



A Case Study on Noise Pollution in Selected Zones of Madurai City, Tamilnadu, India

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ABSTRACT

In this study, 5 different zones were selected such as Industrial Zone (I), Commercial Zone (C), Residential Zone (R), Silent Zone (S) and Traffic Zone (T). The two timings were selected viz. morning time (10 AM to 11 AM) and evening time (6 PM to 7 PM) continuously ten readings were recorded for ten days for the selected area. The data collected from each location was processed for statistical analysis with using Sigmastat version 5.0. The data collected by the Sound meter App in android phone. All the noise monitoring experiments were carried out under ideal meteorological conditions. The average of noise pollution in the industrial zone, commercial, Residential, Silence and Traffic zone were recorded as 79.75dB, 76.35dB, 58.05 dB, 57.025 dB and 83.55dB respectively. In this study, evidently reported that the noise level is beyond much more than the permissible limit in commercial and silent zones and sometimes in residential zones which fallout in noise pollution.

Keywords: Pollution, Noise pollution, decibel, Sigmastat

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INTRODUCTION

Pollution is the intolerable problem of our environment. It is due to the rapid Urban-industrial technology uprising and speedy, exploitation of natural resources by man, population explosion. Today the environment has become unclean, impure, undesirable, and therefore injurious for the health of living organisms, including man [6]. The splendid plentifulness of nature is a heritage that should never be spoiled. But the unlimited voracious exploitation of nature by man has disturbed the flimsy ecological balance existing between living and non-living components on the planet earth [7-10]. This adverse situation created by man has threatened the endurance of man himself and other living biota on the earth. Environment has been described as that ambiance of an individual or community, both physical and cultural backdrop. It is also sometimes used to indicate a certain set of the situation surrounding a fastidious occurrence for example, environment of the deposition [1]. The term environment is alarmed with the whole web of both the geological and biological relations that characterize association between the life and planet earth [2]. On the other hand, the pollution has been explained as apparent in the getting higher dumps of the garbage and wastes, the stubborn insinuation of effluents in the water and the important congeal canopy of the smoke, dust and gases in the atmosphere. The air available in urban and industrial centers is not advisable to breathe [3]. The ecological pollution deals with adverse changes of our surroundings, which take part in to its worsening [4, 5]. Zannin et al [15] worked on environmental noise pollution at thousand locations spread over the urban zones of the city of Curitiba, Brazil. They recorded that 93.3% out of the locations show during the day alike sound levels over 65 dB(A) and 40.3% out of the total number of locations calculated display during the day tremendously high values of the same sound levels over 75dB. Sommerhoff *et al.* [16] make a noise map as a illustration representation of the environmental noise of the city of Valdivia, Chile. They accomplished that the most places in the city do not obey with the guideline value (50-55 dB (A)). Pathak *et al.*, [17] was reported on traffic noise pollution at four areas categories (industrial, commercial, residential and silence zone) in the city of Varanasi, India. They found that 85% of the people were troubled by traffic noise; about 90% of the people reported that traffic noise is the main cause of headache, high blood pressure problem, dizziness and fatigues. Franssen *et al.* [18], showed that hypertension could be credited to aircraft noise. Moreover, there have been some attempts to monetarily quantify the cost of damages to residential areas and environment due to noise

pollution [14]. The aims of this work are to obtain noise-level information that was representative for each site and to assess traffic noise pollution in Madurai city during summer season.

NOISE AND HEALTH

The effects of noise on health are numerous. It can affect central nervous system, cause nausea, vomiting, deafness, loss of appetite, loss of sleep and cardiac failure. A person exposed to noise of 90 dB (A) would lose hearing within 30 years with 40 hr/week. A momentary loud thus called impulse causes more damage than continuous noise. Industrial noise affects person inefficiency of working.

