



## Study of Noise Level in Commercial Zone and Industrial Zone of Jabalpur City

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**Abstract**—Noise pollution is recognized as a major problem for the quality of life in urban area all over the world. Increasing industrialization, urbanization, and commercialization of urban area increase the noise pollution. Traffic is the dominating source of noise. Noise pollution is considered as environmental stressor which now becomes a problem of all over the world especially in developing countries like India. Noise as pollutant produce contaminated environment that become a nuisance and affect the health of a person, his activities and mental abilities. Today one of the major environmental pollution due to anthropogenic activities is noise pollution.

Jabalpur city (Union Territory) is second biggest city of Madhya Pradesh having population of 12.81 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 different zone of Jabalpur city in 2018. Noise level study was conducted at 8 different locations in three different zones (commercial zone, Industrial zone) of Jabalpur and recorded noise data are interpreted in form of parameter  $Leq$ ,  $L10$ ,  $L50$ ,  $L90$ ,  $LNP$ .

The  $Leq$  Value in different hours of different location 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 in per at hour. This study reveals different 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, Sound Level Meter, Noise Parameter, commercial zone, Industrial zone, Jabalpur city

### 1. INTRODUCTION

Sound is atmospheric or airborne vibration perceptible to ear. Noise is usually unwanted, unpleasant or disagreeable sound that causes uneasiness. Noise is a form of pollution because it can cause several physiological and psychological effects on human being. According to W.H.O (World Health Organization) noise pollution is now a day the third most hazardous environmental type of pollution preceding only by air and water pollution. Migration of people from rural to urban area, extension of urban communities, infrastructure development, population growth and urbanization are important factors bringing about motorization and resulting increment in level of different urban contamination. In India noise pollution

in urban centre is gradually increases over the years. According to past survey urban centre in India have revealed that noise level are much higher than the prescribed standards. This resulted that proportion of people exposed to noise is greatly increased and has direct and indirect affect to the people that can lead to the health hazard. Some of the major health hazard causes by excessive exposure to noise are auditory damage, blood pressure, headache, migraine, increase anger, insomnia, fatigue, high blood pressure, high pulse rate, grater perspiration etc.

Noise is term used for any unwanted sound, thus it is a subjective term and varies from person to person. Particular loudness may not be liked by one person, whereas the same loudness may be quite pleasant to another person. Increasing industrialization, urbanization, and commercialization of urban area increase the noise pollution. Traffic is the dominating source of noise. The effect of noise on human health are physical effect such as hearing effect, Physiological effect such as increased blood pressure, irregularity of heart rhythms, Psychological effect such as sleeplessness, going to sleep late, Irritability annoyance and stress. The government of India has introduced the noise pollution (regulation and control) Rule 2000 for the noise producing and generating source which clearly classifies our environment in to four categories and specifies the allowable limit of noise separately for day and night time for different urban environments.

In India Noise pollution studies were carried out for various cities. Vijay Sharma, Pankaj Saini, Sudhanshu Kaushik and B D Joshi 2010 [13] studied noise level of different zone of Haridwar city Uttarakhand state during working day and non working day noise level of selected within city is higher during working day as compared to non working day except residential zone .

## 2. STUDY AREA

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 12.81 lakh. Jabalpur is contributing in country's defence by having Gun Carriage Factory, Ordnance Factory Khamaria, Vehicle Factory, 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. Beside the general requirement of calamity in some of the areas are highly noisy whereas some areas are reasonably calm. To study the intensity of noise pollution in re commercial zone, Industrial zone of Jabalpur city monitoring of noise level will be conducted as per guideline of the central pollution control board (CPCB) India .Total 8 location identified prior to monitoring that are listed below

**Table 1. Survey Locations which have to Survey**

Zone	Location Taken
Commercial Zone	1. Civic Center
	2. Bada Fawara
	3. Shastri Bridge
	4. Russel Chowk
	5. Damoh Naka
Industrial Area	1. Richai
	2. Adhartal
	3. Gohalpur

## 3. METHODOLOGY

Sound level will be measured by following standard procedure prescribed by CPCB using calibrated sound level meter Lurton SLM-100 with measuring range from 34-134 dB(A) between 8am to 9pm 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 to 10 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. 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. 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  $L_{eq}$ ,  $L_{10}$ ,  $L_{50}$ ,  $L_{90}$ ,  $L_{NP}$  has been evaluated to reveal the extent of noise pollution.

