Environmental Noise Pollution Assessment and Mapping of Kottayam Town

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Abstract- **In developing nations noise is a major pollutant to the environment. Road traffic is a superior source of noise pollution and it has detrimental effects on human beings. Fast growing vehicle population in town in the recent years, has resulted in considerable increase in traffic on roads causing alarming noise pollution. In Kerala roads are in bad condition, and poorly maintained and has considerable number of vehicles of outdated technology, the road traffic noise assumes much more importance. Noise affects human body in a number of ways ranging from Psychological to Physiological, e.g. auditory damage, speech interference, sleep interference, general annoyance, reduces the working efficiency, increases blood pressure & fatigue etc. The main objective of this study is to aware the public about the noisy environment with which we live today, due to the increased urbanization and increased traffic intensity. Using ArcGIS 10.7.1 software, noise maps are generated to make the awareness more straight.**

Keywords— Noise mapping, Arc GIS, Sound level analyser

I. INTRODUCTION

The environmental condition of Kottayam town has been changing abruptly along with the rapid growth of urbanization. Reckless use of horns and continuous vehicular movement results the noise pollution problem in the town. The present study is an attempt to evaepaluate noise pollution load of Kottayam town due to urbanization activities and its detrimental effect on the human health and environment. The main use of noise maps is to identify and quantify the scale of noise problems and provide information for town planning and traffic management. Noise maps build in GIS can be used for analysis and management process

So many studies and researches have been done and being doing on this context; In 2008-2009, Dr. Santosh Rangnekar[1] did survey on Noise Pollution and its Management and found out that the average noise level for traffic intersections and silent zone shown some sampling stations with undesirable values. It was concluded that the major reason of noise pollution inside the city was due to air horns and vehicular movements.

In 2013, S.U.Bande[2] completed a review on Road Tarffic Noise Assesment in India and noted that noise environment of the study area may pose as a great threat to the health of dwellers of the study area in long term. Therefore, a strict enforcement of law and regulation is felt in this regard.

In 2015 Jigna Patel[3] did a research on State of the Art

Review on Road Traffic Noise Mapping using GIS. Data collected and results analyzed indicate that almost on all major roads, are always higher than the permissible noise levels/limits prescribed by CPCB.

In 2010 Avnish Chauhan[7] did Assessment of Noise Level in Different Zones of Haridwar City and concluded It was also observed that higher noise level in the city is due to rapid and unplanned urbanization resulting in great influx of people from all parts of the region, lack of sufficient parking spaces and exponential growth.

In 2011 Dev Pramendra[11] and Singh Vartika[12] researched on Enviromental Noise Pollution Monitoring and Impacts On Human Health in Dehradun City.

A. SOURCES OF NOISE

Major source of noise in the town is traffic noise from the motors and exhaust systems of automobiles. Also noise from the roadway is generated by construction, commercial activity, political and religion activities, and ceremonials festivals. Noise levels and its impact depend on infrastructure, number of vehicles, road quality, weather and climate. Further sources are factories, batching plants, railway stations, motor garages, workshops and public address system etc.

II. MATERIALS AND METHODOLOGY

A Noise assessment is the actual measurement of the noise levels. The NIOSH Sound Level Meter (SLM) app combines the best features of professional sound levels meters and noise dosimeters into a simple, easy-to-use package. Developed by experienced acoustics engineers and hearing loss experts. Tested and validated (accuracy ± 2 dB) according to standards in a reverberant chamber at the NIOSH acoustics lab – the only proper method to validate accuracy. The sound level meter application was calibrated before taking the measurements. Sound level measurements during peak time morning (8–10am) and evening (3-5pm) was carried out in Kottayam town areas on both a working day and non working day. The noise level in Kottayam city was observed during different time intervals at different selected study locations. The study locations were identified and grouped into fore different zones namely Commercial Zone, Silent Zone, Residential zone and Industrial Zone. Commercial zone incorporated with a lots of shopping malls, tourist attractive spots etc. It covers Baker Junction, Mall of Joy, Railway station, KSRTC Bus Station, Nagambadom (Bismi Enterprises, Oxygen, Reliance, myG), Private Bus Station. The silent zone is incorporated with educational institutions, hospitals etc. It includes Medical College, M G University, CMS, Baselius, Caritas, Collectrate, Bharath Hospital. Residential zone covers the areas of SFS Flats Kodimatha, Kurishupally areas, Skyline Kanjikuzhy, Souhritha Nagar SH

