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EVALUATION AND ANALYSIS OF TRAFFIC NOISE IN DIFFERENT ZONES OF AMRAVATI CITY

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Abstract: *Noise pollution is unwanted or harmful sound that intrudes upon human or faunal activity. Noise pollution is almost entirely human generated, whether by machine sources or amplified sound of human creation. In developing country like India with the vehicle population increasing at an alarming rate, the residents of cities are experiencing severe environmental problems that results from road traffic in population from Automobiles. Noise from road traffic is major source of environmental pollution and it has detrimental effects on human beings. In this project road traffic noise survey was conducted at different locations in Amravati City. Various parameters are evaluated e.g. Noise Pollution Level, Traffic Noise Index and Equivalent Sound Level. Based on this study broad conclusions are presented and suggestion made to reduce noise due to traffic.*

IndexTerms *- Noise Pollution Level, Traffic Noise Index, Equivalent Sound Level.*

1. INTRODUCTION

Sound in the environment is caused by vibrations in the air or some other medium that reach human ear and stimulate a sensation of hearing. When the sound becomes too loud or disagreeable or unwanted, it becomes noise. Since the noise produces several undesirable effects on human body, health, it can be termed as environmental pollution.

Today's world is a noisy world. Twenty-four hours a day, seven days a week, we are exposed to sounds we do not want, need, or get benefited from. There are few places on the planet where in our daily lives we are free from unwanted sounds. Noise from many outdoor sources assails our hearing as it invades our homes and workplaces i.e. because of traffic, aircraft, barking dogs, neighbor's voices. Noise within the workplace i.e. from office machines, telephones, ventilating systems, unwanted conversation in the next cubicle distracts us from our work and makes us less productive.

Noise from within the home i.e. from appliances, upstairs footsteps, TV sound traveling from room to room keeps our homes from being the restful. Noise can frustrate and impede speech communication. It can imperil us as we walk or drive city streets. It can be a physical health hazard as well. Exposure to high noise levels may cause permanent hearing loss.

In short, Noise is unwanted sound. Sound is the result of pressure changes in the air caused by vibration. Unwanted sound to some may be considered wanted sound by others, as in the case of loud music. Noise, which is often referred to as unwanted sound, is typically characterized by the intensity, frequency, periodicity (continuous or intermittent) and duration of sound.

Traffic noise is one of the most immediate and identifiable environmental problem associated with rapid industrialization, urbanization and population growth. Rapid urbanization, industrialization, expansion of road network and infrastructure cause serve

noise pollution problem. (Pathak ef al. 2008).Traffic noise is considered as one of the important sources of noise pollution and adversely affects human health. The increasing number of vehicles, musical instruments, small scale industries and urbanization activities are the main sources of noise pollution. Noise affects may include annoyance, deterioration of sleep quality and stress related ischemic heart diseases. (Singh & Kaur, 2013). Generally high exposure to noise level may cause feeling of annoyance and irritation, damage to auditory mechanisms, number of health related effects like physiological disorders, psychological disorders, disturbance of daily activities and performances, hypertensions, etc. the most serious health hazards associated with high level of noise exposure is deafness which initially causes temporary hearing problem or prolonged exposure to high noise level causes permanent deafness. Nowadays, noise pollution is considered as one of the main problems of urban communities which have many hazardous effects on urban environment and many result in great deal of costs to the society.

In the present study the ambient noise monitoring was carried out in residential, commercial, industrial and silent zone in Amravati city to find out the noise level. The sound level was measured at interval of 15 min. during 7:00 AM to 9:00 PM with help of noise level meter. The maximum reading was recorded at every 15 min. interval.

2. OBJECTIVES OF STUDY

The present work was planned with following objectives:

1) To study road traffic noise level at various locations in Amravati city and compared with prescribed standards.
2) To monitor and assess the noise level at traffic intersection in Amravati city under heterogenic traffic activities.
3) To evaluate various parameter like Noise Pollution Level, Traffic Noise Index and Equivalent Sound Level.
4) To study the significant correlation of traffic noise in various square in Amravati city

3. DETAIL OF CITY AND SAMPLING SITE

Amravati is a city in the state of Maharashtra, India and the seventh most populous metropolitan area in Maharashtra. Amravati is also the headquarters of the "Amravati Division" which is one of the six divisions of the state of Maharashtra (Amravati and Nagpur divisions together form Vidharbha region) Apart from Amravati district itself, following four districts also come under Division: 1) Akola. 2) Yavatmal. 3) Buldhana. 4) Washim..

Amravati city is geographically located at 200 56' North latitude 770 47' East longitudes. The average altitude is 340.76m above MSL. The higher elevation area of the city is at 401.05m above MSL that is in North East part of the city while city is situated at the foot of the ranges between heights 336 m to 324 m above MSL. The total area of the Municipal Corporation is about 121.56 Sq. Km. and the population is around 899,579 souls. The city is located on the National Highway NH-6 leading to Mumbai in the west and Kolkata in the east. Amravati has good road, rail connectivity with almost all important cities in India. It is extremely well connected to Nagpur, Mumbai, Kolkata, and Chennai. After the general survey of the city special reference to the noise level, sampling site at Irwin Square (Dr. Babasaheb Ambedkar Square), Duffrin Square, Rathi Nagar Square (Shree Chhatrapati Sambhaji Nagar Square), Camp Square, Chitra Square, Jaistambh Square, MIDC Place 1, MIDC Place 2, Rajkamal Square and Rajapeth Square were selected for detailed study of noise pollution.

4. DETAILS OF STUDY

On the day 27/02/2023 detail study of noise pollution was carried on Irwin Square (Dr. Babasaheb Ambedkar Square). Traffic volume was measured manually by counting the number of Vehicles i.e. Number of Two Wheelers , Number of Heavy Vehicles consisting of Buses ; Trucks ; Tractors ;etc and Number of Light Vehicles consisting of Cars ; Autos ; jeeps ; mini trucks ; etc. each separately for every hour. Markings were made for each vehicle on a manual sheet prepared for counting them.

Noise readings were measured with the help of Noise meter for each 15 minutes. The noise meter was held perpendicular to the direction of traffic flow, 1.5m above the ground level. The readings were entered manually on the lists prepared for noise readings. Also the reasons for high readings were mentioned before them.

The readings of Traffic volume and Noise readings were then listed down separately for each 15 minutes. In this way, the day's work came to an end.

Similarly, detailed study of noise pollution was carried on 28/02/2023 at Duffrin Square, on 01/03/2023 at Rathi Nagar Square (Shree Chhatrapati Sambhaji Nagar Square), on 02/03/20223 at Camp Square, on 03/03/2023 at Chitra Square, on 08/03/2023 at

Jaistambh Square, on 09/03/2023 at MIDC place 1, on 13/03/2023 at MIDC place 2, on 14/03/2023 at Rajkamal Square and on 16/03/2023 at Rajapeth Square.

5. SOUND LEVEL MATER (SLM)

Sound Level Mater (SLM) is a device that used to obtain the level of noise in the unit decibel (dBA).This SLM is obtained the reading of sound pressure level in a particular period. During the data reading, SLM when the small air molecule mixed the vibration of sound and give an impact to the surface of microphone. The energy then transform into electrical signal and it appear as a sound value in unit of decibel (dBA).

Meter : Digital Sound Level Meter

Made : LUTRON
Model : SL-4001

Fig. 5.1 - Sound Level Meter

- **Noise has been recognized as ambient air pollutant. Standards in this regards are laid down Under Environment (protection) rules, 1986.**

Table No. 1 Acceptable Levels of Noise in India

Sr. No.	Type of Area	Permissible Noise at Day Time	Permissible Noise at Night Time
1	Industrial Area	75 dB	70 dB
2	Commercial Area	65 dB	55 dB
3	Residential Area	55 dB	45 dB
4	Silence Zone	50 dB	40 dB

- Day time is reckoned in between 6:00 a.m. and 9:00 p.m.
- Night time is reckoned in between 9:00 p.m. and 6:00 a.m.
- Silence zone is referred as areas up to 100 meters around such premises as hospitals, Educational institutions and courts. The Silence zones are to be declared by the competent authority.
- Use of vehicular horns, loudspeakers and bursting of crackers shall be banned in these Zones.

6. RESULT ANALYSIS AND DISCUSSION

Road traffic noise level was monitored in morning (7.00AM – 9.00 PM) by a digital sound level meter. Traffic volume was monitored simultaneously while monitoring noise level. Vehicles crossed at the different locations are depicted in the Fig. 6.1 to Fig. 6.10. Variation of sound level at different locations are shown in Graph 6.1 to Graph 6.10.

