ASSESSING THE ENVIRONMENTAL NOISE LEVEL OF JODHPUR, RAJASTHAN, INDIA

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ABSTRACT

Jodhpur, also called “Sun City”, is the second largest city of Rajasthan, India growing with a fast speed commercially, industrially, and residentially. The exponential growth due to teeming population, increased vehicular traffic, and mushrooming industries has led to many problems including increase in noise levels, which was nonexistent a decade ago. Keeping in view of this fact the present study was undertaken. The noise levels Leq dB (A) were monitored at three sites namely Lachoo memorial college of Science and Technology site, Shastri circle site, and Basni Phase I site — grouped as residential, commercial and Industrial area respectively. The monthly observations were recorded during morning hours (8-10AM), noon hours (12-2PM), and evening hour (5-7 PM) using sound level meter (Envirotech instruments) model SLM 100, taking the readings at an interval of 1min, from September 2017 to November 2017. L10, L90 and noise climate (NC) were also calculated to assess the gravity of noise environment. The maximum noise level recorded at Lachoo memorial college of Science and Technology site was 81.4dB in November 2017 (5-7 PM), at Shastri circle site was 86.7dB in September 2017 (5-7 PM), and was recorded 94.2dB in September 2017 (12-2PM) at Basni Phase I site. The average noise level were found to be more than prescribed limits set by Central Pollution control Board (CPCB) at Lachoo Memorial College of Science and Technology and Shastri circle sites, for all the three months and all the three recording hours (8-10AM, 12-2PM, and 5-7 PM). At Basni Phase I site only it was observed to be below the prescribed limits set by CPCB in September 2017 (5-7 PM), October 2017 (8-10AM), (12-2PM), and in November 2017 (8-10AM).

Key Words: Noise levels, Sound level meter, Central Pollution Control Board (CPCB), L10, L90, Noise Climate (NC)

INTRODUCTION

The word "noise" is derived from the Latin word "nausea" meaning seasickness. Noise can be defined as the level of sound that exceeds the acceptable level and creates an annoyance. Noise is any sound independent of loudness which can produce an undesired physiological or psychological effect on an individual group. Noise is present all around human being and is affecting the wellness at every level. Air and water pollution is mostly talked and taken care of but we pay little attention to the noise pollution which is like a slow poison killing the wellness of humans. We cannot live in a sound proof surrounding but we can at least reduce the noise and reduce the misery caused due to unwanted sound.

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sound and so slow increases in the ambient level go unnoticed. Therefore, noise continues to do the damage silently. Noise pollution in the recent times has been well recognized as one of the major trepidations that impacts the quality of life in urban areas across the globe. Noise pollution is distinguished from other pollution categories due to its source and diffusion characteristics, which can adversely affect public health and environmental quality in urban environment. Noise is becoming an increasingly omnipresent, yet unnoticed form of pollution even in developed countries. Though noise pollution is a slow and subtle killer, yet very little efforts have been made to ameliorate the same. Not only humans wildlife is also affected by noise pollution causing change in path of migratory birds, their feeding habits, breeding duration and season, to name a few.

Jodhpur is second largest city, 231 m (758 ft) above mean sea level, lying between 26.28°N 73.02°E, of Rajasthan and popularly known as Sun City, as the sunshine hours are long through out the year. Jodhpur is fast expanding with growth in population (1.728 million forecasted in 2017). The area of Jodhpur district is about 22,850 square kms and it has about 24374 industrial units registered as per 2011-12 data given by micro, small and medium enterprises, Government of India, Jaipur. Number of vehicles have also increased alarmingly( about three lakh of registered vehicles ) and all this has created the increase in pollution including noise pollution, which was nonexistent a decade ago.

**Review literature**

Mangalekar et al\(^2\) studied noise pollution Noise Pollution in Kolhapur City, Maharashtra, India. The average noise level at industrial, commercial, residential and silence area were 74.28 dB (A), 65.52 dB (A), 58.88 dB (A) and 50.02 dB (A) respectively. The results showed that there is an enhanced pressure of noise at all sites due to increase in number of vehicles and facilities of transportation. All the sites under study showed higher sound level than the prescribed limits of Central Pollution Control Board (CPCB).

