



Assessment of Noise Pollution in Gwalior M.P. India

Khursheed Ahmad Wani and Y.K. Jaiswal²

SOS in Environmental Science (IGAEERE), Jiwaji University, Gwalior

²SOS in Biochemistry, Jiwaji University, Gwalior.

ABSTRACT

Gwalior is an important historical city of Madhya Pradesh. Rising level of transportation mainly by road vehicles i.e. tempos, rickshaws, four wheelers, two wheelers and heavy vehicles is one of the major source of augmented noise pollution in Gwalior. There is a total increase of 1,70,343 vehicles from year 2000 to 2009 on the roads of Gwalior. The ambient noise level was measured by using Sound Level Meter SL- 4010. The highest noise level was recorded at commercial area Railway station (74.3-119.2 dB), (64.5-95.4 dB at Morar; 74.1-92.7 dB at Thathipur) followed by residential zone (60.7-77.2 dB at Laskhar; 51.7-69.8 dB at Pinto park) and silence zone (64.0-79.3 dB at Madhav Dispensary; 45.5-65.8 dB at Jiwaji Campus). The noise level values for exceeded the standards set by the central pollution control board. A cross-sectional study on the basis of questionnaire has been carried out. The results of which revealed that 100% of the respondents are not wearing ear protective equipments. Noise annoyance, headache, speech interference have been reported by various shopkeepers. Various mitigation measures have been suggested to keep the noise level within the prescribed standards.

KEYWORDS: Noise pollution, Silence zone, Residential zone, commercial zone, Shopkeepers, Noise annoyance, Gwalior.