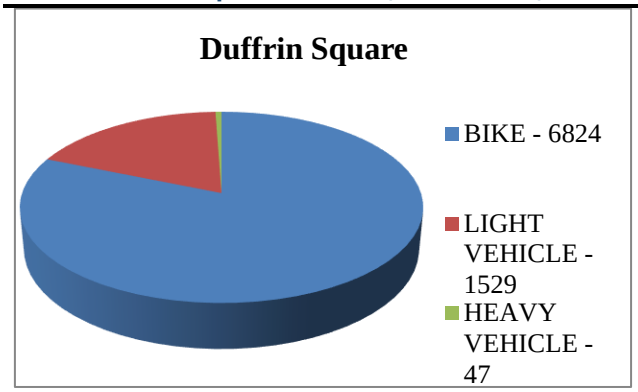


Fig.6.1 - Vehicles Crossed at Duffrin Square

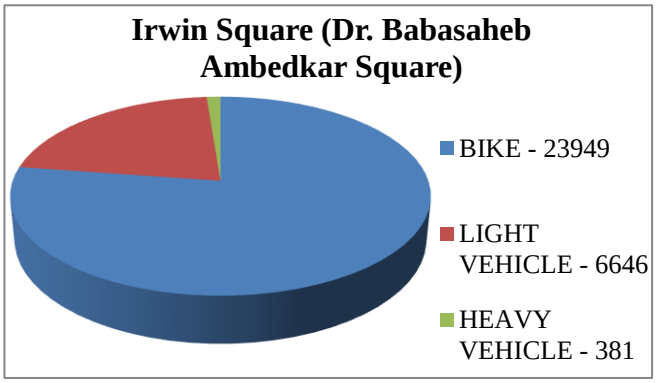


Fig 6.2- Vehicles Crossed at Irwin Square (Dr. Babasaheb Ambedkar Square)

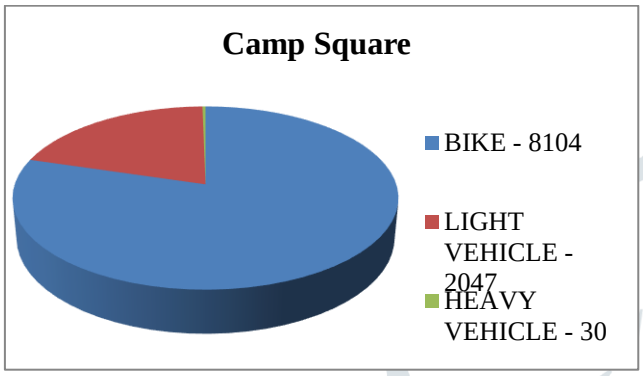


Fig 6.3- Vehicles Crossed at Camp Square

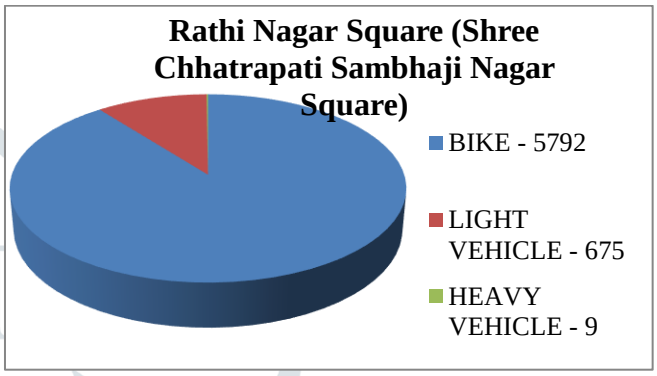


Fig 6.4- Vehicles Crossed at Rathi Nagar Square (Shree Chhatrapati Sambhaji Nagar Square)

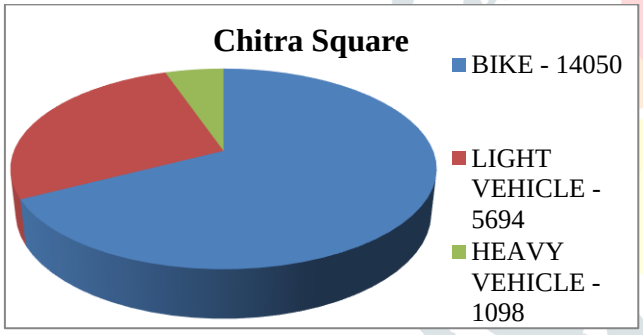


Fig 6.5- Vehicles Crossed at Chitra Square

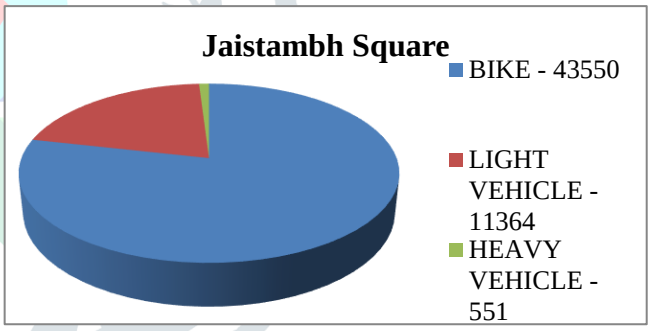


Fig 6.6- Vehicles Crossed at Jaistambh Square

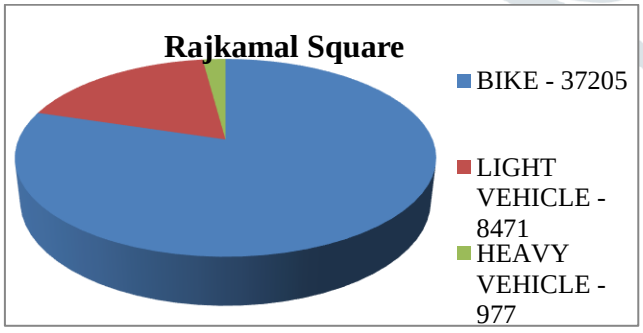


Fig 6.7- Vehicles Crossed at Rajkamal Square

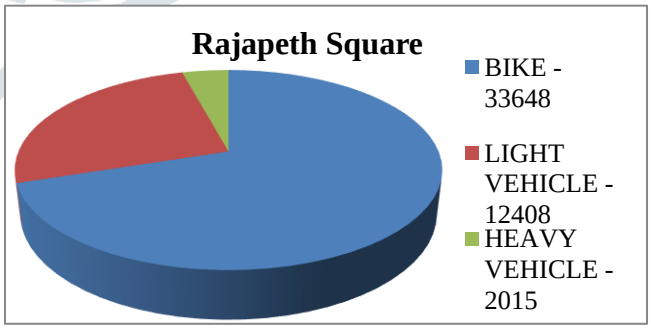


Fig 6.8- Vehicles Crossed at Rajapeth Square

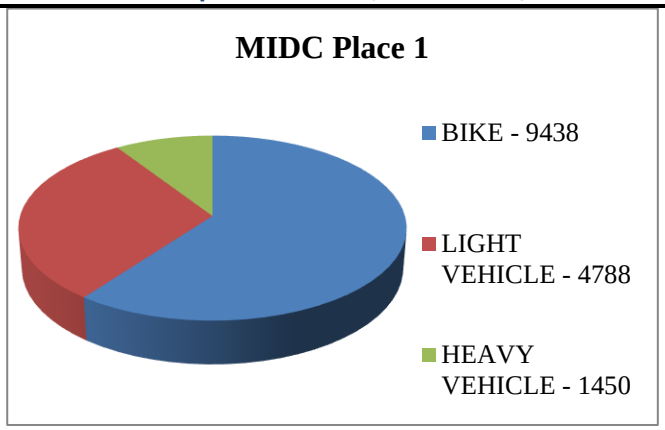


Fig 6.9- Vehicles Crossed at MIDC Place 1

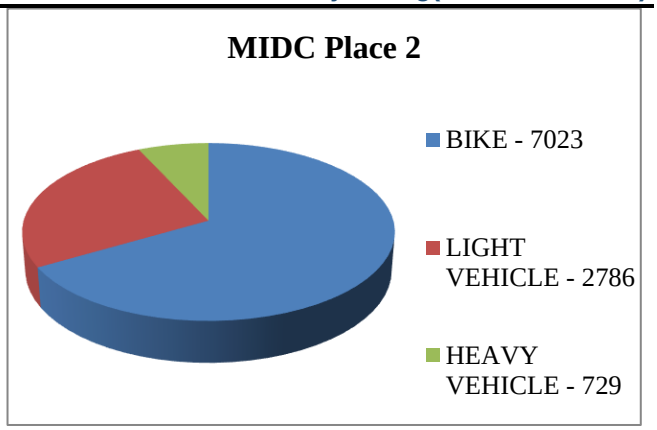
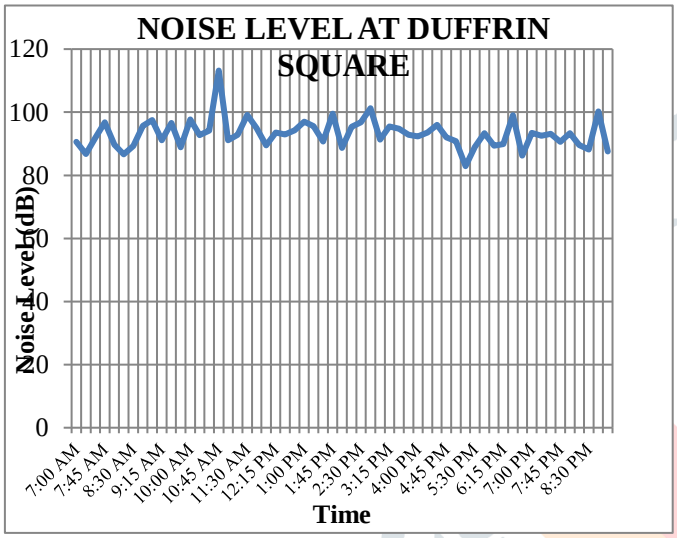
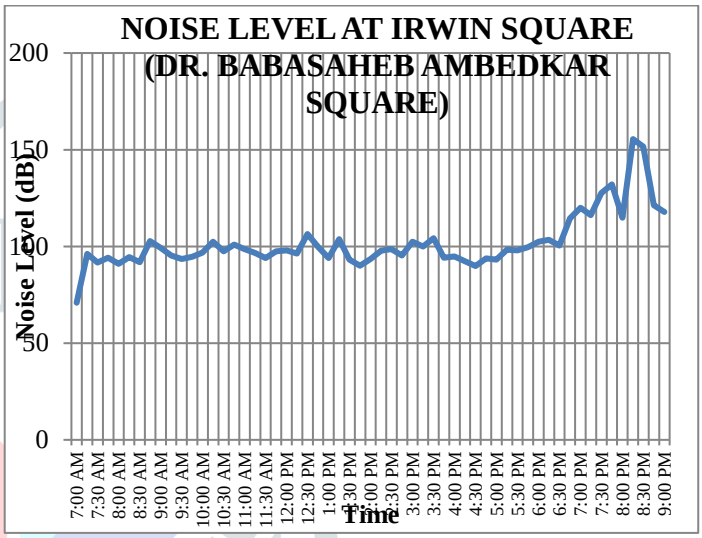