Mount. Industrial Zone comprises of Travancore Cement Kodimatha, MRF Vadavathoor, Murianckal Rubber Industry. The results were noted in at the spot of measurement. The interpretation of noise levels and the cut-off level to which the measured noise levels were compared with the prescribed basic noise level in the different specified zones such as Commercial zone (55 - 60 dB), Silent zone (40 - 50 dB) Residential zone (50 - 55 dB) and Industrial zone (65 – 70 dB) by Central Pollution Control Board (CPCB). The sites are visited every day with this application and data were taken from morning 8 am to10 pm and evening 3 pm to 5 pm on working and nonworking days. Several numbers of primary data were obtained in one spot itself. Noise mapping is prepared using ArcGIS 10.7.1 software for better visual information of the noise environment of Kottatam town. ArcGIS 10.7.1 software used to plot the noise levels contours. It is an effective technique used by various researchers for the purposes of noise mapping. The noise level maps were prepared in ArcGIS for different times of the day to show the diurnal variation of the noise environment in the town. ArcGIS, appropriately gives better visual information of the regions with higher noise levels and also identifies the more vulnerable areas under the noise pollution threat. The study reveals the need of an awareness regarding adverse effect of noise among public.

In this paper, a study on noise pollution rates of four zones in Kottayam town is presented. Analysis using Arc GIS software is used to create respected maps of the zones accordingly.

The sound levels recorded from different zones of Kottayam town were tabularized on TABLE I to TABLE II.

B. MEAN VALUES OF SOUND LEVEL READINGS

TABLE 1. MEAN VALUE OF DIGITAL SOUND LEVEL READING OF COMMERCIAL ZONE

Location	Working days		Non-working days	
	8.00am-10.00 am	***3.00pm-5.00pm***	***8.00am-10.00 am***	***3.00pm-5.00pm***
Baker Jn.	122.86	108.63	135.42	157.33
Mall of Joy	110.72	122.74	132	145.3
Railway Station	113.89	124.10	122.6	112.75
KSRTC Bus Station	143.10	168.9	114.73	151.6
Nagamba-dom	122.45	123.77	112.3	98.65
Private Bus Station	134.67	133.54	121.8	133.39

TABLE 2. MEAN VALUE OF DIGITAL SOUND LEVEL READING OF SENSITIVE ZONE

Location	Working days		Non-working days	
	8.00am-10.00 am	***3.00pm-5.00pm***	***8.00am-10.00 am***	***3.00pm-5.00pm***
Medical College	110.67	114.8	92.86	94.3
St. Joseph School	106.78	123.45	79.56	78.9
CMS	112.99	121.67	88.44	77.69
Baselius College	122.78	124.5	93.6	87
Collectrat-e	122	132.89	115.87	103
Bharath Hospital	119.2	125.54	98	97.5

TABLE 3. MEAN VALUE OF DIGITAL SOUND LEVEL READING OF RESIDENTIAL ZONE

Location	Working days		Non-working days	
	8.00am-10.00 am	***3.00pm-5.00pm***	***8.00am-10.00 am***	***3.00pm-5.00pm***
SFS Flats	116.89	123.45	75.61	78.86
Kurishupa-lly areas	112.78	136.99	138	156.88
Skyline	109.8	124.5	93.6	88
Souhritha Nagar SH Mount	111.32	115.6	105	122.74

