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ASSESSMENT OF NOISE POLLUTION IN SENSITIVE AREAS AT ERNAKULAM BY QGIS

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Abstract - *Nowadays, due to the particular characteristics of hospitals, the hospital buildings are highly sensitive to environmental noise. In our comprehensive one-month research project, traffic and community noise levels were measured and monitored at ten sensitive areas ie; hospitals in its spatial- temporal aspects, at the city of Ernakulam. Noise measurements were taken at different peak sessions from morning to evening. The project presents an analogy of obtained noise readings with the national CPCB standards for silent zones. The main objective of our project is to aware the public about the noisy environment with which we lives today, due to the increased traffic intensity. Using QGIS software, noise maps are generated to make the awareness more precisely. Hospitals are exposed to high volumes of environmental noise. Major source of noise pollution is from vehicles. It has detrimental effects on human health. Increased in population increases the traffic that causing noise pollution.*

Key Words: **QGIS Software, Sensitive areas, Noise levels, MEXTECH SL-36 Sound level meter, Noise mapping, Vehicular traffic.**

1. INTRODUCTION

Sound is the source of communication, received by transmitted waves of pressure and reception of such waves and their perception by the brain. A type of energy caused by vibration sound will sound like when it reaches the ear depends on the medium it travels through and strength of the initial vibration. There are direct relationship between noise and health. Issues related to noise include stress related illness, high blood pressure, speech interference, hearing loss, sleep disruption and cost productivity. The habitual problem of noise pollution is noise induced hearing loss, causes further more health problems. The beginning of noise pollution can be mainly ascribed to the unrestricted growth of urban population. There ae many sources of noise, generally grouped into stationary, mobile and collective sources.

1.1 Sources Of Noise

The main source of noise near hospitals is traffic noise from automobiles. In addition, noise from increased population around hospital region is also a reason. Noise level depends on number of vehicles, population, climate, factories nearby, workshops, etc.

1.2 Objectives

- To determine present traffic noise levels at sensitive areas.
- To analyse and compare noise levels in sensitive areas with respect to Central Pollution Control Board (CPCB) standards.
- Mapping the Vehicular Noise pollution using Quantum Geographical Information System (QGIS).

1.3 Scope

- It helps to collect environmental data in relation to road traffic noise by methods of monitoring and storing them for further retrieval.
- Editing, analysis and promoting their use for the best possible purpose.
- A noise study of the future impact during construction sensitive receptors.
- Noise impacts associated with construction of the power line on sensitive receptors.

2.METHODOLOGY

The methodology consist of 8 steps, from the selection of suitable sensitive zones to the noise mapping of our datas. In fig-1 shows the flow chart of the methodology. The main steps involved in our project is shown in the flow chart below.

