



Assessment of noise levels in institutional and commercial units of Bishnah Town, Jammu (J&K) India

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Abstract

The present study has been made to evaluate indoor and outdoor noise levels at different institutional and commercial units of Bishnah Town, Jammu. The observed values of noise levels in all the institutional and commercial units of the study area were found to be higher than the noise level values prescribed by the Central Pollution Control Board.

Keywords:- Noise pollution, Indoor, Outdoor, Commercial

Introduction

Modern life has given rise to a new form of pollution, called noise pollution. The increased rate of urbanization and industrialization has aggravated the noise problem. The development of society has led to more and more sources giving higher and higher noise levels. Noise is a ubiquitous accessory of mechanical age in our environment. Noise doubles every ten years in pace with our social and industrial progress. This geometric progression wise growth of noise could be mind boggling in view of the ever-increasing pace of technological growth. Bhatnagar and Srinivas (1992) in Chandigarh, Dhillon *et al.* (1994) in Ludhiana, Singh and Jain (1995) in Delhi, Ravichandran *et al.* (1997) in Hosur, Joshi (1998) in Indore, Pandya and Shrivastava (1999) in Jabalpur City, Mishra (2004) in Rewa Town, M.P. and Rampal and Rasool (2004) in Jammu City also studied noise levels in various institutional and commercial areas.

Materials and Method

Noise levels were recorded with the help of Digital Sound Level Meter. Model, 8928 with slow response. The noise levels in Class Rooms, Principal Offices and Staff Rooms in Schools; OPD, In-Patient Wards and Laboratories in Hospitals, Restaurants, Post Offices. Banks, Tea Shops, Kiryana Stores. Cosmetic

Shops, Beauty Parlours, Vegetable Market, Bus Stand and Mini Buses in the study area were recorded. During each sampling of noise 20 readings of SPL (Sound Pressure Level) were recorded at an interval of 30 seconds in a period of 10 minutes. At the end of 10 minutes minimum and maximum SPL (Sound Pressure Level) were recorded with the help of Sound Level Meter.

From the 20 readings of SPL following noise indices were calculated.

i) Leq (Equivalent Noise Level) :-

$$L_{eq} = 10 \log \left(\sum_{i=1}^n f_i 10^{L_i/10} \right) \text{ dB(A)}$$

where,

f_i = fraction of time for which the constant SPL persists.

i = time interval

n = number of observations

L_i = sound intensity

ii) L₁₀ (The noise level that exceeded 10% of time)

iii) L₅₀ (The noise level that exceeded 50% of time)

iv) L₉₀ (The noise level that exceeded 90% of time)

Results and Discussion

The analysis of noise level data of various institutional units revealed that during working hours, the maximum value of average indoor L_{eq} (10 minutes) of 65.99 ± 7.19 dB(A) was observed in the School located in a street, whereas the minimum value of average L_{eq} (10 minutes) of 62.31 ± 6.39 dB(A) was

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observed in School located on Main Road with high traffic (Table-I). This was the surprising observation that the schools located in area with high outdoor noise level exhibited low indoor noise and those located in low outdoor noise level exhibited higher indoor noise. From this it can be concluded that sometimes exterior sources of noise are not responsible for increase in indoor noise level and increase in indoor noise level was because of indoor sources like noise of students, gossiping, noisy fans, open doors and windows and congested building etc. During non-working hours, the average indoor L_{eq} in the Schools ranged from 48.29 ± 4.09 dB (A) in the School located in a street to 52.22 ± 6.11 dB(A) in the School located on Main Road with low traffic (Table-I). But the maximum average outdoor noise level L_{eq} of 71.79 ± 6.89 dB(A) was observed in the School located on Main Road with high traffic and

minimum of 56.65 ± 3.83 dB(A) was observed in School located in a street during working hours. whereas during non-working hours School located on Main Road with high traffic exhibited maximum average outdoor of 62.05 ± 3.41 dB(A) and School located in street with no traffic exhibited minimum average outdoor L_{eq} of 51.25 ± 3.09 dB(A) (Table-1). The average indoor L_{eq} was observed to be higher [71.44 ± 2.44 dB(A)] in Banks than that [65.42 ± 9.44 dB (A)] of Post Offices during working hours. However, Post Offices recorded a higher [62.11 ± 10.35 dB (A)] value of average indoor L_{eq} than that [56.07 ± 6.85 dB (A)] of Banks, during non-working hours. The average outdoor L_{eq} (10 minutes) was observed to be higher in Banks as compared to that of Post Offices during working as well as non-working hours (Table-1).

