A SYSTEMATIC SURVEY AND EXPERIMENTAL ANALYSIS OF NOISE POLLUTION IN SALEM CITY

S. SARANYA[a1], C. RAMGANESH[b], P. SURESH KANNAN[c] AND S. SATHEESHKUMAR[d]

[a]Karur College of Engineering, Tamilnadu, India
[bc]Mahendra Institute of Engineering & Technology, Tamilnadu, India
[d]Kongunadu College of Engineering & Technology, Tamilnadu, India

ABSTRACT

Rapid urbanization and industrialization even though facilite our lives, leads to various forms of environmental pollution. This paper presents the results obtained in a study on environmental noise pollution in the city of Salem. Road traffic noise has been a major contributor to the annoyance, which is substantiated by the result of continuous monitoring of noise equivalent levels (Leq) at a number of silence, resi- dential, commercial, industrial zones and road intersections. In conclusion, the noise pollution of the city is wide spread throughout most of its area, where measured noise levels are similar to those commonly observed in cities that do not have mitigation programmers'. Public participation, education, traffic management, structural designing play a major role in noise management.

KEYWORDS: Noice,Traffic Management, Decebl Level

Noise Pollution And Its Effect

Noise pollution is the disturbing noise with harmful impact on the activity of human or animal life. The source of outdoor noise worldwide is mainly caused by machines and transportation systems, motor vehicles engines and trains. Outdoor noise is summarized by the word environmental noise. Poor urban planning may give rise to noise pollution, side-by-side industrial and residential buildings can result in noise pollution in the residential areas. Documented problems associated with urban environment noise go back as far as Ancient Rome. Noise from roadways and other urban factors can be mitigated by urban planning and better design of roads. Noise pollution mainly caused by human in defferent ways .That is by flight, train, industry and vaicles (Figure 1).

Outdoor noise can be caused by machines, construction activities, and music performances, especially in some workplaces. Noise-induced hearing loss can be caused by outside (e.g. trains) or inside (e.g. music) noise.

High noise levels can contribute to cardiovascular effects in humans and an increased incidence of coronary artery disease. In animals, noise can increase the risk of death by altering predator or prey detection and avoidance, interfere with reproduction and navigation, and contribute to permanent hearing loss.

Figure 1: Map of the Study Area

Goal Of The Study

Our main goal in this study was to analyse the noise creation in our Salem city and to aware the habitants about the effects of noise pollution. Since Salem being congested city no noise pollution measures and control have been proposed. The main objective of our study is to make people aware of the present noise pollution and its hazardous effects.

Proposed Method

In our study we have used Thermo hygrometer to know the humidity and temperature in that particular

[1]Corresponding author

place at that particular time. These 2 factors affect noise pollution widely. In olden analysis no where these humidity and temperature are analysed.

Types Of Data Analyzed

The noise measurement parameters recorded was using sound level meter (SL-4001) for the measurement. The following parameters like:

1. Total vehicle volume per hour

2. Atmospheric temperature in degree Celsius

3. Relative humidity in percentage.

4. Type of vehicles crossing the area during the study.

5. Noise level in that area

Were noted during the study to analyse the noise creation pattern. The study reports community noise levels measured during day time in fast developing semi-urban areas of Salem city, which is one of the rapidly developing industrial cities in Tamilnadu supporting millions of people for their livelihood

Economic Base

The Salem handloom industry is one of the most ancient cottage industries and producing quality sari, dothi and angavasthram out of silk yarn and cotton yarn. In the recent past, home furnishing items are also woven, mainly for export purposes. More than 75,000 handlooms are working and the total value of cloth produced per annum is estimated at Rs.5,000 crores. With more than 125 spinning mills, with modern weaving units and garment units Salem established itself as one of the major textile center in Tamil Nadu .The history of handloom and spinning mills dates back to pre-independence period in Salem. But till 1960s there were fewer than 5 spinning mills. Private handloom weaving started thriving in the region along with the large scale cooperative sector handloom weaving and marketing units. Small scale hand dying units were started around the region to support the industry. Around 1980s the textile industry grew significantly. Many major spinning mills and waste spinning units came up into existence. Many Handloom societies and dying houses were established. New and increased number of Power Loom units were mushroomed in the places like Gugai, Ammapet, Attayampatti, Vennandur, Magudanchavadi, Rasipuram, Komarapalayam Pallipalayam, Jalakandapuram and Ellampillai.