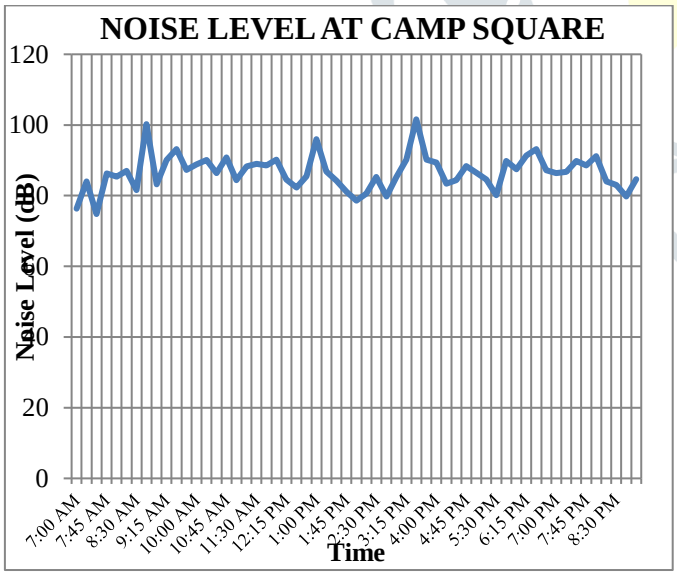
Fig 6.10- Vehicles Crossed at MIDC Place 2



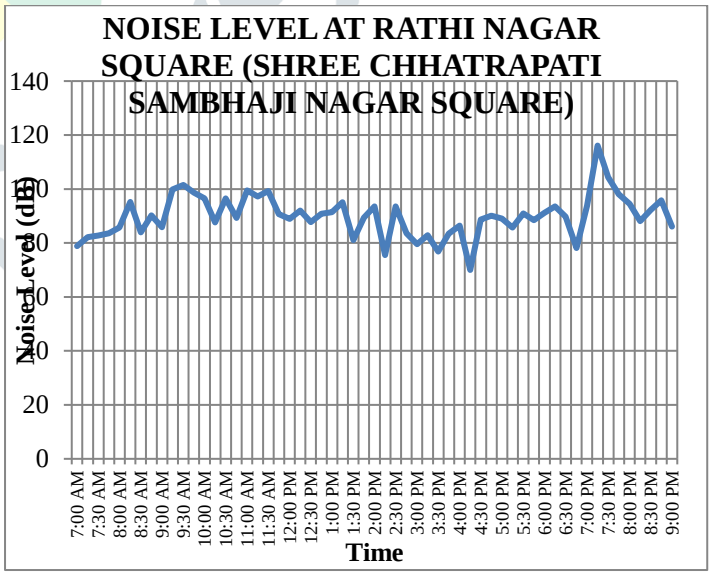
Graph 6.1- Variation of Noise Level at Duffrin Square



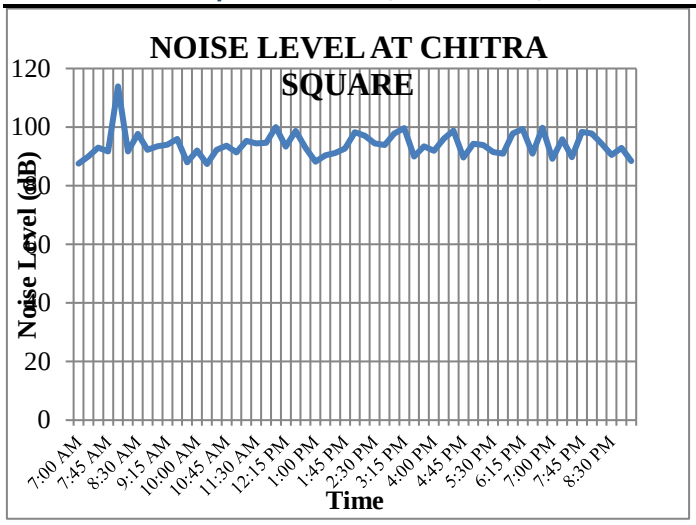
Graph 6.2- Variation of Noise Level at Irwin Square (Dr. Babasaheb Ambedkar Square)



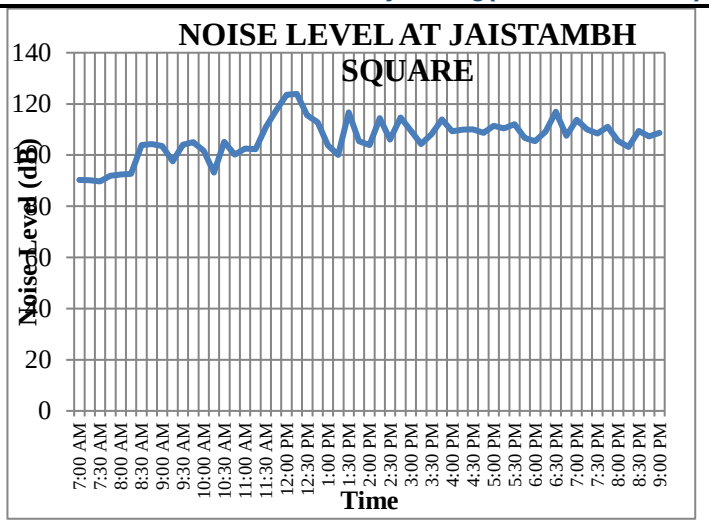
Graph 6.3- Variation of Noise Level at Camp Square



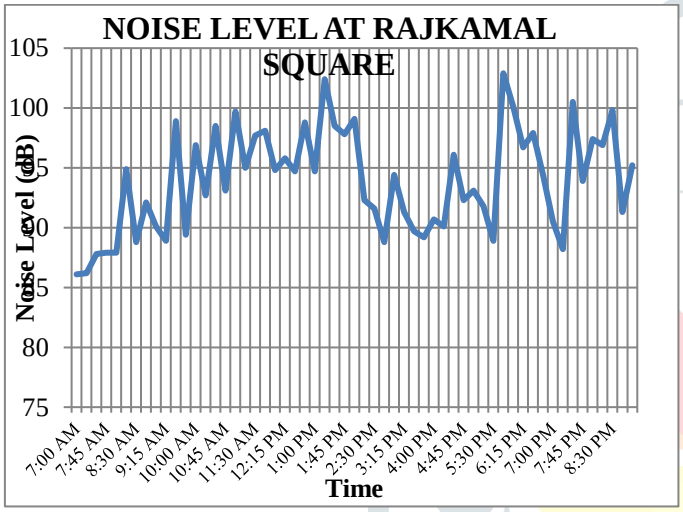
Graph 6.4- Variation of Noise Level at Rathi Nagar Square (Shree Chhatrapati Sambhaji Nagar Square)



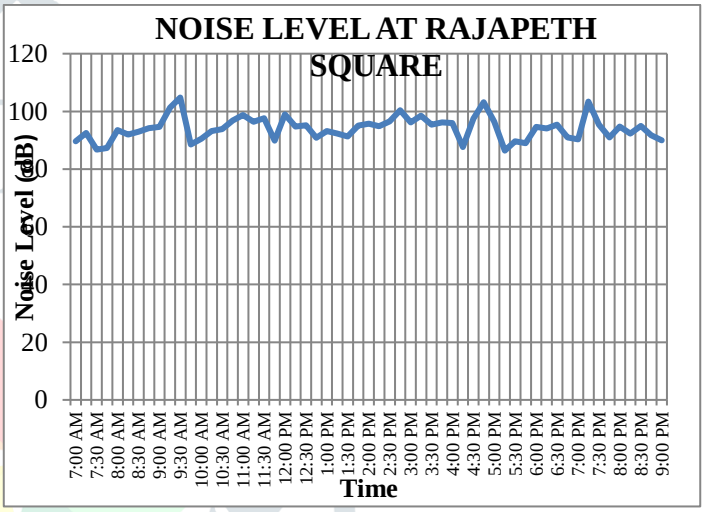
Graph 6.5- Variation of Noise Level at Chitra Square



