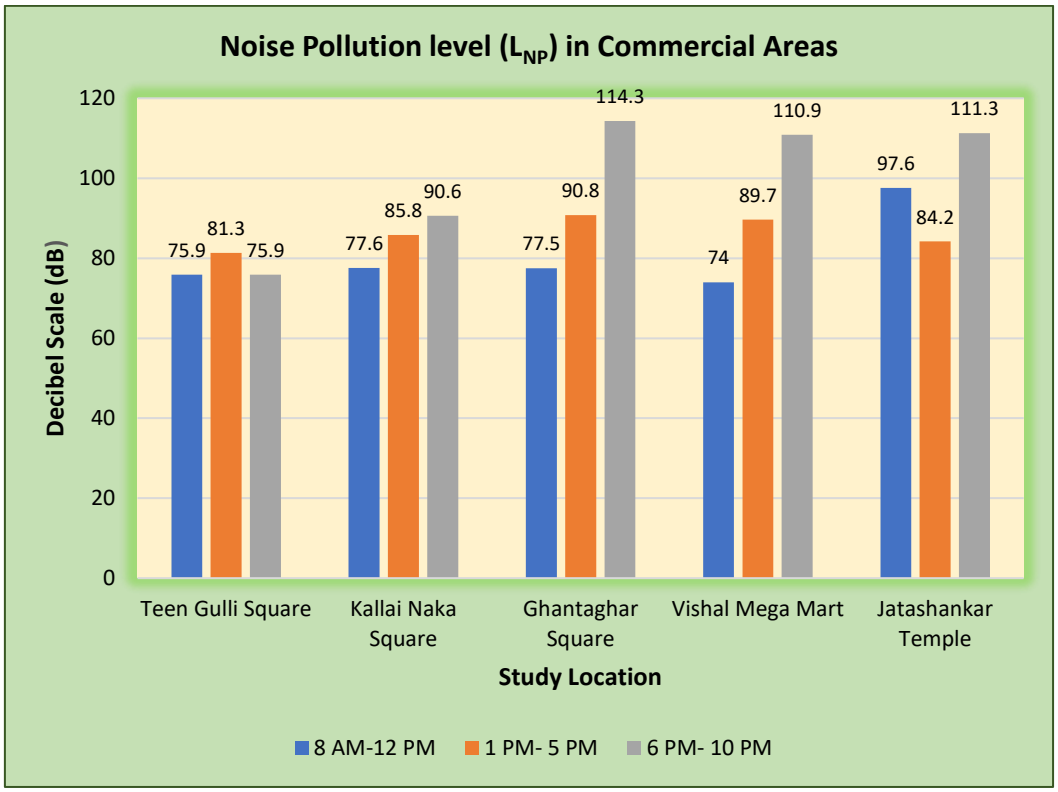

Fig- 4: Temporal Variation of Noise Pollution Level (L_{NP}) in Commercial Area

4.2 Silence Area

In the silence area, as shown in Table 5, Figure 5 and Figure 6, minimum and maximum Equivalent sound pressure levels range between 58.0 dB(A) to 68.7 dB(A). The equivalent Noise level in all the silence areas is much above the standard value of 50 dB (A) during daytime and 40 dB(A) during nighttime. The equivalent noise level observed maximum in daytime between 1 PM to 6 PM at the District Hospital, i.e. 68.1 dB(A). The maximum noise pollution level observed in the District Hospital during the morning (8 AM – 12 PM) is 76.8 dB(A). The result indicates that noise pollution consistently exceeds the permissible limit at this location throughout all measurement times.

Table -5: Noise parameters (L_{eq}, L_{10}, L_{50}, L_{90}, and L_{NP}) at different monitored locations of the Silence Area at different time intervals.