Gayathri et al\(^3\) Assessed Noise Pollution in Thoothukudi City, TamilNadu. The study areas were demarked as silent zone, commercial zone and heavy traffic zone and the sound level prevailed in these areas, were analyzed and it was observed that in all the study areas the observed sound level exceed from the normal permissible level (i.e. Silent Zone (40-50 dB), commercial zone (55-60 dB), heavy traffic zone (80-85 dB)) to a greater significant extent.

Balashanmugam P. et al\(^4\), studied the effect of road traffic noise pollution in Cuddalore town, TamilNadu. The noise assessment of the Cuddalore town indicated that the noise levels in the town are escalating at a very fast rate with growing population and heavy traffic accumulation. Noise levels obtained at different locations of the town viz. commercial, residential, industrial and silence zones were found to be exceeding the noise level /limits prescribed by the CPCB and the Noise Pollution (Regulation and Control) Rules, 2000. It was also observed that in many commercial areas of the town, the noise level exceeded 62-99 dB(A) whereas in residential areas highest noise level recorded between 58-86 dB (A). In silence zones noise levels exceeded 42-86 dB (A). In industrial zones noise levels exceeded 59-85 dB (A) It was also observed that higher noise level in the town is due to rapid and unplanned urbanization resulting in great influx of people from all parts of the region and country, improper management of town roads and traffics, lack of sufficient parking spaces and exponential growth of both private and public vehicles in the city.

Singh and Pandey\(^5\) did study of noise in Gorakhpur city, Uttar Pradesh (India). The noise was recorded in different area of Gorakhpur city categorized as silent, residential and commercial zones, respectively. Study revealed that the range of noise levels in all the areas were much higher than the permissible values as per standards

Phukan and Kalyan\(^6\), did an experimental study of noise pollution in Gauhati University campus, Guwahati, Assam, India by measuring of noise levels at three different time intervals of the day i.e. in the morning 9-11am, midday 12-2pm and in the evening 6-8pm. The present study suggest that equivalent noise level is maximum during the time interval in the morning 9-11am and registered minimum during the time interval midday at 12-2pm at the sampling. The average equivalent noise level was ranged between 57dB(A)– 64.4dB(A) during 9-11am of the day, between 55.3dB(A)-63.4dB(A)
during the hours 12-2pm and ranging between 56.1dB(A)-63.5dB(A) during the time interval 6-8pm respectively. The minimum equivalent noise level registered at Gauhati University Hospital followed by samadhi khetra was justified as the distance was maximum (approximately 100m) from the noise source among the all sampling sites. Similarly maximum equivalent noise level was registered at State Bank of India, Gauhati University branch followed by auditorium as these sampling sites were close to the noise source (30m) among the all sampling sites.

Keerthana et al did an analysis of noise pollution in Tirupur city, results obtained in the study shows that the whole city is affected heavily by noise pollution more during the evening hours when compared to morning hours and in almost 90% of the area prevailing noise level is more than the ambient noise level. It has been found that in many areas the noise level prevailing averages around 85 db at 90% of the busy points of the city. Most of the noise is generated only due to horns of vehicles like rickshaws, buses, wagons & trucks etc., Tirupur being a small and congested city, creates chronic issues related to noise pollution.

Bhende and Bhave8 studied noise pollution during Ganesh utsav in Mumbai city. It was observed that the level of Noise Pollution during Ganesh immersion is much higher when compared with the standard limits. At all the locations the observed sound levels were above the permissible limit in 2012 but seen to decrease in 2013 during the Ganesh Festival. When compared with the noise levels observed during the Ganesh festivals of earlier years, no significant change or reductions of noise at Mumbai was noted. This indicates lack of support of people in making Ganesh festival free from noise pollution or at least less noisy in successive years owing to increasing mass awareness. Pritam et al did assessment of outdoor and indoor noise pollution in commercial areas of Gorakhpur city. The observation sites were selected at eleven different locations in commercial areas of Gorakhpur city and Energy Equivalent noise (Leq) for hourly observations for indoor and outdoor noise were made at these sites. The relative standing of outdoor and indoor noise with respect to regulatory norms was looked into and the range of minimum and maximum values of Leq was also found. It is found that the outdoor noise levels are influenced by traffic volume and congestion, user’s generators and crowd on roads. It is also seen that, on many sites, significant increase in indoor noise is observed only in the afternoon hours around 3:00 pm - 4:00 p.m. when large number of customers starts flowing into the shops after getting free from offices, schools and colleges and other establishments and commercial activity picks up.

