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MITIGATION OF NOISE POLLUTION IN SUBURBAN AREA – AN EXPERIMENTAL STUDY

Engineering

KEYWORDS: Noise pollution, Permissible noise level, Sound level meter

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ABSTRACT

Noise pollution is one of the biggest problems that the modern world is facing. The World Health Organization (WHO) considered noise as the third most hazardous type of pollution right after air and water pollutions. The impact of noise pollution on human health and other biological creatures is a matter of serious concern in the present day's world. Hence, various noise prediction models have been developed, throughout the world to assess its impact on to the society and the human beings. This paper is about taking noise readings in sub-urban zone and comparing with the standards and provide appropriate mitigation measures in sub-urban zone to have a sustainable and healthy environment.

INTRODUCTION

Noise pollution is one of the biggest problems that the modern world is facing. Various human activities, especially the urbanization and the development of transport and industry are responsible for the increasing rate of noise pollution. The noise pollution problem is said to exist when the sound level in the air interfere normal human activities like disturbance in sleep, work etc. The perception of noise level by individual varies depending upon level of exposure, hearing ability, socio economic activities etc. The impact of noise pollution on the community varies in a very wide range and has a very important effect on the health and social condition of the society. Although the noise pollution has not created much public concern but some sort of study in this field has already been done.

As the population of sub-urban area is to grow and land for development grows scarcer, more and more people find themselves living near interstates and other busy roadways. One of the biggest issues with living near such roadways is the attendant noise associated with the steadily increasing traffic flow. Where space is limited, the most common solution for noise is noise barriers. Although these are effective, they can be quite expensive to install initially. Depending on the noise barrier design, many people find them unattractive, and find living near these barriers to be almost as undesirable as the noise they are intended to ameliorate. For this reason, people have wondered over the years whether there are viable alternatives to noise barriers for reducing the noise associated with road noise.

Boni Anil Kumar et.al conducted a study on noise levels across different zones of Visakhapatnam influenced by traffic density. Present study focused on 4 main junctions in Visakhapatnam to assess the varying sound levels influenced by increased traffic density, and the observed readings of noise levels where analysed for parameters like Leq, Ln, TNI (Traffic Noise Index) and the results thus obtained reviled that Maximum dB was observed at BHPV and Minimum was observed at Industrial Estate which shown a positive relationship with TNI. [1]

A.K. Dasarathy et al. conducted a study on the installation of sound barriers is feasible enough to cause a significant decrease in noise pollution on roads. This study analyses how the noise barriers affect the sound intensity level on roads. Noise level generated by a traffic flowing across open stream is compared to that of roads provided with sound barrier. Based on the field measurements an in-depth discussion is carried out to analyses the effectiveness of installing the barriers. The priority of this project is to determine whether the installation of sound barriers is feasible enough to cause a distinct decrease in noise level on the roads. [3]

METHODOLOGY

The research methodology includes

- Selection of study area
- GIS based planning for selected locations
- Selection of instrument
- Identification of noise level
- Results and discussion
- Conclusion
- Recommendation.

Selection of study area

Tambaram is residential locality in Southern part of the metropolitan city of Chennai in the Indian state of Tamil Nadu. Tambaram is a Gateway of South Chennai situated 27 km (17 mi) south of the Broadway in Tamil Nadu, India. It is on the Chennai–Trichy national highway. The highway and the railway line from Chennai egmore to Kanyakumari divide the town into East Tambaram and West Tambaram. The neighborhood is served by the Tambaram railway station of the Chennai Suburban Railway Network. As of 2011, the city had a population of 174,787. Tambaram has lot of education institution, industrial areas, hospital, multi complex, commercial area, mixed and purely residential areas, park, and religious zones.

GIS based planning for selected locations.

ArcGIS version9.3 is a state-of-art GIS software package developed by ESRI. The figure 1 shows the land use map 2016 of Tambaram zone plotted in the ArcGIS map based on the data collected from tambaram municipality. The places like railroad, arterial roads, excluded area, non-urban, low lying, water body, residential, industrial, institutional, agricultural, and commercial area where marked in the GIS map. The latitude and longitude of each locations are noted.

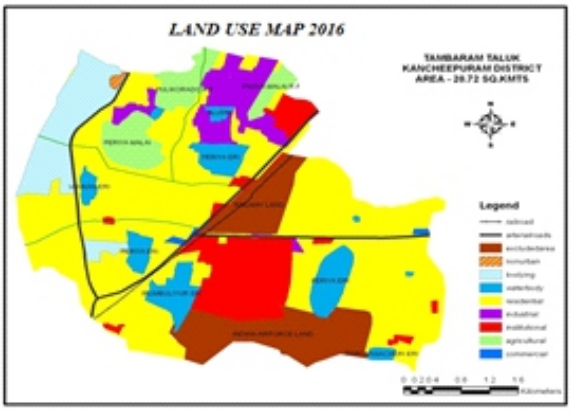

Figure 1 – Land use map

Selection of Instrument

Noise measuring devices typically used a sensor to receive the noise signals emanating from a source. Model 1900 precision integrating/logging sound level meter is used to take readings in tambaram zone with the help of Tamilnadu pollution control board. the reading

like Lmin, Lmax, Lequ, L90, L50, L10 are displayed in the instrument. In each place the instrument is placed for 10mins to get appropriate reading.

Identification of noise level

In the present study various locations where selected in tambaram zone. The R.Z refers to residential zone, C.Z refers to commercial zone, I.Z refers to industrial zone, and S.Z refers to silence zone.

Table 1 – Noise reading at Tambaram.