Table-1: Average L_{eq} in the institutes located in the study area, Bishnah Town, Jammu

	Duration	Min		Max		L_{eq}	
		INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR
School on main road with high traffic	W.H.	47.70	54.60	77.60	87.70	62.31 $\pm$ 6.39 57.08 $\pm$ 69.45	71.79 $\pm$ 6.89 63.88 $\pm$ 76.56
	N.W.H.	35.00	42.50	59.90	73.30	50.36 $\pm$ 3.65 46.45 $\pm$ 53.68	62.05 $\pm$ 3.41 58.88 $\pm$ 65.66
School on road with low traffic	W.H.	47.40	48.20	77.60	78.80	62.87 $\pm$ 6.54 57.07 $\pm$ 69.11	66.52 $\pm$ 5.19 61.51 $\pm$ 71.87
	N.W.H.	35.00	35.00	64.50	64.30	52.22 $\pm$ 6.11 47.35 $\pm$ 59.08	55.88 $\pm$ 2.47 53.14 $\pm$ 57.93
School in street with low traffic	W.H.	51.30	47.50	78.60	66.10	65.99 $\pm$ 7.19 57.68 $\pm$ 70.36	56.65 $\pm$ 3.83 54.42 $\pm$ 61.07
	N.W.H.	35.00	35.00	61.00	64.30	48.29 $\pm$ 4.09 43.71 $\pm$ 51.61	51.25 $\pm$ 3.09 48.48 $\pm$ 54.59
Avg. noise levels in schools	W.H.	47.40	47.50	78.60	87.70	63.72 $\pm$ 1.98 62.31 $\pm$ 65.99	64.99 $\pm$ 7.69 56.65 $\pm$ 71.79
	N.W.H.	35.00	35.00	64.50	73.70	50.29 $\pm$ 1.97 48.29 $\pm$ 52.22	55.47 $\pm$ 6.79 51.25 $\pm$ 62.05
Bank in market	W.H.	70.60	53.60	76.30	67.70	73.16	60.95
	N.W.H.	45.40	56.60	56.70	65.70	51.22	62.00
Bank on main road	W.H.	59.90	59.10	78.40	84.30	69.71	73.07
	N.W.H.	56.80	64.50	65.00	78.60	60.91	72.02
Avg. noise levels in banks	W.H.	59.90	53.60	78.40	84.30	71.44 $\pm$ 2.44 69.71 $\pm$ 73.16	67.01 $\pm$ 8.57 60.95 $\pm$ 73.07
	N.W.H.	45.40	56.60	65.00	78.60	56.07 $\pm$ 6.85 51.22 $\pm$ 60.91	67.01 $\pm$ 7.08 62.00 $\pm$ 72.02
Post office in market	W.H.	35.00	48.00	67.30	66.40	58.74	58.66
	N.W.H.	44.50	53.60	58.80	67.70	54.79	60.12
Post office on main road	W.H.	53.60	55.40	83.40	80.20	72.09	71.81
	N.W.H.	46.40	51.00	81.60	77.40	69.43	68.83
Avg. noise levels in post offices	W.H.	35.00	55.40	83.40	80.20	65.42 $\pm$ 9.44 58.74 $\pm$ 72.09	65.24 $\pm$ 9.29 58.66 $\pm$ 71.81
	N.W.H.	46.40	53.60	81.60	77.20	62.11 $\pm$ 10.35 54.79 $\pm$ 69.43	64.48 $\pm$ 6.16 60.12 $\pm$ 68.83

Note : All the sound level were measured in dB(A)



The analysis of noise level data further revealed the average indoor L_{eq} of 57.53 ± 6.19 dB(A) and average outdoor L_{eq} of 56.55 ± 5.22 dB(A) in Hospital of Study Area (Table-2).

