

**ABSTRACT**

Noise pollution is considered as environmental stressor which now becomes a problem of all over the world especially in developing countries like India. Jabalpur city (Union Territory) is second biggest city of Madhya Pradesh having population of 10.81 lakhs and selected in first round of smart city mission under the government of India. The rapid growth and development of city in terms of industrialization, Increase of traffic and urbanization causing increasing trends of noise level. The present study is concerned with assessment of ambient noise level in commercial zone of Jabalpur city in May 2016. Noise level study was conducted at 5 different locations in commercial area of Jabalpur and recorded noise data are interpreted in form of parameter  $L_{eq}$ ,  $L_{10}$ ,  $L_{50}$ ,  $L_{90}$ , LNP. The  $L_{eq}$  Value in different hours of different locations compared with prescribed standard of Central Pollution Control Board (CPCB) and it was observed that in all the study area sound level is much above the maximum permissible limit. This study reveals commercial area of Jabalpur city is highly exposed to noise pollution and there is a need to adopt suitable control measure for reduction of noise.

**KEYWORDS:** Noise pollution, Equivalent continuous noise level, Noise Parameter, Jabalpur city.

**INTRODUCTION**

Noise is usually unwanted or undesired sound whereas environmental noise is any unwanted or harmful outdoor sound created by human activities that is detrimental to the quality of life of individual. According to the world health organization noise pollution is the third most hazardous environmental pollution. Noise pollution is recognized as a major problem for quality of life in urban area because of rapid growth and development in terms of industrialization, urbanization and commercialization, noise pollution has also increased. The trends towards the use of more automated equipment high wattage stereo, larger construction machinery, increasing number of vehicle, train and aircraft has created a gradual acceptance of noise as natural byproduct of Development. Various noise monitoring studies and sociological survey in recent year have indicated the need for noise abatement. The excessive exposure to noise of sufficient intensity and duration can induce physiological and psychological health effect like temporary and some time permanent hearing loss, irritation, general annoyance, disturbance, headache, fatigue, high pulse rate, high blood pressure, greater perspiration etc. noise can also interfere with mans social activities like work rest recreation sleep and communication. The Jabalpur city is located between latitude 23°10'N and longitude 79°56'E in Central part of India. The city is spread over 53 sqkm area and inhabited by the population of 10.81 lakh .Jabalpur is contributing in country's defence by having gun carriage factory, ordinance factory khamariya, vehicle factory, grey iron foundary, 506 army base workshop and central ordnance depot. Jabalpur is zonal headquarter of WCR and also two national highway NH-7, NH-12 pass through Jabalpur. Jabalpur situated on bank of river Narmada. The habitation in Jabalpur is highly diversified. To study the intensity of noise pollution in commercial zone of Jabalpur city monitoring of noise level will be conducted as per guideline of the central pollution control board (CPCB) India .

## MATERIALS AND METHODS

Sound level will be measured by following standard procedure prescribed by CPCB using calibrated sound level meter SL-4023SD with measuring range from 30-180 dB(A) between 9am to 11pm during working day. Standard noise level for different location during day and night time is followed according to CPCB guideline. our monitoring period comprise of 13 hr of day time (i.e.8 am to 9 am, 9 am to10 am, 10 am to 11 am, 11 am to 12 pm, 12 pm to 1 pm, 2 pm to 3 pm, 3 pm to 4 pm, 4 pm to 5 pm, 5 pm to 6 pm, 6 pm to 7 pm, 7 pm to 8 pm, 8 pm to 9 pm) and 1 hr night time (i.e.10 pm to 11 pm). The reading will be taken at concern hours for 10 minute duration at fixed interval of 10 seconds so 60 reading are taken for each observation hours. As for as possible measurement will be taken 1.5 m above ground level and at least 3.5 m from reflecting surface. Ambient sound levels are being compared with prescribed standards of CPCB (Central Pollution Control Board) India. The national ambient air quality standard in respect of noise as specified under the noise pollution (regulation and control) rule 2000 is referred for present study. Various noise descriptors such as  $L_{eq}$ ,  $L_{10}$ ,  $L_{50}$ ,  $L_{90}$ , LNP has been evaluated to reveal the extent of noise pollution.