$L_{eq}$  - It is 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.

$L_{NP}$  - Noise pollution level  $L_{NP} = L_{eq} + (L_{10} - L_{90})$

The noise levels were calculated in ( ) using the following formula.

**Table 2: The Ambient Air Quality Standards in respect of Noise given by CPCB**

Area	Category of Area Zone	Limits in dB(A) *	
		Day Time	Night Time
(A)	Commercial Zone	65	55
(B)	Industrial Area	75	70

### Commercial Area

Noise parameters (  $L_{eq}$ ,  $L_{10}$ ,  $L_{50}$ ,  $L_{90}$ , and  $L_{NP}$ ) at different monitored location of Commercial zone at different time interval

**Table 3: Zone : Commercial Area Date : 20/11/2018 Location CIVIC CENTER**

TIME	$L_{eq}$	$L_{10}$	$L_{50}$	$L_{90}$	$L_{NP}$
08AM-09AM	61.2	62.4	61.3	58.8	64.8
09AM-10AM	68.0	69.5	67.9	65.8	71.7
10AM-11AM	66.5	69.8	65.8	63.0	73.3
11AM-12PM	64.7	67.0	63.9	62.4	69.3
12PM-01PM	65.3	67.4	65.3	62.8	69.9
02PM-03PM	61.7	63.7	61.3	59.1	66.3
03PM-04PM	61.4	63.0	61.3	59.3	65.1
04PM-05PM	63.1	65.4	63.0	60.4	68.1
05PM-06PM	65.1	67.0	64.4	63.0	69.1
06PM-07PM	66.6	68.3	66.8	63.8	71.1
07PM-08PM	62.0	63.7	62.0	59.4	66.3
08PM-09PM	63.2	64.9	62.1	60.2	67.9

### CIVIC CENTER

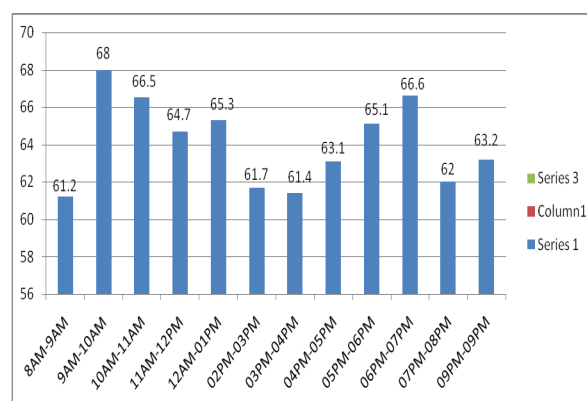


Figure 1: Temporal distribution of equivalent noise level  $L_{eq}$  dB near Civic Center

**Table 4: Zone : Commercial Area Date : 27/11/2018 Location BADA FAWARA**

TIME	L <sub>eq</sub>	L <sub>10</sub>	L <sub>50</sub>	L <sub>90</sub>	L <sub>NP</sub>
08AM-09AM	59.6	62.5	56.6	55.8	66.3
09AM-10AM	61.3	62.4	59.1	56.6	67.1
10AM-11AM	57.6	58.2	56.3	55.9	59.9
11AM-12PM	60.2	62.3	59.2	56.4	66.1
12PM-01PM	65.5	68.4	63.2	61.6	73.3
02PM-03PM	60.8	61.3	58.9	57.5	64.6
03PM-04PM	60.5	60.9	58.2	56.2	65.2
04PM-05PM	61.2	61.9	59.2	58.7	64.4
05PM-06PM	60.5	61.5	59.8	56.3	65.7
06PM-07PM	61.1	62.8	60.3	56.7	68.0
07PM-08PM	63.5	66.5	62.3	58.2	71.8
08PM-09PM	64.3	66.4	62.5	59.6	71.1

