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Assessment of noise pollution in Raipur city of Chhattisgarh, India

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ABSTRACT

In developing countries like India Assessment of Noise pollution is important task. Noise pollution adversely affects the health of human beings. The most important noises sources of noise are road traffic, aircraft, railways and industries, noise in the community from industrial and construction site and noise at home. Road traffic is by far the largest of these and accounts for about 78 per cent of noise annoyance. In India, vehicular traffic is increasing rapidly, which has given birth to overcrowded roads and noise pollution. This study is primarily focusing on the monitoring of noise pollution at different places in Raipur City. In this study, noise monitoring was carried out with the help of a sound level meter model (VA8080). Some important places of Raipur have been selected for noise level study purpose. All the places are categorized under different zones i.e. commercial zone, silent zone, industrial zone and residential zone. All data were collected between 07:00 am to 09:00 p.m. Every hour the noise levels have been measured. To make the noise level more accurate each reading were taken in a gap of 6 minutes, that is, 10 readings per hour. And the average of the readings was taken as per hour sound intensity level. The study period of the survey was 15 days. Therefore this study reveals that the noise levels are higher than the standard level for each zones.

Keywords— *Noise pollution, Sound level meter*

1. INTRODUCTION

NOISE is an unwanted, unpleasant and irritable sound that may cause some psychological and physiological stress to human beings exposed to it [1]. According to the World Health Organization, sound levels less than 70 dB is not damaging to living organisms, regardless of how long or consistent the exposure is. Exposure for more than 8 hours to constant noise beyond 85 dB may be hazardous. If you work for 8 hours daily in close proximity to a busy road or highway, you are very likely exposed to traffic noise pollution around 85dB[2]. Noise pollution can be hazardous to our health in various ways such as Hypertension, Hearing loss, Sleep disturbances, Child development, various cardiovascular dysfunctions**,** Psychological dysfunctions etc. Other than marine life, land animals are also affected by noise pollution in the form of traffic, firecrackers etc., and birds are especially affected by increased air traffic [2]. Thus in India, the problem caused by noise pollution has increased.

2. METHODOLOGY

2.1 Study area

The study area is of Raipur, the capital city of Chhattisgarh, in 21stcentury, the city is the administrative headquarters of Raipur District. It was formerly a part of Madhya Pradesh before the state of Chhattisgarh was formed on 1st November 2000. At the time of the 2011 census, the population within the municipal corporation area of Raipur was 1,010,087. Being capital city urbanization has been increased from last few decades. So it is the peak hour to check the noise level in the city and to plan according to that. Some important places of Raipur have been selected for noise level study purpose. The following figure shows the study area in Raipur city.

All the places are categorized under different zones. That is:

Table 1: Different locations of Raipur

Commercial Zone	Pandri Market	Gole Bazar	Jaistambh Chowk	Telebandha Chowk
Silent zone	Ambedkar Hospital	District Court	Kalibadi School	-
Residential zone	Avanti Vihar	PuraniBasti	Samta Colony	-
Industrial zone	Siltara	-	-	-

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2.2 Study period

All data were collected between 07:00 a.m to 09:00 p.m. Every hour the noise levels have been measured. To make the noise level more accurate each reading were taken in a gap of 6 minutes, that is, 10 readings per hour. And the average of the readings was taken as per hour sound intensity level. The study period of the survey was 15 days.

2.3 Data collection and analysis

2.3.1 Noise level of the commercial zone: Table below specifies the sound level on working and non-working days in different areas.

Table 2: Telebandha Chowk

The sound level on working days			Sound level non-working days		
S no.	**Time**	**The noise level in dB**	**S no.**	**Time**	**The noise level in dB**
1	7 to 8	64.5	1	7 to 8	61.6
2	8 to 9	72.89	2	8 to 9	69.53
3	9 to 10	74.57	3	9 to 10	73.67
4	10 to 11	67.27	4	10 to 11	64.32
5	11 to 12	74.09	5	11 to 12	73.42
6	12 to 01	74.19	6	12 to 01	72.16
7	01 to 02	74.63	7	01 to 02	72.89
8	02 to 03	74.50	8	02 to 03	69.23
9	03 to 04	74.60	9	03 to 04	68.12
10	04 to 05	75	10	04 to 05	73.17
11	05 to 06	77.88	11	05 to 06	76.65
12	06 to 07	75.90	12	06 to 07	76.00
13	07 to 08	74.50	13	07 to 08	74.30
14	08 to 09	73.89	14	08 to 09	73.90