MATERIALS AND METHODS

To study and analyse the noise pollution in Madurai city, a study was carried out from the month of March 2016. In this study, 5 different zones were selected such as Industrial Zone (I), Commercial Zone (C), Residential Zone (R), Silent Zone (S) and Traffic Zone (T). The two timings were selected viz. morning time (10 AM to 11 AM) and evening time (6 PM to 7 PM) continuously ten readings were recorded for ten days for the selected area. The average reading gives the noise pollution produced in the area (Table.1). The data collected from each location was processed for statistical analysis with using Sigmastat version 5.0. The data collected by the Sound meter App in android phone. All the noise monitoring experiments were carried out under ideal meteorological conditions.

Table.1. shows that Zones and Areas of sampling sites for estimate the noise pollution in and around Madurai city.

Zone	Area	Code
I	IRON WORK	I1
	SAW MILL	I2
	LATHE	I3
	RICE MILL	I4
C	PERIYAR BUS STAND	C1
	SOUTH GATE MARKET	C2
	VILAKKU THOON	C3
	NETHAJI ROAD	C4
R	VILLAPURAM	R1
	AVANIYAPURAM	R2
	MUNICHALAI	R3
	SOUTH GATE	R4
S	MEENAKSHI AMMAN TEMPLE	S1
	WEST GATE CSI CHURCH	S2
	SOUTH GATE MAJITH	S3
	ANDAL PURAM SAI BABA TEMPLE	S4
T	PERIYAR SIGNAL	T1
	GORIPALAYAM SIGNAL	T2
	EAST GATE SIGNAL	T3
	KALAVASAL SIGNAL	T4

RESULTS

The complete results (various parameters) on the noise levels in industrial zones, commercial zones, residential areas, silence zones and traffic zones are given in table 2. For better understanding, noise levels in each area can be explained as follows.

Industrial zone

Iron work, Saw mill, Lathe, Rice mill is included in this industrial zone of Madurai city. The average noise pollution for the ten days study revealed that in first three days iron work shows the maximum level and day 3 onwards rice mill shows the maximum level upto 7th day. From day 7 onwards lathe area shows that maximum level of noise pollution till end of the study. Finally the average of noise pollution in the industrial zone is found as 79.75dB.

Commercial Zone

Periyar shopping complex, South Gate Market, Vilakku thoon, Nethaji Road is included in Commercial zone of Madurai city. The average noise pollution for the ten days study resulted that Vilakkuthoon area shows the maximum level, next level is nethaji road, Periyar is in third position and finally south gate market at 4th rank in noise pollution when compared to rest of the area. Finally the average of noise pollution in the commercial zone is monitored as 76.35dB.

Residential Zones

Villapuram, Avaniapuram, Munichalai, South Gate is included in Residential zone of Madurai city. The average noise pollution for the ten days study resulted that order of South gate > Villapuram > Avaniapuram > Munichalai. Finally the average of noise pollution in the Residential zone is monitored as 58.05 dB.

Silence zones

Meenakshi amman temple, West gate CSI Church, South Gate Majith and Andalpuram Saibaba Temple is included in Residential zone of Madurai city. The average noise pollution for the ten days study resulted that order of South gate majith > Andalpuram Sai Baba Temple > West Gate CSI church > Meenakshi Amman Temple. Finally the average of noise pollution in the commercial zone is monitored as 57.025 dB.

Traffic Zones

Periyar Signal, Goripalayam Signal, East Gate Signal and Kalavasal Signal is included in Traffic zones of Madurai city. The average noise pollution for the ten days study resulted that order of Kalavasal Signal > Goripalayam Signal > East Gate signal > Periyar signal. Finally the average of noise pollution in the traffic zone is monitored as 83.55dB.

