

## DESIGN AND DEVELOPMENT OF NOISE PREDICTION MODELS USING GIS IN VISAKHAPATNAM

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### ABSTRACT

*Visakhapatnam is one of the fastest growing cities in India, with this the population and the vehicular growth has been tremendously increasing, day by day. Due to this vehicular growth, the traffic flow on the roads is paralleling increasing and as a bi-product huge disturbance is created in the city environment in the form of sound. This unwanted sound in the environment is known as Noise pollution. Noise pollution has become the one of the major pollutant in the city. The main sources of this pollution are vehicular traffic, mechanical works, construction activities, aircraft movements, railways and other human related activities. The city consists of an inbuilt port, due to its daily activities like import and export undertakings also resulting in the Noise Pollution. Environmentalists say that if the Noise is more than the permissible limits it may lead to cause severe health problems. It is observed that Noise level ranges from 70 to 82 dB on average along the National highways which pass through the middle of the city, and in busy junctions during peak hour timing both in the morning and evening, these levels were recorded in between 85 to 95 dB, which is quite high and hazardous to citizens of the areas where the Noise Levels are more than the recommended levels. Sensitive areas such as KGH, Sevenhills hospital and other areas which come under the silent zone had the quietest being annoying by noise pollution. Flight services are also affecting the lives of people who reside in the areas, where the takeoff and landing are close to the houses. It is recommended that, proper provisions should be made to overcome this noise pollution. Construction of Noise barriers and plantation along the roadways, regular scanning of the automobiles may control the noise pollution and maintenance of home appliances may help in decreasing the Noise pollution inside the houses.*

**KEYWORDS:** *Sound Level Meter, Graphs, Attribute Data & Noise Barriers*

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### INTRODUCTION

Noise pollution might be characterized as undesirable sound which is dumped into the atmosphere, without regards to the unfriendly impacts it might have. Its impact is different on different people. Noise can be measured in decibels (dB). Some people can hear frequencies that others cannot detect. The greater part of the general population possessing metropolitan urban community or enormous towns and those working in processing plants are vulnerable to the unfriendly impacts of Noise. The problem of Noise pollution is less in residential areas and the places, which are away from the highway. Those dwelling in towns, metropolitan, near the highway and railroads are vulnerable to noise pollution. Unpredictable utilization of horn of the vehicles and boundless utilization of noisy speakers in Indian social and religious services cause a few wellbeing dangers to the urban tenants. Visakhapatnam City in Andhra Pradesh (India), is one of the ancient cities in India, with the growth of the city, the population growth is also tremendously increasing year on year, as a result the vehicular activities are

creating disturbance in the atmosphere, as Noise Pollution. Now, it has become a major issue in the city.

### Scope and Structure of the Study

This paper is, researching on the issue of the noise pollution, as far as vehicle activity is concerned. The investigation begins with noise pollution, its impact among the people, and writing the survey. It mainly consists of gathering data from different locations of the city, by assembling the Noise level meter. The main subject of this work is, to collect the noise data from the different areas and analysis part, application of noise barriers in order to reduce the noise levels and the preparation of Noise maps for the Visakhapatnam city.

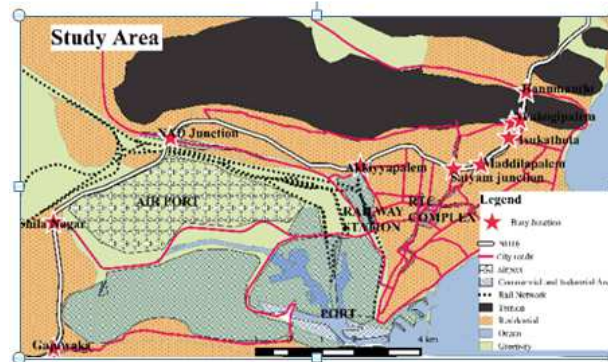


Figure 1

### Site Selection and Measurement of Noise

Choosing of site locations is based on silence zones like hospital zone (KG Hospital), a typical residential area (MVP Colony), Schools (CBM Compound), sea breeze and tidal waves, vehicular traffic activities, along Jagadamba Junction, Andhra Pradesh State Road Transport Corporation (APSRTC) Complex Junction, prone market, MVP colony, along the stretch of the national highway which passes middle of the city from Zoo Park to Old Gajuwaka and Seaport activities (Ore is handling belt near the port. Noise levels were observed signifying 24h, during the period of January to May of 2017, using Noise Level Meter (accuracy +1dB, inbuilt memory for data collection and processing software to interface with computer along with calibrator).