$L_{eq}$ - It is an energy mean of the noise level over a specified period.

$L_{10}$ - indicate respectively the level exceeded for 10% of time in a recorded noise level for a given interval.

$L_{50}$ - indicate respectively the level exceeded for 50% of time in a recorded noise level for a given interval.

$L_{90}$ - indicate respectively the level exceeded for 90% of time in a recorded noise level for a given interval.

The noise levels were calculated in ( $L_{eq}$ ) using the following formula.

$$L_{eq} = 10 \log_{10} \sum_{i=1}^{i=n} t_i * 10^{(L_i/10)}$$

Where,  $L_{eq}$ = Equivalent Noise Level

n = Total number of sound samples

$L_i$  = The noise level of any  $i$ th sample

$t_i$  = Time duration of  $i$ th sample, expressed as fraction of total sample time

**Table 1: The Ambient Air Quality Standards in respect of Noise given by CPCB**

Area	Category of Area / Zone	Limits in dB(A) $L_{eq}$ *	
		Day Tme	Night time
(A)	Industrial Area	75	70
(B)	Commercial Area	65	55
(C)	Residential Area	55	45
(D)	Silence Zone	50	40

NOTE- 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 meters around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority. 4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

\* dB(A)  $L_{eq}$  denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

“A”, in dB(A)  $L_{eq}$ , denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

## RESULTS AND DISCUSSION

The study is conducted over five important station which are located in different parts of jabapur city. Table shows different noise parameter ( $L_{eq}$ ,  $L_{10}$ ,  $L_{50}$ ,  $L_{90}$ , LNP) in day and night time of all commercial area. Commercial area include Civic Center, Bada Fawara, Bloom Chouk, Rasal Chouk and Damoh Naka. The equivalent noise level at all sampling point has been shown in the fig. 1 to fig. 5. It is seen from fig. 1 to fig. 5 that noise level remains above the permissible limit from early morning to whole day except at Civic Center where noise level is within limit at morning.

**Table 2: Noise parameters ( $L_{eq}$ ,  $L_{10}$ ,  $L_{50}$ ,  $L_{90}$  and LNP) at different monitored location at different time interval.**

ZONE	DATE	LOCATION	TIME	$L_{eq}$	$L_{10}$	$L_{50}$	$L_{90}$	LNP
COMMERCIAL ZONE	5/5/2016	CIVIC CENTER	8 AM -9 AM	57.8	59.6	56.9	55.2	62.3
			9 AM-10 AM	62.3	63.7	61.6	58.5	67.5
			10 AM-11 AM	70.6	74.9	67.3	66.5	79.0
			11 AM-12 PM	76.3	75.5	70.4	67.2	84.6
			12 PM-01 PM	67.5	69.0	66.7	63.6	72.8
			02 PM-03 PM	69.0	71.3	67.1	63.3	76.9
			03 PM-04 PM	67.2	69.8	65.8	63.0	73.9
			04 PM-05 PM	68.3	70.0	68.0	60.7	77.5
			05 PM-06 PM	70.3	72.7	68.2	64.1	78.8
			06 PM-07 PM	74.1	77.6	71.3	66.2	85.5
			07 PM-08 PM	76.8	81.1	71.3	68.9	89.0
	08 PM-09 PM	76.9	79.0	76.2	72.6	83.3		
	10 PM-11 PM	69.9	72.0	69.2	65.9	76.0		
	6/5/2016	BADA FAWARA	8 AM -9 AM	68.6	70.9	66.9	65.4	74.1
			9 AM-10 AM	70.5	72.9	67.7	64.0	79.4
			10 AM-11 AM	72.8	72.8	71.0	68.0	77.6
			11 AM-12 PM	70.9	73.5	69.6	67.9	76.5
			12 PM-01 PM	71.1	74.7	68.0	65.4	80.4
			02 PM-03 PM	70.1	72.0	69.3	65.6	76.5
			03 PM-04 PM	72.2	74.2	72.2	66.8	79.7
			04 PM-05 PM	73.8	76.5	72.5	69.9	80.4
			05 PM-06 PM	75.7	77.5	74.5	71.1	82.1
			06 PM-07 PM	76.0	79.1	73.4	70.8	84.3
			07 PM-08 PM	78.5	80.7	77.3	73.5	85.7
	08 PM-09 PM	75.5	76.9	74.8	70.5	81.9		
	10 PM-11 PM	71.1	72.7	70.9	68.5	75.3		
	11/5/2016	BLOOM CHOUK	8 AM -9 AM	71.6	73.4	70.9	69.6	75.3
			9 AM-10 AM	76.7	77.5	72.1	70.8	83.4
			10 AM-11 AM	75.1	76.6	74.6	72.8	79.0
			11 AM-12 PM	78.5	82.1	75.8	72.1	88.5
			12 PM-01 PM	77.0	79.1	75.4	72.2	83.9
			02 PM-03 PM	72.2	73.6	72.2	67.0	78.8
			03 PM-04 PM	73.8	75.1	72.8	69.5	79.4
04 PM-05 PM			74.9	76.7	74.0	71.8	79.8	
05 PM-06 PM			76.9	78.4	75.1	71.3	84.0	
06 PM-07 PM			76.8	80.1	75.3	73.0	83.9	
07 PM-08 PM			80.2	81.7	78.3	74.9	87.1	
08 PM-09 PM	75.4	76.7	74.7	71.9	80.2			
10 PM-11 PM	72.5	74.7	70.7	67.7	79.5			