DISCUSSION

As per the Noise Pollution (Regulation and Control) Rules, 2000, the permissible limit for Industrial zone during the day time is 70 dB. However, the measured noise levels reached a maximum of 92 dB, because of using machineries without sound proof rooms, in open condition, without proper maintenance of machine will make over sound. As per the Noise Pollution (Regulation and Control) Rules, 2000, the permissible limit for commercial zone during the day time is 65 dB. However, the measured noise levels reached a maximum of 90 dB. It ranges between 62 dB to 90 dB. The increased level of noise pollution is the ultimate result of parking the vehicles in front of commercial area. As per the Noise pollution (Regulation and control) Rules, 2000, the permissible limit during day time in residential area is 55 dB. However, due to factors like auto rickshaws, loud human voices while speaking in mobile phones, television, and music player etc., high decibel values has been registered [10]. The value ranged from 47 dB during peak hours to 82 dB during non-peak hours. It can be noted from figure-5 that for most of the days the noise level was far below the permissible limit prescribed in the Noise pollution rules (Regulation and control) Rules, 2000. According to Noise Pollution (Regulation and Control) Rules, 2000, the permissible limit for the silent zone is 50 dB. However, the measured noise levels ranged from 47dB to 79 dB. The main reasons for exceeding permissible limits are auto rickshaw movement inside the campus and peoples speak loudly in mobile phones and more number of vehicles movements. As per the Noise Pollution (Regulation and Control) Rules, 2000, the permissible limit for traffic zone during the day time is 70 dB. However, the measured noise levels reached a maximum of 91 dB. In the morning time people used the air horn in heavy vehicle during the time of peak hours ranges from 75 as minimum and maximum of 91 dB. The changes are so marked; repeated exposure to unexpected noise should obviously be kept to a minimum range [19]. Kiernan [31] find that even comparatively low levels of noise effects human health negatively. The effects of huge noise could be serious that either there is a amnesia or a psychiatric disorder [32]. This calls for correct evaluation of the noise pollution and medical manage dealings. The common instruments used to measure the scale of noise variations include decibel meters etc. [33]. The noise is commonly measured as sound intensity that is resolute in terms of the pressure of sound waves on the eardrums, and the scale is logarithmic. Sound level corresponds to the degree of sensation depending on the intensity of sound and the sensitivity of the ear [12]. 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, residential, commercial, industrial zones and road intersections [13]. Paper assesses the intensity of noise in different zones of the Kanpur city. A critical perusal of the data obtained with the mandatory values revealed that most of the zones surveyed are under the threat of noise menace. Paper also refers the legal options available to counteract this menace [20]. The noise levels exceed or are about to cross the permissible standards at most of the sampling sites of current concern in the city. In addition, a simple noise model in the current assessment predicts the ambient noise level Leq and the predicted values are compared with the experimental noise levels. As the predicted values are in reasonable agreement with the estimated

values of noise levels, it can be concluded that the modeling equations of present study can be used to predict the noise levels all over the city [19]. The analysis of audibility test for teachers and students and the school located near vicinity of NH-6 passing through Jalgaon city. About 84% teachers and 92% students have reported hearing difficulty in the questionnaire [21]. In the sound testing gentle hearing loss (25 to 35 dBHL) was observed in both the subject groups. The strategies need to adopt for protection of the teachers/students from the noise exposure are suggested. Banerjee D, *et. al.*, reported that hours of darkness time noise levels (10.00 pm - 6.00 am) in all the locations exceeded the limit prescribed by Central Pollution Control Board [22]. The hours of daylight noise level were much higher at all locations in respect to the nighttime noise level. The Day-Night equivalent noise level (Ldn) was determined and ranged between 67.16 dB (A) and 89.44 dB (A). Twelve locations with sound level meter to evaluate day time and night time noise levels of Lucknow city. In residential areas, noise ranged between 67.7 to 78.9 and 52.9 to 56.4; in commercial cum traffic areas 74.8 to 84.2 and 68.2 to 74.9 and in industrial areas 76.9-77.2 and 72.2-73.1 dB (A) during day and night time respectively, Values were higher than their prescribed standards, which may pose a significant impact on quality of life [23].