### The objectives of the Study were as the Following

- Identifying the sources of noise pollution and their status
- To study the road behavior and the traffic in the study area.
- To examine the current status of noise levels in the examination region by recording the noise intensity at different areas.
- Identifying the high impact areas and consideration of Noise reduction methods.
- Distinguish between Commercial Industrial Residential and the Silent zones based on the Noise Levels.

### Effects of Noise

#### Harmful Effects of Noise on Human Beings

Some of the adverse effects of noise pollution are given below:

- Noise leads to change in performance levels, increases in stress and make person irritate.
- Noise may lead to permanent hearing damage. A sudden loud noise can cause severe damage to the eardrum.
- Noise reduces the memory power in the children.
- Noise will result in heart beat expansion and choking of veins.
- Noise can have the effect on patients who need rest.
- Noise may cause severe health problems like blood pressure, heart-attack, sudden deaths etc.
- Noise can affect the pregnant ladies and the birth of the babies.

### How sound Can Transform Behavior

California, USA, in 2010 conveyed speakers playing a blend of generative music and birdsong along a half-mile (750m) extend of the city's primary street. In its first year the establishment was connected to a 15% lessening in announcing crime, and a 6% diminishment in serious crime.

The second originates from the London Underground in England, which introduced a sound framework playing classical music at one station where the crime was rife to the point that prepare drivers were unwilling to stop there. Following a year and a half, robberies had fallen by 33%, attacks on staff by 25%, and vandalism by 37%. Subsequently, the London Underground stretched out the way to deal with approximately 40 stations over its system.

### METHODOLOGY

A sound level meter is used for measuring the Sound pressure levels. It is generally a handheld instrument with a receiver. The stomach of the mouthpiece reacts to changes in pneumatic stress caused by sound waves. That is the reason the instrument is infrequently alluded to as a Sound Pressure Level (SPL) Meter. The instrument has to know the affectability of the specific amplifier being utilized. Utilizing this data, the instrument can precisely change over the electrical signal back to a sound pressure, and show the subsequent sound pressure level (dB).



Figure 2

### Noise Levels at Different Places Based on the Local Traffic Conditions

- Areas with heavy traffic and the heavy machinery activities 80 –105 dB (A).
- Areas where the recruit's activities are taking place will have the sound intensity 90-100dBA.

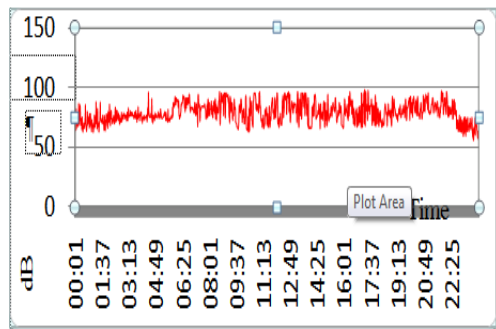
- Places like Railway Stations, Traffic Junctions, Busy markets has had the traffic intensity of 70 –90 dB (A).
- Residential Areas close to traffic, National Highways and markets; 60 –80 dB (A).
- Residential areas which are free from the Noise: 40 –60 dB (A).