Code	Zones	Locations with Latitude and Longitude	Lmin	Lmax	Lequ
Tam 1	R. Z	Krishna Nagar 12o54'52.398"N 80o6'9.0936" E	37.7	75.3	54.3
Tam 2	R. Z	Mixed residential 12o55'10.524"N 80o4'34.3236" E	38.8	63.3	56.3
Tam 3	C. Z	Fish market 12o54'55.0152"N	58.9	77.5	72
Tam 4	C. Z	Vegetable market 12o56'5.8848"N 80o7'32.7216" E	64.7	80.4	75.8
Tam 5	C. Z	Railway station 12o55'33.3048"N 80o7'5.232" E	61.3	90.1	77.9
Tam 6	C. Z	Bus stand 12o55'52.11"N 80o7'21.0756" E	73.5	93.6	85.7
Tam 7	C. Z	Selayaur junction	59.4	83.4	67.9
Tam 8	C. Z	GST road 12o55'52.11"N 80o7'21.0756" E	68.3	98.7	88.4
Tam 9	I. Z	Bhavani industries 12o58'25.662"N 80o7'52.356" E	74.6	97.2	89.3
Tam 10	I. Z	Chandra blue metal industries 12o55'2.9748"N 80o6'12.3228" E	76.8	98.3	91.6
Tam 11	S. Z	Hindu mission Hospital 12o55'25.8528"N 80o6'50.3352" E	68.4	82.8	76.8
Tam 12	S. Z	Shankara global academy school 12o55'22.1952"N 80o7'56.2152" E	60.4	72.3	66.1
Tam 13	S. Z	Christ king girls high school 12o55'20.2764"N 80o7'49.9944" E	61.2	73.3	65.6
Tam 14	S. Z	M.C. college 12o55'22.782"N 80o7'10.9128" E	38.3	72.9	59.6
Tam 15	S. Z	Jummah Masjid 12o55'43.4020"N 80o6'43.29" E	65.6	86.1	76.9
Tam 16	S. Z	Selva Vinayakar 12o53'39.0084"N 80o8'16.278" E	61.6	81.5	73.1
Tam 17	S. Z	CSI church 13o3'9.1944"N 80o13'36.7068" E	64.7	81.1	75.1
Tam 18	S. Z	Muthurangam park 13o1'56.7912"N 80o13'44.166" E	50.4	71.2	61.8

(Source; Noise level reading was taken in field survey by using Sound level meter)

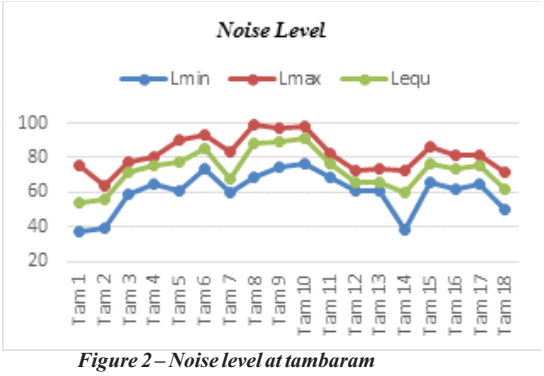

Figure 2 – Noise level at tambaram

The GST road was high due to more vehicle population. The lowest noise level was at M.C. College due to large number of trees in campus.
Results and discussion

The standards as per the noise pollution (regulation and control) rules 2000 are listed below.

Table 2; Noise Standards

Category of noise standards	Limits in (dB) Day time	Night time
Residential zone	55	45
Commercial zone	65	55
Industrial zone	75	70
Silence zone	50	40

(Source; Ministry of Environment and Forests)

Table 3 – Noise level in tambaram zone

Category of noise standards	Limits in (dB) Day time	Night time
Residential zone	70	65
Commercial zone	87	82
Industrial zone	97	92
Silence zone	78	73

All readings are 20% more than the standards. So the mitigation measures has to take place to reduce the noise level.

CONCLUSION

The noise level was measured in various locations of tambaram zone. These locations are classified into 4 zones industrial, commercial, residential, and silence zone. In every locations the reading was taken for 10min, in their peak and non-peak hours. The location is plotted in GIS software based on the noise readings. The average noise level readings in various zones are residential (70 dB), commercial (87 dB), and industrial zone (97 dB), silence zone (78 dB). The present noise level in all the zones in the study area is 20% more than the standards. Noise barriers are required to reduce the noise level. So planting of trees and construction of noise barriers will reduce noise level and provide healthy environment.

RECOMMENDATION

A noise barrier (also called a sound wall, sound berm, sound barrier, or acoustical barrier) is an exterior structure designed to protect inhabitants of sensitive land use areas from noise pollution. Noise barriers are designed to cut off direct sound from various source, aiming to reduce noise levels through energy losses that created upon the occurrence of sound diffraction. While the effect of noise barriers varies with such factors as barrier size and the distance between the noise barrier and sound receiving point [6].

The various types of noise barriers such as vertical and cantilever noise barriers, and semi-enclosures. To reduce the noise, the height of barriers must be above or equal to building height. Materials used for noise barriers usually involve gabion, earthen berm, trees, solid block, brick, concrete, wood, and light- transmitting glass. The size of barrier

are 20mm to 1m, based on the increase in size of barrier the noise decibel (dB) is reduced. The noise barriers suitable for tambaram are earthen berm, trees, concrete barriers, brick barriers. These materials are easily available and its cost of construction and maintenance are very low comparing with other type of barriers. These give aesthetic view and suitable for all type of buildings and roads.

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