The Salem region also houses the Tamil Nadu largest number of Sago industries which are engaged in the production Sago Foods and Starch. In Salem District alone, 34000 hectares of land is under tapioca cultivation which is the raw material for the sago industries and there are 650 units engaged in tapioca processing. In and around Salem the yield of tapioca is about 25-30 T/ha, highest in the World. National average is 19 T/ha and World average production stands at 10 T/ha. Hence it is called land of sago. In 1981, Salem Starch and Sago Manufacturers Service Industrial Co-operative Society Ltd(popularly called as SAGOSERVE) was established to promote the growth of sago industries. Nearly 80% of the national demand for Sago and Starch is being met by the Sagoserv.

Salem Steel Plant, a special steel unit of Steel Authority of India Ltd have their plant located in Salem which produces Cold rolled stainless steel and Hot rolled stainless steel/carbon steel. The plant can produce austenitic, ferritic, martensitic and low-nickel stainless steel in the form of coils and sheets with an installed capacity of 70,000 tonnes/year in Cold Rolling Mill and 1,86,000 tonnes/year in Hot Rolling Mill. In addition, the plant has country's first top-of-the-line stainless steel blanking facility with a capacity of 3,600 tonnes/year of coin blanks and utility blanks/circles. Expansion and modernisation of Salem Steel Plant is ongoing. The plan envisages installation of Steel Melting and Continuous Casting facilities to produce 1,80,000 tonnes of slabs along with expansion of Cold Rolling Mill complex, enhancing the capacity of Cold Rolled Stainless Steel Products from 65,000 TPA to 1,46,000 TPA and an additional Roll Grinding Machine for Hot Rolling Mill for increasing production to 3,64,000 TPA. The total project area is 1130 acres and cost of the project is 1780 crores.

Southern Iron & Steel Company Ltd (joint venture with JSW Steel) the first integrated steel plant of India at a cost of 2,235 Crores, located near Salem for the production of TMT corrosion resistant bars/alloy steels. The Salem plant is the largest special steel plant in India aims to develop the Kanjamalai, Kavuthimalai and Vediappanmalai iron ore mines in Tamil Nadu on receipt of requisite approvals to improve raw material security. This will facilitate expansion of production capacity to 2 MTPA. It will also allow the unit to diversify into the production of value-added products such as annealed, drawn and peeled steel. The plant is continuously working

to develop special grades for critical automotive applications

The Madras Aluminium Company Ltd (MALCO) is part of Vedanta Resources Plc, a London Stock Exchange listed FTSE 100 diversified metals and mining major. MALCO has a state-of-the-art, coal-based Captive Power Plant at the same location which was commissioned in the year 1999. In the year 2004 MALCO augmented its smelter capacity from earlier 25,000TPA to 40,000TPA. It generates 100 MW power from 4 units of 25MW each through power plant located at Mettur, Tamil Nadu. Around 90% of the entire power generated is exported; the rest is used internally. Efficient plant operations enabled MALCO to achieve a higher plant load factor since existence.

The region around Salem is rich in mineral ores. Salem has one of the largest magnesite, and bauxite and also iron ore deposits in India. It has many magnesite factories operated by private and public sectors such as Burn Standard & Co, Dalmia Magnesites and Tata Refractories, SAIL refractories. The Leigh Bazaar market in Salem is the biggest regional market for agro products. Narasus coffee one of the famous coffee in Tamil Nadu, Nandhi Dall Mills the oldest flour mill company, BSP refineries (Usha Refined Sunflower Oil) are other few companies have their presence in Salem.

Being one of the fastest growing tier II cities, the Tamil Nadu government and ELCOT are planning to establish an IT park in Salem covering about 160 acres (0.65 km^2). SAIL is planning a Steel SEZ inside the Salem Steel plant covering about 250 acres (1.0 km^2). There is an exclusive Electrical and Electronics Industrial Estate in the Suramangalam area of Salem city. Coimbatore-Erode-Salem stretch was well known for Industries and Textile processings and it is announced as Coimbatore-Salem Industrial Corridor and further development works are carried by SIPCOT Linking.