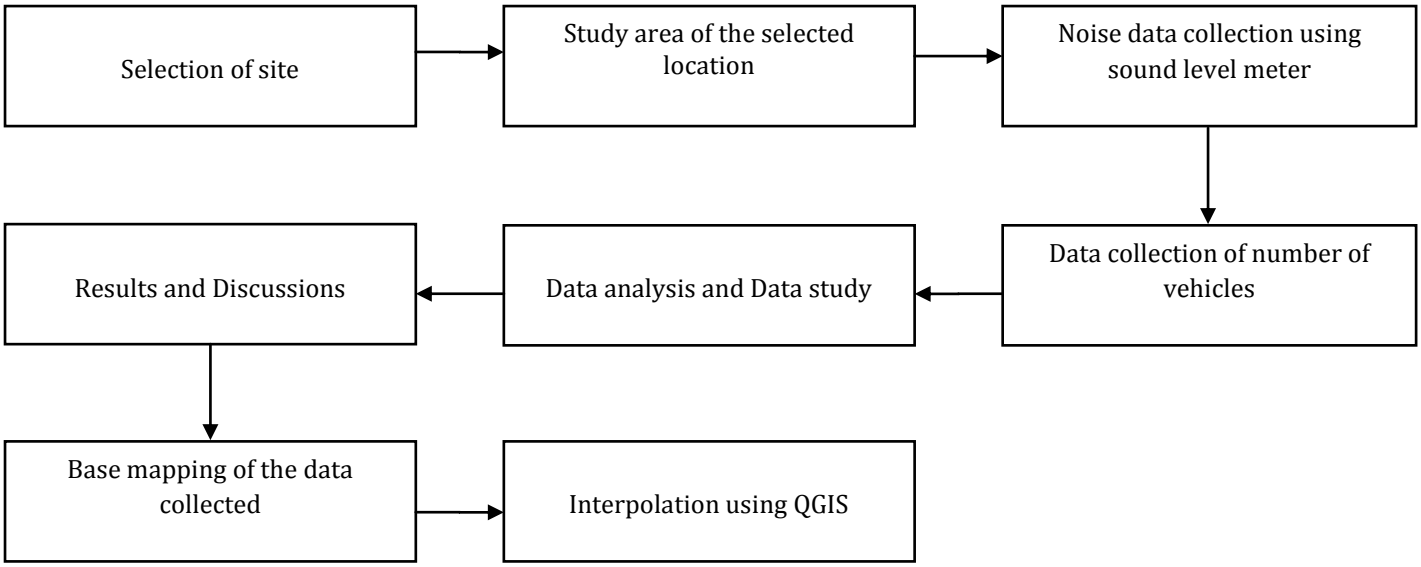

Fig – 1 : Flow Chart

3. AREAS OF STUDY AND NOISE MEASUREMENT

The noise level in Ernakulam city was observed during different time intervals at sensitive areas. The silent zone is incorporated with hospitals. It includes Dharmagiri hospital, Government hospitals, MBMM hospital, MCS hospital, Sabine hospital & research center, Charis hospital and San Joe hospital were selected, as shown in fig 2