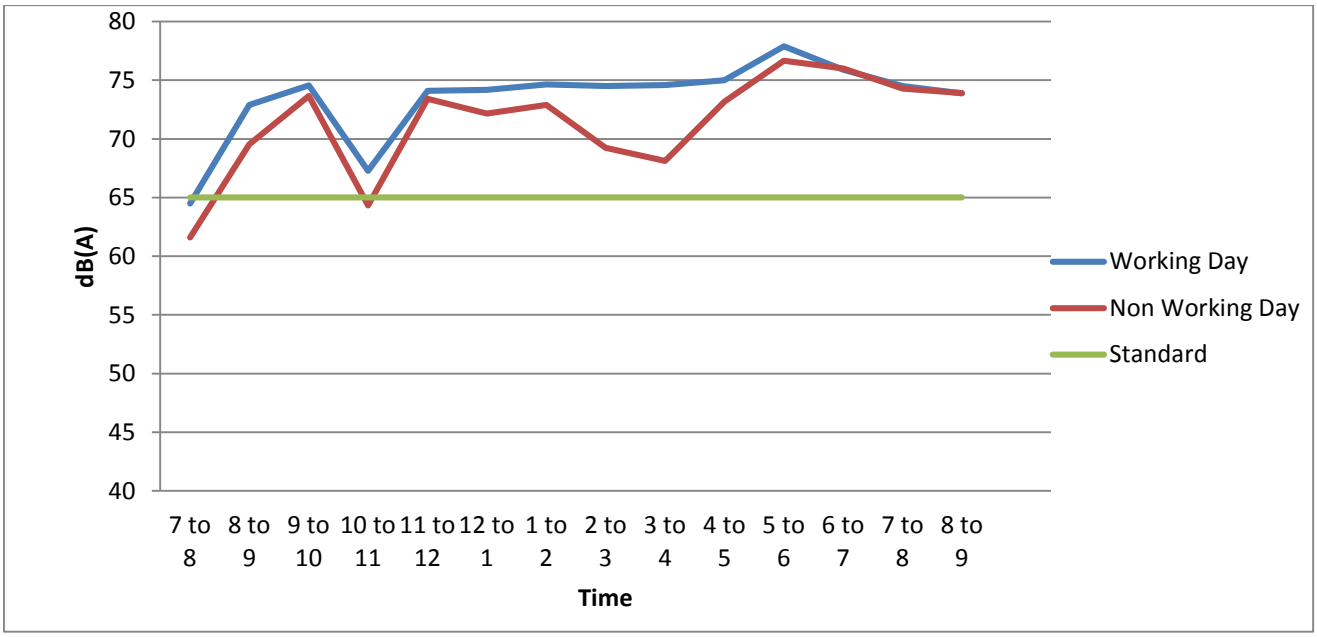

Fig. 1: Comparative graph of sound level of working day and non-working day

Table 3: Noise level of Jaistambh Chowk

Sound level on working day			Sound level on working day		
S no.	**Time**	**Noise level in dB**	**S no.**	**Time**	**Noise level in dB**
1	7 to 8	72.94	1	7 to 8	71.10
2	8 to 9	73.07	2	8 to 9	71.65
3	9 to 10	73.50	3	9 to 10	72.07
4	10 to 11	75.12	4	10 to 11	75.88
5	11 to 12	76.74	5	11 to 12	76.35
6	12 to 01	74.92	6	12 to 01	78.25
7	01 to 02	75.01	7	01 to 02	68.17
8	02 to 03	75.29	8	02 to 03	73.97
9	03 to 04	72.71	9	03 to 04	74.03
10	04 to 05	73.88	10	04 to 05	74.86
11	05 to 06	73.69	11	05 to 06	75.01
12	06 to 07	73.64	12	06 to 07	74.97
13	07 to 08	74.32	13	07 to 08	73.89
14	08 to 09	72.56	14	08 to 09	72.98

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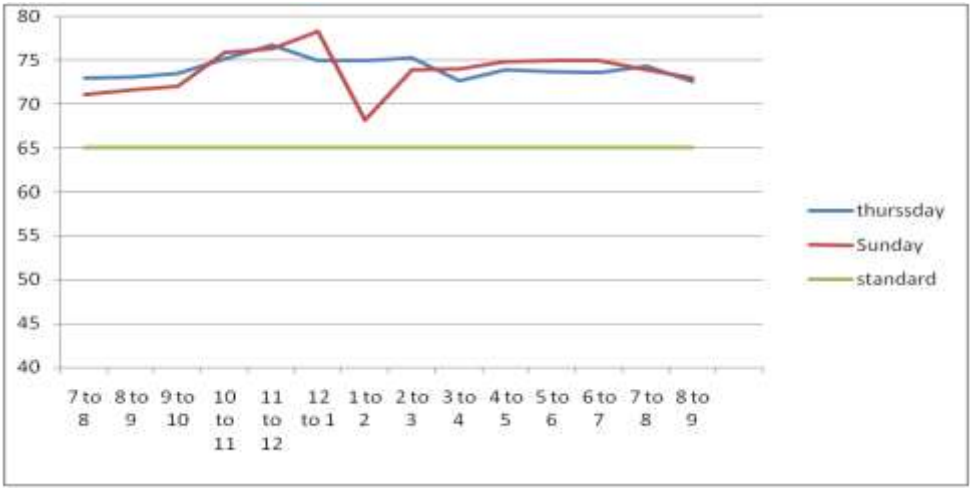

Fig. 2: Comparative graph of sound level for working day and non-working days

Table 4: Noise level of Gole Bazar

Sound level on working day			Sound level non-working day		
S no.	**Time**	**Noise level in dB**	**S no.**	**Time**	**Noise level in dB**
1	7 to 8	52.96	1	7 to 8	53.89
2	8 to 9	58.28	2	8 to 9	60.76
3	9 to 10	67.91	3	9 to 10	69.50
4	10 to 11	67.36	4	10 to 11	68.23
5	11 to 12	67.94	5	11 to 12	70.56
6	12 to 01	72.53	6	12 to 01	63.09
7	01 to 02	63.01	7	01 to 02	71.34
8	02 to 03	69.15	8	02 to 03	71.00
9	03 to 04	69.77	9	03 to 04	71.18
10	04 to 05	69.33	10	04 to 05	74.63
11	05 to 06	73.72	11	05 to 06	74.65
12	06 to 07	74.36	12	06 to 07	74.00
13	07 to 08	73.89	13	07 to 08	73.80
14	08 to 09	73.60	14	08 to 09	73.23