**Table 5: Zone :Commercial Area Date : 28/11/2018 Location SHASTRI BRIDGE**

TIME	L <sub>eq</sub>	L <sub>10</sub>	L <sub>50</sub>	L <sub>90</sub>	L <sub>NP</sub>
08AM-09AM	66.3	65.9	62.3	56.2	76.0
09AM-10AM	69.5	72.3	65.4	60.7	81.1
10AM-11AM	72.3	71.8	69.3	66.5	77.6
11AM-12PM	70.2	72.6	68.1	64.9	77.9
12PM-01PM	71.3	72.6	67.5	62.4	81.5
02PM-03PM	61.3	63.5	57.4	52.3	72.5
03PM-04PM	62.3	65.4	61.9	56.8	70.9
04PM-05PM	66.5	67.8	64.2	58.4	75.9
05PM-06PM	67.4	67.4	64.2	58.9	76.0
06PM-07PM	70.2	71.6	66.5	63.8	78.0
07PM-08PM	68.2	70.6	66.9	64.8	74.0
08PM-09PM	70.8	72.1	65.7	58.5	84.4

**BADA FAWARA**

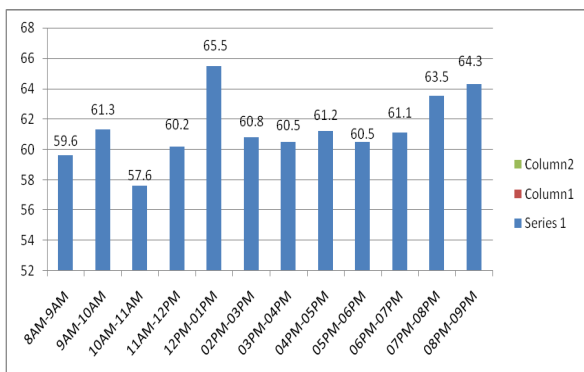


Figure 2: Temporal distribution of equivalent noise level Leq dB near Bada Fawara

**SHASTRI BRIDGE**

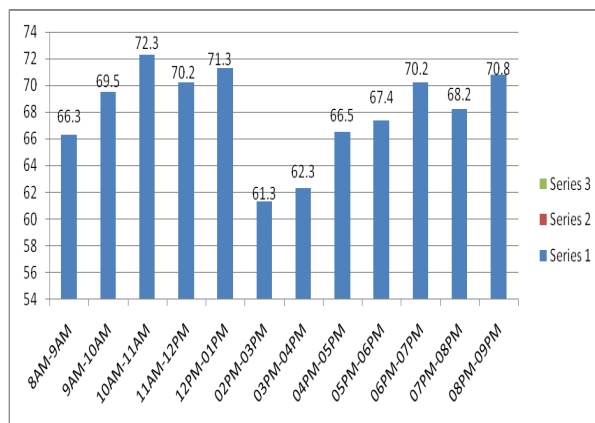


Figure 3: Temporal distribution of equivalent noise level Leq dB near Shastri Bridge

**Table 6: Zone : Commercial Area Date : 29/11/2018 Location RUSSEL CHOWK**

TIME	Leq	L10	L50	L90	LNP
08AM-09AM	60.5	63.5	59.8	56.2	67.8
09AM-10AM	67.8	68.9	64.5	62.8	73.9
10AM-11AM	73.5	77.8	67.1	62.9	88.4
11AM-12PM	67.8	70.2	64.2	61.9	76.1
12PM-01PM	68.9	71.5	65.8	62.7	77.6
02PM-03PM	64.8	62.8	60.3	59.4	68.2
03PM-04PM	67.5	67.9	65.2	60.8	74.8
04PM-05PM	67.2	68.2	65.4	65.9	69.5
05PM-06PM	73.5	69.4	65.2	63.0	79.9
06PM-07PM	69.2	71.5	68.9	63.7	77.0
07PM-08PM	71.3	74.5	69.5	63.4	82.4
08PM-09PM	72.1	70.4	67.8	63.5	79.0

**Table 7: Zone : Commercial Area Date : 30/11/2018 Location DAMOH NAKA**

TIME	Leq	L10	L50	L90	LNP
08AM-09AM	60.2	64.4	60.2	57.0	67.6
09AM-10AM	64.3	66.0	65.8	59.2	71.1
10AM-11AM	66.4	69.2	65.8	62.8	72.8
11AM-12PM	71.2	71.5	64.8	62.0	80.7
12PM-01PM	71.2	70.4	65.9	61.8	79.8
02PM-03PM	65.8	63.4	62.8	54.9	74.3
03PM-04PM	66.8	68.4	63.5	60.7	74.5
04PM-05PM	66.9	68.7	68.7	59.2	76.4
05PM-06PM	70.2	74.5	67.9	62.8	81.9
06PM-07PM	69.8	70.2	68.7	65.2	74.8
07PM-08PM	69.3	72.8	68.1	58.4	83.7
08PM-09PM	69.0	72.1	68.3	65.8	75.3