Sahu and Sahu10 did environmental noise assessment of Indore city. The observation reveals that noise level is exceeding the permissible limits in the following area-Silence, residential and commercial and industrial. The study offers several recommendations which if implemented, would reduce significantly the noise levels in the city.

Sharma et al11 did study on noise pollution in some places of industrial, commercial, residential and silence zone within Jagirroad town, Assam. The observed noise level ranges are 69.6 to 88.7 dB (A), 61.5 to 89.5 dB(A), 38.7 to 59.5 dB (A) and 40.1 to 59.8 dB(A) in industrial, commercial, residential and silence areas respectively. The findings indicates that the maximum noise level is found in commercial area due to heavy vehicular movement, high traffic congestion and outdated vehicles, narrow and poorly managed roads, etc. Moreover, urban area and commercial zones are not established according to land use plan, which is responsible to noise level enhancement. Kumar et al12 did noise pollution analysis in different mega cities of India during Deepawali festival. It was observed that the sound pressure level produced by Indian crackers is higher than the permissible limits prescribed by the Central Pollution Control Board (CPCB).

Sidhardhan et al13 did assessment of the environmental noise level of Tirunelveli city, Tamil Nadu, India. The present study was carried out at 33 locations in different zones with sound level meter to assess daytime and night time noise levels of Tirunelveli city during August – October 2013. The results show that the noise level values in urban area of the city exceed the standards set by central pollution control board throughout most of its area.

Baniya and Mishra14 did noise pollution analysis during chhath puja in Gorakhpur city. It was found that the noise levels are generated by
traffic volume and congestion, generators and people on roads. It is also seen that, on many sites, significant increase in noise is observed whole day as because of public holiday. Maximum people were in the market for shopping and after 2 p.m. people were in chaos to arrive at Chhath ghats and other establishments and commercial activity picks up. Due to Chhath puja daily traffic volume in the market was larger than the normal days.

Baghel et al. did Evaluation of present scenario of ambient noise level in residential zone and silence zone of Jabalpur city. The investigation reveals that the Residential Zone and Silence Zones of Jabalpur City are highly exposed to noise pollution. Spontaneous urbanization, heavy traffic flow and vehicle horn are the main reason that cause noise pollution in the city.

Charan did an assessment of environmental noise pollution in Bikaner city of western Rajasthan, India. The present investigation was focused of the assessment of noise level at five different sites in Bikaner city for day time as well night time during February, 2016 to April, 2016. The results of the present investigation revealed that the noise level in Bikaner city is extremely high from the prescribed level. Almost all the observations at Industrial, Commercial, Residential and even the silence zone (PBM Hospital) have shown the level of noise above its maximum permissible level. The residential site (JNV colony) was quite noiseless during night time, however in day time, noise level at JNV colony site has also found above the prescribed level.

Patel and Pandey did a study of noise pollution at the campus of Madan Mohan Malaviya University of Technology Gorakhpur, Uttar Pradesh (India). The present study shows that each and every sampling site are facing noise level more than the prescribed limit suggested by central pollution control board, India (CPCB) for the prescribed area category. The results of present study match with the findings of different workers and it may be said that Jodhpur is sitting on volcano of another problem called noise pollution, other than water and air pollution.