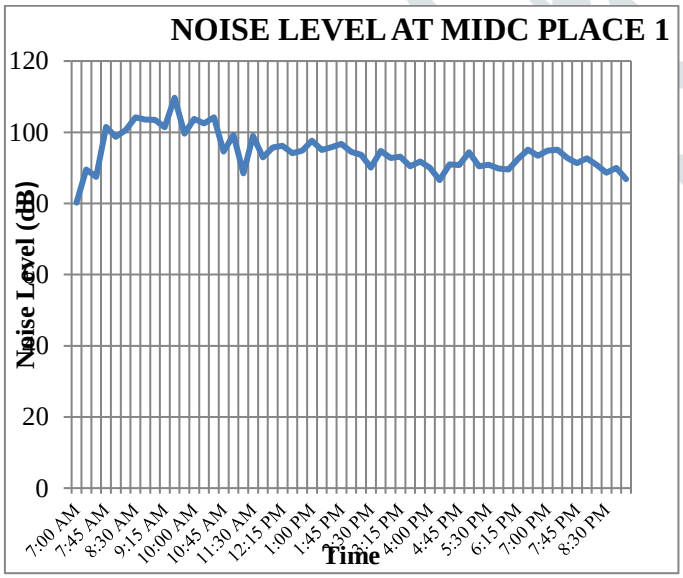
Graph 6.6- Variation of Noise Level at Jaistambh Square



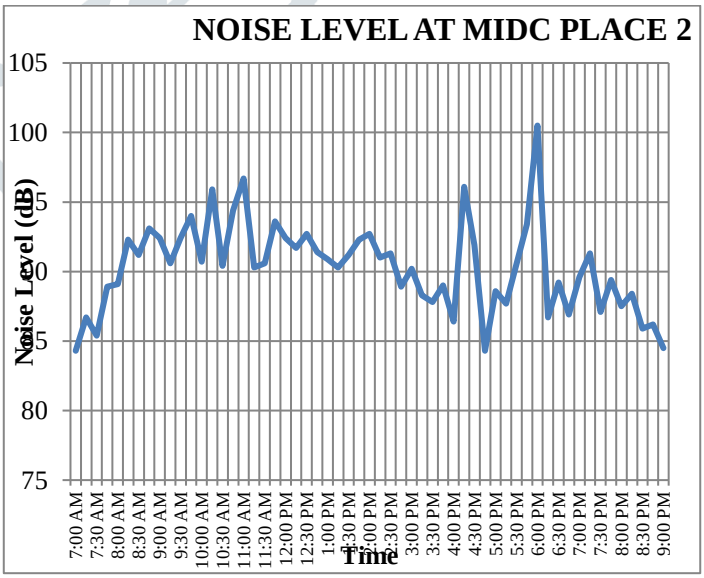
Graph 6.7- Variation of Noise Level at Rajkamal Square



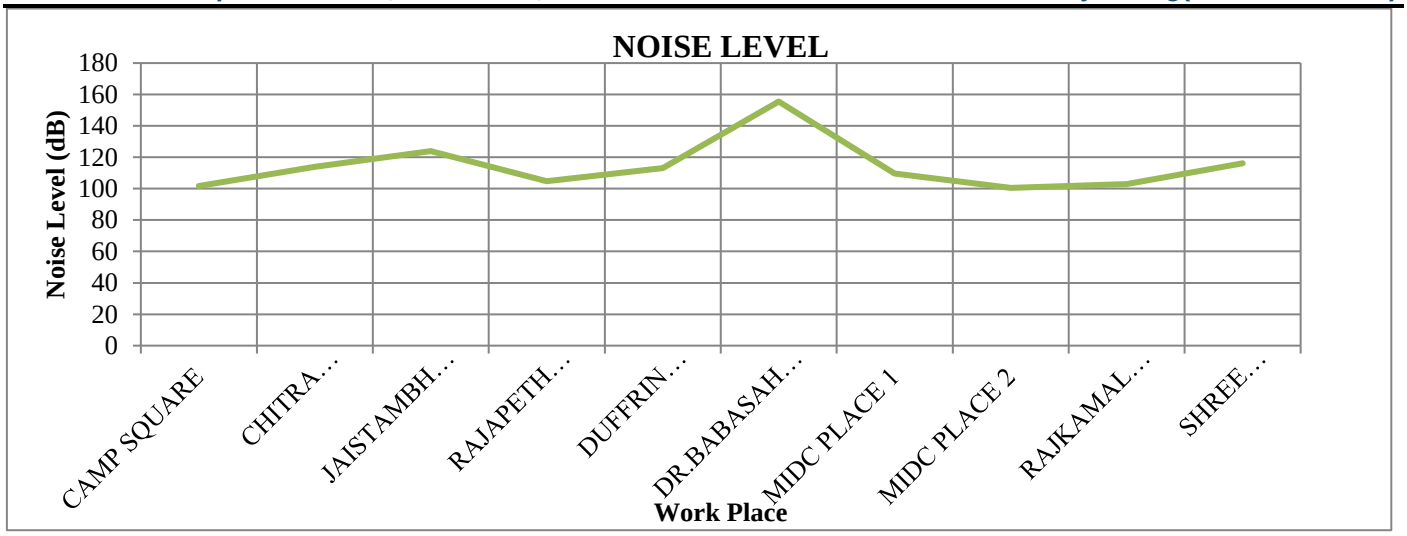
Graph 6.8- Variation of Noise Level at Rajapeth Square



Graph 6.9- Variation of Noise Level at MIDC Place 1



Graph 6.10- Variation of Noise Level at MIDC Place 2



Graph 6.11- Maximum Noise Level at Different Locations

6.1 NOISE LEVEL PARAMETERS

6.1.1 Unit of Noise

The basic unit of noise is decibels. If the amplitude of pressure fluctuations is P, the sound level in decibel is given by

$L = 10\ log\ [P/Po]\ db$

Where $Po = 2 \times 10^{-5}$, N/m^2 (amplitude of audible pressure wave). The overall sound pressure is denoted by *dB*(*A*).

6.1.2 Percentile Exceeded Sound Level (L_x) decibel

The noise level exceeded for x per cent of the time is denoted by L_x. The most common noise exceeded level used is L_{10} i.e. noise level exceeding for 10 per cent of time. It is an indication of the peak level of the intruding noise, where as L_{90} level is an indicator of the background noise level.

6.1.3 Traffic Noise Index (TNI)

It is defined as $TNI = 4(L_{10}-L_{90})+L_{90} - 30d_B(A)$

This index attempts to make an allowance for noise variability with respect to L_{10} level. It correlates with dissatisfaction towards traffic noise expressed by people. The measurement of TNI is difficult because of the uncertainty arising from background noise coming from sources other than traffic on the road being considered. Prediction is also difficult because of problem in predicting the background noise at large distance from the road.

6.1.4 Equivalent (A Weighted) Sound Level (L_{eq}).

It is combined index of common measure o environmental noise. This is the steady noise which in the measurement period would carry the same energy as the time

$L_{eq} = L_{50} + (L_{10}-L_{90})/56$

6.1.5 Noise Pollution Level (*LNP*)

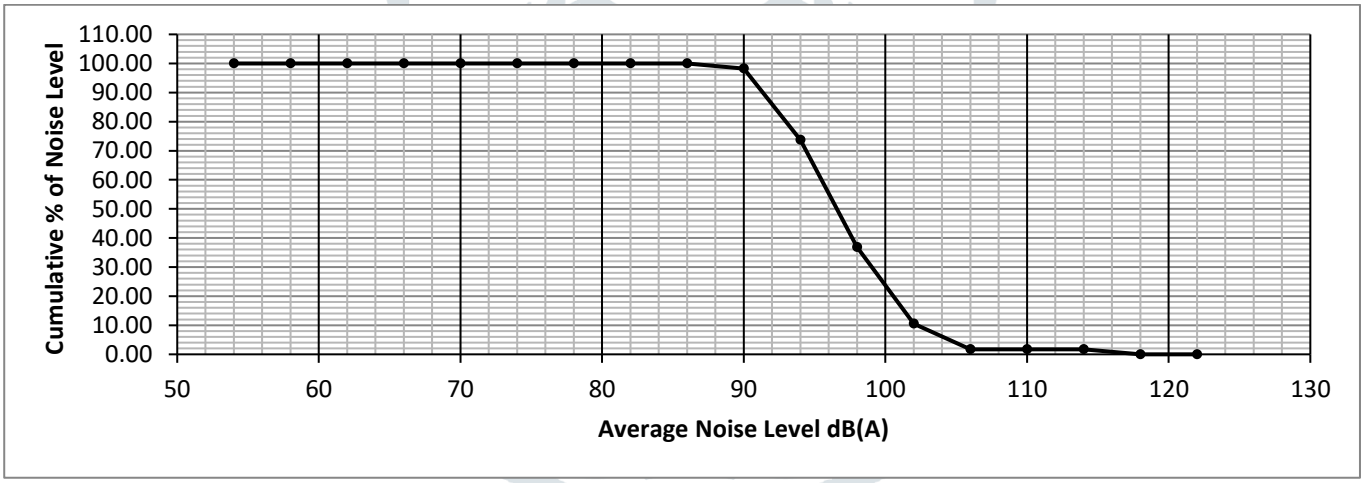
It is found that L_{eq} on an energy basis is not sufficient to describe the degree of annoyance caused by fluctuating noise. A new parameter noise pollution level is given

$LNP = L_{eq} + (L_{10}-L_{90})$

In this project, noise level survey was undertaken in ten identified squares. For the calculations of Noise Parameters the data is arranged in the tabular format as shown in Table 6.1 for the location – Duffrin Square. The values of L_{10}, L_{50}, and L_{90} for each set of observations obtained by plotting the graph with noise level dB (A) on X axis and cumulative percentage of the time observation period for which that sound level is exceeded on Y axis as shown in Fig. 6.12. Similarly, Table 6.2 to Table 6.10 are prepared for calculation of noise parameters for remaining locations. Based on these Tables, the graphs between noise level dB and cumulative percentage are shown in Graph 6.13 to Graph 6.21. The different noise parameters are presented in Table 6.11. The acceptable values of L_{eq}, LNP and TNI are 50, 74 and 74 dB(A).