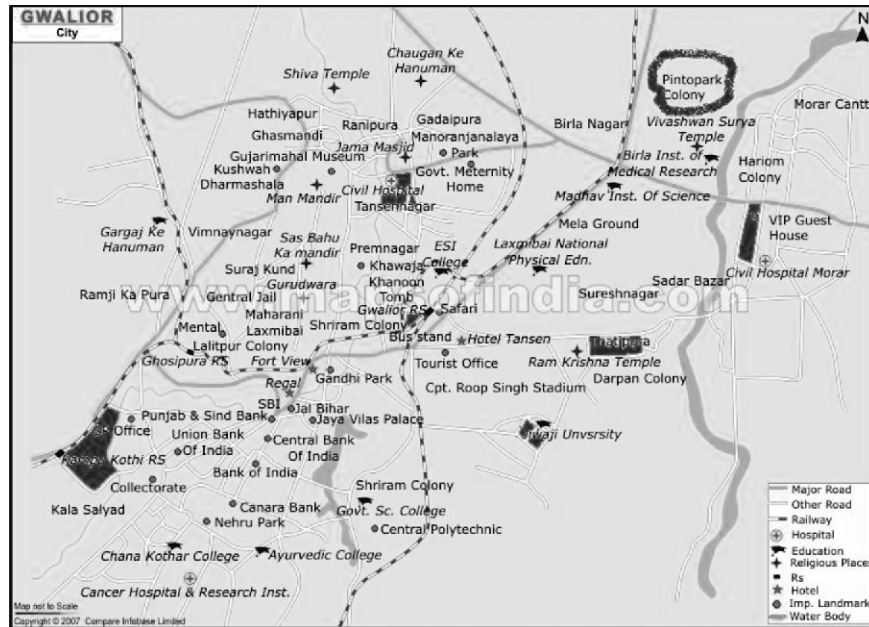
INTRODUCTION

Gwalior is located at 26.22 °N and 78.18 °E. It is a historical Indian city located at periphery of Madhya Pradesh state 321 kms away from capital Delhi. Medium and small scale industries are located in this town. The city is home to well know educational institutions. Hence the town supports large number of floating population. As of 2001 India census, Gwalior had a population of 826,919. Males constitute 54% of the population and females 46%. Gwalior has an average literacy rate of 70%, higher than the national average of 59.5%: male literacy is 76%, and female literacy is 63%. The vehicles represent the most important noise source. It was estimated to about 80% from road vehicles. Road traffic noise is one of the most widespread and growing environmental problems in urban areas. The impact of road traffic noise on the community depends on various factors such as road location and design, land use planning measures, building design, vehicle standards and driver behavior. Gwalior's public transport system consists of tempos, auto rickshaw taxis. Recently the municipal corporation has launched Gwalior City Bus covering some routes in the city. The tempos and auto-rickshaws are often cited as a cause of pollution and road congestion. Gwalior is well connected via train services to all parts of the country including 4 metros. Noise is one of the most important factors in producing deterioration of both well being and quality of life of people in urban areas. Noise produces a series of physiological, psychological, behavioral changes in responses [1]. In the present study, the extent of noise pollution in Gwalior town and the exposure of shopkeepers to noise pollution during peak hours have been assessed. Several noise pollutions studies in different areas are available [2,3,4,5]. All these reported existence of high noise level due to automobiles in those places. No study for Gwalior has been carried so far and hence the present study has been undertaken.

MATERIALS AND METHODS

Noise measurements were carried out by using Sound Level Meter SL- 4010. Noise levels were measured at university campus, Morar, Thathipur, railway station, Laskhar, Pinto Park. University and Madhav dispensary represented the silence zone. Railway Station, Thathipur and Morar were selected for the present study to assess the noise level of commercial areas and the effect of noise on shopkeepers. Laskhar and Pinto Park represented the residential area for the study. At each sampling site six readings were taken after an interval of every 45 minutes.

Average, maximum and minimum values were calculated and compared with standards prescribed by the Central Pollution Control Board. A cross-sectional study has been conducted involving 100 randomly selected persons. The age of workers ranges from 20 yr to 55 yr. A comprehensive questionnaire was formulated to assess the subjective information. The questionnaire included age, noise exposure, working hours, use of protective measures, noise annoyance and awareness about NIHL. The questionnaire was pretested and then was used to assess the information. The information was collected through personal interviews. Since the workers are mostly illiterate or less educated therefore, statements of the questionnaire were translated in both local language of the state i.e. Hindi.



Source: www.mapsofindia.com

TRANSPORTATION SECTOR

The following Figures show the number of vehicles that has been registered from 2000 to 2009 in Madhya Pradesh and Gwalior. In Madhya Pradesh the total number of vehicles registered in 2008- 09 is 513848, while as in Gwalior the total number of vehicles registered in 2008-09 is 23159. Thus there is a total increase of 1,70,343 vehicles from year 2000 to 2009 on the roads of Gwalior alone. The increase in the number of vehicles will increase the level of noise pollution in and around the Gwalior city especially in peak hours of the day.