DATE	LOCATION	TIME	L_{10}	L_{50}	L_{90}	Leq	L_{NP}
20/08/2024	Govt. PG College #L6	8 AM-12 PM	62.4	58.8	55.2	59.0	66.0
		1 PM-5 PM	66.5	62.0	57.5	62.3	71.0
		6 PM-10 PM	63.3	60.9	58.5	61.1	65.7
23/08/2024	Central School #L7	8 AM-12 PM	63.7	60.1	56.5	60.3	67.3
		1 PM-5 PM	69.7	64.1	58.6	64.5	75.2
		6 PM-10 PM	63.3	61.2	59.2	61.3	65.3
27/08/2024	District Office #L8	8 AM-12 PM	64.3	61.3	58.3	61.5	67.3
		1 PM-5 PM	71.5	68.5	65.5	68.7	74.5
		6 PM-10 PM	57.3	57.8	50.3	58.0	64.8
29/08/2024	Govt. Polytechnic college #L9	8 AM-12 PM	61.4	58.9	56.4	59.0	63.9
		1 PM-5 PM	62.8	61.3	59.8	61.4	64.3
		6 PM-10 PM	63.5	61.5	59.5	61.6	65.5
31/08/2024	District Hospital	8AM-12PM	66.5	66.1	55.8	66.5	76.8
		1 PM-5 PM	71.9	67.9	63.6	68.1	76.2
		6 PM-10 PM	69.8	65.5	61.2	65.8	74.1