TABLE 4. MEAN VALUE OF DIGITAL SOUND LEVEL READING OF INDUSTRIAL ZONE

Location	Working days		Non-working days	
	8.00am-10.00 am	***3.00pm-5.00pm***	***8.00am-10.00 am***	***3.00pm-5.00pm***
Travancor-e Cements	80.78	86	73	76.77
MRF	98.56	98	76.48	78.21
Murianick-al Rubber Industry	86.42	87.11	75	71.2

III. ANALYSIS AND RESULTS

Noise maps of the four zones both for working and non-working days were plotted accordingly with the help of Arc GIS 10.7.1 software and thus the results were obtained as shown below on Fig. 1 to 8.

Mean values were marked under 3 categories as low, medium and high accordingly through the software.

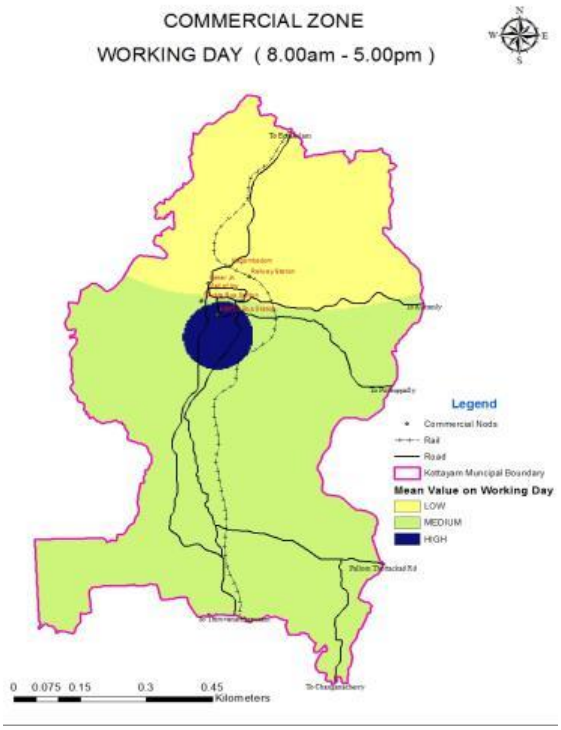

Fig. 1. Noise map of commercial zone on working days. It is observed that a small area around KSRTC is having a high mean value compared to other.

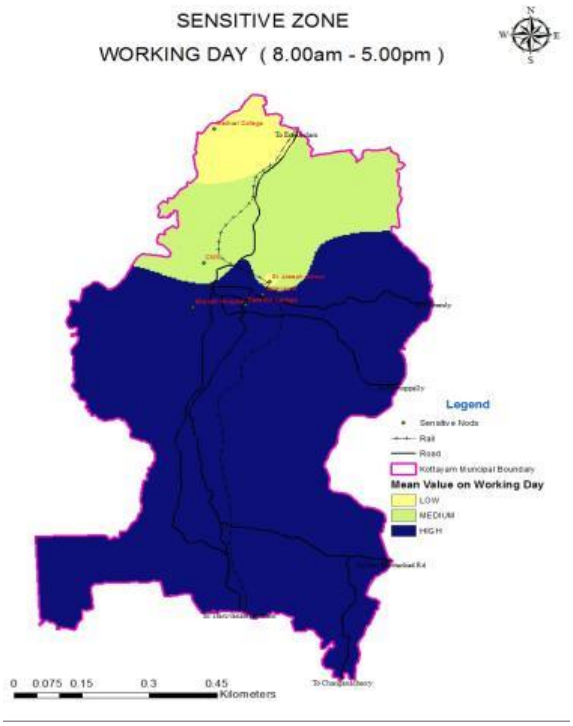

Fig. 3. Noise map of sensitive zone on working days. For the working days this zone is having large area with high mean value .