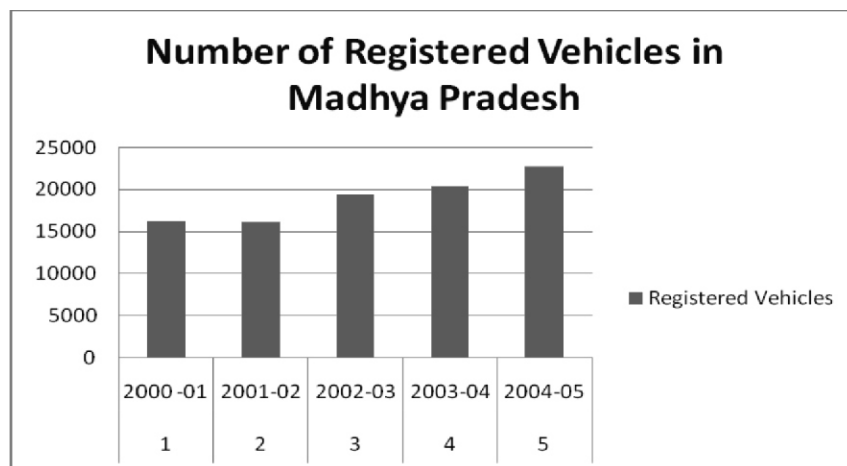
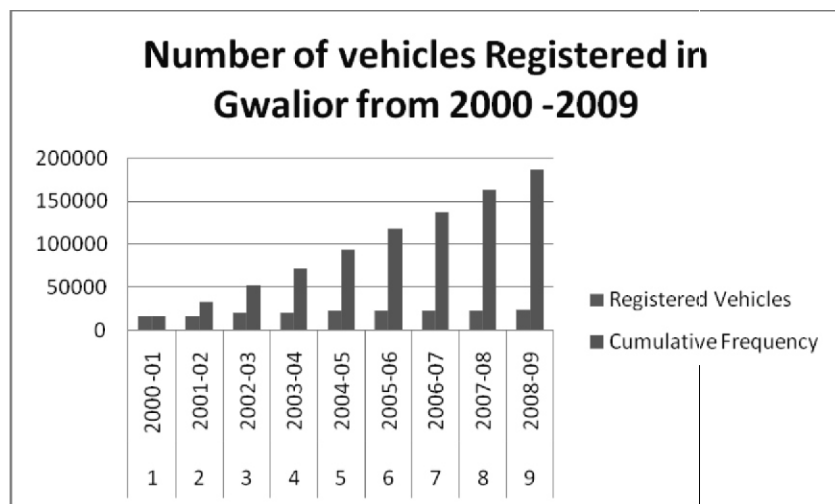


Fig. (a). New Registered Vehicles in M.P.



*Source: RTO,MP

Fig.(b). Registered Vehicles in Gwalior

NOISE LEVEL STANDARDS

The CPCB has notified ambient air quality standards for noise (which has been included as an air pollutant under section 20 of the amended Air Act of 1987) [6]. The permissible noise levels in Commercial, residential, and silence zone during day time are given in Table 1. The day time is from 6:00 A.M. to 9 P.M. Silence zone is defined as an area up to 100 m around such premises as hospitals, educational institutes, and courts. The silence zone is to be declared by competent authority. Use of vehicular horns, loud speakers, and bursting of crackers are to be banned in such zones.

Table 1. Ambient noise standards prescribed by CPCB

S.No	Area	Standard day time 06 A.M. to 09 P.M.
1	Commercial area	65
2	Residential area	55
3	Silence zone	50

RESULTS AND DISCUSSIONS

Silence Zone

Noise levels recorded in all the sites of silence zone exceeded the prescribed standard level of 50 dB (A). Both the places selected under silence zone had noise level above the permissible limit set by CPCB. The average noise level at Jiwaji Campus ranged between 52 60.18 dB (A). The noise level at city hospital was recorded between 53.3 58.83 dB (A) Table 2 and 3. These high noise levels will cause adverse health effects and aggravate the problems of the patients. The students in the educational institutes will get distracted and lose their concentration and interfere with the studies of student community in the campus [5]. The high traffic flow is the major cause of high noise level.

Table 2. Noise levels in dB at silence zone: (A) Jiwaji University

S.No	I	II	III	IV	V	VI	Average	S.D.	Max	Min
1	68.5	50.6	64.1	69.3	55.0	53.6	60.18	8.11	69.3	50.6
2	63.2	55.9	67.0	58.5	47.1	52.2	57.31	7.2	67.0	47.1
3	52.8	48.4	49.3	55.1	52.5	51.1	51.53	2.45	55.1	48.4
4	48.1	45.8	50.4	55.3	57.8	54.1	51.91	4.6	57.8	45.8
5	48.6	45.8	50.4	55.3	57.8	54.1	52	4.6	57.8	45.8
6	51.4	46.2	46.7	44.7	45.5	47.6	47.01	1.11	51.4	45.5