	13/5/2016	<b>RASAL CHOUK</b>	8 AM -9 AM	68.4	69.4	68.1	66.4	71.4
			9 AM-10 AM	74.1	76.8	72.5	66.9	84.0
			10 AM-11 AM	76.1	78.3	75.1	72.8	81.6
			11 AM-12 PM	77.5	81.6	74.2	73.1	86.0
			12 PM-01 PM	77.9	81.2	75.8	73.0	86.1
			02 PM-03 PM	72.6	73.5	72.0	70.8	75.3
			03 PM-04 PM	72.2	75.1	70.2	68.7	78.7
			04 PM-05 PM	72.7	74.5	71.0	69.1	78.1
			05 PM-06 PM	78.6	81.3	78.1	73.5	86.4
			06 PM-07 PM	75.1	76.8	74.1	72.3	79.5
	07 PM-08 PM	79.2	81.3	77.7	74.0	86.6		
	08 PM-09 PM	80.6	82.9	78.4	74.4	89.1		
	10 PM-11 PM	71.2	73.6	70.3	67.6	77.3		
	16/5/2016	<b>DAMOH NAKA</b>	8 AM -9 AM	70.8	72.4	69.4	67.8	75.4
			9 AM-10 AM	74.1	75.2	73.0	71.5	77.8
			10 AM-11 AM	76.3	77.6	75.4	72.2	81.8
			11 AM-12 PM	77.9	80.0	76.7	73.2	84.8
			12 PM-01 PM	77.7	79.7	76.1	74.5	82.8
			02 PM-03 PM	72.3	71.7	66.4	63.9	80.0
			03 PM-04 PM	72.2	73.1	71.5	69.9	75.4
04 PM-05 PM			75.2	75.7	73.4	70.9	80.0	
05 PM-06 PM			74.3	75.1	73.8	72.6	76.7	
06 PM-07 PM			76.7	78.8	76.2	72.6	82.9	
07 PM-08 PM	77.9	80.3	77.4	71.9	86.2			
08 PM-09 PM	77.3	78.6	76.7	74.8	81.1			
10 PM-11 PM	71.3	72.8	70.1	65.1	79.0			