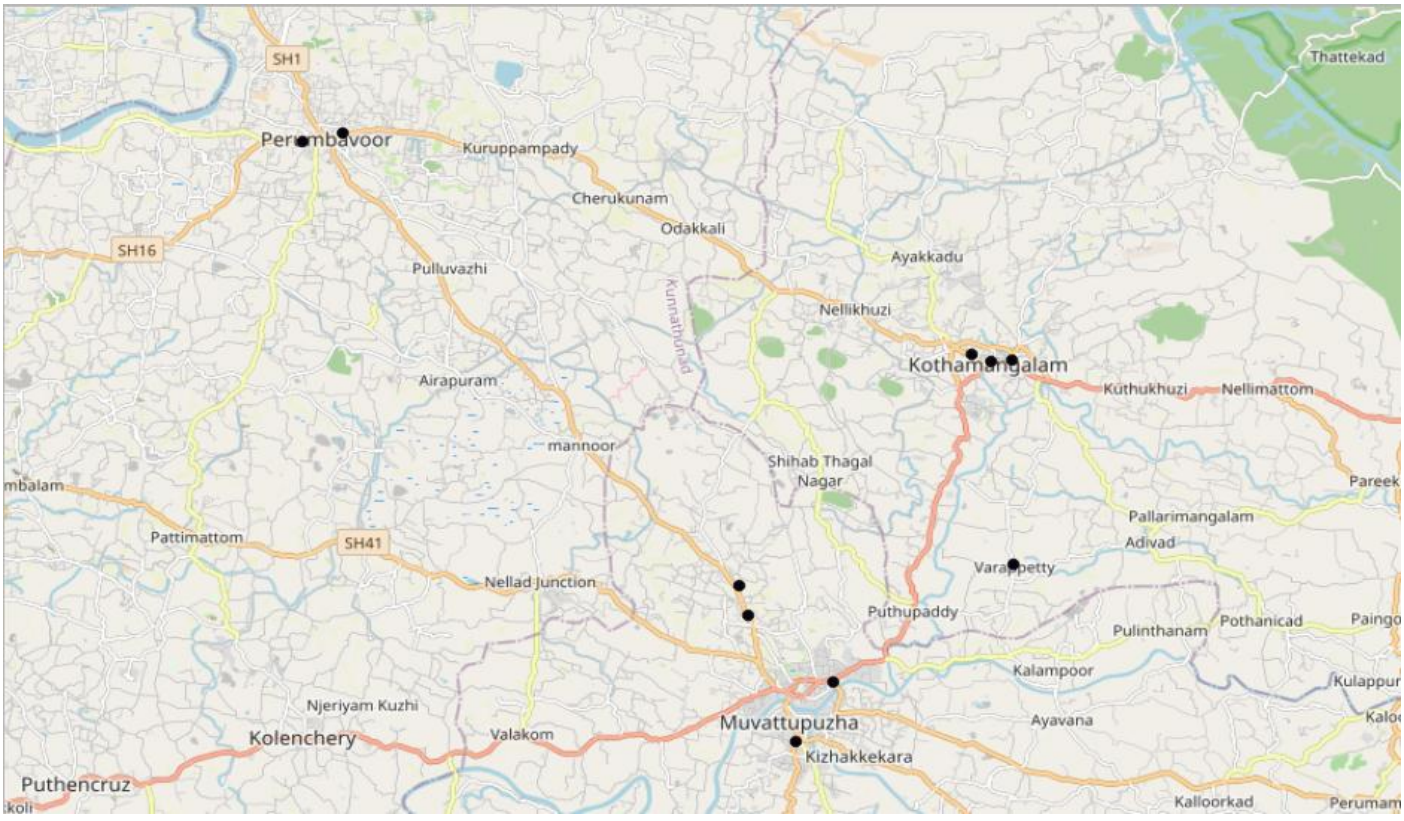

Fig – 2: Location of various hospitals

3.1 Location Characteristics

These hospitals were selected on the basis of traffic volume, demography and presence of residential and commercial buildings in the surrounding. The characteristics of the ten hospital locations that were chosen for noise assessment.

Table - 1: Locations for noise level monitoring

Sl.no	Hospital Name	Location	Location Characteristics
1	Govt. Hospital	Kothamangalam	Located in heart of the city; in close proximity to surrounding public transits.
2	MBMM Hospital	Kothamangalam	Located by a crossway junction leading to three different routes.
3	Dharmagiri Hospital	Kothamangalam	Mostly constituting commercial and educational establishments.
4	San Joe Hospital	Perumbavoor	Located in heart of the city; in close proximity to bus stand, petrol pump and school.
5	Govt. Hospital	Perumbavoor	Located by a crossway junction leading to three different routes; in close proximity to Union bank and public transits.
6	Govt. Hospital	Muvattupuzha	Mostly constituting commercial and educational establishments
7	Govt. Hospital	Varappetty	Developing area close proximity to village office and commercial establishment
8	Charis Hospital	Muvattupuzha	Located in heart of city and sound due to public transits
9	MCS Hospital	Muvattupuzha	Located nearby bridge
10	Sabine Hospital	Muvattupuzha	Close proximity to substation nearby and noise mainly due to public transits

The above table 1 shows the location characteristics of the hospital zones, which are chosen for the assessment of noise pollution. The ten selected hospitals and their locations are also mentioned in detail for easy understanding about the zone that we selected.