MATERIAL AND METHODS

The noise levels Leq dB (A) were monitored at three sites of Jodhpur, namely Lachoo memorial college of Science and Technology site, Shastri circle site, and Basni Phase I site grouped as Residential, commercial and Industrial area respectively. The monthly observations were recorded during morning hour (8-10 AM), noon hours (12-2 PM), and evening hour (5-7 PM) using sound level meter (Envirotech instruments) model SLM 100, taking the readings at an interval of 1 min, from September 2017 to November 2017. Sound level meter was placed about 1.5 meter above ground level and and at a minimum distance of 3.0 meter from the reflecting surface. L10, L90 and noise climate (NC) were also calculated to assess the gravity of noise environment. Lachoo memorial college of Science and Technology site is a residential area with number of houses in the locality called Shastri Nagar. Vehicular traffic, construction activities and other activities create the noise pollution in this area. Shastri circle site is a an area with commercial activities– vendors, vehicular traffic, loud music sound etc contribute to noise pollution. Basni Phase I site is the area which is part of industrial area of Jodhpur hence noises arising from machineries, heavy traffic, generator etc are the main contributors to noise pollution.

RESULTS AND DISCUSSION

The maximum noise level recorded at Lachoo memorial college of Science and Technology site was 81.4 dB in November 2017 (5-7 PM) (Table 3), at Shastri circle site was 86.7 dB in September 2017 (5-7 PM) (Table 3), and was recorded 94.2 dB in September 2017 (12-2 PM), (Table 3) at Basni Phase I site. The average noise level were found to be more than prescribed limits set by Central Pollution control Board (CPCB 2000) (Table 1) at Lachoo Memorial College of Science and Technology (Fig 1, Table 2) and Shastri circle sites (Fig 2, Table 2), for all the three months and all the three recording hours (8-10 AM, 12-2 PM, and 5-7 PM) (Fig 1, Table 2).

At Basni Phase I site (Fig 3 and Table 2) only it was observed to be below the prescribed limits set by CPCB in September 2017 (5-7 PM), October 2017 (8-10 AM), (12-2 PM), and in November 2017 (8-10 AM). The noise climate (NC) calculated was found to be highest (13.57 dB) at Lachoo Memorial College of Science and Technology site in September 2017 (5-7 PM), at Shastri circle site it was highest in October 2017 (12.14 dB) (12-2 PM), and at Basni Phase I site it was highest in September 2017 (19.0 dB) (8-10 AM) (Table 4).
Observation sites

Two observation sites – Shastri circle (A) and Lachoo memorial college of Science and Technology (B)

Third Observation site – Basni Phase I (C)

Fig. 1: Observed noise average (dB) at Lachoo memorial college of Science and Technology site during study period
Table 1: Noise standards as given by Central Pollution Control Board, India (CPCB, 2000)

<table>
<thead>
<tr>
<th>Area code</th>
<th>Category of area/Zone</th>
<th>Limits in dB (A) Leq</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Day time</td>
</tr>
<tr>
<td>A</td>
<td>Industrial area</td>
<td>75</td>
</tr>
<tr>
<td>B</td>
<td>Commercial area</td>
<td>65</td>
</tr>
<tr>
<td>C</td>
<td>Residential Area</td>
<td>55</td>
</tr>
<tr>
<td>D</td>
<td>Silence Zone</td>
<td>50</td>
</tr>
</tbody>
</table>

1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority.

Table 2: Observed Noise Average (dB) at different sites during study period (September 2017 to November 2017)

<table>
<thead>
<tr>
<th>S/N</th>
<th>Zone</th>
<th>Place of observation</th>
<th>September 2017</th>
<th>October 2017</th>
<th>November 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-10 AM</td>
<td>12-2 PM</td>
<td>5-7PM</td>
</tr>
<tr>
<td>1</td>
<td>Residential (Acceptable limit daytime 55 dB)</td>
<td>Lachoo Memorial college of Sc and Tech. Circle (A)</td>
<td>66.64 dB</td>
<td>69.69 dB</td>
<td>66.75 dB</td>
</tr>
<tr>
<td>2</td>
<td>Commercial (Acceptable limit daytime 65 dB)</td>
<td>Shastri Circle (C)</td>
<td>69.94 dB</td>
<td>73.67 dB</td>
<td>78.02 dB</td>
</tr>
<tr>
<td>3</td>
<td>Industrial (Acceptable limit daytime 75 dB)</td>
<td>Basni Phase I (C)</td>
<td>80.62 dB</td>
<td>83.24 dB</td>
<td>68.94 dB</td>
</tr>
</tbody>
</table>
### Table 3: Observed Lmax and Lmin at different sites during study period (September 2017 to November 2017)