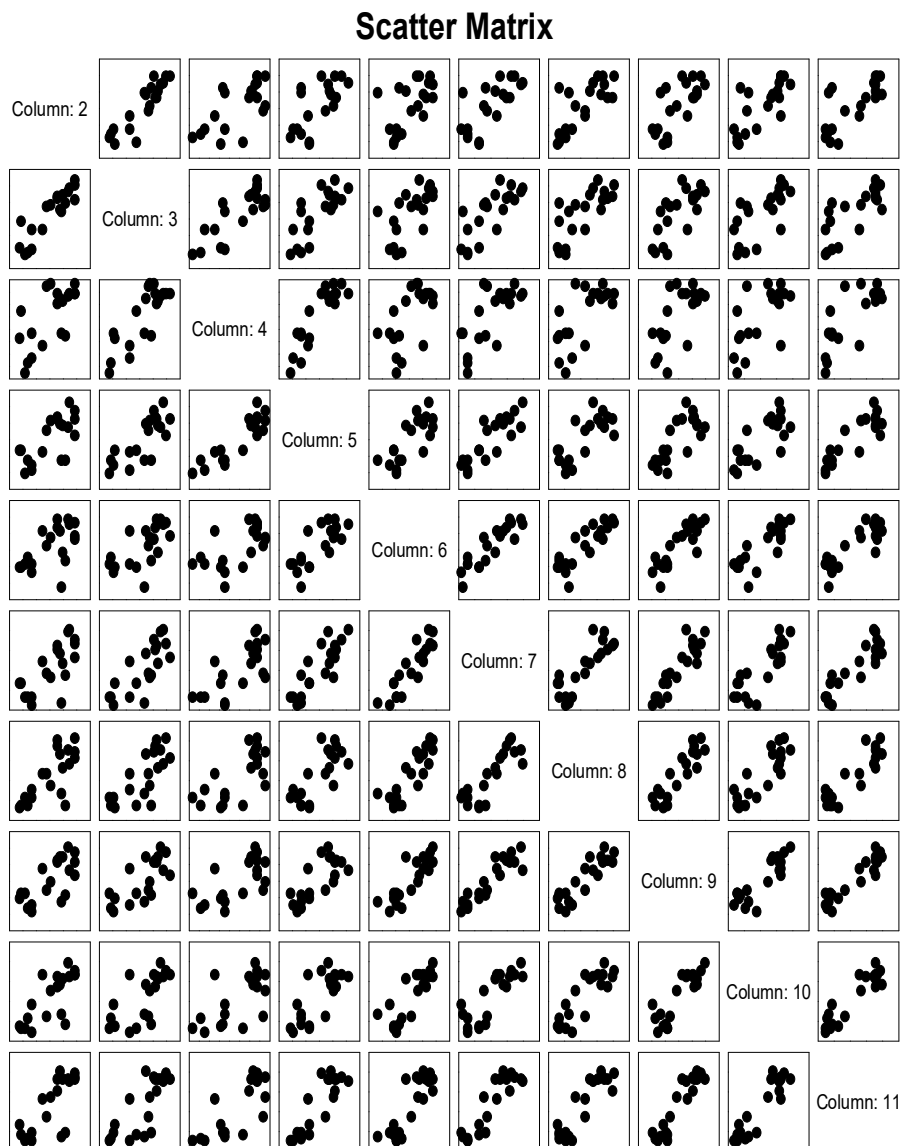


Fig 1: Shows that scatter matrix for Pearson Product Moment Correlation of Noise pollution data collected in Madurai City.