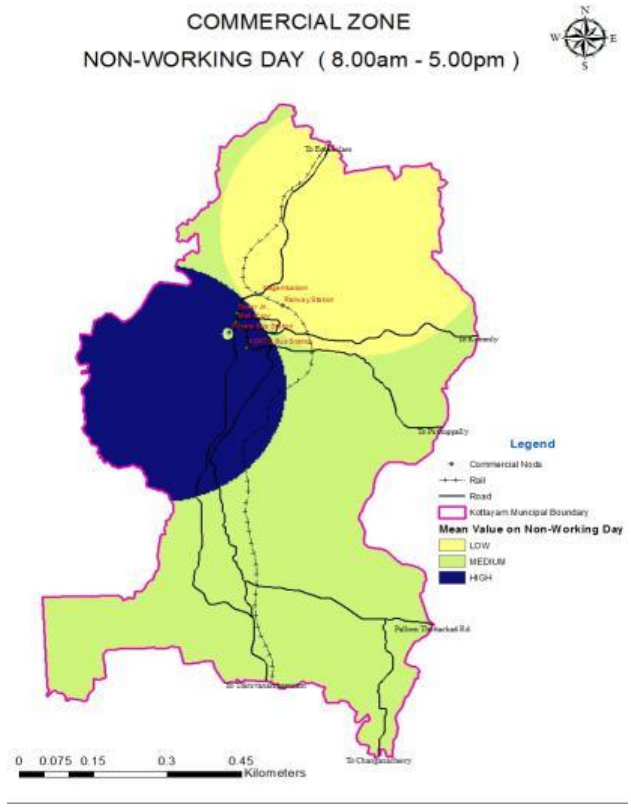

Fig. 2. Noise map of commercial zone on non-working days. In non working days the areas with where hving a low and medium mean value is having high mean value which indicating area is having a rush during those days.

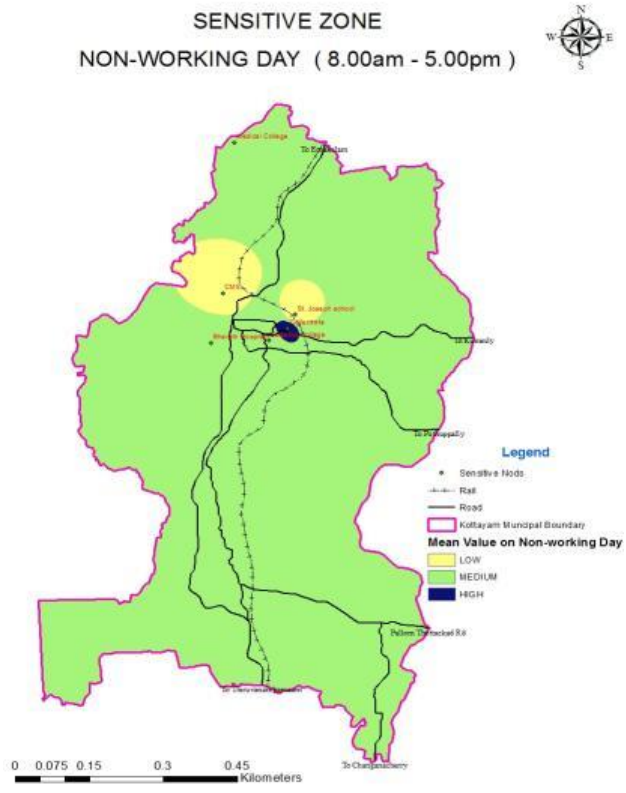

Fig. 4. Noise map of sensitive zone on non-working days. For non working days the areas are least exposed to sound.