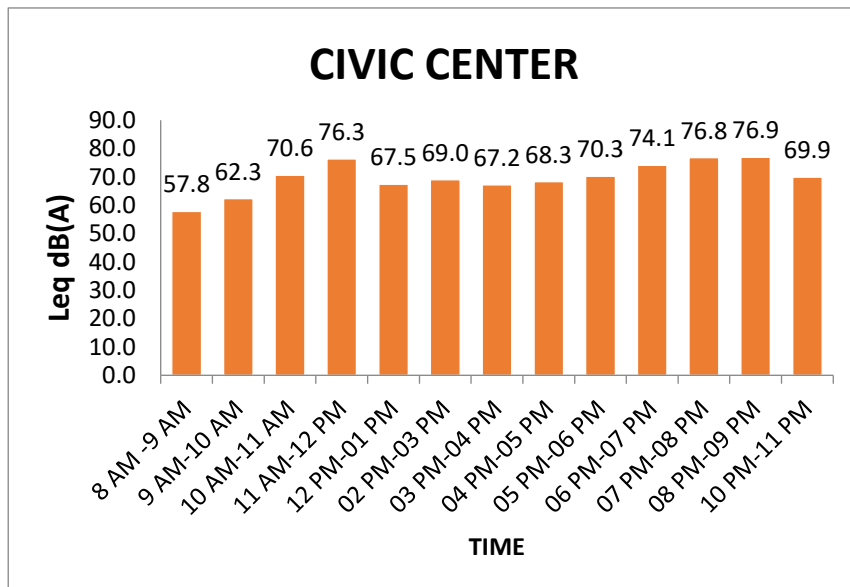


Fig 1: Temporal distribution of equivalent noise level  $Leq$  dB(A) near Civic Center

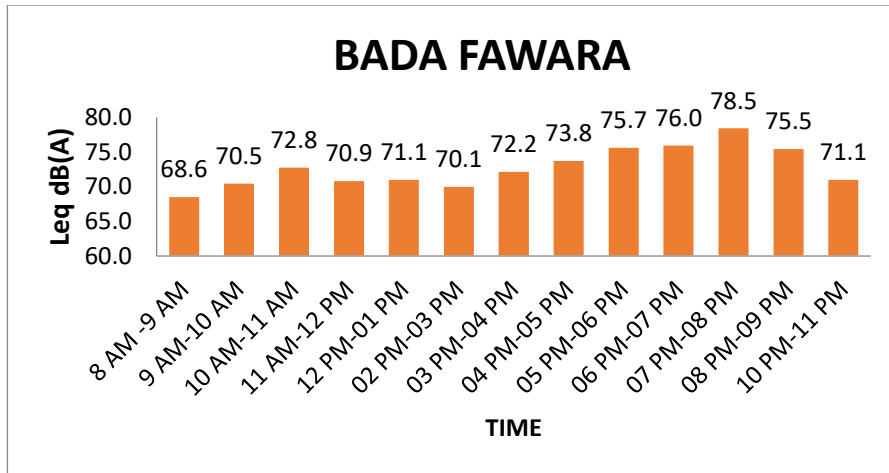


Fig 2: Temporal distribution of equivalent noise level Leq dB(A) near Bada Fawara

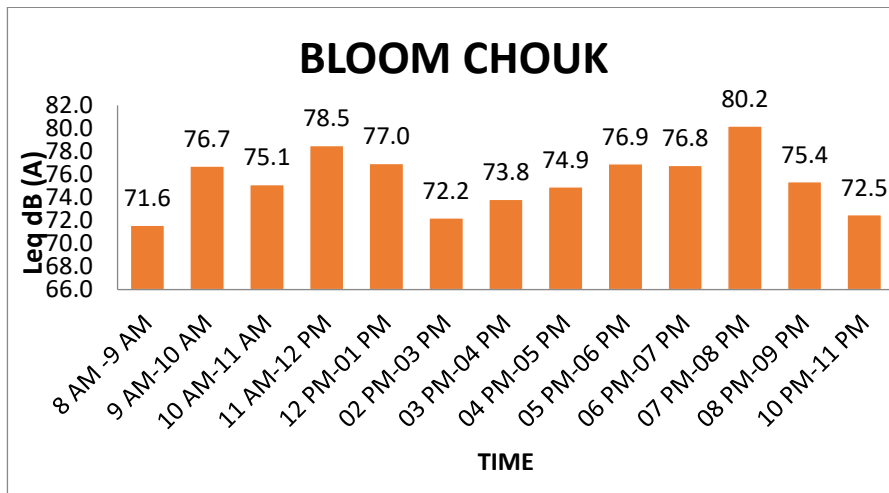


Fig 3: Temporal distribution of equivalent noise level Leq dB(A) near Bloom Chouk