4. COMPARISON OF COLLECTED DATAS

Table 2 Comparison of noise pollution by device and vehicle traffic

Hospitals	Time	Noise Pollution ratio measured by the device		Percentage of total pollution resulting from vehicle traffic	
		Working day	Nonworking day	Working day	Nonworking day
GOVT HOSPITAL KOTHAMANGALAM	8am-10am	94.4	94.4	82.63	83.32
	10am-12pm	85.3	85.3	80.85	80.42
	2pm-4pm	82.1	82.1	79.75	78.78
	4pm-6pm	76.2	76.2	76.61	74.84
MBMM HOSPITAL KOTHAMANGALAM	8am-10am	83.7	83.7	80.79	76.7
	10am-12pm	97.9	97.9	81.49	79.19
	2pm-4pm	71.6	71.6	71.5	76.26
	4pm-6pm	73.2	73.2	73.39	72.88
DHARMAGIRI HOSPITAL KOTHAMANGALAM	8am-10am	85.4	75.3	79.71	76.56
	10am-12pm	82.9	80.4	79.24	76.20
	2pm-4pm	80.6	76	77.25	74.20
	4pm-6pm	68.2	69.8	67.97	66.49
MCS HOSPITAL MUVATTUPUZHA	8am-10am	76.2	84.9	68.39	77.3
	10am-12pm	84.8	94.2	72.77	75.31
	2pm-4pm	78.4	85.1	69.44	72.45
	4pm-6pm	67.6	70.4	65.20	69.09

SAN JOE HOSPITAL PERUMBAVOOR	8am-10am	89.7	90.4	82.92	83.42
	10am-12pm	82.3	103.5	82.11	81
	2pm-4pm	82.6	93.2	82.18	79.67
	4pm-6pm	83.8	83.5	83.69	78.86
GOVT HOSPITAL PERUMBAVOOR	8am-10am	92.4	91.6	84.39	83.69
	10am-12pm	85.1	112.4	82.86	81.81
	2pm-4pm	91.5	95.2	82.60	79.90
	4pm-6pm	88.4	86.7	89.97	75.79
GOVT HOSPITAL MUVATTUPUZHA	8am-10am	97.9	96.8	82.31	83.8
	10am-12pm	81.2	80.9	77.55	80.57
	2pm-4pm	78	76.1	73.81	76.04
	4pm-6pm	79.3	74.8	77.68	73.77
CHARIS HOSPITAL MUVATTUPUZHA	8am-10am	71.5	73.8	80.73	79.88
	10am-12pm	75.3	76.4	79.12	79.03
	2pm-4pm	68.6	72.9	77.13	77.09
	4pm-6pm	75.8	77.2	78.58	75.46
GOVT HOSPITAL VARAPPETTY	8am-10am	65.8	71.5	53.05	52.14
	10am-12pm	71.4	76.9	49.53	48.98
	2pm-4pm	51.3	54.3	39.82	44.46
	4pm-6pm	61.5	57.6	50.52	43.24
SABINE HOSPITAL MUVATTUPUZHA	8am-10am	90.1	92.2	81.78	83.52
	10am-12pm	85.8	103.5	79.90	78.56
	2pm-4pm	71.7	84.7	78.69	80.70
	4pm-6pm	76	87	79.24	77.33

5. NOISE MAP OF SENSITIVE ZONE ON WORKING AND NONWORKING DAYS

From the collected datas on working and nonworking days in the sensitive zones we ploted the following noise maps. For easy understanding of the people we categories them in to different zones on the basis of their reading with different colours. In table 3 shows the colour that we selected for our noise mapping and their ranges are also mentioned in the table.

Table 3 Colour Chart of different noise level

Noise Level	Colours
50 – 60	Light green
60 – 70	Lemon yellow
70 – 80	Chrome yellow
80 – 90	Orange
90 – 100	Red
100 – 110	Blue
110 - 120	Purple

In fig 3,4,5,6,7,8,9,10 shows the noise map of 10 hospitals on working days and nonworking in time interval 8-10,10-12,2-4,4-6. From the map itself we can understand that the noise level that we measured at the sensitive zone are higher than the CPCB standards.