**RUSSEL CHOWK**

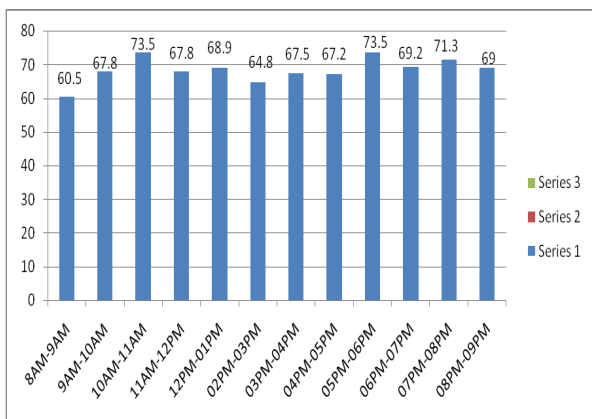


Figure 4: Temporal distribution of equivalent noise level Leq dB near Russel Chowk

**DAMOH NAKA**

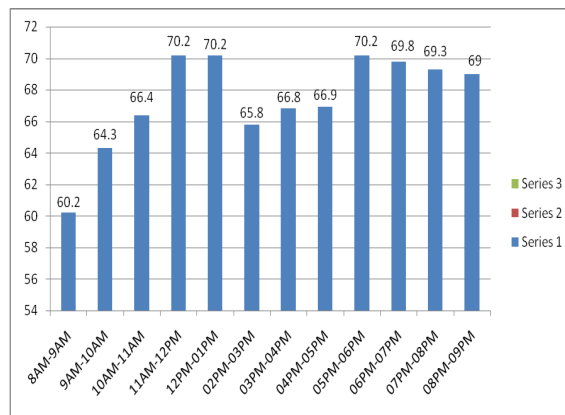


Figure 5: Temporal distribution of equivalent noise level Leq dB near Damoh Naka

### Industrial Area

Noise parameters ( Leq, L10, L50, L90, and LNP) at different monitored location of Industrial zone at different time interval.

**Table 8: Zone : Industrial Area Date : 02/12/2018 Location RICHAJ**

TIME	Leq	L10	L50	L90	LNP
08AM-09AM	78.5	77.6	76.2	79.8	76.3
09AM-10AM	80.2	81.1	88.6	76.9	84.4
10AM-11AM	84.2	86.5	82.5	79.0	91.7
11AM-12PM	85.2	86.9	84.2	79.0	93.1
12PM-01PM	82.5	86.3	78.2	78.1	90.7
02PM-03PM	83.1	85.2	81.8	78.7	89.6
03PM-04PM	75.3	78.4	76.1	72.9	80.8
04PM-05PM	83.2	83.5	79.1	76.8	89.9
05PM-06PM	85.1	85.9	85.8	84.8	86.2
06PM-07PM	81.7	82.8	83.7	80.4	84.1
07PM-08PM	79.3	82.5	76.8	68.6	93.2
08PM-09PM	78.6	80.4	76.8	68.2	90.8