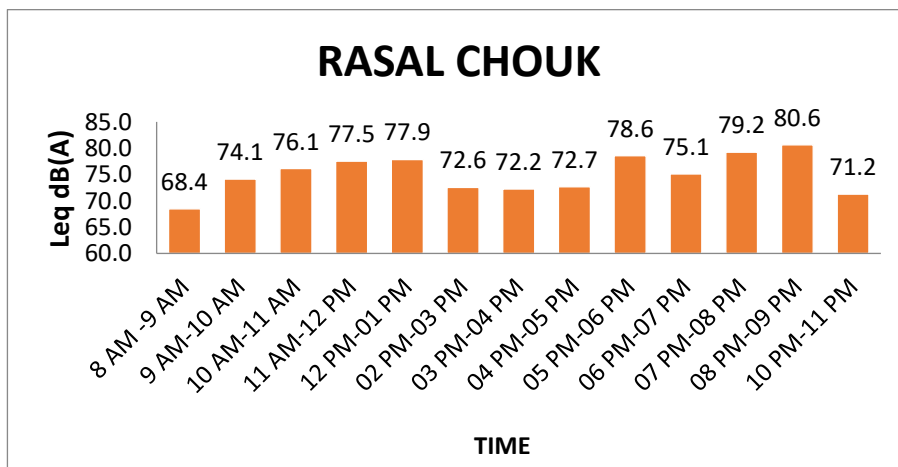
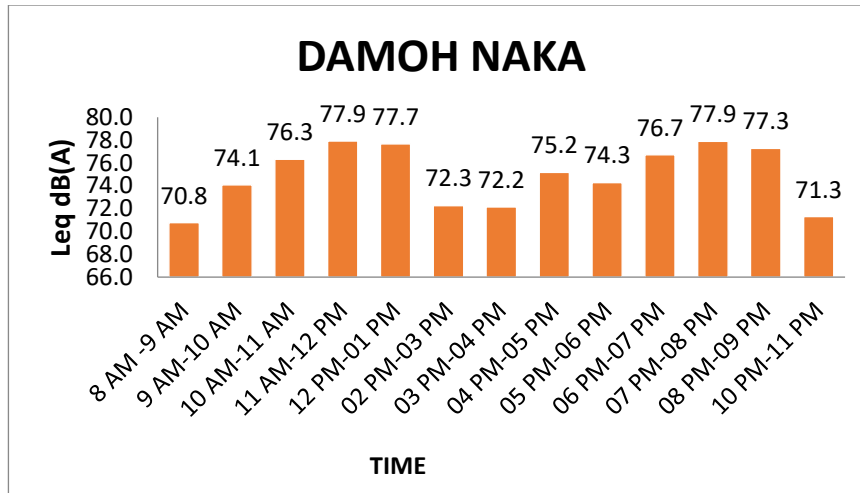


Fig 4: Temporal distribution of equivalent noise level Leq dB(A) near Rasal Chouk



**Fig 5: Temporal distribution of equivalent noise level  $Leq$  dB(A) near Damoh Naka**

It is revealed from table that at most of the observation site the minimum noise level are observed in early forenoon hours whereas the maximum noise level are observed in evening hours after 6:00 pm when the business activity in the shop is at the peak but at damoh naka where maximum noise level also observed at mid of day which could be an outcome of increase in traffic activity in adjoining roads. Minimum and maximum equivalent sound pressure level of all commercial areas ranges 57.8 to 80.6 dB(A).