Table No 3. Noise levels in dB at silence zone: (B) city hospital

S.No	I	II	III	IV	V	VI	Average		Max	Min
1	50.5	49.9	53.3	54.4	53.2	60.8	53.68	3.89	60.8	49.9
2	49.7	49.8	62.8	63.7	65.8	61.2	58.83	7.19	65.8	49.7
3	50.4	51.7	53.4	50.3	52.1	45.5	50.55	2.73	53.4	45.5
4	48.3	52.9	57.1	53.7	51.4	56.6	53.33	3.29	57.1	48.3
5	56.8	57.2	57.4	56.0	61.8	55.5	55.71	2.25	61.8	55.5
6	57.8	50.0	59.8	62.0	61.4	62.4	57.23	4.67	62.4	50.0

Commercial Zone

All the places under commercial zone recorded fairly higher noise level than the prescribed limit. The average noise levels at Morar ranged between 72.87 82.0 dB (A) and it was between 80.6 86.2 dB (A) at Thathipur. The noise levels in railway station were extremely high. The noise level ranged between 81.05 110.2 dB (A) Table 4, 5 and 6. Shopkeepers and vendors who spend most of the time in these places are exposed to these high level noise and hence will have problems associated with noise pollution. At Railway station, the arrival and departure of trains, movement of carrier carts on platforms generate lot of noise. In market the movement of two wheelers and four wheelers are the cause of noise pollution.

Table No 4. Commercial Areas: Noise levels in dB at (A) Morar

S.No	I	II	III	IV	V	VI	Average	S.D.	Max	Min
1	64.5	80.6	70.5	83.3	68.5	69.5	72.87	7.4	83.3	64.5
2	78.1	69.9	67.8	82.7	86	67.2	75.2	8.1	86	67.2
3	81.3	73.9	77.9	72	80.3	74.1	76.5	3.7	81.3	72
4	77.5	77.9	95.4	80.3	87.2	74.1	82.	7.8	95.4	74.1
5	72.8	76.8	82.9	87.5	80.2	78.4	79.7	5.07	87.5	72.8
6	83.6	79	78.5	80.2	79.9	67.7	78.4	5.42	83.6	67.7

Table No 5. Noise levels in dB at (B) Thathipur

S.No	I	II	III	IV	V	VI	Average	S.D.	Max	Min
1	74.5	82.2	80.6	81.2	83	82.5	80.6	3.14	83	74.5
2	79.5	78.2	81.9	83.6	74.1	90.8	81.3	5.6	90.8	74.1
3	84.5	81.8	86.9	81.4	84.5	81.7	83.4	2.19	86.9	81.4
4	87.9	92.3	83.8	89.4	80.9	84.1	86.4	4.2	92.3	80.9
5	88.6	82.8	85.8	81.8	83.7	90.8	85.5	3.5	90.8	81.8
6	82.2	90.8	92.7	80.7	89.9	81.2	86.2	5.4	92.7	80.7

Table No 6. (C) Noise levels in dB at Railway Station

S.No	I	II	III	IV	V	VI	Average	S.D.	Max	Min
1	101	104.1	104.8	119.2	118.9	113.2	110.2	7.9	119.2	101
2	100.2	100	109.3	103.2	100.8	105.1	103.1	3.6	100	109.3
3	99	98.2	99.1	98.9	99.9	108.7	100.63	3.9	98.2	108.7
4	99.9	96.6	95.2	99.9	92	98	81.93	3.03	99.9	92
5	82.7	77.9	89.1	74.3	76.9	85.4	81.05	5.64	89.1	74.3
6	79.2	78.2	79.3	78.4	82.8	88.4	81.05	3.96	88.4	78.2

Residential Area

The prescribed limit for the residential area is 55 dB (A) during day time. None of the selected places of the residential zones in Gwalior recorded less than 55 dB (A). All the places had values that ranged between 64.88 69.05 dB (A) at Laskhar and 56.95- 63.28dB (A) in pinto park Gwalior Table 7 and 8. Use of horns and traffic congestion is the main cause of noise pollution in these areas.