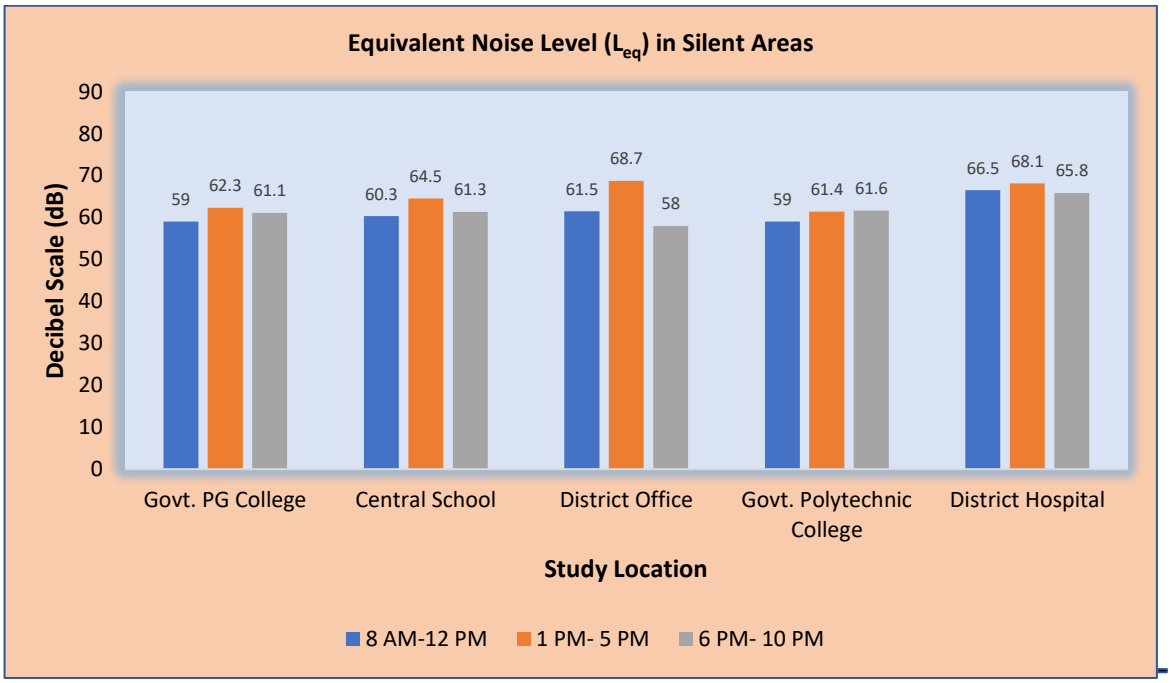

Fig-5: Temporal Variation of Equivalent Noise Level (L_{eq}) in Silent Area

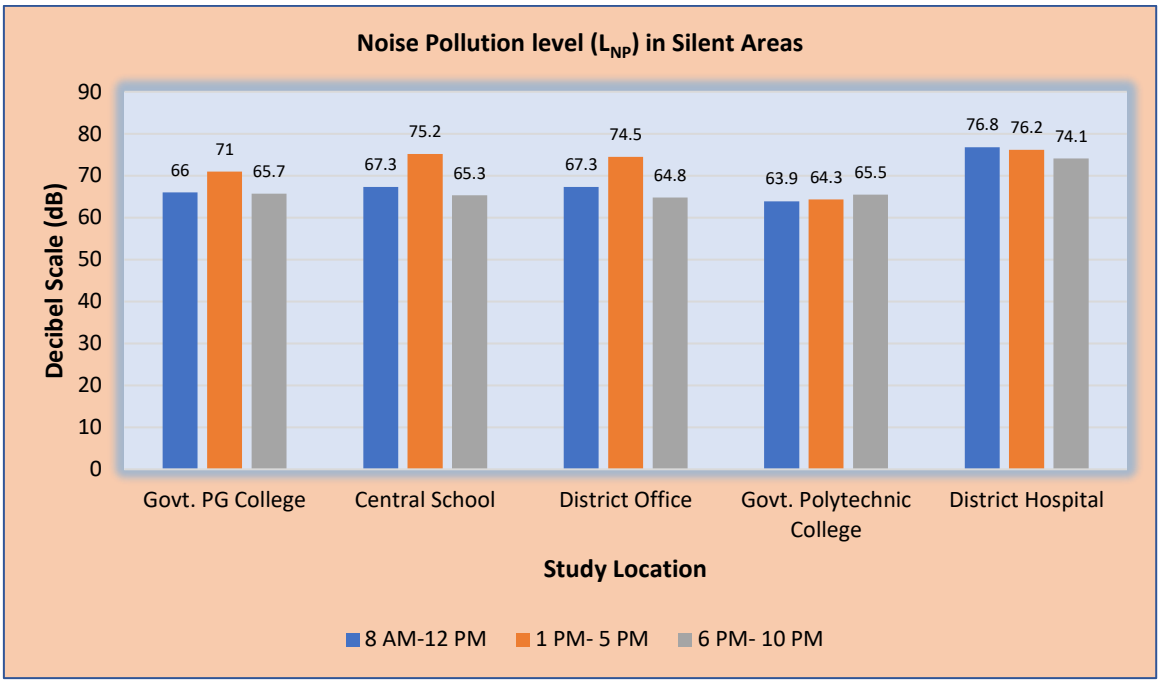

Fig - 6: Temporal Variation of Noise Pollution Level (L_{NP}) in Silence Area

5. CONCLUSION

The current study revealed that all 10 locations recorded higher noise levels and breached the ambient noise standard of CPCB. Hence, the governing bodies must implement mitigating approaches to control it as higher levels cause different health problems among the exposed population of the city. Rapid urbanization, heavy traffic flow, and vehicle horns are the basic factors for noise pollution in the city. Hence, to keep the noise level within the acceptable limit, necessary preventive measures must be taken by the appropriate authority to implement the Noise Pollution (Regulation and Control) Rules.

1. Use of traffic controls efficiently
2. Creation of silence zones
3. Commercial activities should not be permitted in the silence area
4. Eco-city planning
5. The playing of noise-generating devices should be preferable at low volume.
6. sufficient road facilities for easy movement of traffic
7. proper maintenance of road and vehicle

The study recommends making strict regulations near the most sensitive areas like hospitals, schools, and other silent regions to ensure a good and healthy environment in the city. Finally, it can be concluded that this issue can be resolved if people become aware of the long-term health effects of noise pollution.

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