Table-2: Average L_{eq} in a Hospital located in the study area, Bishnah Town, Jammu

	Indoor	Outdoor
Min.	43.20	40.00
Max.	71.10	68.80
L_{eq}	57.53 ± 6.19 52.80 ± 64.55	56.55 ± 5.22 51.73 ± 62.09

Mukthopadhyay and Ramanathan (1967) in Calcutta, Sargent *et al.* (1980), Tiwari and Ali (1988) in

Rourkela, Bansal and Grewal (1990) in Ludhiana, Bayo *et al.* (1995), Ravichandran *et al.* (1997) in Hosur and Rampal and Rasool (2004) in Jammu City also observed the higher values of noise levels in institutional area as compared with noise level values prescribed by Central Pollution Control Board.

Analysis of average L_{eq} in Mills of Study Area showed that Rice Mills exhibited average indoor L_{eq} of 80.34 ± 1.42 dB(A) which was close to 80.08 ± 4.98 dB(A) of Flour Mills. The average L_{eq} (10 minutes) ranged from 56.39 ± 3.24 dB(A) during non-working hours to 81.73 ± 1.3 dB(A) during working hours in Saw Mills (Table-3).

Table-3: Average L_{eq} in Mills located in the study area, Bishnah Town, Jammu

Mills		Min.	Max.	L_{eq}
Rice mill in market	Indoor	57.00	84.50	79.33
	Outdoor	58.50	72.40	68.71
Rice mill in street	Indoor	78.60	87.90	81.34
	Outdoor	56.30	69.60	61.72
Avg. noise levels in rice mills	Indoor	57.00	87.90	80.34 ± 1.42 79.33 ± 81.34
	Outdoor	56.30	72.40	65.22 ± 4.94 61.72 ± 68.71
Flour mill on main road	Indoor	81.60	85.70	83.60
	Outdoor	66.50	73.60	69.92
Flour mill in street	Indoor	73.00	79.10	76.55
	Outdoor	60.20	74.50	67.15
Avg. noise levels in flour mills	Indoor	73.00	85.70	80.08 ± 4.98 76.55 ± 83.60
	Outdoor	66.50	74.60	68.54 ± 1.96 67.15 ± 69.92
Saw mill on road with low traffic	Working hours	71.40	82.60	79.51
	Non working hours	45.80	63.40	58.69
Saw mill on road with high traffic	Working hours	82.40	87.00	83.94
	Non working hours	35.00	60.40	54.10
Avg. noise levels in saw mills	Working hours	71.40	87.00	81.73 ± 3.13 79.51 ± 83.94
	Non working hours	35.00	63.40	56.39 ± 3.24 54.10 ± 58.69

The critical analysis of the data of noise levels of Commercial Units of Study Area revealed the maximum indoor average L_{eq} of 72.71 ± 2.28 dB(A) at Tea Stalls and the minimum average L_{eq} of 58.55 ± 5.80 dB(A) at the Karyana Stores of Study Area (Table-4).

The maximum average outdoor L_{eq} of 68.03 ± 1.46 dB(A) was observed at Tea Shops and the minimum average outdoor L_{eq} of 61.77 ± 3.41 dB(A) was observed at Beauty Parlours of Study Area (Table-4).



Table-4: Average L_{eq} in different shops located in the study area, Bishnah Town, Jammu