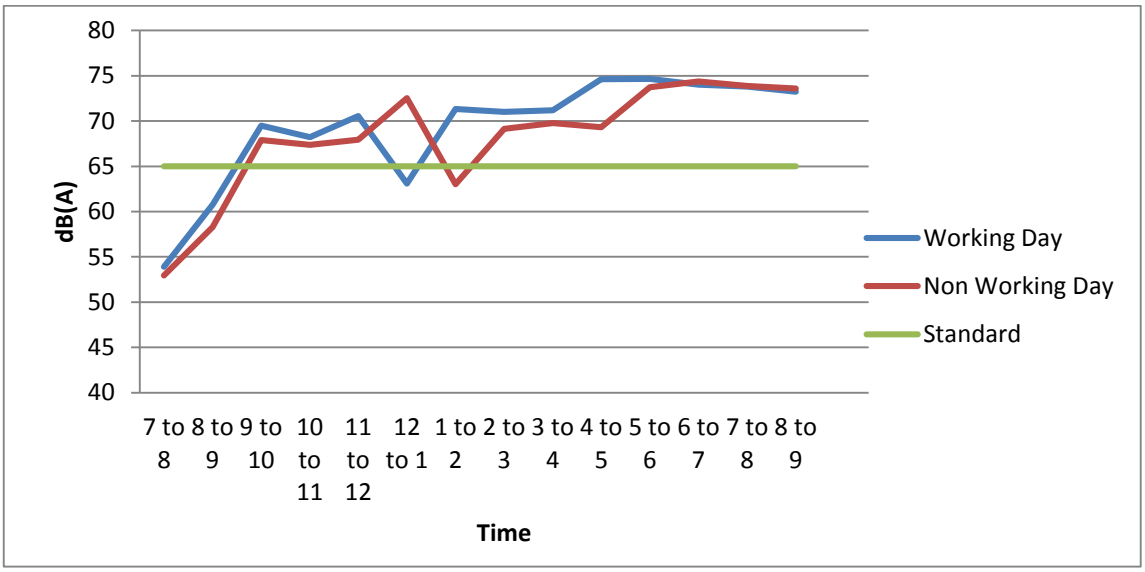

Fig. 3: Comparative graph of sound level of working day and non-working day

Table 5: Noise Level of Pandri Market

Sound level on working day			Sound level non-working day		
S no.	**Time**	**Noise level in dB**	**S no.**	**Time**	**Noise level in dB**
1	7 to 8	57.88	1	7 to 8	53.67
2	8 to 9	63.10	2	8 to 9	60.43
3	9 to 10	66.26	3	9 to 10	63.23
4	10 to 11	65.00	4	10 to 11	65.89
5	11 to 12	68.49	5	11 to 12	66.34
6	12 to 01	71.25	6	12 to 01	68.90

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7	01 to 02	68.16	7	01 to 02	66.21
8	02 to 03	68.35	8	02 to 03	65.39
9	03 to 04	70.72	9	03 to 04	68.46
10	04 to 05	71.32	10	04 to 05	69.33
11	05 to 06	73.84	11	05 to 06	70.69
12	06 to 07	75.29	12	06 to 07	69.90
13	07 to 08	74.33	13	07 to 08	68.48
14	08 to 09	74.29	14	08 to 09	67.25

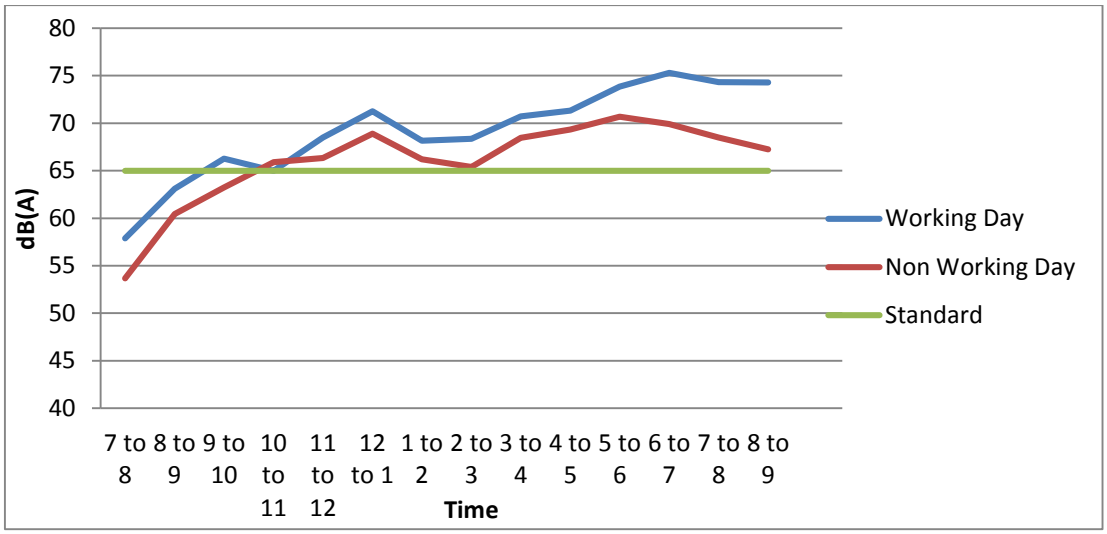

Fig. 4: Comparative graph of sound level of working day and non-working day

2.3.2 Silent Zone

Table 6: Kalibadi School

Sound level on working day			Sound level non-working day		
S no.	**Time**	**Noise level in dB**	**S no.**	**Time**	**Noise level in dB**
1	7 to 8	52.34	1	7 to 8	49.37
2	8 to 9	58.14	2	8 to 9	53.04
3	9 to 10	58.70	3	9 to 10	55.47
4	10 to 11	60.80	4	10 to 11	57.29
5	11 to 12	59.44	5	11 to 12	57.19
6	12 to 01	61.90	6	12 to 01	58.35
7	01 to 02	61.00	7	01 to 02	59.16
8	02 to 03	63.32	8	02 to 03	60.72
9	03 to 04	63.25	9	03 to 04	59.69
10	04 to 05	62.74	10	04 to 05	58.95
11	05 to 06	60.85	11	05 to 06	56.52
12	06 to 07	59.09	12	06 to 07	57.29
13	07 to 08	59.80	13	07 to 08	56.89
14	08 to 09	56.39	14	08 to 09	52.19