It is also observed from table equivalent noise levels of all location when compared to prescribe standards of CPCB are found to much exceeded in day and night time. Maximum equivalent noise level observed in day time at Civic Center, Bada Fawara, Bloom Chouk, Rasal Chouk, Damoh Naka are 76.9 dB(A), 78.5 dB(A) 80.2 dB(A), 80.6 dB(A) and 77.9 dB(A) respectively. Equivalent noise level observed in night time at Civic Center, Bada fawara, Bloom Chouk, Rasal Chouk, Damoh Naka are 69.9 dB(A), 71.1 dB(A) 72.5 dB(A), 71.2 dB(A) and 71.3 dB(A) respectively.

## CONCLUSION

The present study reveals that the Commercial zones of Jabalpur City are highly exposed to noise pollution. Rapid urbanization and rapid increase of vehicular population are the main reason that poses noise pollution in the town. Therefore need of Eco-City planning and awareness of people in the matter of environment will be a solution of noise pollution problem. Necessary preventive measures must be taken by the appropriate authority to implement the Noise Pollution (Regulation and Control) Rules, 2000 in time bound manner. As it is a short term assessment of noise pollution problems in the town, further study may also be required to address the chronic effect of noise pollution in the Jabalpur city.

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**REFERENCES**

- [1] Dev Pramendra and Singh Vartika (2011). Environmental Noise Pollution Monitoring and Impacts On Human Health in Dehradun City, Uttarakhand, India. Civil and Environmental Research [www.iiste.org](http://www.iiste.org) Vol 1, No.1, 2011
- [2] Gayathari K , A. Amutha Jaisheeba and R. Sornaraj (2012). Assessment of Noise Pollution in Thoothukudi City. International Journal of PharmTech Research Vol.4, No.3, pp 1345-1350, July-Sept 2012
- [3] Garg S. K. and Garg R., (2010). Environmental Engineering (Vol. II) - Sewage Disposal and Air Pollution Engineering. Khanna Publishers.
- [4] Manish Raman and R C Chhipa (2014). Study of Noise Pollution at Intersections in Jaipur city. International Journal of Engineering Science & Research Technology 3(8) August, 2014
- [5] N.U. Singh and D. Shinde, Study of Noise Pollution Levels during a Hindu Festival in Dhar Town, MP, India, Res. J. Che. Sci., Vol.3(12), pp. 71-75, December 2013.
- [6] Okeke, P.N and George, D.M.C (2015). Evaluation of Ambient Noise Levels in Port Harcourt Metropolis, South-South, Nigeria. *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)* e-ISSN: 2319-2402, p- ISSN: 2319-2399. Volume 9, Issue 7 Ver. I (July. 2015), PP 54-60.
- [7] Srimanta Gupta and Chitralkha Ghatak (2011). Environmental noise assessment and its effect on human health in an urban area. INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCES Volume 1, No 7, 2011
- [8] Swapnil R Deshmukh and Prof. D.C. Deshmukh (2015). Study and Assessment of Noise pollution in Amravati city. International Journal of Advance Engineering and Research Development *Volume 2, Issue 12, December-2015* .
- [9] The Noise Pollution (Regulation and Control) Rules, 2000, CPCB Delhi from <http://cpcb.delhi.nic.in>.
- [10] Urvi Pritam, Govind Pandey and Satya Pal Singh (2014). Assessment of Outdoor and Indoor Noise pollution in Commercial Areas of Gorakhpur City. . International Journal of Engineering Research & Technology (IJERT).ISSN: 2278-0181. Vol 3 Issue 12, December- 2014 .
- [11] Viki Das, Dr Umesh Mishra, and Sabbir kumar Jamatia (2014). Evaluation of Noise pollution: A Case study of Udaipur, Tripura, India. International Journal of Engineering Research & Technology (IJERT) Vol. 3 Issue 8, August – 2014.
- [12] Vijay Sharma, Pankaj Saini, Sudhanshu kaushik and B D Joshi(2010). Assessment of Noise Level in Different Zones Of Haridwar City OF Utterakhand State India. New York Science Journal, 2010.
- [13] World Health Organization, United Nations Road Safety Collaboration: A Handbook of Partner Profiles (Geneva: World Health Organization), 2005.