Site	M in .		M ax .		L _{eq}	
	Indoor	Outdoor	Indoor	Outdoor	Indoor	Outdoor
Tea shop at bus stand	65.00	60.50	77.00	73.30	72.05	66.49
Tea shop in market	58.20	60.40	79.60	73.60	70.83	68.20
Tea shop on main market	48.20	53.60	77.60	78.60	75.25	69.39
Avg. noise levels in the tea shop	48.20	53.60	79.80	78.60	72.71±2.28 70.83±75.25	68.03±1.46 66.49±69.39
Karyana store on main road	55.10	57.40	73.30	79.80	64.49	71.67
Karyana store in market	45.90	56.60	64.90	73.00	58.26	68.86
Karyana store in street	45.00	48.40	59.20	65.80	52.89	56.11
Avg. noise levels in the Karyana store	45.00	48.40	73.30	79.80	58.55±5.80 52.89±64.49	65.55±8.29 56.11±71.67
Cosmetic shop in the market	52.50	54.20	73.60	71.70	67.21	65.18
Cosmetic shop at bus stand	55.10	56.80	78.80	76.10	67.24	69.66
Cosmetic shop in market	51.30	51.60	77.40	75.90	66.06	65.35
Avg. noise levels in the Cosmetic shops	51.30	51.60	78.80	76.10	66.84±0.67 66.06±67.24	66.73±2.54 65.18±69.66
Restaurant in market	62.00	52.00	74.20	72.80	68.40	66.35
Restaurant on main road	67.10	55.40	82.30	74.40	76.74	67.48
Avg. noise levels in the restaurant	62.00	52.00	83.30	74.40	72.57±5.89 68.40±76.77	66.92±0.79 66.35±67.48
Beauty parlour in market	64.00	51.80	74.60	68.70	71.87	61.73
Beauty parlour in main road	45.10	55.50	68.40	69.30	62.79	65.20
Beauty parlour in street	52.20	35.00	69.60	64.80	65.41	58.39
Avg. noise levels in Beauty parlours	45.10	35.00	73.60	68.70	66.69±4.67 62.79±71.87	61.77±3.41 58.39±65.20

The Vegetable Market and Bus Stand of Study Area exhibited same value of L_{eq} of 54.86 dB(A) during morning hours, whereas Bus Stand exhibited a higher value of L_{eq} [73.73 dB(A)] as compared to that of Vegetable Market [68.29 dB(A)], during afternoon hours but Vegetable Market exhibited a higher value of L_{eq} of 70.52 dB(A) as compared to 68.98 dB(A) of Bus Stand during evening hours. On an average Bus Stand exhibited a higher value of average L_{eq} [65.86 ± 9.82 dB (A)] as compared to (64.56 ± 8.47 dB (A) of Vegetable Market during day (Table-5). The average outdoor and indoor L_{eq} of 94.98 ± 2.05 dB (A) and 82.86 ± 1.57 dB (A) respectively were observed in Mini Buses plying in the Study Area (Table-6).

Bhatnagar and Srinivas (1992) in Chandigarh, Pandya and Srivastava (1999) in Jabalpur City, Bhattacharya and De (2000) in Durgapur, Rajamohan (2000) in Madurai and Singh *et al.* (2000) in Dhanbad also observed higher values of noise levels in commercial areas as compared with the values prescribed by Central Pollution Control Board. Dhillon *et al.* (1994) in Ludhiana, Singh and Jain (1995) in Delhi, Joshi (1998) in Indore, Moses *et al.* (2000) in Tamil Nadu, Ravichandran *et al.* (2000) in Pudukkottai and Lalitha *et al.* (2002) in Tiruchirappalli and Mishra (2004) in Rewa Town, M.P also observed higher value of noise levels in the residential, institutional and commercial areas as compared with the values prescribed by Central Pollution Control Board.



Table-5: Average L_{eq} at vegetable market and bus stand located in the study area, Bishnah Town, Jammu during different time periods

Time	Sites	Min.	Max.	L_{eq}
Morning time (0600-0800 hrs)	Vegetable market	44.70	64.50	54.86
	Bus-stand	44.00	64.50	54.86
Afternoon time (1400-1600 hrs)	Vegetable market	60.00	78.00	68.29
	Bus-stand	56.00	79.00	73.73
Evening time (1800-2000 hrs)	Vegetable market	62.16	76.60	70.52
	Bus-stand	59.90	73.90	68.98
Average Noise Level	Vegetable market	44.70	78.00	64.56±8.47 54.86±70.52
	Bus-stand	44.00	79.00	65.86±9.82 54.86±73.73

Table-6: Average L_{eq} in mini buses plying in the study area, Bishnah Town, Jammu

Noise levels	Indoor	Outdoor
M in.	68.60	68.00
M ax.	88.20	106.60
L_{eq}	82.86±1.57	94.98±2.05
	81.54±84.59	93.47±97.32