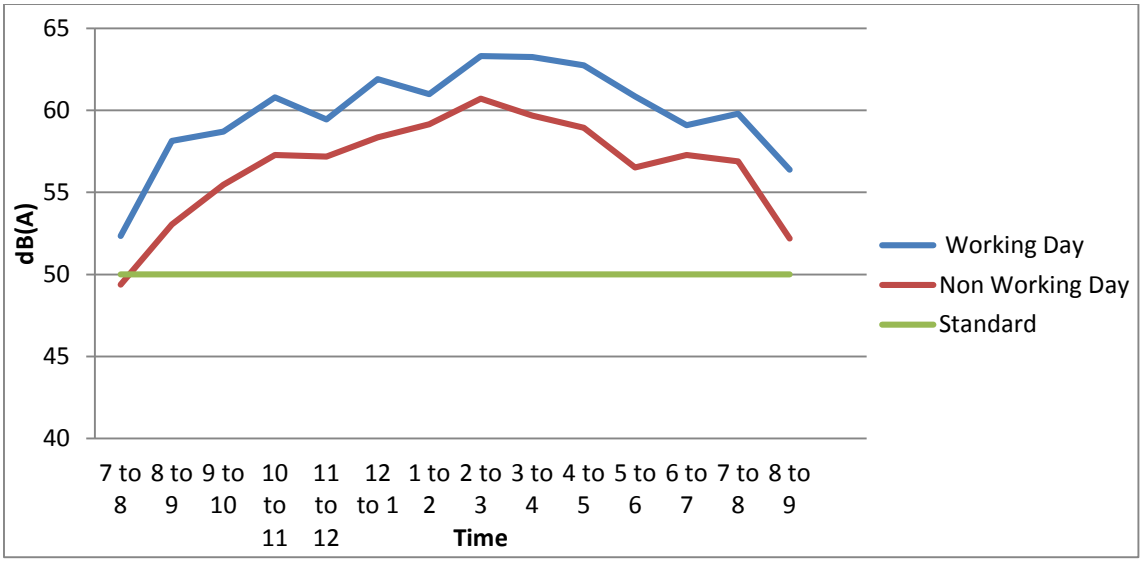

Fig. 5: Comparative graph of sound level, for working day and non-working day

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Table 7: Noise level of district court

Sound level on working day			Sound level on non-working day		
S no.	**Time**	**Noise level in dB**	**S no.**	**Time**	**Noise level in dB**
1	7 to 8	54.53	1	7 to 8	52.30
2	8 to 9	58.93	2	8 to 9	54.23
3	9 to 10	57.58	3	9 to 10	55.67
4	10 to 11	64.14	4	10 to 11	59.17
5	11 to 12	64.10	5	11 to 12	61.79
6	12 to 01	65.51	6	12 to 01	63.20
7	01 to 02	62.73	7	01 to 02	59.20
8	02 to 03	64.33	8	02 to 03	59.60
9	03 to 04	64.95	9	03 to 04	63.93
10	04 to 05	64.35	10	04 to 05	63.72
11	05 to 06	65.82	11	05 to 06	64.21
12	06 to 07	61.22	12	06 to 07	62.59
13	07 to 08	59.40	13	07 to 08	58.30
14	08 to 09	58.59	14	08 to 09	57.85