Table 2: Shows that Pearson Product Moment Correlation of Noise pollution data collected in Madurai City

Pearson Product Moment Correlation

Wednesday, April 20, 2016, 3:19:11 PM

Data source: Data 2 in Notebook 1

Cell Contents:

Correlation Coefficient

P Value

Number of Samples

	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
Col 2	0.896	0.679	0.686	0.586	0.732	0.740
	0.0000000903	0.00100	0.000849	0.00666	0.000242	0.000190
	20	20	20	20	20	20
Col 3		0.826	0.782	0.640	0.772	0.747
		0.00000720	0.0000465	0.00236	0.0000669	0.000153
		20	20	20	20	20
Col 4			0.895	0.622	0.721	0.695
			0.0000000991	0.00340	0.000337	0.000677
			20	20	20	20
Col 5				0.765	0.847	0.763
				0.0000842	0.00000243	0.0000926
				20	20	20
Col 6					0.897	0.856
					0.0000000863	0.00000147
					20	20
Col 7						0.852
						0.00000185
						20
Col 8						
Col 9						
Col 10						
Col 11						
	Col 9	Col 10	Col 11			
Col 2	0.702	0.751	0.761			
	0.000563	0.000134	0.0000989			
	20	20	20			
Col 3	0.727	0.691	0.766			
	0.000285	0.000735	0.0000831			
	20	20	20			
Col 4	0.674	0.662	0.785			
	0.00112	0.00147	0.0000409			
	20	20	20			
Col 5	0.752	0.761	0.876			
	0.000131	0.0000968	0.000000420			
	20	20	20			
Col 6	0.849	0.826	0.851			

	0.00000224	0.00000713	0.00000200
	20	20	20
Col 7	0.906	0.836	0.897
	0.000000397	0.00000437	0.0000000835
	20	20	20
Col 8	0.892	0.860	0.896
	0.000000126	0.00000119	0.0000000926
	20	20	20
Col 9		0.872	0.932
		0.000000549	0.0000000244
		20	20
Col 10			0.922
			0.0000000800
			20
Col 11			

Note: The pair (s) of variables with positive correlation coefficients and P values below 0.050 tends to increase together. For the pairs with negative correlation coefficients and P values below 0.050, one variable tends to decrease while the other increases. For pairs with P values greater than 0.050, there is no significant relationship between the two variables.