NOISE POLLUTION AND ITS IMPACT

Noise is one of the most important pollution in the metropolitan and urban areas, the recognition of road traffic noise as one of the main sources of environmental pollution is the need of the hour. In urban areas people commute regularly for performing their day to day activities which leads to more and more travel using automobiles which are one of the chief agent of noise pollution. Population growth, development of the mega

cities and their impacts on urban traffic are the most important problems that is harrying the people in cities. Traffic noise from roadways and highways creates problems for surrounding area, especially when there are high traffic volume and high speeds. Vehicular traffic noise problem is contributed by various kinds of vehicles like heavy, medium truck / buses, automobiles and two wheelers..Most of the noise is generated only due to heave movement of vehicles. This high level attributed to vehicular traffic specially auto rickshaw with ineffective silencers (without filters) and frequent use of the pressure horns by buses, wagons and trucks etc. Since the traffic noise is increasing more in this city day by day so this has to be analyzed and controlled so that no health hazards pose. nodes.(Chitravel.V et al., 2013).

Noise is a disturbance to the human environment that is escalating at such a high rate that it will become a major threat to the human beings. Traffic related noise pollution accounts for nearly two thirds of the total noise pollution. Traffic noise from highways creates problems for surrounding areas, especially when there is a high traffic volume and speed. The present study emphasis on the effect of traffic volume and speed under interrupted and uninterrupted traffic flow conditions. It was observed from the analysis that noise level at both traffic flow conditions were within the permissible limits. The influence of volume on noise level shows that noise levels is higher under interrupted traffic flow condition and similarly for speed on noise level indicate that the noise level is higher on interrupted traffic junction than uninterrupted junction..(H. Karibasappa et al., 2013).

The accretion of traffic has led to the use of more sophisticated Traffic management system in today's society. Traffic Congestion is a major factor which forestalls the smooth flow of Ambulance and VIP vehicles. To abate the inconvenience caused by the traffic, the Traffic Light Controller (TLC) is used which minimizes the waiting time of vehicle and also manages traffic load. RFID based systems play a crucial role in solving the problems caused by traffic. The project is a replica of a four way lane crossing of real time scenario. In the first part, concentrated on problems faced by Ambulances, RFID concept is used to make the Ambulance's lane Green and thus provides a free way without interrupting the Ambulance. In the second part, concentrated on problems faced by Priority vehicles, IR sensors are used to actuate the timers accordingly and thus preventing traffic congestion. In the third part,

concentrated on Traffic density control, IR transmitter and receiver are used to provide dynamic traffic control and thus increasing . (Devika M D.,2007)

METHODOLOGY

Study Area

Salemis a city in Salem district in the Indian state of Tamil Nadu. It is located about 160 kilometres (100 mi) northeast of Coimbatore, 186 kilometres (116 mi) southeast of Bangalore and about 340 kilometres (210 mi) southwest of the state capital, Chennai. Salem is the sixth largest city in Tamil Nadu bypopulation and covers 91.34 km^2 The town and the surrounding hilly regions were part of the Chera dynasty and was part of the trade route with the Roman empire. It was later governed by Poligars, who built temples and forts in and around the city. It was part of the Vijayanagara empire before being captured by Hyder Ali during the early 18th century, after the Mysore-Madurai war. It was ceded to the British in 1768 and the area became part of the struggle between Kongu Nadu led by Dheeran Chinnamalai and the British. Salem became part of Salem district since independence in 1947. Salem city is governed by Municipal Corporation which comes under Salem Metropolitan Region.

As per provisional reports of Census India, population of Salem in 2011 is 829,267; of which male and female are 417,317 and 411,950 respectively. Although Salem city has population of 829,267; its urban / metropolitan population is 917,414. The ambient noise levels were monitored in selected silence, residential, commercial, Industrial zones and road intersections of the city and compared with the ambient noise standards promulgated by Central Pollution Control Board (CPCB). The noise level measurements were recorded using a preci- sion sound level meter-TES 1350 with a measuring range between 35-130dB. The instrument was calibrated before the measurements were recorded. A distance of 2m from the source has been maintained during measurements (Prabhakara Murty and Sudharshan Reddy, 1996). In each location, adequate number of samples was made with one-minute time interval between two subsequent readings (Edison et al., 1999). The noise levels are recorded both during peak (0800 to 1000 and 1700 to 1900 hours) and non-peak (1000 to 1700 hours) timings of the day (Vishwanath and Anantha murthy, 2003) in road intersections and commercial areas. From these measurements, the minimum sound pressure level Lmin, the maximum sound pressure level L max was

observed. However, to quantify the variability of noise during each measurement, the percentiles L90 and Leq were also calculated (Michael, 1991).