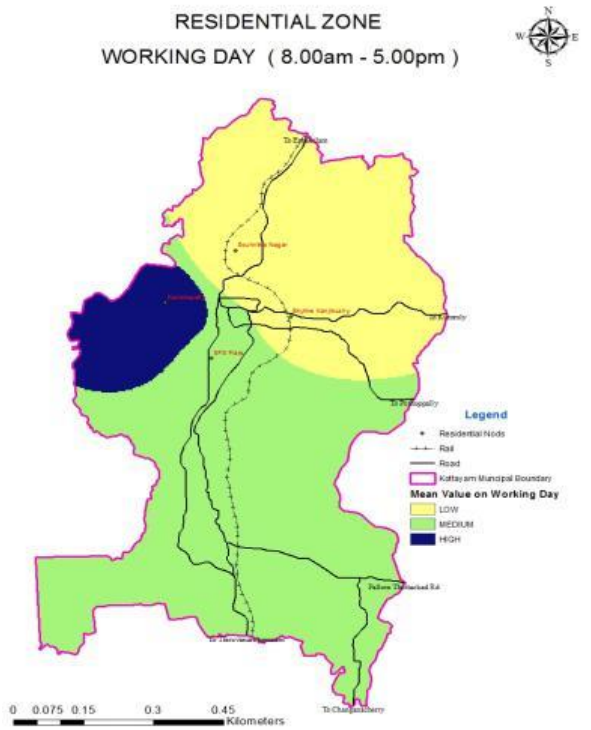

Fig. 5. Noise map of residential zone on working days.Kurishupally area is having a high mean vaue while other residential areas are having comparatively low noise.

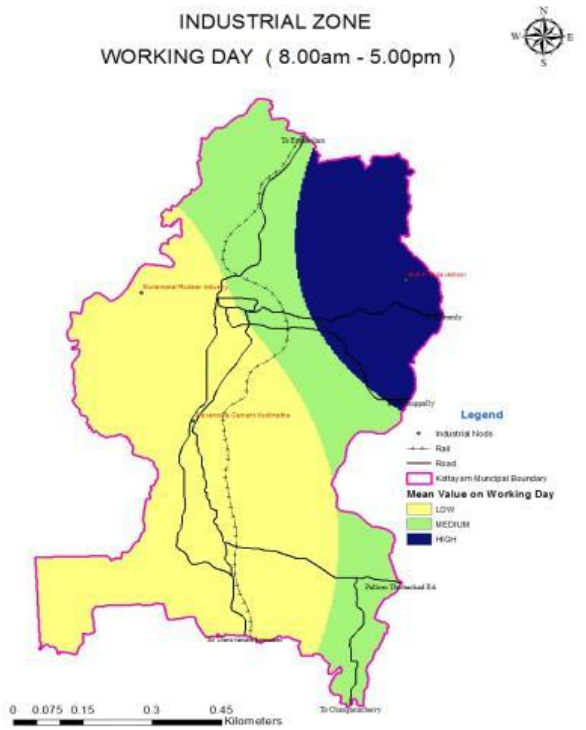

Fig. 7. Noise map of industrial zone on working days. MRF and areas near are having high values whlie comparatively large area is having low mean value.

