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STUDY OF NOISE POLLUTION IN INDORE CITY DURING GANESH UTSAV – A CASE STUDY

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ABSTRACT

Noise is an unwanted, unpleasant and irritable sound that may cause some psychological and physiological stress to human beings exposed to it. Noise Pollution has now been recognized as one of the type of pollution that affects the quality of life. Man made sound contribute largely to noise pollution. Present study deals with the trend and status of noise generated during an important festival Ganesh Utsav. The results obtained at all the selected study locations were recorded higher sound levels than the prescribed safe limit of Central Pollution Control Board of India.

Keywords: *Noise pollution, Ganesh Utsav, Sound level meter, Ambient Noise Standard*

I. INTRODUCTION

Noise pollution is a significant environmental problem in many urban areas. Noise is an unwanted, unpleasant and irritable sound that may cause some psychological and physiological stress to human beings exposed to it. The World Health Organization considered noise pollution as the third most hazardous pollution after air and water pollution. It causes significant health effects, such as heart problems, change in social behavior and quality of life. In India, the problem caused by noise pollution is increased during celebration, festival, marriage or religious functions. Indian festivals are traditionally celebrated with song and dance in large groups, using musical instruments, drums etc.

A decibel is the standard for the measurement of noise. The zero on a decibel scale is at the threshold of hearing, the lowest sound pressure that can be heard. According to D.B. Smith, 20 dB is whisper, 40 dB is quiet office, 60 dB is normal conversation and 80 dB is the level at which sound becomes physically painful. Noise is measured in decibels (dBA). ‘A’ symbol indicates a measurement of a logarithmic scale. In each case, the actual measurement ‘a’ is compared to a fixed reference level ‘r’ and the “decibel” value is defined to be $10 \log_{10} (a/r)$. ‘A’ weighing filters out lower frequencies very severely.

Leq (Equivalent Sound Level) : It is the constant sound pressure level which would have produced the same total energy as the actual sound level over the given time. It is denoted as Leq.

$$Leq = 10 \log(\sum F_i \sqrt{10 L_i / 10})^2$$

Where,

F_i = (time interval of monitoring) / (Total monitoring time)

L_i = intensity of sound

Measured Leq. Values were used for calculation of Noise Pollution Level (LNP). Noise pollution Level (LNP): It is Equivalent sound level that has probability of exceedence of 0.5%. Mathematically it is expressed as

$$LNP = Leq(\infty) + 2.56\sigma$$

Where,

σ = standard deviation = $[\{\sum (Leq(i) - Leq(\infty))^2\} / N - 1]^{1/2}$ and

$Leq(\infty)$ = Leq of sufficient long period

Thus the LNP values are higher than Leq. and are indicator of annoyance. Higher the Noise Pollution Levels, higher the annoyance caused by the noise levels.

The Ganesh festival is celebrated by Hindus around the world as the birthday of Lord Ganesha. It is observed during mid-August to mid-September and lasts for 10 days, ending on the day of 'Ananta Chaturdashi'. After 10 days, Ganesh idols are immersed in the water bodies. Large number of people participates in the festival and the immersion procession on the last day. Vocal music and musical instruments during the festival causes high levels of noise. In general, ambient levels of noise increase considerably.

The metropolitan city Indore is a commercial and industrial centre of Madhya Pradesh and lies in the heart of Malwa Plateau. Indore covers an area of 3831 sq km with a total population of the district 32,72,335 (2011 census) with the density of 9,718 per sq. Km. It is bounded by N latitudes 22 31' and 23 05' and E longitudes 75 25' and 76 15'. Indore city is divided into 12 zones and 85 wards by Indore Municipal Corporation, Indore.

II. MATERIAL AND METHOD

Noise pollution monitoring during Ganesh Festival has been carried out from 25-08-17 to 05-09-17.

Table 1: Ambient noise standards

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

Study Area:

Noise monitoring was done at eight different locations considering the two locations each from different categories of area viz. Industrial, Commercial, Residential and Silence Zone. The detailed description of locations is given in Table 2.

Table 2: Location details

Sr. No.	Category	Sample Code	Location Name	Location
1	Industrial	A1	Sanwer Road	22.778563, 75.849822
2		A2	Kila Maidan	22.742178, 75.848086
3	Commercial	B1	Kothari Market	22.719983, 75.862465
4		B2	Malwa Mill	22.734155, 75.875069
5	Residential	C1	New Palasia	22.727838, 75.886320
6		C2	Vijay Nagar	22.752294, 75.893733
7	Silence Zone	D1	Residency Area	22.705679, 75.883901
8		D2	Bombay Hospital	22.754497, 75.903933

Pre-calibrated Sound Level Meters (Type II) were used for the monitoring. All the measurements were made at fast response mode using 'A' filter, keeping in view the quickly changing nature of noise levels.