Assessment of Traffic Noise

The main reason for traffic noise in this city was attributed due to the vehicle horns, silencers, etc., which is too hazardous to the inhabitants. The number of vehicles is increasing day by day which is contributing more in noise pollution. All these have to be analysed and control measures are to be implemented as soon as possible so as to avoid the health issues

Types of Areas Covered

In our study we have selected silent zones like areas surrounding schools and some commercial areas. The data were recorded during early hours of day i.e., from 6.30 am to 9.30 am

MATERIALS AND METHODS

In this study an effort is made to identify the noise level in some main areas of Salem city using sound level meter. Since noise level varies with atmospheric conditions, in each area respective temperature and its humidity has also been recorded. The readings were taken during early hours of the day (6.30 AM to 9.30 AM). In each area for each a minute readings were taken almost for 15 minutes. The following parameters like

1. Total vehicle volume per hour

2. Atmospheric temperature in degree Celsius

3. Relative humidity in percentage.

4. Type of vehicles crossing the area during the study.

5. Noise level in that area

Noise measurement was done at a distance of 3m from road side at an elevation of 130cm above the road surface. A and C sound level meter type SL-4001 with the capacity of measuring noise from 30 dB to 130 dB was used for measurements. Humidity in % and temperature in degree Celsius was measured by Thermo- hygrometer ATC-288 in each area. For averaging purpose the study is conducted repeatedly and the average value is taken for the results analysis.

RESULTS AND DISCUSSION

It is noticeable that the major part of the populations exposed to noise levels greater than 65 dBA

everyday. A widely accepted scientific fact is that the living in area with the LAeq higher than 65 dBAput an urban population in a high risk category for numerous noise subjective effects, including sychological, sleep, and behavioural disorders. However many useful works have been done to mitigate the noise problem. There are about 3,000,000 different types of vehicles in the city of Salem which one third of them are more than 20-yearold. Planning along with lack of strong police monitoring are the major reasons of noise pollution in the city. Although heavy vehicles are not permitted to enter the city in the daytime 06:00 – 22:00 but still the main fraction of transport activities are relied to personal gasoline cars and diesel buses which generate the high level of noise pollution due to poor maintenance and old technology. The other effective source that raises the noise pollution is the motorcycle fleet especially in the central areas of the city. It is concluded that the downtown area of the Salem is environmentally noise polluted and the road traffic is a major environmentally health hazard for its habitants. Among all things that can be done to relieve the environmental noise pollution problem in the city, the most effective one is to promote the environmental culture and the awareness of the citizens about the risk of daily exposure to high noise levels.

DISCUSSION

The traffic noise level was measured at the various locations of Salem district. The data was collected from busiest roads of commercial areas, silent area like schools, hospitals, colleges and industrial areas Table, 7 to 30 reports the traffic noise level 3 Taluk locations of Salem district. The traffic noise level at all 3 Taluk in table 1 to table 5 indicated higher noise levels 91 to 115 dB when compared to National Environmental Quality standards of Noise 85 dB. The maximum noise level of 115 dB has been reported.

Table 1: Noise level in Salem Industrial Zone (Morning & Evening Time)

Sl. No.	Location	Time	Noise Level	No of Vehicle	Temperature	Humidity
			dB		^{0}C	%
1	Super White Marbles	9.42 – 9.47	76.8	195	31.1	49
2	Simco Thread mills	10.00 – 10.05	72.4	5	31.9	45
3	Theresa Engineering Works	10.09 – 14.14	71.2	2	36.4	41
4	The Standard cooling system	10.15 – 10.20	74.1	1	33.6	40
5	Kumaran welding works	10.23 – 10.28	85.6	11	34.6	44