References

- Bansal, A.S. and Grewal, P.S., 1990. *Noise Pollution: Its Awareness and Control. In: Environmental Management* (Eds. G.S. Dhaliwal and V.K. Dilawari). Punjab Agricultural University, Ludhiana. pp: 5-11.
- Bayo, M.V., Garcia, A.M. and Garcia, A., 1995. Noise levels in an Urban Hospital and Workers Subjective Responses. *Arch. Env. Health*, 50: 247-252.
- Bhatnagar, V.S. and Srinivas, M.S.N., 1992. Analysis of Noise Levels in Commercial areas of Chandigarh. *Indian.J. Env. Health*, 34(1): 5-14.
- Bhattacharya, S. and De, A., 2000. Noise Study Comparison at two Different Road Intersections in the Street City of Durgapur. *Indian.J. Env. Prot.*, 20(8): 573-583.
- Dhillon, M.K., Gupta, R. and Dhaliwal, G.S., 1994. Vehicular Intensity and Prediction of Noise Levels in Ludhiana City. *Indian.J. Ecol.*, 21(1): 60-66.
- Joshi, G., 1998. The Ambient Noise Levels at Indore, Madhya Pradesh. *Poll. Res.*, 17(1): 75-77.
- Lalitha, M., Bhanumathy, V. and Rao, N.S., 2002. Traffic Noise Pollution Analysis at Selected Sites in Tiruchirappalli City. *Indian.J. Env. Prot.*, 22(6): 671-676.
- Mishra, B.K., 2004. Status and Assessment of Noise Pollution Level at Rewa Town. M.P. *J. Curr. Sci.*, 5(1): 623-628.
- Moses, A.A., Ravichandran, C., Sagila, J.C., Sangeetha, R., Srinivasan, K., Andrews, J. and Raja, R.E., 2000. Noise Pollution Assessment in Chidambaram, Erode and Thanjavur Towns in Tamil Nadu. *Indian.J. Env. Prot.*, 20(12): 881-884.
- Mukhopadhyay, R.N. and Ramanathan, N.L., 1967. Vehicular Noise in Quiet Zone in Calcutta. *Indian.J. of Occup. Health*, 10: 117.
- Pandya, M. and Shrivastava, R.K., 1999. Analysis of Noise Levels and its Health Effects in Commercial Areas of Jabalpur city: Part 1 Analysis of Noise Levels. *Indian .J. Env. Sci.*, 3(2): 197-200.
- Rajamohan, S., 2000. Noise Pollution at Madurai Corporation Area: A case Study. *J. Ecotoxicol. Env. Monit.*, 10(3): 211-214.
- Rampal, R.K. and Rasool, N., 2004. Assessment of Noise Levels in Various Government Hospitals of Jammu City (J&K). *J.Curr. Sci.*, 5(2): 629-634.
- Rampal, R.K. and Pathania, D., 2008). Assessment of Noise Levels in Households of Bishnah Town, Jammu (J&K). India. *Poll.Res.*, 27(1): 69-72.
- Ravichandran, C., Chandrasekaran, G. and Venkatasubramanian, R., 1997. Status of Noise Pollution in Hosur. *Indian J. Env. Prot.*, 17(4): 278-280.
- Ravichandran, C., Chandrasekaran, G. and Vijaya, M., 2000. Noise Pollution Assessment in Pudukkottai. Tamil Nadu. *Poll. Res.*, 19(13): 431-434.
- Sargent, J.W., Gidman, M.I., Humphreys, M.A. and Utley, M.W., 1980. The Disturbance Caused to School Teachers by Noise. *J. Sound Vibr.*, 70(1): 557-572.
- Singh, B.B. and Jain, V.K., 1995. A Comparative Study of Noise Levels in Some Residential, Industrial and Commercial Areas of Delhi. *Env. Monit. Asses.*, 35(1): 1-11.
- Singh, P.K., Prasad, S.S. and T.N. Singh, T.N., 2000. Status of Noise Pollution in Dhanbad Municipal Area. *Indian J. Env. Prot.*, 20(1): 11-14.
- Tiwari, T.N. and Ali, M., 1988. Survey of noise pollution in Rourkela: 111 Noise in government offices. *Indian J. Env. Prot.*, 8(10): 724-728.