#### RICHAJ

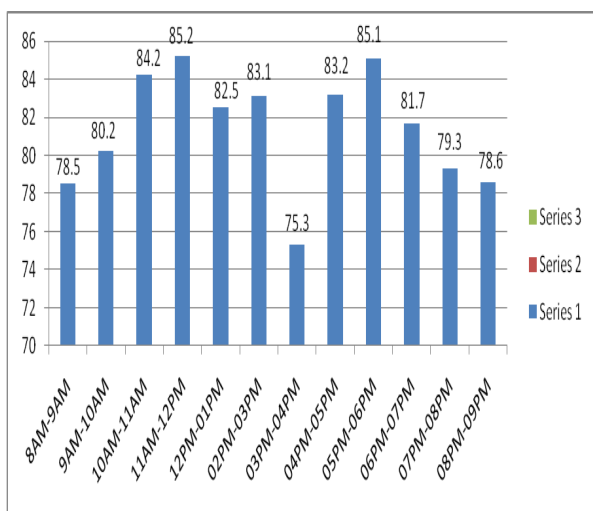


Figure 6: Temporal distribution of equivalent noise level Leq dB RICHAJ

**Table 9: Zone : Industrial Area Date : 07/12/2018 Location ADHARTAL**

TIME	Leq	L10	L50	L90	LNP
08AM-09AM	69.7	67.9	66.3	65.8	71.8
09AM-10AM	76.2	80.0	84.1	69.1	87.1
10AM-11AM	80.2	82.4	76.9	76.1	86.2
11AM-12PM	79.7	81.8	77.1	73.8	87.9
12PM-01PM	78.1	81.2	75.3	73.7	85.6
02PM-03PM	79.4	80.2	78.1	74.1	85.5
03PM-04PM	69.1	71.3	68.1	67.4	73.0
04PM-05PM	70.1	73.0	69.7	67.1	76.0
05PM-06PM	71.6	73.4	69.6	66.1	83.9
06PM-07PM	69.1	70.1	69.7	65.3	73.9
07PM-08PM	69.9	70.6	67.1	65.8	74.7
08PM-09PM	76.1	80.2	72.8	70.7	85.6

#### ADHARTAL

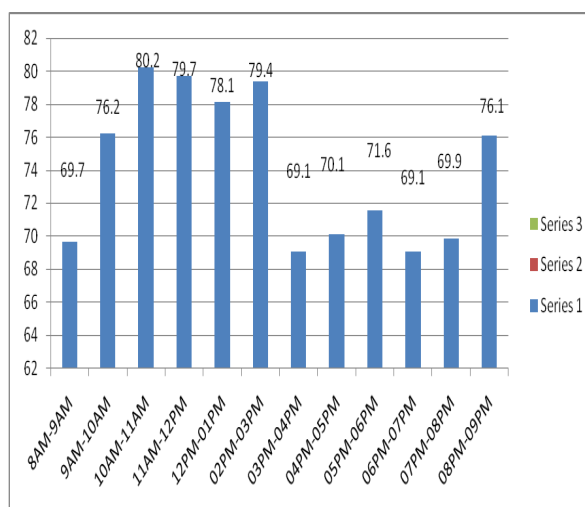


Figure 7: Temporal distribution of equivalent noise level Leq dB ADHARTAL

**Table 10: Zone : Industrial Area Date :  
 17/12/2018 Location GOHALPUR**

TIME	Leq	L10	L50	L90	LNP
08AM-09AM	77.5	81.0	78.3	73.1	85.4
9AM-10AM	83.9	85.9	84.5	81.0	88.8
10AM-11AM	87.0	89.0	82.8	78.0	88.0
11AM-12PM	86.1	88.6	85.2	83.1	81.6
12PM-01PM	87.1	88.9	86.8	83.1	82.9
02PM-03PM	83.5	85.1	82.8	80.0	88.6
03PM-04PM	87.2	88.8	86.1	82.5	83.5
04PM-05PM	86.8	88.1	85.1	80.5	74.4
05PM-06PM	85.6	86.3	84.0	82.5	88.4
06PM-07PM	85.1	86.6	85.8	84.5	87.2
07PM-08PM	84.8	82.1	85.2	82.3	84.6
08PM-09PM	83.1	82.5	79.8	78.1	87.5

#### 4. RESULT DISCUSSION

##### Commercial area

Russel Chowk area is found to have the maximum Equivalent Noise level 73.5 dB during day time (10am-11ampm). Maximum equivalent Noise level observed in day time at Civic Center, Bada Fawara, Shastri Brige, Gussel chowk and Damoh Naka are 68.0 dB, 65.5 dB, 72.3 dB, 73.5 dB and 71.5 dB respectively. Maximum equivalent noise level observed in night time at Civic Center, Bada Fawara, Shastri Brige, Gussel chowk and Damoh Naka are 66.6 dB, 64.3 dB, 70.8 dB, 62.1 dB and 69.8 dB respectively. The main reasons of noise in residential area traffic movement at vehicles horn, household equipment and construction work.