Sl. No.	Location	Time	Noise Level	No of Vehicle	Temperature	Humidity
			dB		^{0}C	%
1	Super White Marbles	5.35 – 5.40	91.5	212	34.5	29
2	Simco Thread mills	5.50 – 5.55	73.4	6	33.3	36
3	Theresa Engineering Works	6.34 – 6.39	74.2	1	32.5	37
4	The Standard cooling system	6.18 – 6.23	78.7	7	31.9	33
5	Kumaran welding works	6.04 – 6.09	62.6	-	30.6	34

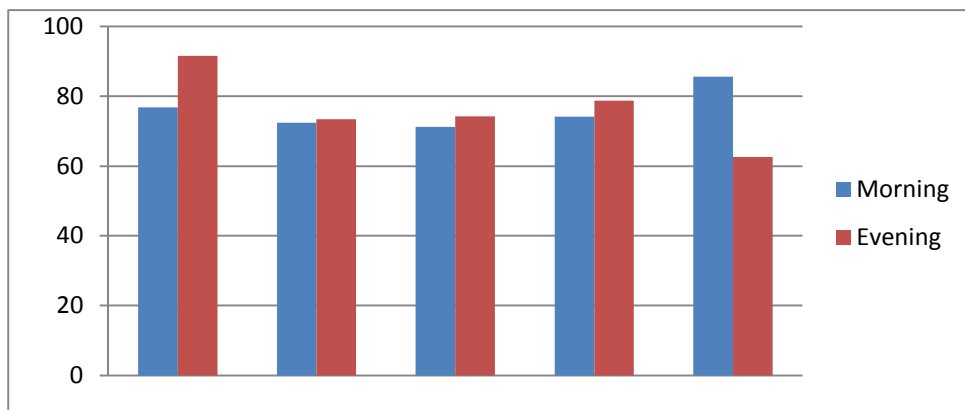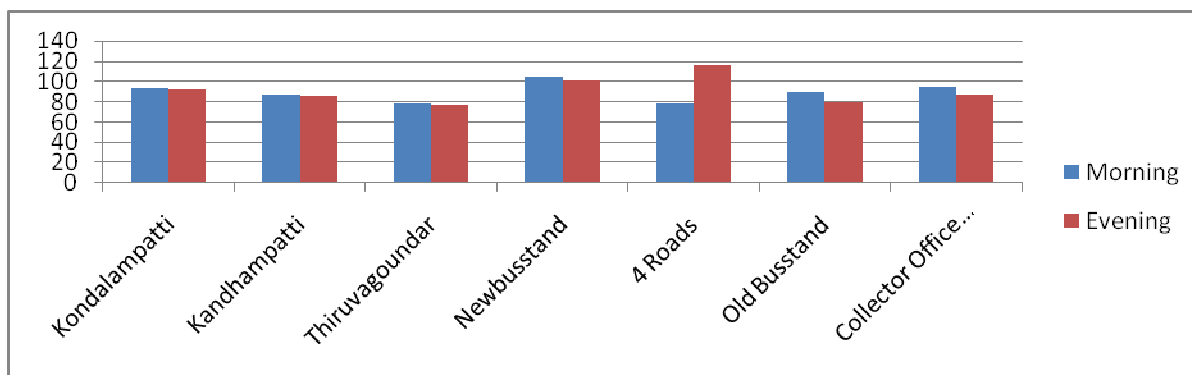SARANYA ET. AL.: A SYSTEMATIC SURVEY AND EXPERIMENTAL ANALYSIS OF NOISE POLLUTION IN SALEM CITY

Table 2: Noise level in Salem Traffic Zone (Morning &Evening Time)

Sl. No.	Location	Time	Noise Level dB	No of Vehicles	Temperature ^{0}C	Humidity %
1	Kondalampatti	6.35 – 6.45	93.6	65	25.9	55
2	Kandhampatti	6.55 – 7.05	87.4	49	24.6	52
3	Thiruvagoundanur	7.15 – 7.25	78.7	77	30.6	49
4	New Bus Stand	7.32 – 7.42	104.7	94	32.5	34
5	4 Roads	9.19 – 9.29	78.6	62	34.8	36
6	Old Bus stand	9.50 – 10.00	89.2	77	32.6	33
7	Collector Office Signal	10.14 – 10.24	94.6	71	31.9	29