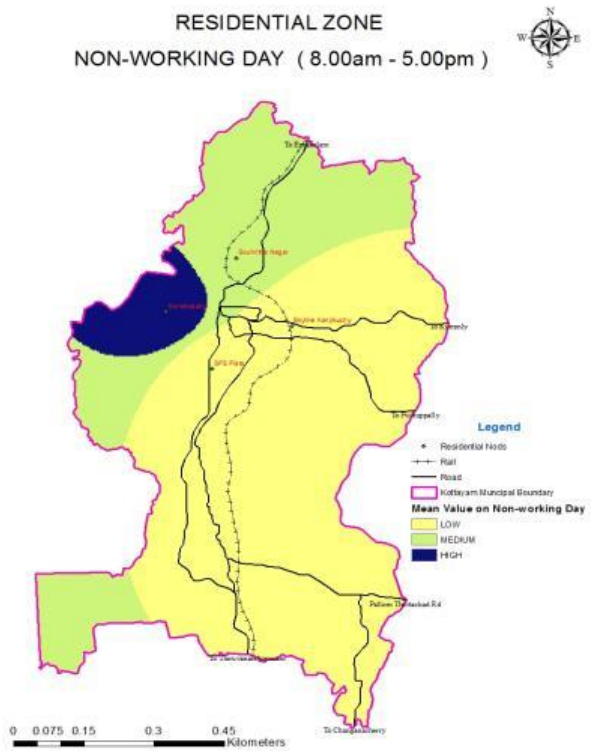

Fig. 6. Noise map of residential zone on non-working days. It is observed both during non working and working days residential zone is having only sligth differnce in noise exposure.

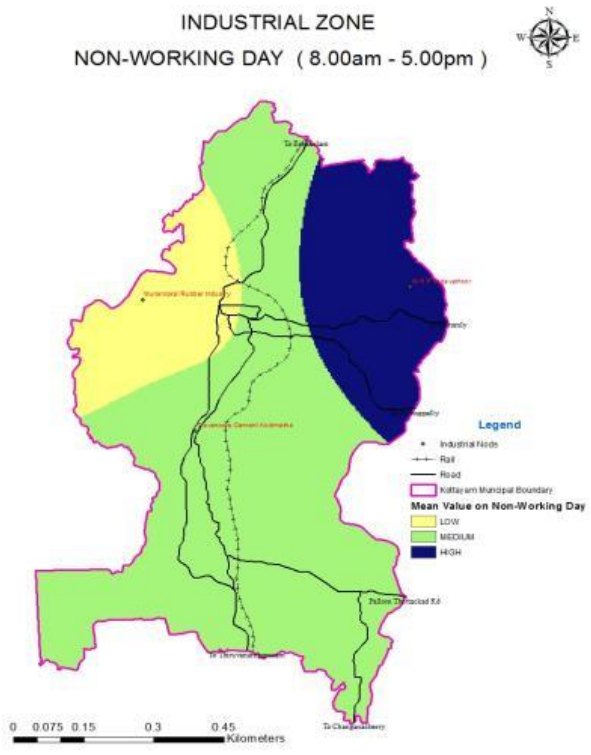

Fig. 8. Noise map of industrial zone on non-working days. In non working days its observed a large part of low mean value areas are changed to medium mean value.

C. CONTROLL MEASURES TO BE ADOPTED

a) Installing proper noise barriers around the premises of Mall of Joy and nearby buildings.
b) Vehicles directing towards the Mall should be properly deviated without causing any delays to the vehicles heading towards the town centre.
c) Soundproof doors and windows can be installed to block unwanted noise from outside at sensitive zones like Medical College and Bharath hospital.
d) Strict legislative measures must be adopted along this areas of hospitals and institutions like limiting the number of vehicles, banning horns etc.
e) Maintaining and improving the vegetation by planting more trees and plants all over the residential zone.
f) Replacing noise producing machines with suitable improved technique like silencing can reduce a considerable amount of noise at the industrial zones.

g) Use of ear plugs or ear muffs or even cotton balls by the worker in the industry can protect them from hazardous effects of noise pollution in these areas.

IV. CONCLUSIONS

Eight maps of four zones at two intervals of time on both working and non-working days were plotted for Kottayam town based on the sound level data collected from the respective study areas.

Following conclusions were derived through the software analysis:

1. It was observed that the noise of the areas is rapidly reaching at high intensities.
2. The sound levels also reached over the limit of CPCB at respective zones which shows the high value of noise pollution in the town area.
3. At areas of sensitiveness, the noise was found to have a high value which will cause ill effects in educative and medical zones in the future.
4. Higher noise level in the town is due to rapid and unplanned urbanization resulting in great influx of people, lack of awareness and also due to insufficient parking spaces.
5. It is seen that noise at the study area may pose as a great threat to the health of the people.
6. Therefore, a strict enforcement of law and regulation is the need of the hour.

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