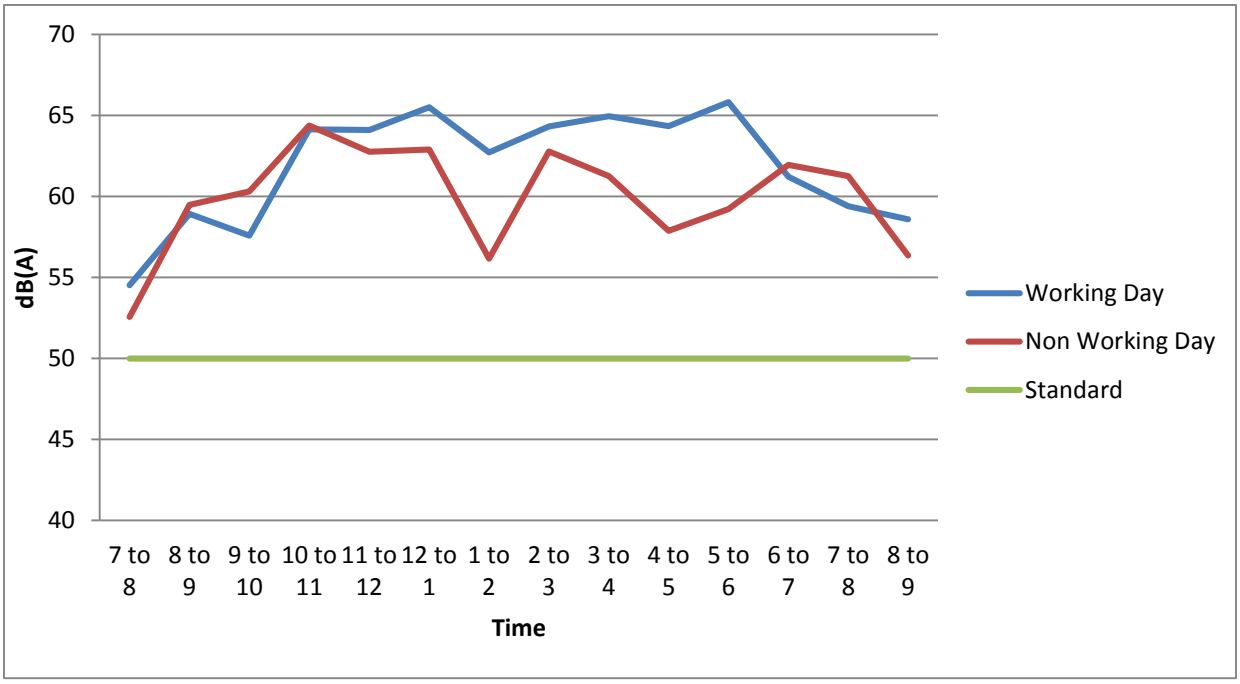

Fig. 6: Comparative graph of sound level, for working day and non-working day

Table 8: Noise level of B.R. Ambedkar Hospital

Sound level on working day			Sound level non-working day		
S no.	**Time**	**Noise level in dB**	**S no.**	**Time**	**Noise level in dB**
1	7 to 8	56.20	1	7 to 8	52.57
2	8 to 9	63.31	2	8 to 9	59.48
3	9 to 10	63.76	3	9 to 10	60.32
4	10 to 11	68.33	4	10 to 11	64.39
5	11 to 12	63.47	5	11 to 12	62.76
6	12 to 01	65.97	6	12 to 01	62.90
7	01 to 02	59.43	7	01 to 02	56.17
8	02 to 03	64.66	8	02 to 03	62.79
9	03 to 04	65.32	9	03 to 04	61.27
10	04 to 05	61.90	10	04 to 05	57.89
11	05 to 06	60.33	11	05 to 06	59.23
12	06 to 07	61.63	12	06 to 07	61.96
13	07 to 08	62.53	13	07 to 08	61.27
14	08 to 09	60.32	14	08 to 09	56.36

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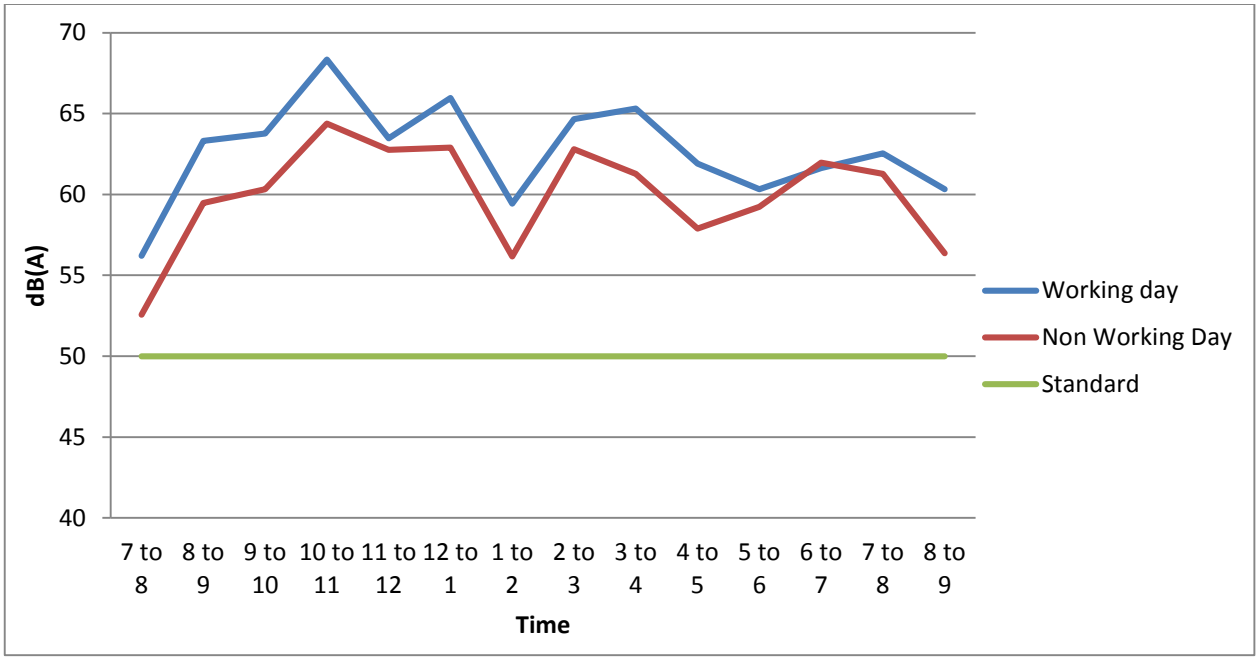

Fig. 7: Comparative graph of sound level, for working day and non-working day

2.3.3 Industrial Area

Table 9: Noise level of Siltara Area

Sound level on working day			Sound level non-working day		
S no.	**Time**	**Noise level in dB**	**S no.**	**Time**	**Noise level in dB**
1	7 to 8	70.53	1	7 to 8	69.93
2	8 to 9	71.30	2	8 to 9	70.89
3	9 to 10	74.78	3	9 to 10	73.54
4	10 to 11	77.97	4	10 to 11	76.93
5	11 to 12	76.34	5	11 to 12	78.19
6	12 to 01	73.34	6	12 to 01	74.95
7	01 to 02	75.00	7	01 to 02	76.67
8	02 to 03	74.25	8	02 to 03	75.66
9	03 to 04	77.29	9	03 to 04	78.56
10	04 to 05	74.67	10	04 to 05	75.00
11	05 to 06	76.97	11	05 to 06	77.88
12	06 to 07	77.18	12	06 to 07	76.89
13	07 to 08	75.89	13	07 to 08	74.30
14	08 to 09	73.91	14	08 to 09	73.89