Sl. No.	Location	Time	Noise Level dB	No of Vehicles	Temperature ^{0}C	Humidity %
1	Kondalampatti	6.15 – 6.25	91.6	73	22.7	34
2	Kandhampatti	6.31 – 6.41	86.3	79	29.4	37
3	Thiruvagoundanur	6.49 – 6.59	76.7	53	31.8	46
4	New Bus Stand	7.16 – 7.26	101.4	73	30.7	49
5	4 Roads	7.43 – 7.53	115.7	61	34.6	42
6	Old Bus stand	8.17 – 8.27	79.9	91	31.6	31
7	Collector Office Signal	8.33 – 8.43	87.4	68	31.9	43

Table 3: Noise level in Salem Silent Zone (Morning & Evening Time)

Sl. No.	Location	Time	Noise Level dB	No of Vehicles	Temperature ^{0}C	Humidity %
1	Saradha College	6.35 – 6.45	85	35	32.6	43.5
2	Holy Angels	7.01 – 7.11	88.4	38	31.7	45.7
3	Fairylands Murugan Kovil	7.19 – 7.29	95.1	39	37.16	32
4	Kamala Hospital	7.35 – 7.45	97.1	42	32	32.5
5	Gokulam Hospital	8.03 – 8.13	93	45	29.6	33.5
6	C.S.I. Lechler Church	9.10 – 9.20	92.7	65	32.6	40.6
7	S.K.S. Hospital	9.31 – 9.41	94.4	73	39.7	44.4
8	Government Hospital	9.52 – 10.03	88.3	84	41.6	40.6
9	St. Marys School	10.15 – 10.25	93.9	78	35.7	34.2

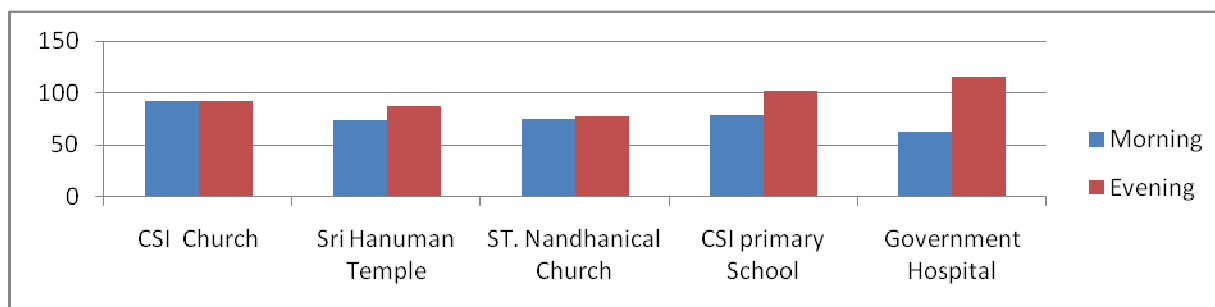| Sl. No.	Location	Time	Noise Level	No of Vehicles	Temperature	Humidity
			dB		^{0}C	%
1	Saradha College	6.01 – 6.10	84.6	46	24.9	26.4
2	Holy Angels	6.17 – 6.27	88	65	30.9	29.8
3	Fairylands Murugan Kovil	6.32 – 6.42	78.7	85	29	49.7
4	Kamala Hospital	6.50 – 7.00	96	45	29.5	55.7
5	Gokulam Hospital	7.09 – 7.19	93.7	67	28.6	43.3
6	C.S.I. Lechler Church	7.23 – 7.33	93.3	54	30.2	51.8
7	S.K.S. Hospital	7.50 – 8.00	85.9	21	25	50.4
8	Government Hospital	8.11 – 8.21	96.4	78	28	47.9
9	St. Marys School	8.35 – 8.45	85.17	23	34.6	45.5

Table 4: Noise level in Omalur Silent Zone (Morning&Evening Time)

Sl. No.	Location	Time	Noise Level	No of Vehicles	Temperature	Humidity
			dB		^{0}C	%
1	Mecheri Main Road	7.12-7.22	78.7	45	29.9	59
2	Omalur Bus Stand	7.28-7.38	56.8	43	29.8	56
3	T.N. Highway Road Employees Association	7.43-7.53	98.6	56	28.9	53
4	Mettur Main Road	8.55-9.05	79.8	21	34.4	65
5	Taramangalam Main Road	9.13-9.23	87.9	65	36.7	59