<table>
<thead>
<tr>
<th>S/N</th>
<th>Zone</th>
<th>Place of observation</th>
<th>September 2017</th>
<th>October 2017</th>
<th>November 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lmax dB</td>
<td>Lmin dB</td>
<td>Difference between Lmax and Lmin dB</td>
</tr>
<tr>
<td>1</td>
<td>Residential</td>
<td>Lachoo Memorial college of Sc and Tech.</td>
<td>79.8</td>
<td>54.6</td>
<td>25.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Observation duration</td>
<td>5-7PM</td>
<td>5-7PM</td>
<td>------</td>
</tr>
<tr>
<td>2</td>
<td>Commercial</td>
<td>Shastri Circle</td>
<td>86.7</td>
<td>61.3</td>
<td>25.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Observation duration</td>
<td>5-7PM</td>
<td>8-10 AM</td>
<td>------</td>
</tr>
<tr>
<td>3</td>
<td>Industrial</td>
<td>Basni Phase I</td>
<td>94.2</td>
<td>60.0</td>
<td>34.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Observation duration</td>
<td>12-2 PM</td>
<td>8-10 AM</td>
<td>------</td>
</tr>
</tbody>
</table>

### Table 4: Observed Noise climate (NC) at different sites during study period (September 2017 to November 2017)

<table>
<thead>
<tr>
<th>S/N</th>
<th>Zone</th>
<th>Place of observation</th>
<th>September 2017</th>
<th>October 2017</th>
<th>November 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-10 AM</td>
<td>12-2 PM</td>
<td>5-7 PM</td>
</tr>
<tr>
<td>1</td>
<td>Residential</td>
<td>Lachoo Memorial college of Sc and Tech.</td>
<td>12.86 dB</td>
<td>10.00 dB</td>
<td>13.57 dB</td>
</tr>
<tr>
<td>3</td>
<td>Industrial</td>
<td>Basni Phase I</td>
<td>19.0 dB</td>
<td>16.42 dB</td>
<td>8.57 dB</td>
</tr>
</tbody>
</table>
CONCLUSION

During the study period the average noise level at Lachoo memorial college of Science and Technology site was found to be high during the time period 12-2.00PM (September 2017 -69.69 dB, October 2017-70.93 dB, November 2017-71.8 dB). At Shastri circle site it was found to be high during time period 12-2.00 PM (November 2017-78.02 dB) and 5.00-7 PM ((September 2017- 78.71dB, October 2017-74.41 dB) and at Basni Phase I site it was found to be high between 12-2 PM (September 2017- 83.24 dB) and 5-7 PM (October 2017-76.28 dB, November 2017-77.78 dB ). Shastri Circle and Basni Phase I being commercial and industrial area, respectively, peak noise level was observed only after 12 noon going up to 7PM in the evening pointing towards the high activity period in these area between 12 and 7 PM. Lachoo memorial college of Science and Technology site, which is a residential area observed high noise level during 12-2 PM period which might be due to most of the schools close during this time.
and buses, school taxis return back dropping children to their home. Other activities like construction, vendors selling vegetables etc during this period might have also contributed in increasing the noise level during this period at this site. Hence the study concludes that increase in population has put load on the existing system. Increase in vehicular traffic and increase in industrial units have added salt to the miserable condition. Only few researchers have studied noise pollution of Jodhpur and hence the present study can help a lot in understanding the problem and how to tackle it.

**RECOMMENDATIONS**

It is strongly recommended to undertake a detailed study of noise pollution of Jodhpur by Government of Rajasthan as well as Government of India and proper planning should be undertaken to curb this problem in coming years. Noise pollution is a physical pollutant which is not easily recognized, but it act as silent killer aggravating the behavior, and diseases like cardiovascular disease to a great extent.

**REFERENCES**

of Ambient Noise Level in Residential zone and Silence zone of Jabalpur city, 