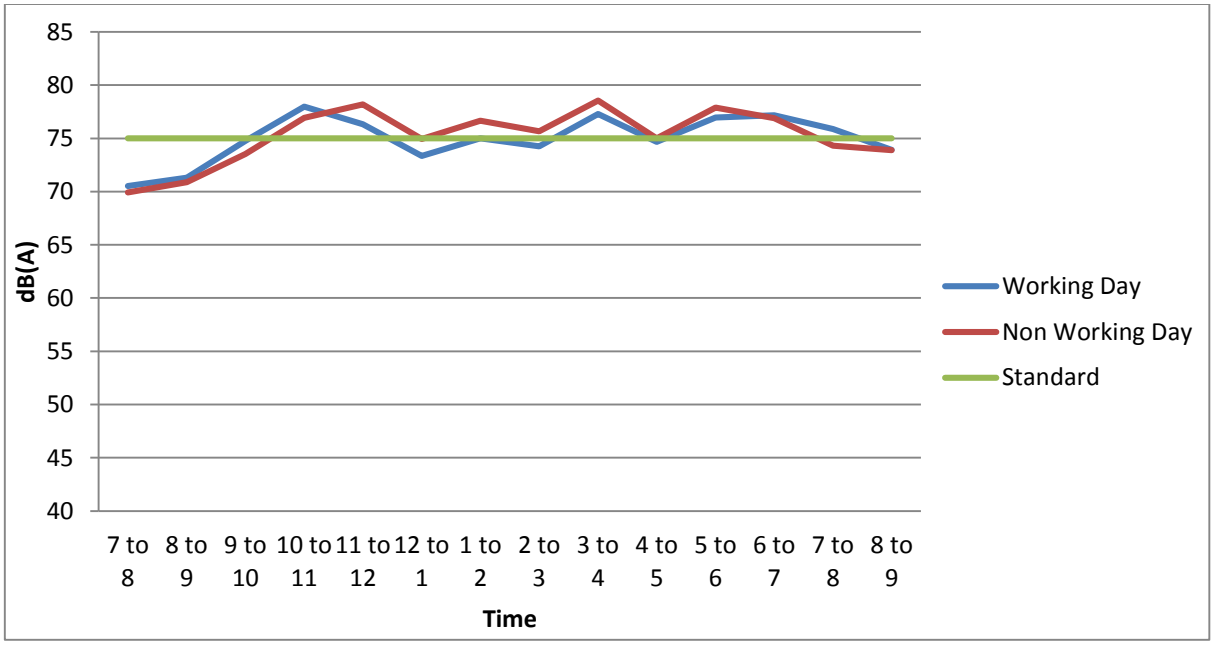

Fig. 8: Comparative graph of sound level, for working day and non-working day

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2.3.4 Residential Zone

Table 10: Noise level of Avanti Vihar on working days (Tuesday)

S no.	Time	Noise level in dB
1	7 to 8	49.88
2	8 to 9	51.45
3	9 to 10	55.67
4	10 to 11	57.56
5	11 to 12	57.23
6	12 to 01	54.64
7	01 to 02	54.97
8	02 to 03	55.47
9	03 to 04	57.21
10	04 to 05	58.32
11	05 to 06	59.25
12	06 to 07	58.38
13	07 to 08	56.48
14	08 to 09	55.69

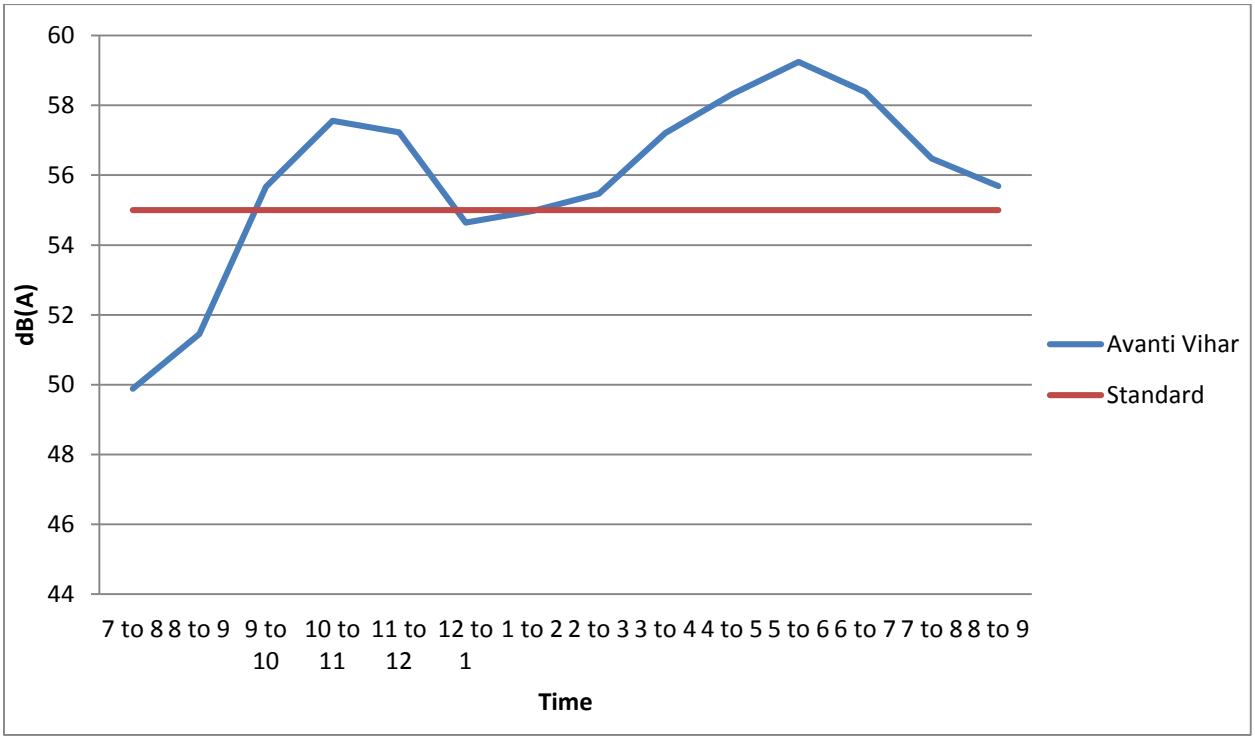

Fig. 9: Shows the comparison graph of observed sound level with standard sound

Table 11: Noise level of Samta Colony

S no.	Time	Noise level in dB
1	7 to 8	48.58
2	8 to 9	52.84
3	9 to 10	56.67
4	10 to 11	57.52
5	11 to 12	56.40
6	12 to 01	55.93
7	01 to 02	54.28
8	02 to 03	52.83
9	03 to 04	57.72
10	04 to 05	58.26
11	05 to 06	60.46
12	06 to 07	57.42
13	07 to 08	56.52
14	08 to 09	53.68