Table 6.1 : Computation of Cumulative Percentage of Noise for Location – Duffrin Square

Noise Level Interval d_B(A)	Average Noise Level d_B(A)	No of Occurance	% of Time Noise Level Exist	Cumulative %
52-56	54	0	0.00	100.00
56-60	58	0	0.00	100.00
60-64	62	0	0.00	100.00
64-68	66	0	0.00	100.00
68-72	70	0	0.00	100.00
72-76	74	0	0.00	100.00
76-80	78	0	0.00	100.00
80-84	82	0	0.00	100.00
84-88	86	1	1.75	100.00
88--92	90	14	24.56	98.25
92-96	94	21	36.84	73.68
96-100	98	15	26.32	36.84
100-104	102	5	8.77	10.53
104-108	106	0	0.00	1.75
108-112	110	0	0.00	1.75
112-116	114	1	1.75	1.75
116-120	118	0	0.00	0.00
120-124	122	0	0.00	0.00



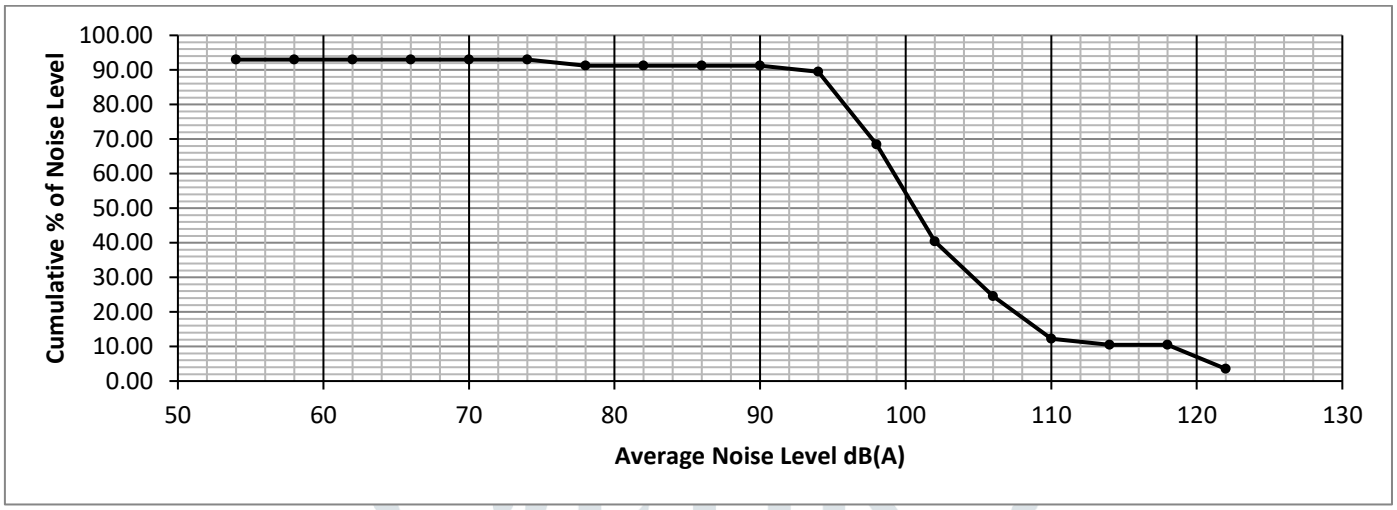
L_{10}	L_{50}	L_{90}	L_{eq}	TNI	LNP	NC
102.00	96.50	91.50	96.69	103.50	107.19	10.50

Graph 6.12 : Variation of Average Noise Level with Cumulative Percentage of Noise Level for Location Duffrin Square

Table 6.2 : Computation of Cumulative Percentage of Noise for Location – Irwin Square (Dr. Babasaheb Ambedkar Square)

Noise Level Interval d_B(A)	Average Noise Level d_B(A)	No of Occurance	% of Time Noise Level Exist	Cumulative %
52-56	54	0	0.00	92.98
56-60	58	0	0.00	92.98
60-64	62	0	0.00	92.98
64-68	66	0	0.00	92.98
68-72	70	0	0.00	92.98
72-76	74	1	1.75	92.98
76-80	78	0	0.00	91.23
80-84	82	0	0.00	91.23
84-88	86	0	0.00	91.23
88--92	90	1	1.75	91.23

92-96	94	12	21.05	89.47
96-100	98	16	28.07	68.42
100-104	102	9	15.79	40.35
104-108	106	7	12.28	24.56
108-112	110	1	1.75	12.28
112-116	114	0	0.00	10.53
116-120	118	4	7.02	10.53
120-124	122	2	3.51	3.51

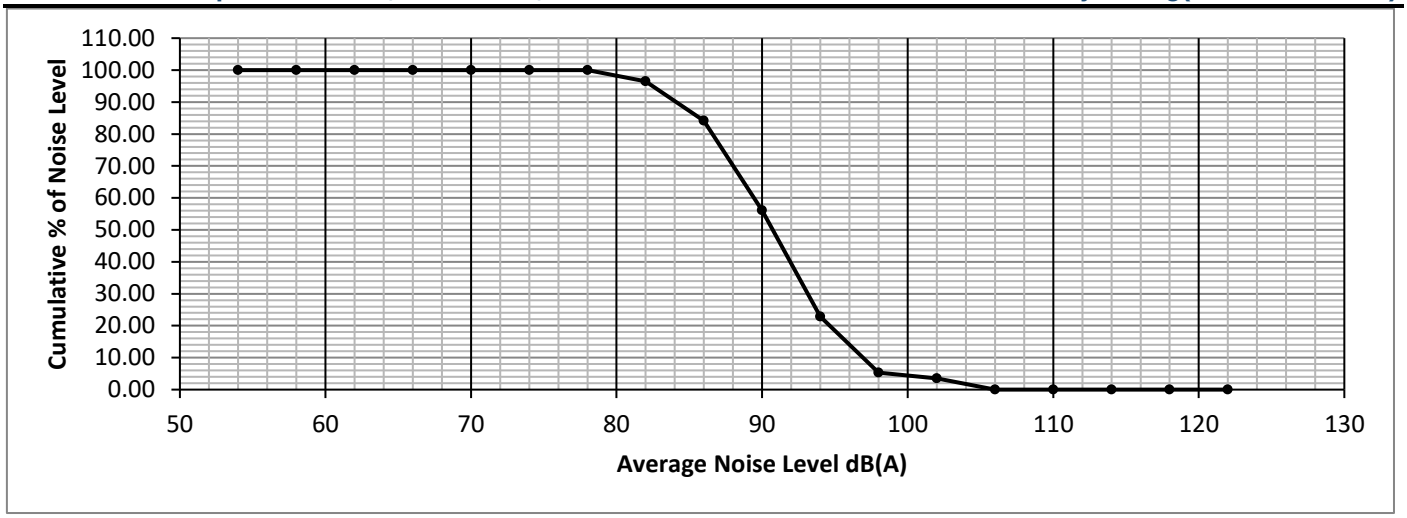


L_{10}	L_{50}	L_{90}	L_{eq}	TNI	LNP	NC
118.50	100.60	92.00	101.07	168.00	127.57	26.50

Graph 6.13 : Variation of Average Noise Level with Cumulative Percentage of Noise Level for Location- Irwin Square (Dr. Babasaheb Ambedkar Square)

Table 6.3 : Computation of Cumulative Percentage of Noise for Location – Camp Square

Noise Level Interval d_B(A)	Average Noise Level d_B(A)	No of Occurance	% of Time Noise Level Exist	Cumulative %
52-56	54	0	0.00	100.00
56-60	58	0	0.00	100.00
60-64	62	0	0.00	100.00
64-68	66	0	0.00	100.00
68-72	70	0	0.00	100.00
72-76	74	0	0.00	100.00
76-80	78	2	3.51	100.00
80-84	82	7	12.28	96.49
84-88	86	16	28.07	84.21
88—92	90	19	33.33	56.14
92-96	94	10	17.54	22.81
96-100	98	1	1.75	5.26
100-104	102	2	3.51	3.51
104-108	106	0	0.00	0.00
108-112	110	0	0.00	0.00
112-116	114	0	0.00	0.00
116-120	118	0	0.00	0.00
120-124	122	0	0.00	0.00