**Table 1: WHO Recommended Noise Levels**

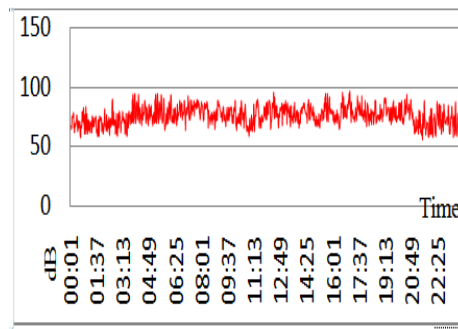
S No.	Place	WHO Recommended Noise Level
1	Night time sleeping, and patient rooms in hospitals	30
2	School classrooms	35
3	Operating theatres	45
4	Maximum Night time noise	40

**RESULTS AND DISCUSSION**

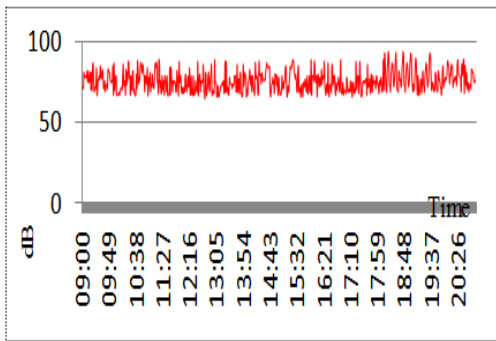
Noise samples collected from different location from the city and their sample graphs as follows day and night time pollution levels:



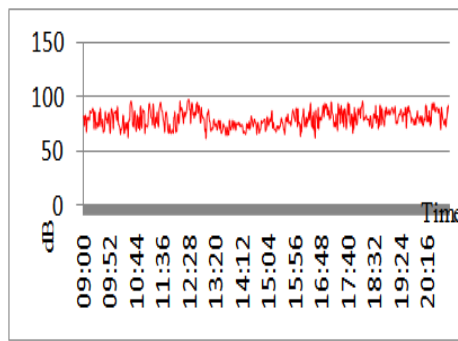
**Maddilapalem: (24hour data)**



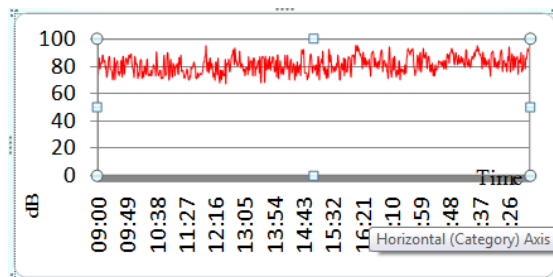
**RTC complex**



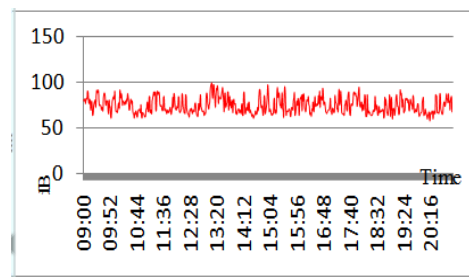
**Jagadamba (commercial)**

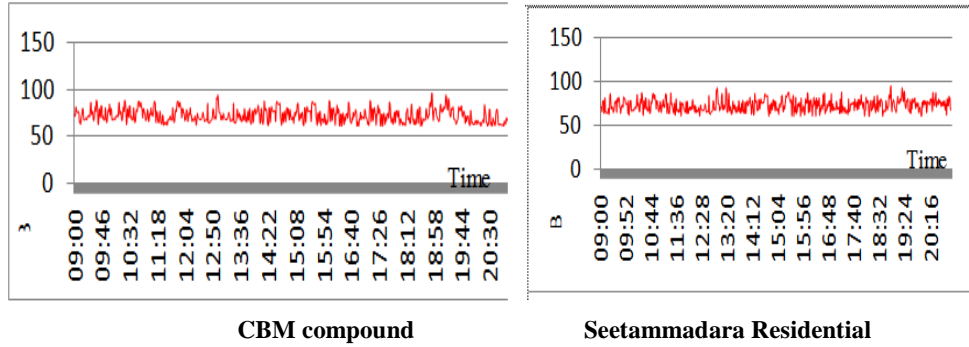


**Siripuram Juncti**



**NAD Junction: KGH Lane (Sensitive)**





Attribute data for Noise Levels in various places of Visakhapatnam

Table 2: Noise Levels in various places in Visakhapatnam

S No.	Place		Noise Level in dB Day Night		Type of Zone	
1	RTC Complex	Noise level limit at day time @ commercial zones <b>65dB</b>	80.9	Noise level limit at night time @ commercial zones <b>55dB</b>	68.0	Commercial
2	Diamond Park		76.5		66.3	Commercial
3	Akkayyapalem		71.2		60.3	Commercial
4	Railway Station		77.4		65.2	Commercial
5	Maddilapalem		80.1		63.8	Commercial
6	NAD junction		75.8		68.9	Commercial
7	Gajuwaka		79.4		64.8	Commercial
8	Siripuram Junction		73.4		59.7	Commercial
9	venkojipalem		73.5		57.1	Commercial
10	Hanumanthuwaka		81.6		61.8	Commercial
11	Dabagardens		72.1		65	Commercial
12	Port		77.1		65.3	Commercial
13	Jagadamba		78.4		66.8	Commercial
14	MVP colony Double Road		69.9		56.0	Commercial/Residential
15	Poorna market		78.8		64.9	Commercial/Residential
16	Madhurawada	Noise level limit at day time @ Residential zones <b>55dB</b>	72.9	Noise level limit at night time @ Residential zones <b>50dB</b>	61.4	Residential
17	Seetammadara		74.2		62.4	Residential
18	seethampeta		75.6		64.3	Residential
19	PeddaWaltair		70.9		53.7	Residential
20	Satyam Junction		74.2		62.4	Residential
21	CBM compound		73		57	Residential/Silent
22	Convent Junction	Noise level limit at day time @ Silent zones <b>50dB</b>	80.7	Noise level limit at night time @ Silent zones <b>40dB</b>	66.3	Silent
23	KGH Lane		78.4		66.8	Silent
24	Ram Nagar Care Hospital Road		74.5		61.6	Silent



Noise levels are extremely unbearable through the national highway which passes along the middle of the city from Kommadhi to Kurmanapalem, along this stretch are the busy junctions like hanumanthuawka, venkojipalem, isukathota, maddilapalem, Satyam Centre, Gurudwara, akkiyyapalem, NAD, Sheela Nagar and Old Gajuwakaand Kurmanapalem. All these centers are becoming very busy, during the morning and evening peak hours, and these are coming under both commercial and residential zones. Noise levels during this time are exceedingly high and some of the residential areas from the middle of the city are highly affected by this pollution like daba gardens, diamond park, MVP colony, poorna market, peddawalair, siripuram, Seethampeta and seetammadara. Industrial and commercial activities are run continuously in port trading business. Noise levels in these areas are more than the standard limits.

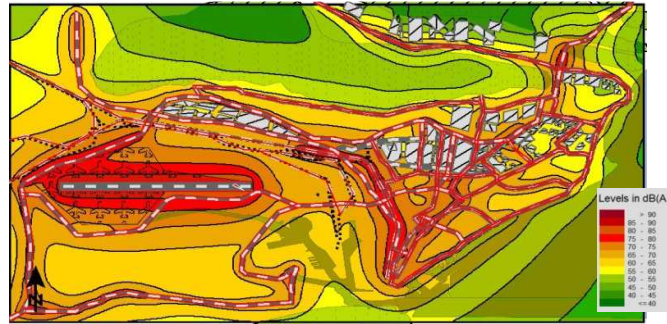


Figure 1: Noise Map (Day Time) in Visakhapatnam



Figure 2: Noise Map (Night Time) in Visakhapatnam

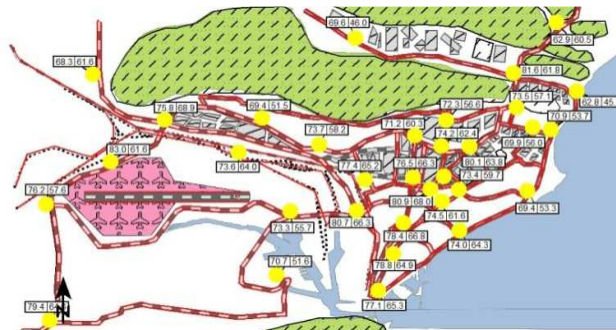


Figure 3: Noise Levels in various Places in Visakhapatnam

**Noise Standards for Some Countries**

Different standards are being utilized as a part of various nations with respect to the satisfaction levels of noise depending on the circumstance. Limits of Noise level set up by various organizations are given in Table 3.