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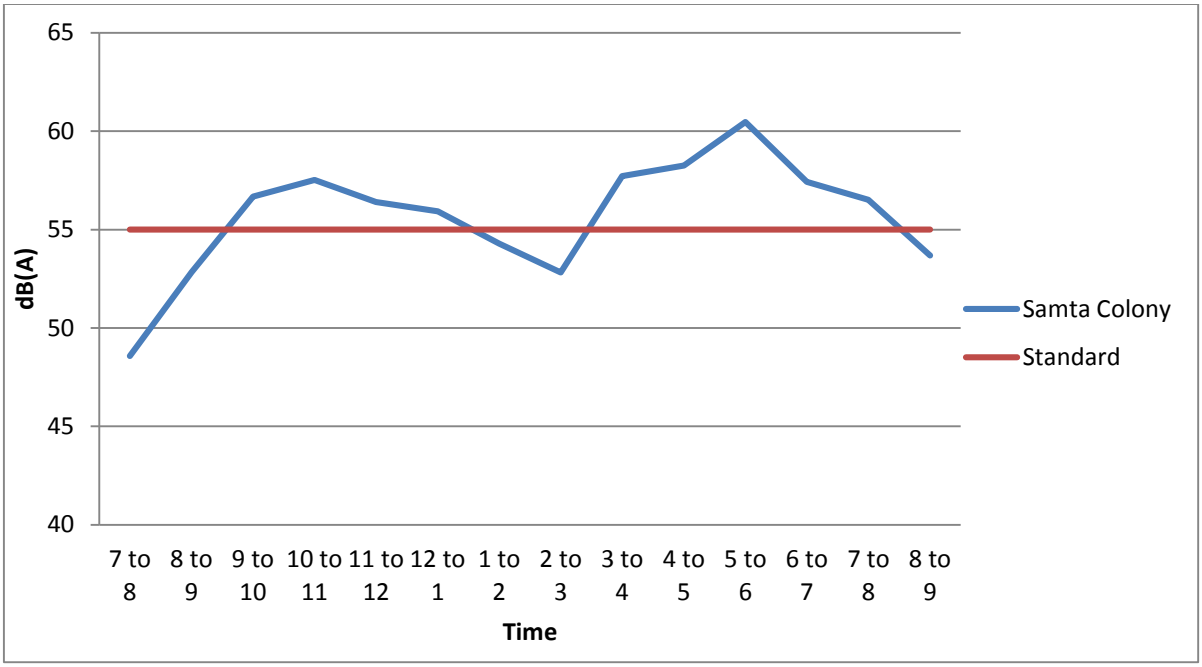

Fig. 10: Comparative graph of sound level, time with dB

Table 12: Noise level of Purani Basti

S no.	Time	Noise level in dB
1	7 to 8	49.58
2	8 to 9	54.24
3	9 to 10	57.46
4	10 to 11	57.5
5	11 to 12	56.24
6	12 to 01	54.72
7	01 to 02	51.69
8	02 to 03	54.68
9	03 to 04	58.14
10	04 to 05	58.90
11	05 to 06	61.34
12	06 to 07	60.36
13	07 to 08	59.63
14	08 to 09	57.85

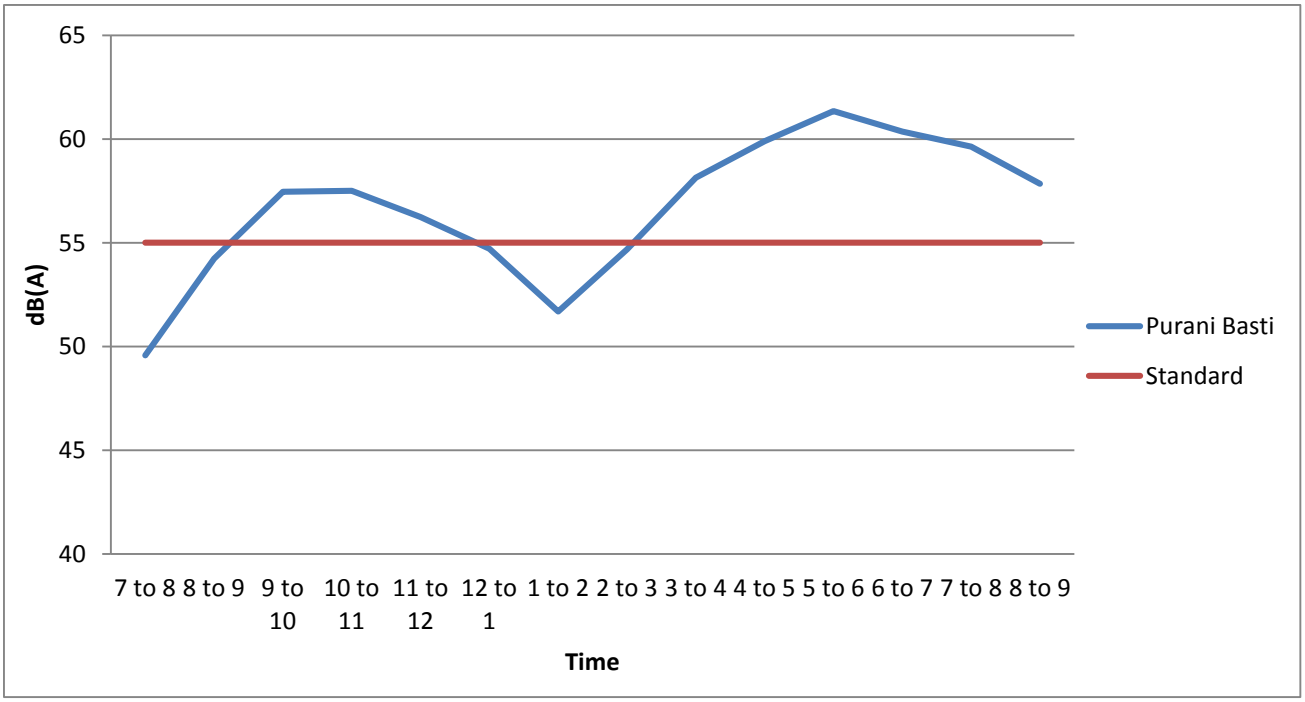

Fig. 11: Comparison graph of sound level, time with dB

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2.4 Comparison of noise level different residential areas