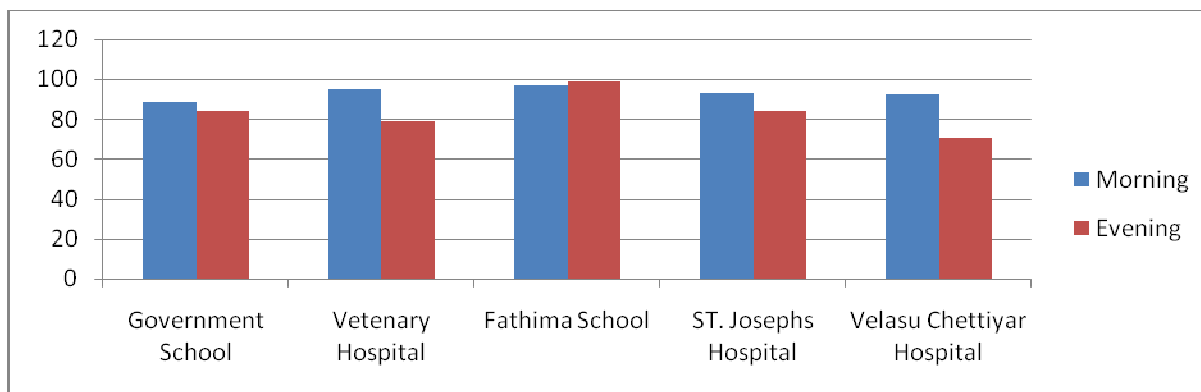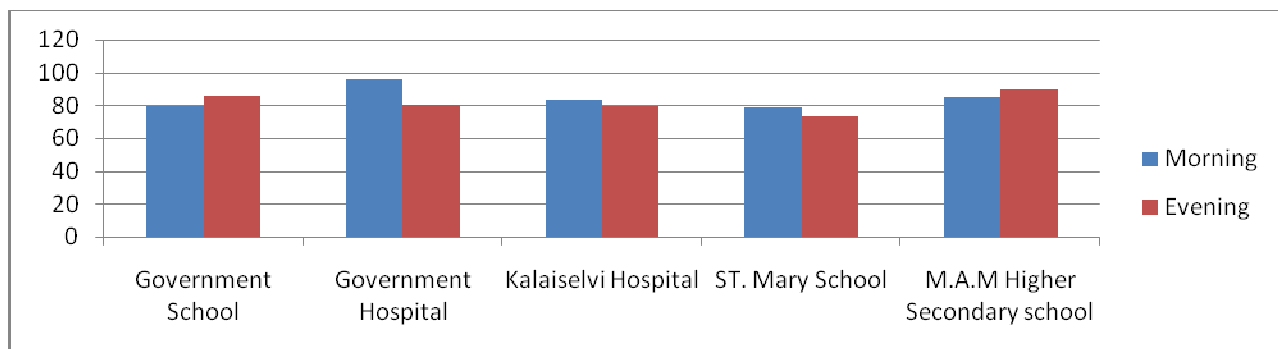| Sl. No.	Location	Time	Noise Level	No of Vehicles	Temperature	Humidity
			dB		^{0}C	%
1	Government School	4.56-5.06	84	34	29.9	59
2	Vetenary Hospital	5.12-5.17	78.9	32	31	58
3	Fathima School	5.25-5.35	98.9	21	34.7	54
4	St. Josephs Hospital	5.43.-5.53	83.8	8	32.6	52
5	Velasu Chettiyar Hospital	6.06-6.16	70.7	21	29.9	54

Table 5: Noise level in Mettur Silent Zone (Morning & Evening Time)

Sl. No.	Location	Time	Noise Level dB	No of Vehicles	Temperature 0C	Humidity %
1	Government School	7.02-7.12	79.4	10	32.4	33
2	Government Hospital	7.20-7.30	95.5	45	39.3	46
3	Kalaiselvi Hospital	7.40-7.50	83.5	24	35.4	37
4	St. Mary School	8.02-8.12	78.4	18	42.4	32.4
5	M.A.M. Higher Secondary School	9.10-9.20	85.2	39	39	30