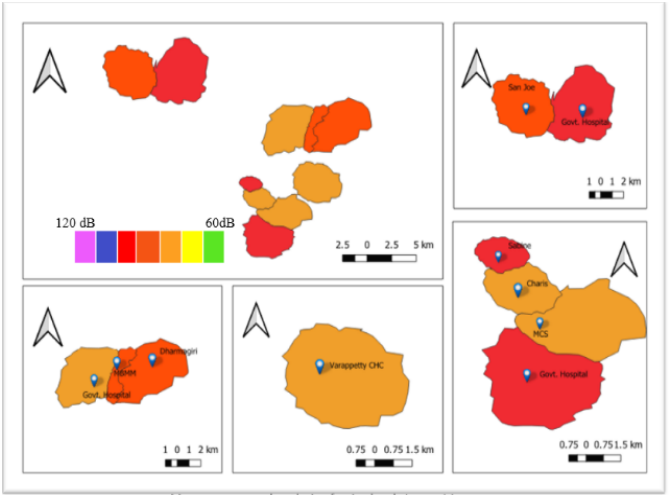

Fig – 3: 8:00 am-10:00 am working day

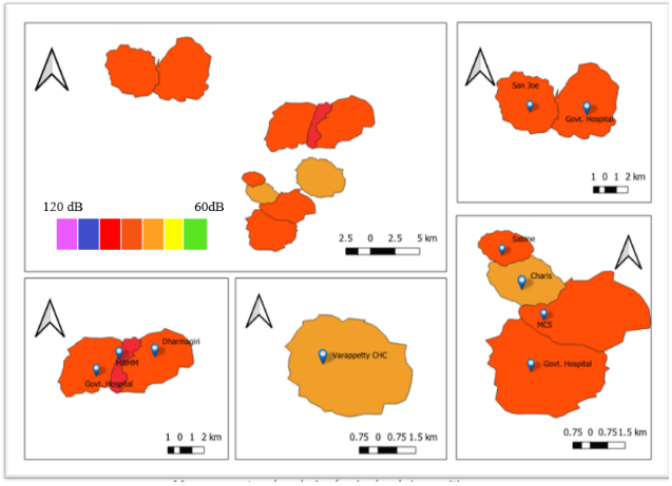

Fig – 4: 8:00 am-10:00 am nonworking day

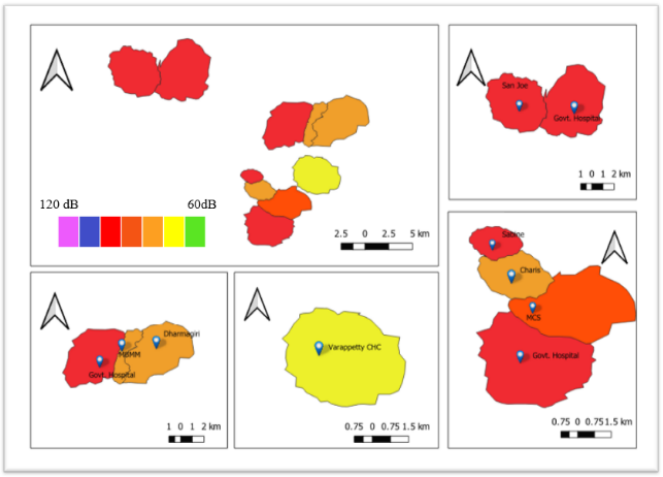

Fig – 5: 10:00 am-12:00 pm working day

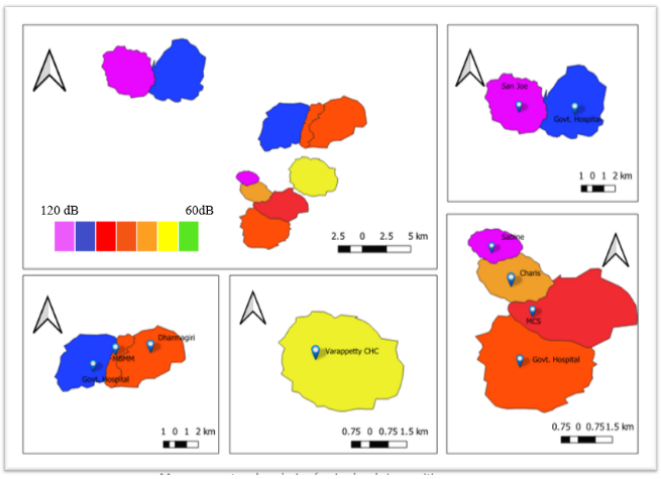

Fig – 6: 10:00 am-12:00 pm nonworking day

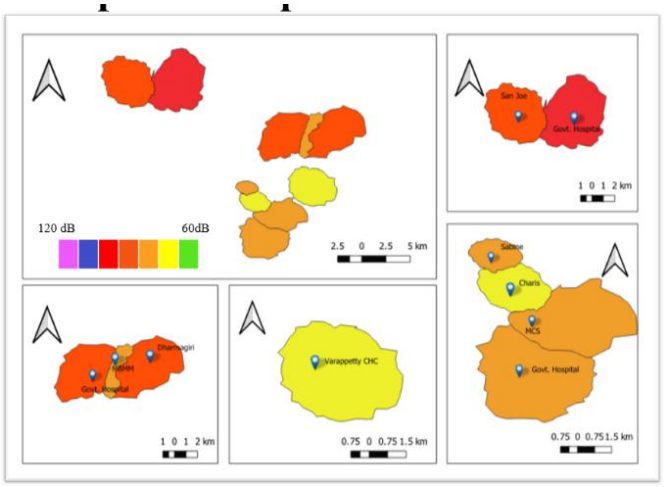

Fig – 7: 2:00 pm-4:00 pm working day

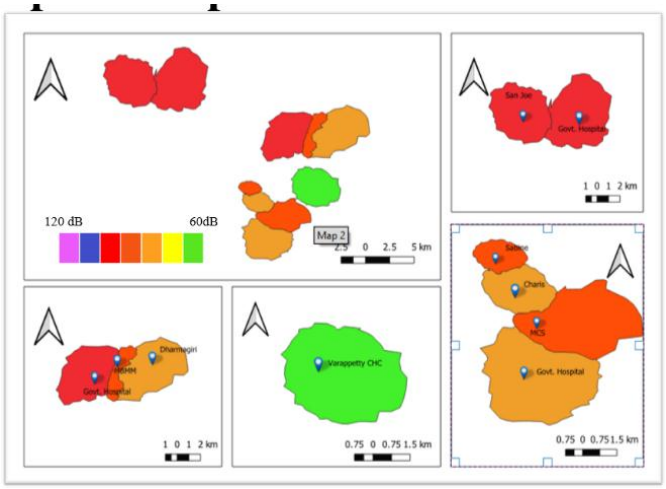

Fig – 8: 2:00 pm-4:00 pm nonworking day

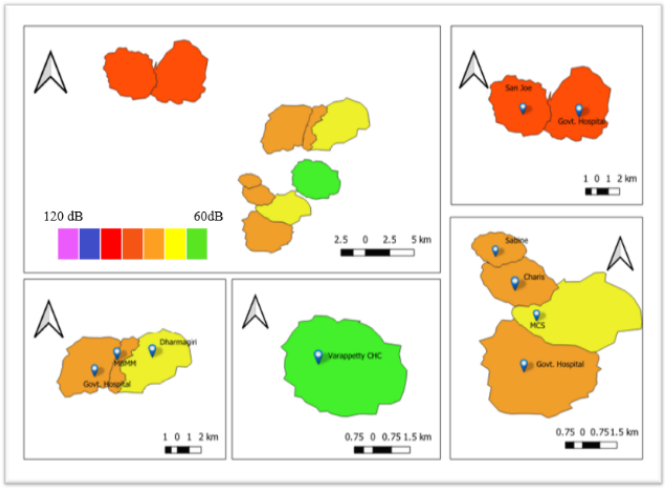

Fig – 9: 4:00 pm-6:00 pm working day

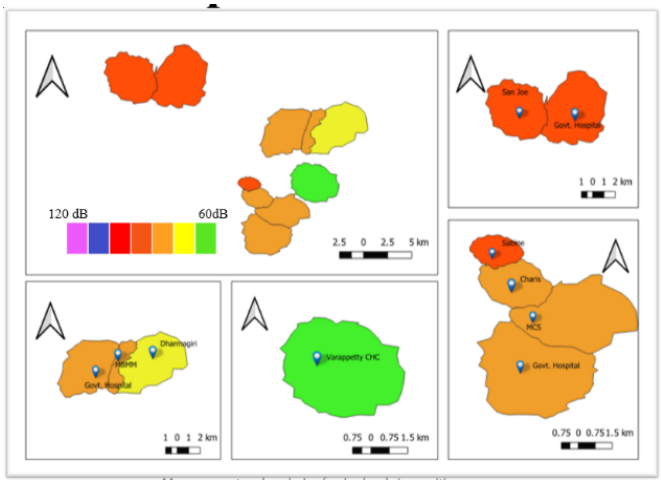

Fig – 10: 4:00 pm-6:00 pm nonworking day

6. CONCLUSIONS

Noise monitoring was done in the ten sensitive areas of Ernakulam City. The average noise levels in all ten stations were truly advanced than the day time CPCB specified noise limits. Eight maps were produced for the Ernakulam city based on the sound level data collected from the study area. The conclusions from our project are listed below:

- The noise assessment of the study area indicated that the noise situations in the area are raising at a veritably fast rate with growing population and heavy business accumulation. Noise situations attained at different locales of the megacity are setup to be exceeding the noise position/ limits specified by the CPCB "The Noise Pollution (Regulation and Control) Rules, 2000".