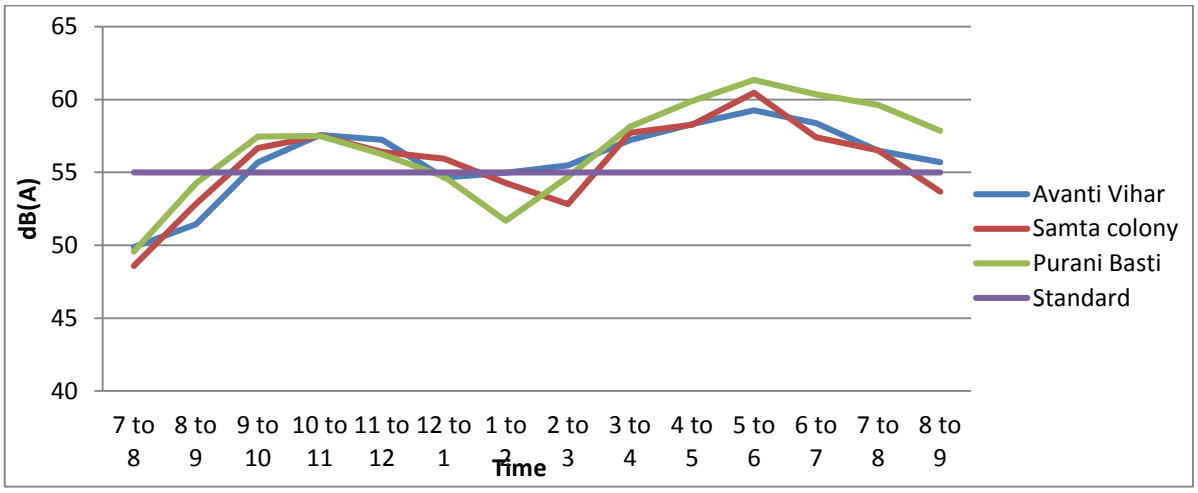

Fig. 12: Comparative graph of sound level, of a different residential area

3. RESULTS AND DISCUSSION

After the reading from a different location, the data was analysed and the result was found out of working days and non-working days. Talking about commercial zone at Telibandha Chowk maximum sound level was found to be 77.88 at 5-6 PM and 76.65 dB at 5-6PM. Maximum sound level at Jaistambh Chowk was 76.74db at 11-12 AM and 74.65dB at 12-01 PM similarly for Goal Bazaar level was 74.36dB at 6-7 PM and 74.65db 5-6PM . At last Pandri markets level was found to be 75.29dB at 6-7PM and 70.69 at 5-6pm. Now in the silent zone at Kalibadi school level was 63.32dB at 02 -03PM and 60.72dB at02 -03PM.for the District Court, level was 65.82dB at05 -06PMand 64.21dBat 05 -06PM.lastly at B.R. Ambedkar Hospital level was found to be 68.33dB at 10 -11AM and 64.39dBat 10 -11AM. Now in Residential Zone firstly Avanti Vihar was taken and result was found to be 59.25dB At 05 -06PM and 56.65 dB at 05 -06PM. Similarly for Samta Colony result was found to be 58.26dB at04 -05PM and 57.36 dB at 05 -06PM.lastly for Purani Basti result was 61.34dB at 05 -06PM and 62.68 dB at 06 -07PM. At last in Industrial Zone two areas were taken and the result was 78.19dB at 10-11AM and 76.78 dB at 05 -06PM for area 1 and for area 2 was 77.78 dB at 05 -06PM and 75.55 dB at 05 -06PM. The results of noise level in the Raipur has been summarized in Table.

Table 13: Noise level at different location of Raipur city

Zones	Name of site	Maximum sound level on working day and time	Minimum sound level on non-working day and time	Standards by Central Pollution Control Board
Commercial Zone	Telebandha Chowk	77.88 dB 05 -06PM	76.65 dB 05 -06PM	65dB
	JaistambhChowk	76.74 dB 11 -12AM	78.25dB 12 -01PM	
	Goal Bazar	74.36dB 06 -07PM	74.65dB 05 -06PM	
	Pandri Market	75.29dB 06 -07PM	70.69dB 05 -06PM	
Silent Zone	*Kalibadi School*	63.32dB 02 -03PM	60.72dB 02 -03PM	50dB
	District Court	65.82dB 05 -06PM	64.21dB 05 -06PM	
	B.R. Ambedkar Hospital	68.33dB 10 -11AM	64.39dB 10 -11AM	
Residential Zone	Avanti Vihar	59.25dB 05 -06PM	56.65 dB 05 -06PM	55dB
	Samta Colony	58.26dB 04 -05PM	57.36 dB 05 -06PM	
	Purani Basti	61.34dB 05 -06PM	62.68 dB 06 -07PM	
Industrial Zone	Siltara Area 1	78.19dB 10-11AM	76.78 dB 05 -06PM	75dB
	Siltara Area 2	77.78 dB 05 -06PM	75.55 dB 05 -06PM	

4. CONCLUSION

The observed noise levels locations observed are high as compared to Central Pollution Control Boards standards. Therefore, controlling measures needs to be adopted by the state government pollution board. Thus the people living in noise pollution

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prominent area (especially noise level above 70 dB) should take proper precaution to avoid noise-induced hearing loss and other health-related problems.

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