Table 7. Noise levels in dB at (A) Laskhar

S.No	I	II	III	IV	V	VI	Average	S.D.	Max	Min
1	65.1	68.2	67.8	60.7	75.8	69	67.66	4.9	75.8	60.7
2	66.7	67.2	63.6	72.2	76.6	68.6	69.05	4.5	76.6	63.6
3	66.6	69.6	67.6	69.8	72.6	65.8	68.61	2.5	72.6	65.8
4	72.4	66.5	69.2	68.7	77.2	62.6	68.74	5.0	77.2	62.6
5	67.8	66.7	64.3	68.3	65.2	71.3	67.26	2.49	71.3	64.3
6	63.5	67.5	62.8	61.9	66.4	67.2	64.88	2.43	67.5	61.9

Table 8. Residential Area: Noise levels in dB at (B) Pinto Park.

S.No	I	II	III	IV	V	VI	Average	S.D	Max	Min
1	55.4	65.9	67.9	56	63.1	69.8	63.01	6.08	69.8	55.4
2	59.6	68.1	57.8	60.2	57.3	55.5	59.75	4.42	68.1	55.5
3	58.7	68.6	53.4	59.1	49.1	52.8	56.95	6.8	68.6	52.8
4	61.7	56.3	55.4	58.2	60.2	51.7	57.25	3.5	61.7	51.7
5	63.6	69.4	62.4	64.9	59.5	55	62.46	4.89	69.4	55.0
6	57.4	59.2	62.7	68.6	69.4	62.4	63.28	4.85	69.4	57.4

Table 9: Comparison of noise level in dB(A) at silence zone, residential zone and commercial zone

Silence Zone Average dB(A)		Residential Zone Average dB(A)		Commercial zone Average dB(A)		
City hospital	Jiwaji	Laskhar	Pinto park	Morar	Thathipur	Railway station
53.68±1.6	60.18±3.4	67.66±1.23	63.01±1.2	72.87±2.79	80.6±2.1	110. ±4.5
58.83±1.1	57.31±1.6	69.05±0.46	59.75±2.2	75.2±1.58	81.3±2.27	103.1±4.6
50.55±1.5	51.53±3.5	68.61±1.07	56.95±2.1	76.5±4.0	83.4±1.76	100.63±4.4
53.33±2.1	51.91±3.2	68.74±1.8	57.25±1.9	82. ±2.1	86.4±1.33	81.93±6.8
55.71±2.4	52±2.16	67.26±2.1	62.46±2.7	79.7±2.7	85.5±2.10	81.05±6.09
57.23±2.5	47.0±1.02	64.88±1.2	63.28±2.8	78.4±1.8	86.2±1.82	81.05±4.57

SUBJECTIVE RESPONSE TO NOISE

The subjective response was collected from 100 respondents randomly selected from each of the three areas. The results of the questionnaire interviews revealed that 50% of the respondents reported always annoyed, 25% often, 32% sometime, 15% people were seldom annoyed and 30% never felt annoyed with high noise levels. As far as the head ache due to noise is concerned only 33% reported always and 17% with often report of head ache. In case of speech interference 43% of the people reported high, 21% moderate, 32% reported low and 4% reported least speech interference. The overall disturbance due to noise is given in Table 11.

Table 11. Subjective response of various respondents in Percentage.