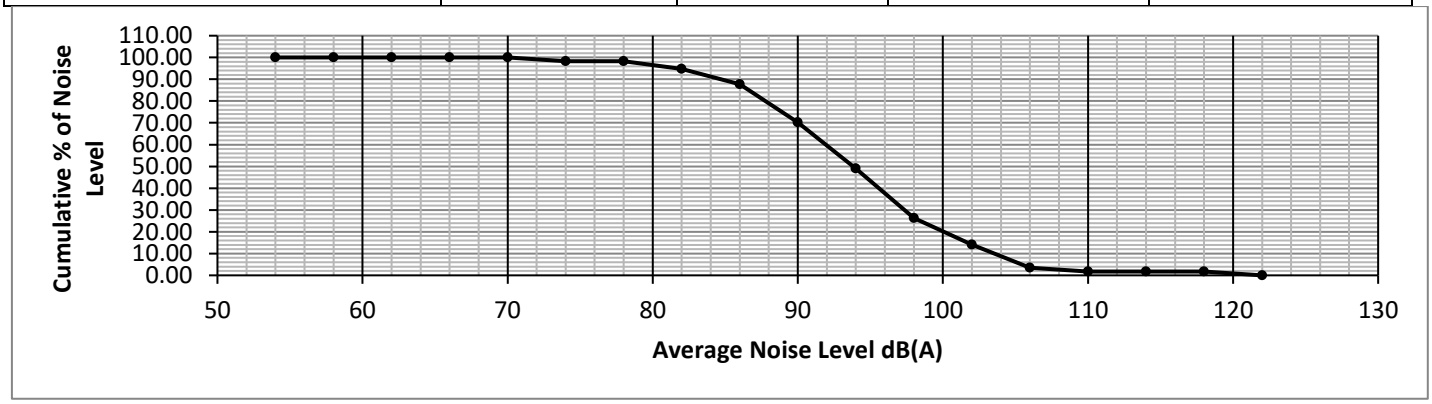


L_{10}	L_{50}	L_{90}	L_{eq}	TNI	LNP	NC
97.00	90.80	83.80	91.04	106.60	104.24	13.20

Graph 6.14 : Variation of Average Noise Level with Cumulative Percentage of Noise Level for Location - Camp Square

Table 6.4 : Computation of Cumulative Percentage of Noise for Location – Rathi Nagar Square (Shree Chhatrapati Sambhaji Nagar Square)

Noise Level Interval d_B(A)	Average Noise Level d_B(A)	No of Occurance	% of Time Noise Level Exist	Cumulative %
52-56	54	0	0.00	100.00
56-60	58	0	0.00	100.00
60-64	62	0	0.00	100.00
64-68	66	0	0.00	100.00
68-72	70	1	1.75	100.00
72-76	74	0	0.00	98.25
76-80	78	2	3.51	98.25
80-84	82	4	7.02	94.74
84-88	86	10	17.54	87.72
88--92	90	12	21.05	70.18
92-96	94	13	22.81	49.12
96-100	98	7	12.28	26.32
100-104	102	6	10.53	14.04
104-108	106	1	1.75	3.51
108-112	110	0	0.00	1.75
112-116	114	0	0.00	1.75
116-120	118	1	1.75	1.75
120-124	122	0	0.00	0.00

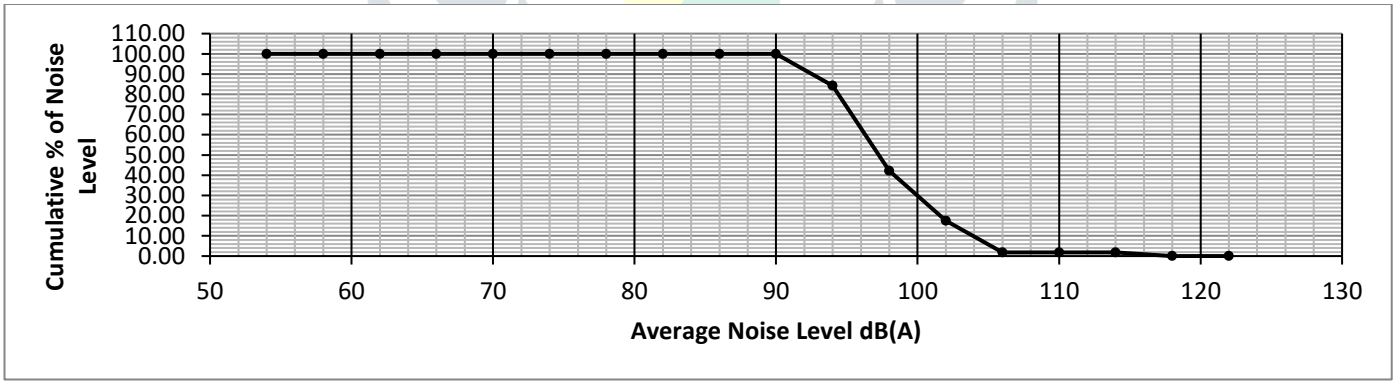


L_{10}	L_{50}	L_{90}	L_{eq}	TNI	LNP	NC
103.00	94.00	85.00	94.32	127.00	112.32	18.00

Graph 6.15 : Variation of Average Noise Level with Cumulative Percentage of Noise Level for Location – Rathi Nagar Square (Shree Chhatrapati Sambhaji Nagar Square)

Table 6.5 : Computation of Cumulative Percentage of Noise for Location – Chitra Square

Noise Level Interval d_B(A)	Average Noise Level d_B(A)	No of Occurance	% of Time Noise Level Exist	Cumulative %
52-56	54	0	0.00	100.00
56-60	58	0	0.00	100.00
60-64	62	0	0.00	100.00
64-68	66	0	0.00	100.00
68-72	70	0	0.00	100.00
72-76	74	0	0.00	100.00
76-80	78	0	0.00	100.00
80-84	82	0	0.00	100.00
84-88	86	0	0.00	100.00
88--92	90	9	15.79	100.00
92-96	94	24	42.11	84.21
96-100	98	14	24.56	42.11
100-104	102	9	15.79	17.54
104-108	106	0	0.00	1.75
108-112	110	0	0.00	1.75
112-116	114	1	1.75	1.75
116-120	118	0	0.00	0.00
120-124	122	0	0.00	0.00



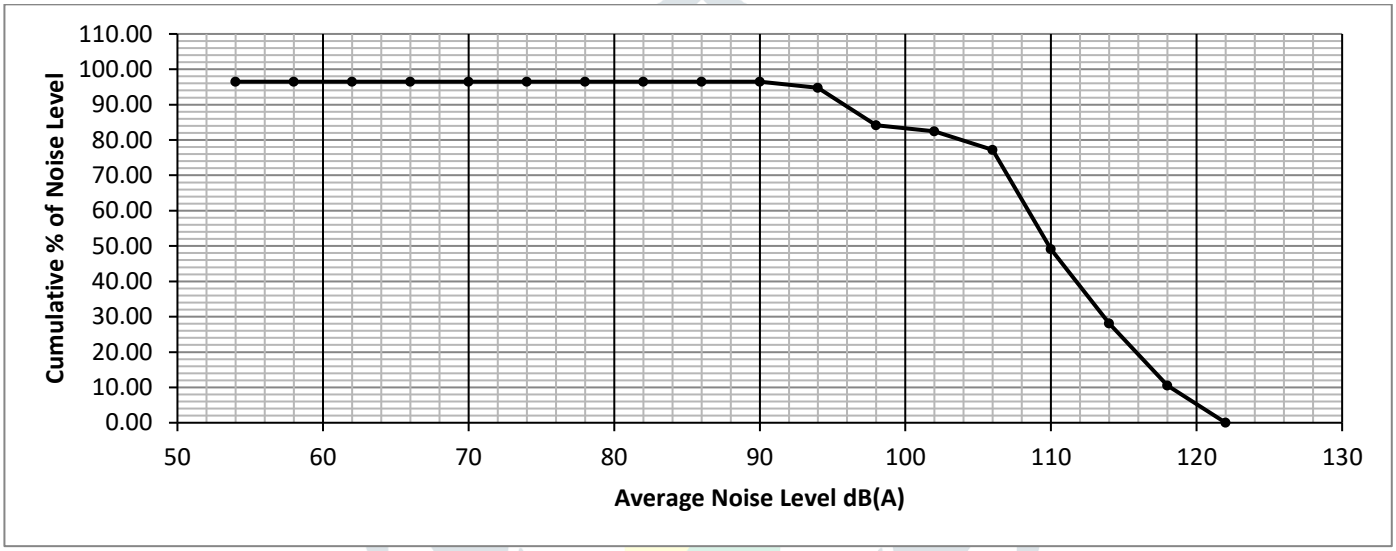
L_{10}	L_{50}	L_{90}	L_{eq}	TNI	LNP	NC
103.50	97.25	92.50	97.45	106.50	108.45	11.00

Graph 6.16 : Variation of Average Noise Level with Cumulative Percentage of Noise Level for Location - Chitra Square

Table 6.6 : Computation of Cumulative Percentage of Noise for Location – Jaistambh Square

Noise Level Interval d_B(A)	Average Noise Level d_B(A)	No of Occurance	% of Time Noise Level Exist	Cumulative %
52-56	54	0	0.00	96.49
56-60	58	0	0.00	96.49
60-64	62	0	0.00	96.49
64-68	66	0	0.00	96.49

68-72	70	0	0.00	96.49
72-76	74	0	0.00	96.49
76-80	78	0	0.00	96.49
80-84	82	0	0.00	96.49
84-88	86	0	0.00	96.49
88--92	90	1	1.75	96.49
92-96	94	6	10.53	94.74
96-100	98	1	1.75	84.21
100-104	102	3	5.26	82.46
104-108	106	16	28.07	77.19
108-112	110	12	21.05	49.12
112-116	114	10	17.54	28.07
116-120	118	6	10.53	10.53
120-124	122	0	0.00	0.00