- It was also observed that in numerous areas of the city, the noise position reached maximum intensity.
- Data collected and results anatomized indicate that nearly on all major roads, are always advanced than the permissible noise situation/limits specified by CPCB "The Noise Pollution (Regulation and Control) Rules, 2000".
- In silence zones noise situations exceeded the admissible morals of 50 dB (A). It was also observed that advanced noise position in the city is due to rapid fire and unplanned urbanization performing in great affluence of people from all corridor of the region, lack of sufficient parking spaces and exponential growth of private vehicles in the city.
- It is felt that noise terrain of the study area may pose as a great trouble to the health of residers of the study area in long term. Thus, a strict enforcement of law and regulation is felt in this regard.

7. CONTROL MEASURES

Noise monitoring study reveals that noise situations at all the selected locations are greater than the prescribed limits set by CPCB standards in sensitive areas during day time. The following strategies can be espoused to minimize traffic noise pollution in the above-said locations:

- Soundproof doors and windows can be installed to block unwanted noise from outdoor.
- Noise walls can be installed along the walls of hospitals, educational institution etc will gives an esthetic appearance and reduces sound pollution.
- Strict legislative measures must be espoused along the sensitive zones like banning horns, limiting the number of vehicles etc.
- Maintaining and improving the vegetation by planting more trees all over the sensitive zone.
- Signal values should be duly synced as per the traffic.
- The noise at source can be reduced by replacing noise producing machines with suitable modified technique.
- An insulating material may be applied on the noise producing machinery and equipment's which causes sound proofing.
- The use of entrapments or ear muffs or even cotton balls can protect them from dangerous effects of noise pollution.
- Limit construction in nearby surroundings to night time, with the use of noise insulators.
- Make girding areas as no- honking zones.
- Produce detailed noise maps at silence zones to help install rigid and thick noise walls in hospitals and other similar sensitive buildings.
- Design future hospitals away from high traffic densities, but in close vicinity to easily accessible roads.
- Divert heavy vehicles to other pathways if possible or apply speed limit for such vehicles.

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