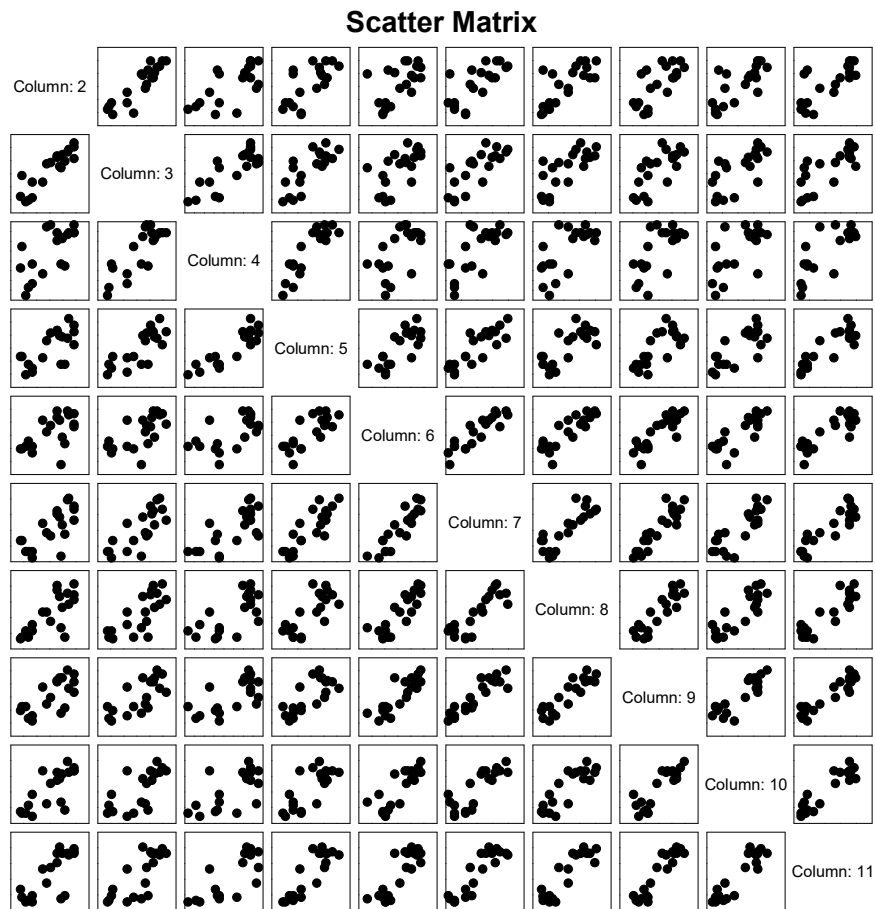


Fig 2: Shows that scatter matrix for Spearman Rank Order Correlation of Noise pollution data collected in Madurai City.

Table 2: Shows that Spearman Rank Order Correlation of Noise pollution data collected in Madurai City**Spearman Rank Order Correlation**

Wednesday, April 20, 2016, 3:19:47 PM

Data source: Data 2 in Notebook 1

Cell Contents:

Correlation Coefficient

P Value

Number of Samples

	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11
Col 2	0.867	0.634	0.592	0.565	0.710	0.693	0.614	0.758	0.721
	0.000	0.00273	0.00597	0.00944	0.000	0.000	0.00393	0.000	0.000
	20	20	20	20	20	20	20	20	20
Col 3		0.725	0.750	0.706	0.804	0.755	0.721	0.729	0.757
		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		20	20	20	20	20	20	20	20
Col 4			0.820	0.524	0.643	0.641	0.574	0.573	0.737
			0.000	0.0175	0.00217	0.00232	0.00814	0.00835	0.000
			20	20	20	20	20	20	20
Col 5				0.688	0.811	0.693	0.671	0.635	0.792
				0.000	0.000	0.000	0.00113	0.00264	0.000
				20	20	20	20	20	20
Col 6					0.892	0.854	0.825	0.783	0.736
					0.000	0.000	0.000	0.000	0.000
					20	20	20	20	20
Col 7						0.824	0.862	0.796	0.836
						0.000	0.000	0.000	0.000
						20	20	20	20
Col 8							0.851	0.811	0.817
							0.000	0.000	0.000
							20	20	20
Col 9								0.777	0.875
								0.000	0.000x
								20	20
Col 10									0.823
									0.000
									20
Col 11									

Note: The pair(s) of variables with positive correlation coefficients and P values below 0.050 tends to increase together. For the pairs with negative correlation coefficients and P values below 0.050, one variable tends to decrease while the other increases. For pairs with P values greater than 0.050, there is no significant relationship between the two variables.