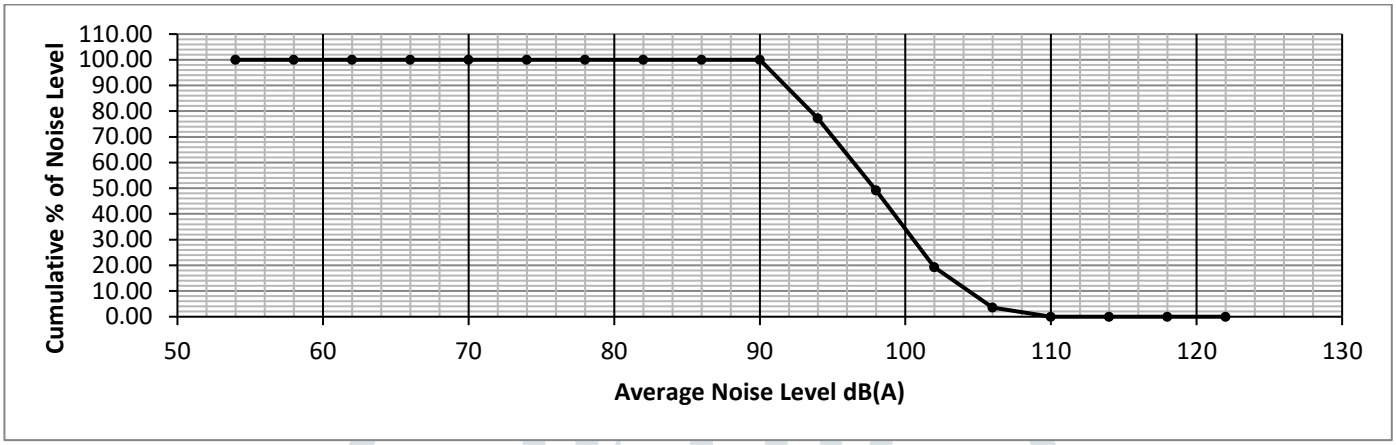
L_{10}	L_{50}	L_{90}	L_{eq}	TNI	LNP	NC
118.25	109.75	95.50	110.16	156.50	132.91	22.75

Graph 6.17 : Variation of Average Noise Level with Cumulative Percentage of Noise Level for Location Jaistambh Square

Table 6.7 : Computation of Cumulative Percentage of Noise for Location – Rajkamal Square

Noise Level Interval d_B(A)	Average Noise Level d_B(A)	No of Occurance	% of Time Noise Level Exist	Cumulative %
52-56	54	0	0.00	100.00
56-60	58	0	0.00	100.00
60-64	62	0	0.00	100.00
64-68	66	0	0.00	100.00
68-72	70	0	0.00	100.00
72-76	74	0	0.00	100.00
76-80	78	0	0.00	100.00
80-84	82	0	0.00	100.00
84-88	86	0	0.00	100.00
88—92	90	13	22.81	100.00
92-96	94	16	28.07	77.19

96-100	98	17	29.82	49.12
100-104	102	9	15.79	19.30
104-108	106	2	3.51	3.51
108-112	110	0	0.00	0.00
112-116	114	0	0.00	0.00
116-120	118	0	0.00	0.00
120-124	122	0	0.00	0.00

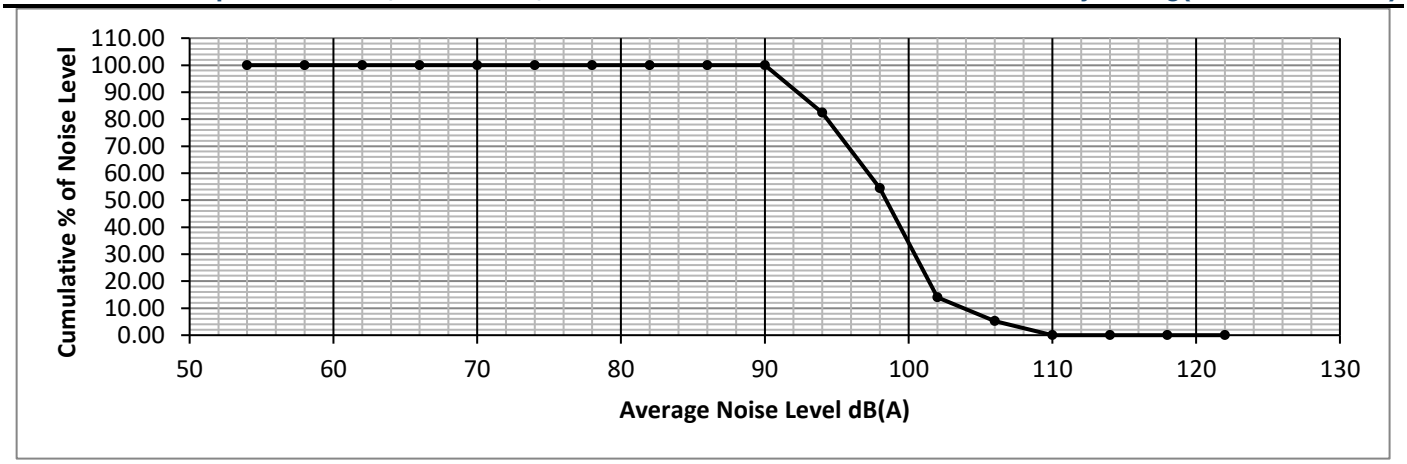


L_{10}	L_{50}	L_{90}	L_{eq}	TNI	LNP	NC
104.25	97.50	91.50	97.73	112.50	110.48	12.75

Graph 6.18 : Variation of Average Noise Level with Cumulative Percentage of Noise Level for Location - Rajkamal Square

Table 6.8 : Computation of Cumulative Percentage of Noise for Location – Rajapeth Square

Noise Level Interval d_B(A)	Average Noise Level d_B(A)	No of Occurance	% of Time Noise Level Exist	Cumulative %
52-56	54	0	0.00	100.00
56-60	58	0	0.00	100.00
60-64	62	0	0.00	100.00
64-68	66	0	0.00	100.00
68-72	70	0	0.00	100.00
72-76	74	0	0.00	100.00
76-80	78	0	0.00	100.00
80-84	82	0	0.00	100.00
84-88	86	0	0.00	100.00
88—92	90	10	17.54	100.00
92-96	94	16	28.07	82.46
96-100	98	23	40.35	54.39
100-104	102	5	8.77	14.04
104-108	106	3	5.26	5.26
108-112	110	0	0.00	0.00
112-116	114	0	0.00	0.00
116-120	118	0	0.00	0.00
120-124	122	0	0.00	0.00

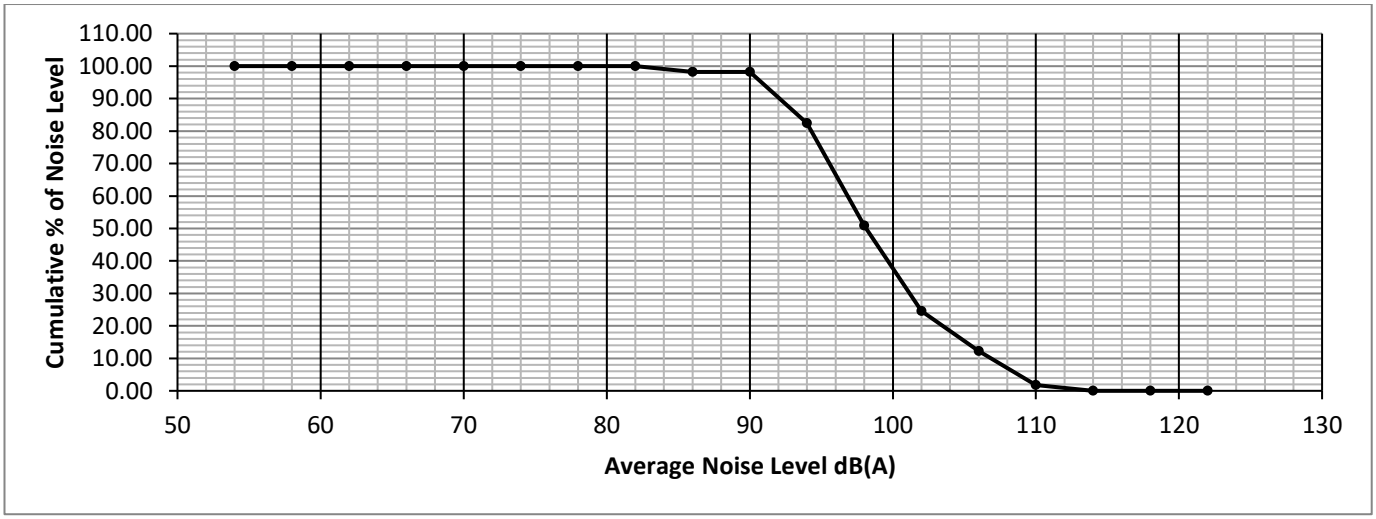


L_{10}	L_{50}	L_{90}	L_{eq}	TNI	LNP	NC
103.50	98.25	92.25	98.45	107.25	109.70	11.25

Graph 6.19 : Variation of Average Noise Level with Cumulative Percentage of Noise Level for Location - Rajapeth Square

Table 6.9 : Computation of Cumulative Percentage of Noise for Location – MIDC Place 1