Question	Percentage
1) Noise annoyance	Always 50 %, 25% often, 32% sometimes, 15% seldom, 30% never.
2) Head ache due to noise	33% always, 17% often.
3) Speech Interference	43% high, 21% moderate, 32% low, 4% least
4) Awareness of noise ill effects	97% No, 3% yes.
5) Hearing disability	7%, Yes , 97 % No
6) Awareness of benefits of PPE	100% No
7) Use of PPE	100 % No
8) Working hours/day Shopkeepers	10 hours average

PROPOSED PLANTS

Plantation of tree species along road side is one of the cost effective methods to control noise pollution. Many workers like [7,8,9] have identified the tolerant species of noise pollution on the basis of air pollution tolerant index. *Azadirachta indica*, *Mangifera indica*, *Albizia lebbek*, *cassia fistula*, *Michelia champaca*, *Eucalyptus umbellate*, *Pongamia pinnata*, *Acacia nilotica* are the species that are effective in controlling noise pollution. Hence for the future plantation programs these species are suggested along the road side, around residential, silence and commercial zones of Gwalior to reduce the intensity of noise pollution.

ACKNOWLEDGEMENT

We are highly thankful to late Prof. R.R.Das for his technical, administrative and moral support. We are also highly thankful to the Director, IGAEERE, Jiwaji University, Gwalior, for providing all necessary facilities to carry out the present study.

CONCLUSION

The honking of horns, flow of ill maintained vehicles, poor road conditions and encroachments find on road sides that cause traffic congestion were found to be the reasons for high noise level in Gwalior. People in general, patients and students in particular are highly exposed to noise level. Residential areas are too exposed to the high noise level. The study also concludes that:

1. Majority of the people are not wearing hearing protective equipments Main reasons were their negligence, feeling of un-comfortableness
2. Mostly people are illiterate or very less educated even under primary or middle and are not fully aware of the hazardous effects of noise.
3. Almost all the people are highly exposed to high noise levels [>60 dB (A)], without proper ear protection.
3. The shopkeepers should be motivated to use PPE and educated for NIHL and other non auditory affects of noise exposure.

Following measures need to be taken to tackle the situation:

- a). Ban on use of horns.
- b). Proper maintenance of roads
- c). Removal of road side encroachments
- d). Planting of recommended plant species
- e). The public may be educated to abide the rules, so that the frequent use of horns will be avoided.
- f). The implementation of the technical measures for noise levels.

REFERENCES

- [1] Evans, G.W, and Cohen, S. (1987) Environmental stress. In D. Stokols and I.Altman (Eds), Handbook of environmental psychology. New York Wiley 571-610.
- [2] Ravichandran, C., Chandrasekaran, G.E. and Madhu, S. (1997) The status of noise pollution in Tiruchirapalli city. *Indian J.Env.Prot.*, 17(11), 806-808.
- [3] Ravichandran, C., Chandrasekaran, G.E. and Venkatsubramanian, R. (1997) Status of noise pollution in Hosur. *Indian J.Env.Prot.*, 18(4)278-280.

- [4] Tandoon, N. and H. Pandey. (1998) Noise levels of some vehicles and traffic noise level at some road crossings in South Delhi. *Indian J Env.prot.*, 18(6) 454-458.
- [5] Raja, R.E., Ravichandran, C., and Sagila, C.S. (1999) An assessment of noise pollution due to automobiles in Cuddalore, Tamil Nadu. *Indian j. Environ Hlth.*, 41(4) 312-316.
- [6] CPCB. (1995). Pollution control acts, rules, and notifications issued there under. Pollution control series: PCL/2/1992 (Volume I) New Delhi: Central pollution control board.
- [7] Agarwal, S. and Tiwari, S.L. (1997) susceptibility level of few plants on the basis of air pollution tolerance index, *Ind forester*, 4, 319-322.
- [8] Kumar, S. and Paulsany, S. (2006). Studies on identification of suitable tree species for control of effect of air pollution in Tamil Nadu. *Nat Env and Poll tech.*, 5(4) 591-599.
- [9] Paulsanmg, S and Latha, N. (2000) Evaluation of air pollution tolerant tree species in Coimbatore city. *J Ecol. Res. Biocon*, (2), 20-23.