##### Industrial area

In Industrial area as shown in table 5.2 and Fig 6-10 and 5.12 Minimum and Maximum Equivalent sound pressure level ranges between 69.1 dB to 87.2 dB. Equivalent Noise level in all the Industrial area much have above the standard value of 75 dB, during day time and 70 dB during night time. maximum equivalent noise level observed in day time at Richai, Adhartal, and Gohalpur are 85.2 dB,80.2 dB, and 87.2 dB. respectively. Maximum equivalent noise level observed in night time at Richai, Adhartal, and Gohalpur are 75.3 dB,69.1 dB, and 77.5 dB, dB. respectively. Thus it is seen noise pollution is exceeded permissible limit at each location during day and night time. The High court Bhavartal garden and Victoria hospital found to be highly noise polluted.

#### GOHALPUR

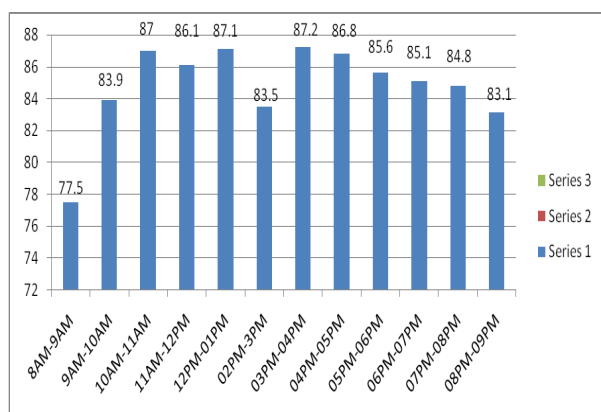


Figure 8: Temporal distribution of equivalent noise level Leq dB GOHALPUR

#### 5. CONCLUSION

The investigation reveal that the Jabalpur city are highly exposed to noise pollution. Rapid urbanization and heavy traffic flow and vehicle horn are the main reason that poses noise pollution in the town. Hence to keep the noise level with in the acceptable limit the following noise control measure should be followed.

- Movement of vehicles on the inner arterial roads should be restricted.
- The vehicles should not generate noise more than limit prescribed by the Regulatory Authorities.
- Heavy vehicles movement near residential and silence area should be restricted.
- The noisiest three wheeler tempo should be banned.
- There should be restriction on the use of horn by vehicles passing by the residential area.
- Commercial activities should not be permitted in residential area and silence area.
- Houses should not be preferable located near the main road. Attention should be given to the architectural layout of residential localities so as to reduce the travel of noise from one house to another.
- There should be plenty of trees and bushes in open space between houses and roads.
- Use of loud speaker should be reduced.
- Playing of noise generating devices in houses should be preferable low volume.
- Diesel generator sets and pumps used in multi-storeyed buildings should have proper noise.
- Houses should be located far away from the roads.

Noise at receiver end can be controlled by adopting hearing protector. The prime function of ear protector is to reduce the noise level at the wearer's ears to within safe limits. The uses of ear plugs ear muffs are necessary. Attention must be given to hygiene discomfort and other medical problems that may arise through their use. Noise control can also be done by treatment of noise path. In this some barriers are placed in between the

source and receiver. Use of sound absorbent in ordinary buildings should also be encouraged. Appropriate planning of city, sufficient road facilities for easy movement of traffic, reduce vehicular movement, proper maintenance of road and vehicle, street side noise barriers and plantation will be solution of such type noise pollution. People Corporation, participation and awareness in the matter of environment, Eco-city planning and application of laws effectively may play important role in prevention and control of noise. Necessary preventive measures must be taken by the appropriate authority to implement the Noise pollution (Regulation and Control) Rules 2000 in time bound manner. professionals, such as town planners, architect, and environmental engineers should have the problem of environmental noise pollution in mind when setting new roads, shopping centre, schools, hospitals, and houses.

Preparation of noise maps for city is the one of most valuable step to decrease noise pollution in Jabalpur. Noise maps are very powerful tools for communicating result of assessment of environmental noise to the general public and for the government (local and national) to devise noise correction measure. The noise map itself, with the values of descriptors, provides baseline data for planner, engineers and other professional and researcher for the planning and execution of their projects.

At last it can be concluded that this issue can be resolved if people become aware of long term ill effects of noise pollution.

As it is a short term assessment of noise pollution problems in the town, further study may also be required to address the effect of noise pollution in the Jabalpur city.

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