Noise Level Interval d_B(A)	Average Noise Level d_B(A)	No of Occurance	% of Time Noise Level Exist	Cumulative %
52-56	54	0	0.00	100.00
56-60	58	0	0.00	100.00
60-64	62	0	0.00	100.00
64-68	66	0	0.00	100.00
68-72	70	0	0.00	100.00
72-76	74	0	0.00	100.00
76-80	78	0	0.00	100.00
80-84	82	1	1.75	100.00
84-88	86	0	0.00	98.25
88—92	90	9	15.79	98.25
92-96	94	18	31.58	82.46
96-100	98	15	26.32	50.88
100-104	102	7	12.28	24.56
104-108	106	6	10.53	12.28
108-112	110	1	1.75	1.75
112-116	114	0	0.00	0.00
116-120	118	0	0.00	0.00
120-124	122	0	0.00	0.00

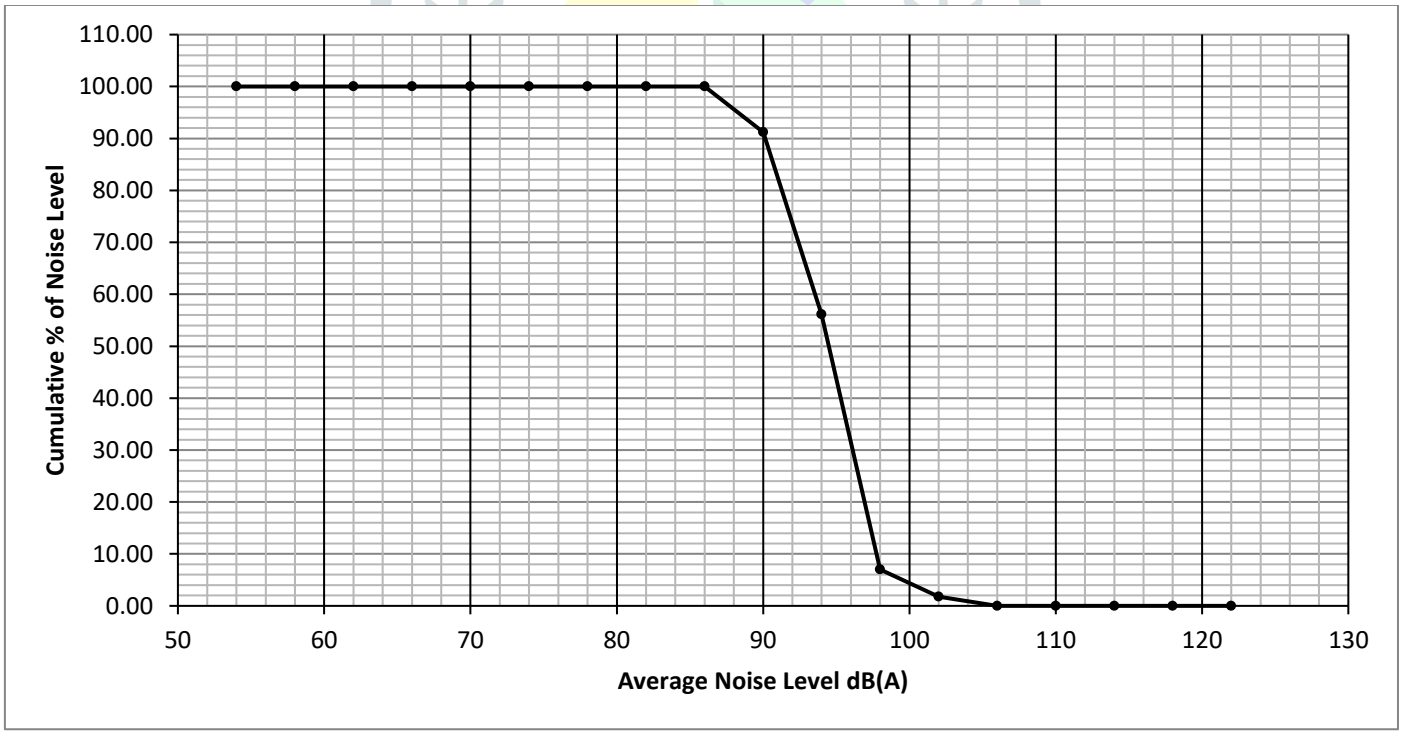


L_{10}	L_{50}	L_{90}	L_{eq}	TNI	LNP	NC
106.75	97.75	91.75	98.02	121.75	113.02	15.00

Graph 6.20 : Variation of Average Noise Level with Cumulative Percentage of Noise Level for Location – MIDC Place 1

Table 6.10 : Computation of Cumulative Percentage of Noise for Location – MIDC Place 2

Noise Level Interval d_B(A)	Average Noise Level d_B(A)	No of Occurance	% of Time Noise Level Exist	Cumulative %
52-56	54	0	0.00	100.00
56-60	58	0	0.00	100.00
60-64	62	0	0.00	100.00
64-68	66	0	0.00	100.00
68-72	70	0	0.00	100.00
72-76	74	0	0.00	100.00
76-80	78	0	0.00	100.00
80-84	82	0	0.00	100.00
84-88	86	5	8.77	100.00
88—92	90	20	35.09	91.23
92-96	94	28	49.12	56.14
96-100	98	3	5.26	7.02
100-104	102	1	1.75	1.75
104-108	106	0	0.00	0.00
108-112	110	0	0.00	0.00
112-116	114	0	0.00	0.00
116-120	118	0	0.00	0.00
120-124	122	0	0.00	0.00



L_{10}	L_{50}	L_{90}	L_{eq}	TNI	LNP	NC
97.75	94.25	89.75	94.39	91.75	102.39	8.00

Graph 6.21 : Variation of Average Noise Level with Cumulative Percentage of Noise Level for Location – MIDC Place 2

Table 6.11 : Noise Level Parameters at Different Locations

SN	Location	Type of Zone	L_{10}	L_{50}	L_{90}	L_{eq}	TNI	LNP	NC
1	Duffrin Square	Silence Zone	102.00	96.50	91.50	96.69	103.50	107.19	10.50
2	Irwin Square (Dr. Babasaheb Ambedkar Square)	Silence Zone	118.50	100.60	92.00	101.07	168.00	127.57	26.50
3	Camp Square	Residential Zone	97.00	90.80	83.80	91.04	106.60	104.24	13.20
4	Rathi Nagar (Shree Chhatrapati Sambhaji Nagar Square)	Residential Zone	103.00	94.00	85.00	94.32	127.00	112.32	18.00
5	Chitra Square	Commercial Zone	103.50	97.25	92.50	97.45	106.50	108.45	11.00
6	Jaistambh Square	Commercial Zone	118.25	109.75	95.50	110.16	156.50	132.91	22.75
7	Rajkamal Square	Commercial Zone	104.25	97.50	91.50	97.73	112.50	110.48	12.75
8	Rajapeth Square	Commercial Zone	103.50	98.25	92.25	98.45	107.25	109.70	11.25
9	MIDC Place 1	Industrial Zone	106.75	97.75	91.75	98.02	121.75	113.02	15.00
10	MIDC Place 2	Industrial Zone	97.75	94.25	89.75	94.39	91.75	102.39	8.00

The minimum and maximum SPL(sound pressure level) recorded ranged between 70 to 116.1dB at all selected residential zone of Amravati city While the permissible limit is 55dB for day time and 45dB for night time. The minimum and maximum SPL recorded ranged between 70.9 to 155.5 dB at all selected silence zone of Amravati city while the permissible limit is 50dB for day time and 40dB for night time. The minimum and maximum SPL recorded ranged between 80.2 to 109.7 dB at all selected Industrial zone while the permissible limit is 75 dB for day time and 70 dB for night time. The minimum and maximum SPL recorded ranged between 86.1 to123.9 dB at all selected commercial zones of Amravati city.

In the present study, the noise level recorded was higher than prescribed Indian Standards at all selected sites. Important factors affecting noise values are continuity of the city centre traffic, dimension of the roads, position of the roads and the road surface material with city centre cross road signal system. Traffic noise increases with increasing density of traffic related traffic composition, road slope, road width, road surface structure distance.

7. CONCLUSION

Noise levels in different zones of Amravati city like silence zone, industrial zone, commercial zone, residential zone are measured and analyzed. The analysis has revealed that the noise pollution levels are more than permissible limits. Traffic noise was found to be interfering with daily activities. Concluding remarks are as follows.

1) The noise level at all the ten locations under study have exceeded the acceptable limits as laid down by Central Pollution Control Board.

2) Higher the volume of traffic, higher is the value of the traffic noise parameters.

3) Higher percentage of slow moving vehicles retard the mixed traffic stream and consequently also reduce LNP and TNI.

4) It has been observed that poor surface condition of road area, poor condition of vehicles are also responsible to a great extent for higher noise level.

5) Heavily loaded vehicle, tempo, auto-rickshaw, tractor-trolley are main reasons of highly intolerable noise-level.

RECOMMENDATIONS

1) Special provisions in the law should be made to control the noise pollution. It should be implemented strictly.

2) The necessary preventive measures should be taken in different areas such as proper maintenance of vehicles and roads, proper checking of vehicles, poor and old vehicle should be banned and plantation should be encouraged to improve the present status of human health, to reduce the noise levels and to improve the environment of the Amravati city.

3) Road side tress and road divider with shrubs considerably reduce noise pollution.

4) There is an urgent need for an alternative public transport system. The government should strictly enforce traffic rules. The Government should equip vehicles with approach horns and silencers. Environment protection agency should re-determine the limit of noise to protect healthy and welfare to set noise emission standard to major source of noise pollution in the environment.

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