**Table3: Noise Standards for Some Countries**

Country	Industrial Area Day/Night	Commercial Area Day/Night	Residential Area Day/Night	Silence Zone Day/Night
Australian Capital Territory	65/55	55/45	45/35	45/35
India	75/70	65/55	55/45	50/40
Japan	60/50	60/50	50/40	45/35
U. S. (E. P. A.)	70/60	60/50	55/45	45/35
W. H. O. & E. C.	65	55	55/45	45/35

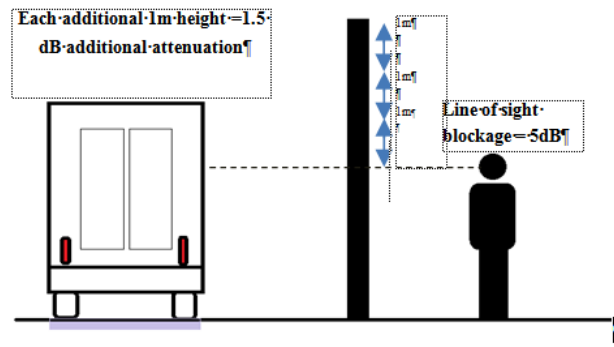
**HOW TO CONTROL THE NOISE POLLUTION**

**NOISE BARRIERS**

Noise barriers are utilized to encounter the issue of noise, these are working towards decreasing the sound that diverts the group from expending or engrossing the sound waves. To maintain a strategic distance from any measure of reflection or the ingestion what is required is the way that a sound barrier made up of good quality materials ought to be utilized so that there won't be any measure of blockage.

Sound Barrier walls are generally used to reduce the Noise from the source to the target population.

Sound barriers are a viable intends to lessen the noise effect from sound sources influencing sound-touchy recipients. Basic sound sources, incorporate streets, interstates, railroads, retail and huge box improvements, Mechanical hardware, development destinations, and so on. Recipients may incorporate homes or condos, schools, healing facilities, office structures or even open parks. At the point when noise turns into an issue between such sources and collectors, the utilization of sound barriers might be a perfect arrangement.



**Figure 4: Sectional View of a Noise Barrier**

**PLANTATION ALONG THE LENGTH OF THE HIGH WAYS**

Practice in environmental safety by arranging trees we can plant more trees as they are great commotion sponges. As indicated by considers, it can lessen commotion by 5 to 10 decibels (dB) around them. Make Healthy noise to dispose of undesirable polluted. If we can't eliminate undesirable pollution originating from outside, then we can create healthier noise such as, for example, classical or melodious music, birds singing or waterfalls in homes or workplaces.

**AWARENESS ABOUT NOISE POLLUTION**

Say Authorities about Disobedience of Noise Rules We can inform to government organizations in the event that

somebody isn't following principles and control in regards to noise levels. Frequently check noise levels regularly checking the noise level in a modern intricate and indoor to keep noise levels inside cutoff points. It is fundamental for thoughtful individuals around us, through different mediums. We can begin from us, to spread awareness about noise contamination and its consequences for human condition. Point of confinement for noise at day time is 55 dB and around evening time it is 30 dB, to stay away from wellbeing impacts.

## CONCLUSIONS

Through the outcomes acquired from the above results, it's extremely apparent that the city is experiencing serious Noise Pollution because of the vehicular activity; the government contributes less stressed over addition in Noise Pollution. This is generally recognized towards a congested development run, unconstrained road sort out, decreased one way action, advancement of quiet zone in the basic zone of the city, unprepared urban spread out. In most the zones the Noise level is over the best with more than 85 dB over the city in the peak hour activity, many schools, medical facilities are arranged in the core of the city are likewise influenced extremely by the Noise pollution.

- Noise pollution can be minimized by the following ways:
- Constructing the noise barriers on either side of the roadway,
- Speed restrictions for the vehicles,
- Planting on either side of the road,
- Restriction of heavy duty vehicles,
- Regular maintenance of the automobiles
- Use of traffic controls that smooth vehicle flow

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