The main purpose of noise monitoring was to find out the impact of noise generated during Ganesh Festival by various activities like bursting fire crackers, Sound systems, Music Systems, etc. on human being and disturbance made in environment.

III. RESULTS AND DISCUSSIONS

The results of noise monitoring during Ganesh festive has been summarized in Table 3 to 14.

Table 3: Noise levels at different locations on 25-08-2017

Time	Sound Levels Leq dB (A)					25-08-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	88.2	92.9	77.2	76.4	79.3	78.6	64.8	65.2	
19:00 - 20:00 hrs (Day)	100.8	101	78.4	84.2	78.6	80.3	67.8	72	
20:00 - 21:00 hrs (Day)	101.6	100.9	80.2	81.7	88.1	82.1	69.5	70.6	
21:00 - 22:00 hrs (Day)	90.5	89.2	79.6	81.6	83.7	79.4	63.9	64.8	
22:00 - 23:00 hrs (Night)	89.2	91.8	79.4	78.4	79.5	76.9	62.3	66.2	
23:00 - 24:00 hrs (Night)	90.6	91.7	72.2	70.3	72.8	71.7	63.7	61.8	

Table 4: Noise levels at different locations on 26-08-2017

Time	Sound Levels Leq dB (A)					26-08-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	85.1	91.3	68.4	77.4	76.9	74.8	63.6	73.6	
19:00 - 20:00 hrs (Day)	99	99.7	79.7	79.6	71.7	78.6	65.5	68	
20:00 - 21:00 hrs (Day)	98.5	100.3	83.2	79.4	88.9	77.1	66.3	69.4	
21:00 - 22:00 hrs (Day)	91.8	89.8	81.7	83.2	88.2	76.4	70.8	72.3	
22:00 - 23:00 hrs (Night)	91.6	91.1	78.2	80.7	80.1	79.4	67.4	67.4	
23:00 - 24:00 hrs (Night)	89.9	92.2	69.6	70.6	72.1	72.2	61.5	62.1	

Table 5: Noise levels at different locations on 27-08-2017

Time	Sound Levels Leq dB (A)					27-08-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	86	89.1	72.4	73	71.9	71.8	65.1	66.7	
19:00 - 20:00 hrs (Day)	104.5	101.2	76.3	75.2	77.7	78.1	61.5	63.3	
20:00 - 21:00 hrs (Day)	100.1	99.9	76.9	75.9	76.4	76	65.4	62.5	
21:00 - 22:00 hrs (Day)	85.1	84.4	78.1	87.3	79	84.8	58.4	57.7	
22:00 - 23:00 hrs (Night)	88.9	86	77.9	72.1	76.8	70	68.2	65.6	
23:00 - 24:00 hrs (Night)	89.7	87.3	72.5	79.3	77.6	71.8	57.9	57.6	

Table 6: Noise levels at different locations on 28-08-2017

Time	Sound Levels Leq dB (A)					28-08-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	91.8	91.6	69	68.6	74.8	62.1	67.9	68	
19:00 - 20:00 hrs (Day)	91.7	89.9	68.4	71.5	69.2	67.8	67.9	69.3	
20:00 - 21:00 hrs (Day)	86.5	86.6	71.4	75.5	75.5	74.8	58.1	60.3	
21:00 - 22:00 hrs (Day)	84.5	86.3	79.4	71.9	66.3	69.4	57	56.6	
22:00 - 23:00 hrs (Night)	83.1	83.4	74.2	70	70.8	72.3	65.4	67.2	
23:00 - 24:00 hrs (Night)	91.8	94.6	79.5	79.8	77.4	77.4	61.7	60.1	

Table 7: Noise levels at different locations on 29-08-2017

Time	Sound Levels Leq dB (A)					29-08-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	91.1	88.9	74.9	74.9	75.4	73.9	60.1	57.8	
19:00 - 20:00 hrs (Day)	92.2	89.7	90.1	69.1	71.7	72.9	64.2	62.3	
20:00 - 21:00 hrs (Day)	81.6	90.6	77.1	70.6	83.9	79.8	63.2	57.9	
21:00 - 22:00 hrs (Day)	89.9	91.6	72.6	76.9	77.7	77.1	58.4	55.1	
22:00 - 23:00 hrs (Night)	94.7	93.2	71.4	69.8	69	73.5	68.4	62	
23:00 - 24:00 hrs (Night)	88.2	83.3	79.1	67.5	70.3	73	59.2	54.5	