Sl. No.	Location	Time	Noise Level dB	No of Vehicles	Temperature 0C	Humidity %
1	Government School	4.50-5.00	85.4	39	37.5	42
2	Government Hospital	5.12-5.22	80.6	47	35	33
3	Kalaiselvi Hospital	5.36-5.46	79.5	29	32.4	52
4	St. Mary School	5.54-6.04	73.4	19	29.4	45
5	M.A.M. Higher Secondary School	6.10-6.20	89.4	25	39.2	32

CONCLUSION

This research study is based on the expected relation- ship between traffic noise and its effect on human work efficiency in his/her respective working places. From the survey and endings it is evident that road traffic noise affects human work efficiency at Government Offices, Private Organizations, and Commercial Business Centres beside the busy main roads. Collected data were compared with the regression models developed by different set so find dependent variables. The hypothesis

was also tested using t-test in order to examine the goodness of fit between the observed annoyance level and its expected level for each of the three models separately. It can be concluded that the model based on noise indices gives a significantly acceptable high correlation coincident values. The summarized detail shows that all the models can predict the annoyance level among the individuals' is within the acceptable limits in comparison to observed noise annoyance with a certain degree of error. The difference between the observed level of annoyance and its expected value obtained from noise-based level is not significant at 5% level. There are a number of such locations in the State Tripura facing the same problems. The present model will draw the attention of the State Government and will help the policy maker to take necessary steps to reduce this problem so that the respective works in Government Offices, Private Organizations, and Commercial Business Centres can run smoothly. Theinvestigation technique along with the database and outputs will be helpful for the town administrator and planners for the effective traffic management and noise control in the area.

REFERENCES

Khan M.W., Memon M.A., Khan M.N. and Khan M.M., 2010. "Traffic Noise Pollution in Karachi Pakistan" JLUMHS; **9**(3):114-120.

Patil C.R., Modak J.P., Choudhari P.V. and Dhote D.S., 2011. "Subjective Analysis Of Road Traffic Noise Annoyance Around Major Arterials In Intermediate City" European Journal Of Applied Sciences, **3**(2):58-61.

Chouhan S., Ahirwal R.R. and Jain Y.K., 2012. "Traffic Control Scheme Using Mobile Data Collectors For Wsn" International Journal Of Scientific and Research Publication, **2**:1-7.

Yoo S.-E., 2013. "A Wsn- Based Portable Vehicle Detector Evaluation System" Sensors, **13**:1160-1182; Doi:10.3390/S 130101160.

Yang S.S., Kim G.Y. and Choi H., 2008. "Vehicle Identification Using Discrete Spectrums In Wireless Sensor" Journal Of Networks, **3**(4):51-57.

Shruthi K.R. and Vinodha K., 2012. "Priority Based Traffic Lights Controller Using Wireless Sensor Networks" International Journal Of Electronics Signals and Systems, **1**(4):58-61.

Shukla S.P., Yadav S.K., Lohani B., Biswas S., Behra S.N. and Singh N.K., 2012. "Characterization Of Traffic Noise For A Typical Indian Road Crossing" Current Science, **103**(10):1193-1201.

Subramani T., Kavitha M. and Sivaraj K.P., 2012. "Modeling of Traffic Noise Pollution" International Journal of Engineering Research and Applications, **2**(3):3173-3182.

Tandel B.N. and Jem M., 2013. "Assessment And MLR Modelling Of Urban Traffic Noises At Major Arterial Roads Of Surat, India" Journal Of Environmental Research And Development. **7**(4A):1703-1709.

Torija Antonio J. Ruiz Diego P. Ramos, 2007. "Noise Pollution Level Corrected In Terms Of The Incident Total Sonorous Energy" 19th International Congress On Acoustics-Ica 2007 Madrid, pp.2-7.

Tirupur Corporation, 2013, available at http://tiruppurcorporation.tn.gov. in/ sal_ population.htm, accessed during August 2013.

Wei-wei Fang Ji-Ming Chen Lei ShuTian-Shu-Chu De-Pei Qiar, 2010. "Congestion Avoidance, Detection and Alleviation in Wireless Sensor Networks" Journal of Zhejiang University Science (Computers and Electronics), **11**(1):63-73.

Keerthana, Gobinath R., Singhvi N., Chitravel V. and Kannan T., 2013. "Evaluation of Urban Traffic Noise Pollution – A Case Study of Tirupur City" American Journal Of Advanced Civil Engineering Research (Ajacer), **1**(1):1-16.