Table 8: Noise levels at different locations on 30-08-2017

Time	Sound Levels Leq dB (A)					30-08-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	98.5	100.3	88.8	78.1	75	72.3	66.4	69.1	
19:00 - 20:00 hrs (Day)	91.8	89.8	102.1	74.4	75.9	74.1	65.1	62.3	
20:00 - 21:00 hrs (Day)	91.6	91.1	100.2	76.1	63.6	73.6	63.9	68.7	
21:00 - 22:00 hrs (Day)	89.9	92.2	88.5	67.4	65.5	68	56.5	54.1	
22:00 - 23:00 hrs (Night)	86.6	81.6	89.8	68.9	79.4	76.1	62.3	61.5	
23:00 - 24:00 hrs (Night)	86.3	89.9	90.2	70.6	71.9	71	57	57.6	

Table 9: Noise levels at different locations on 31-08-2017

Time	Sound Levels Leq dB (A)					31-08-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	87.2	86.4	67.8	83.7	71	76.7	61.5	64.8	
19:00 - 20:00 hrs (Day)	88.4	94.2	74.8	77.4	77.9	76.9	57.6	67.8	
20:00 - 21:00 hrs (Day)	90.2	91.7	69.4	83.8	75.8	77.4	67.2	69.5	
21:00 - 22:00 hrs (Day)	89.6	91.6	72.3	74.9	74.9	75.4	56.2	63.9	
22:00 - 23:00 hrs (Night)	89.4	88.4	77.4	90.1	69.1	71.7	71.7	62.3	
23:00 - 24:00 hrs (Night)	82.2	80.3	69.9	77.1	70.6	68.9	66.7	63.7	

Table 10: Noise levels at different locations on 01-09-2017

Time	Sound Levels Leq dB (A)					01-09-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	89.2	99.9	75.1	75.4	82.8	74	66.7	56.5	
19:00 - 20:00 hrs (Day)	91.8	84.4	74.1	75.8	67	74.3	63.3	62.3	
20:00 - 21:00 hrs (Day)	91.7	86	74.8	76.5	65.7	70.2	62.5	57	
21:00 - 22:00 hrs (Day)	86.5	87.3	78.8	92.9	72.4	73	57.7	68.3	
22:00 - 23:00 hrs (Night)	84.5	91.3	76	81	76.3	75.2	65.6	57.2	
23:00 - 24:00 hrs (Night)	83.1	89.3	75.3	71	76.9	75.9	57.6	68	

Table 11: Noise levels at different locations on 02-09-2017

Time	Sound Levels Leq dB (A)					02-09-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	91.7	89.9	72.1	76.8	70	70.4	55.5	60.1	
19:00 - 20:00 hrs (Day)	86.5	86.6	79.3	77.6	71.8	81.3	61.3	64.2	
20:00 - 21:00 hrs (Day)	84.5	86.3	87.1	89.6	85.1	74.3	57.8	63.2	
21:00 - 22:00 hrs (Day)	85.1	91.3	83.2	82.3	82.9	89.9	62.3	58.4	
22:00 - 23:00 hrs (Night)	99	99.7	79.5	75.5	78.4	86.1	57.9	68.4	
23:00 - 24:00 hrs (Night)	98.5	100.3	76.7	74.4	76.9	87.6	55.1	59.2	

Table 12: Noise levels at different locations on 03-09-2017

Time	Sound Levels Leq dB (A)					03-09-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	86.6	88.5	71	76.7	68.4	77.4	66.9	70.3	
19:00 - 20:00 hrs (Day)	86.7	89.8	77.9	76.9	79.7	79.6	58.1	60.9	
20:00 - 21:00 hrs (Day)	84.4	90.2	75.8	77.4	83.2	79.4	68.2	67.9	
21:00 - 22:00 hrs (Day)	85.5	85.8	74.9	75.4	81.7	83.2	67.8	67.9	
22:00 - 23:00 hrs (Night)	85.4	88.6	69.1	71.7	78.2	80.7	58	58.1	
23:00 - 24:00 hrs (Night)	81	84.4	70.6	68.9	69.6	70.6	54.1	58.7	

Table 13: Noise levels at different locations on 04-09-2017

Time	Sound Levels Leq dB (A)					04-09-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	88.9	89.1	78.3	76.6	75	88.5	57.2	56.2	
19:00 - 20:00 hrs (Day)	89.7	101.2	73.6	76.7	71.2	89.8	68	71.7	
20:00 - 21:00 hrs (Day)	90.6	99.9	74.3	74.4	72.3	90.2	69.3	66.7	
21:00 - 22:00 hrs (Day)	91.6	84.4	74.5	75.5	76.4	75.8	60.3	54.2	
22:00 - 23:00 hrs (Night)	93.2	86	74.6	75.4	74.2	78.6	56.6	55.5	
23:00 - 24:00 hrs (Night)	83.3	87.3	68.3	71	71.9	74.4	67.2	61.3	

Table 14: Noise levels at different locations on 05-09-2017

Time	Sound Levels Leq dB (A)					05-09-2017			
	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	
18:00 - 19:00 hrs (Day)	80	83.4	76.8	79.3	88.8	69	65.4	67.2	
19:00 - 20:00 hrs (Day)	81.8	91.3	77.6	78.6	101	68.4	61.7	60.1	
20:00 - 21:00 hrs (Day)	95.1	94.3	89.6	88.1	100.2	71.4	64.3	64.2	
21:00 - 22:00 hrs (Day)	92.9	89.9	82.3	83.7	88.5	79.4	65	63.2	
22:00 - 23:00 hrs (Night)	98.4	86.1	75.5	79.5	89.8	74.2	64.8	58.4	
23:00 - 24:00 hrs (Night)	86.9	87.6	74.4	72.8	90.2	79.5	65.7	68.4	

Table 15: Minimum and maximum Noise levels at different locations.

Code	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2
Max	104.5	101.2	102.1	92.9	101	90.2	71.7	73.6
Min	80	80.3	67.8	67.4	63.6	62.1	54.1	54.1

The above data (Table 3 to 14) shows the results for all the four categories at eight locations for 6 hrs. and Table 15 shows the minimum and maximum values during the all 12 days of festival. From the data it is seen that during the festival the noise levels were much higher than the prescribed noise levels for all the categories.

IV. CONCLUSION

During the present study the noise levels observed were found to have a range bound trend, which remained same for study period. The noise levels observed to be much higher than the Ambient Noise Standard for the noise in all the categories.

V. RECOMMENDATIONS

The monitoring locations consist of areas belonging to industrial, residential, commercial and sensitive zones. The noise so produced during the festival are area source, so it is very hard to locate one particular high noise emitting source. To counter this problem following steps can be taken,

- Proper supervision is required to make sure that cracker manufacturers/sellers following the noise standards set for crackers.
- Making people more aware about the effects of noise pollution.
- And to make sure that all existing laws, such as the time limit on the use of firecrackers, are followed by citizens

REFERENCES

1. N. Singh and S.C. Davar: *Noise Pollution- Sources, Effects and Control*, J. Hum. Ecol., 2004, 16(3): 181-187.
2. World Health Organization (2005) *Occupational and community noise*. WHO-OMS. <http://www.who.int.inffs/en/fact.html>
3. WHO, *Environmental health criteria of noise*.12. World Health Organization (1980).
4. Patel. Nitinkumar L and Bhave Prashant P (2014) *Study of Noise Pollution during Deepawali festival* International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2163 Volume 1 Issue 6 (July 2014).
5. Shivhare, N., Khan, S., Patel, N., Joshi, A., & Dutt, B. (2017). *Effect of nallahs on groundwater in indore city*. International journal of engineering sciences & research technology, 6(5), 434-444.
6. http://cpcb.nic.in/divisionsofheadoffice/pci2/noise_rules_2000.pdf
7. Agarwal, S., Yadav, S. *Noise Pollution and Its Impact on Health*. International Institute for Science, Technology and Education (IISTE), Vol 3, no 6, 2013.
8. Concha-Barrientos, M., Campbell-Lendrum, D. and Steenland, K. *Occupational noise, assessing the burden of disease from work related hearing impairment at national and local levels*. Environmental burden disease series, no 9, World Health protection of the human environment, Geneva, 2004.
9. P.H. Bhagwat and Pramod M. Meshram, *Study Of Noise Pollution During Ganesh Utsav In Yavatmal City*. International Journal of Pharmaceutical and Chemical Sciences Vol. 2 (1) Jan-Mar 2013, 496 – 499.
10. P.H. Bhagwat. *Study of Noise Pollution during Ganesh Utsav and Durga Utsav in Yavatmal city in 2016*. Research Journal of Chemical Sciences, Vol. 6(6), June (2016), 36-40