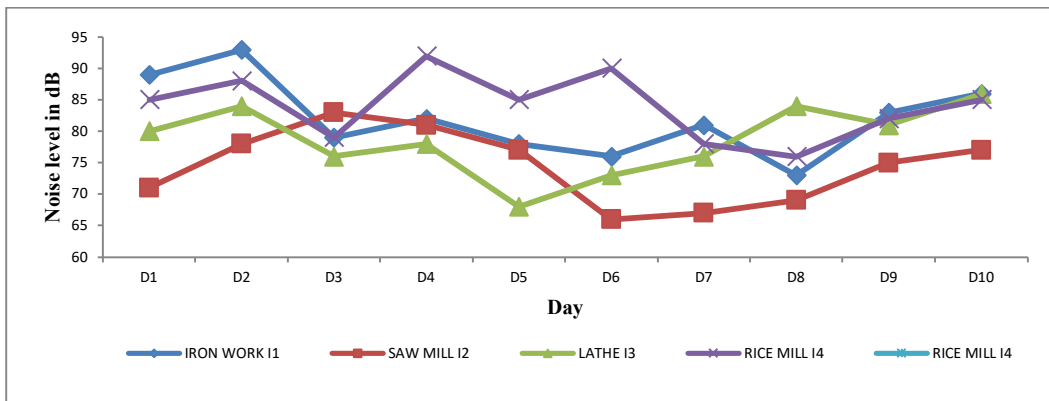


Fig 3. Shows that Noise pollution level at Industrial Zone of Madurai city

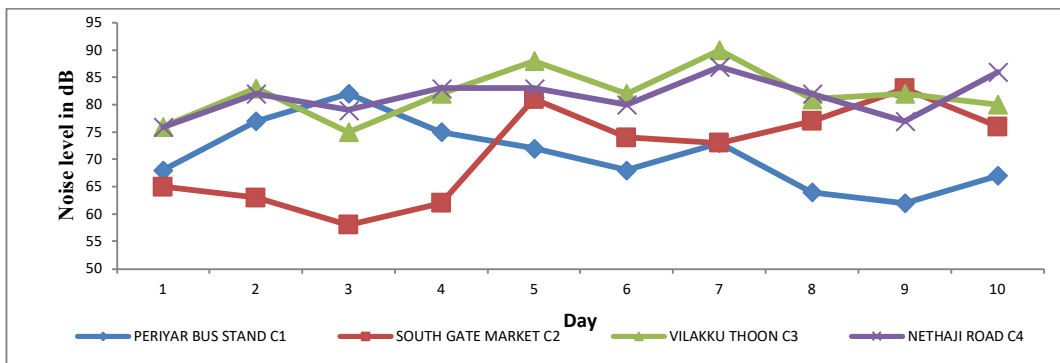


Fig 4. Shows that Noise pollution level at Commercial Zone of Madurai city

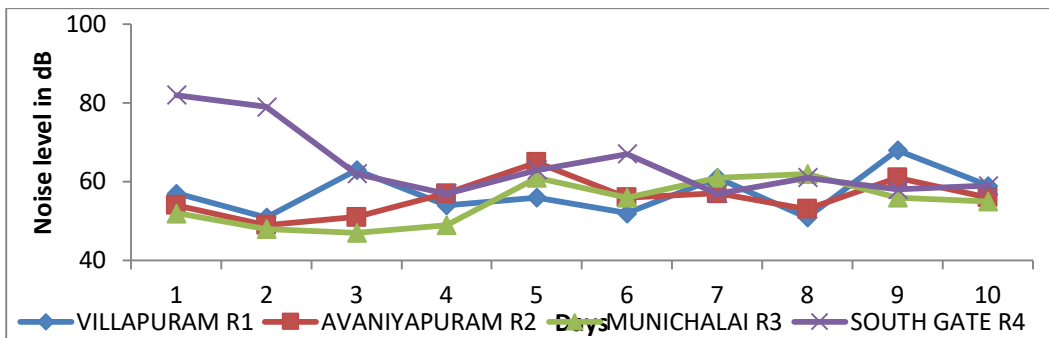


Fig 5. Shows that Noise pollution level at Residential Zone of Madurai city

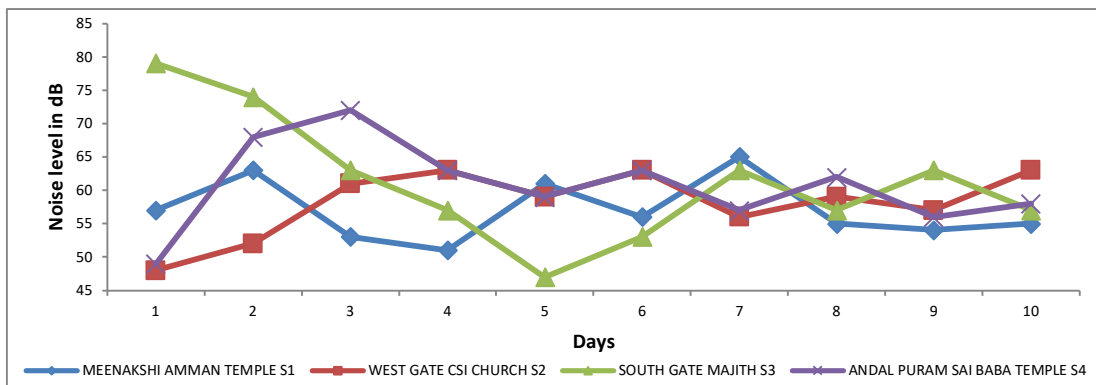


Fig 6. Shows that Noise pollution level at Silent Zone of Madurai city

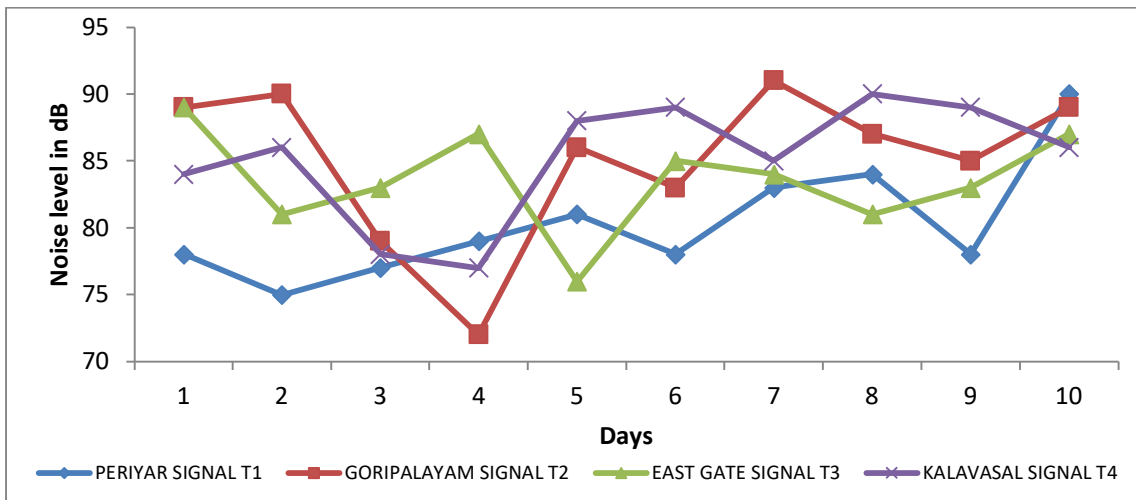


Fig 7. Shows that Noise pollution level at Traffic Zone of Madurai city

Table 2. shows that data representing of sampling sites of different zones in Madurai City

Zone	SAMPLING SITES	CODE	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
I	Iron work	I1	89	93	79	82	78	76	81	73	83	86
	Saw mill	I2	71	78	83	81	77	66	67	69	75	77
	Lathe	I3	80	84	76	78	68	73	76	84	81	86
	Rice mill	I4	85	88	79	92	85	90	78	76	82	85
C	Periyar bus stand	C1	68	77	82	75	72	68	73	64	62	67
	South gate market	C2	65	63	58	62	81	74	73	77	83	76
	Vilakku thoon	C3	76	83	75	82	88	82	90	81	82	80
	Nethaji road	C4	76	82	79	83	83	80	87	82	77	86
R	Villapuram	R1	57	51	63	54	56	52	61	51	68	59
	Avaniyapuram	R2	54	49	51	57	65	56	57	53	61	56
	Munichalai	R3	52	48	47	49	61	56	61	62	56	55
	South gate	R4	82	79	62	57	63	67	57	61	58	59
S	Meenakshi amman temple	S1	57	63	53	51	61	56	65	55	54	55
	West gate csi church	S2	48	52	61	63	59	63	56	59	57	63
	South gate majith	S3	79	74	63	57	47	53	63	57	63	57
	Andal puram sai baba temple	S4	49	68	72	63	59	63	57	62	56	58
T	Periyar signal	T1	78	75	77	79	81	78	83	84	78	90
	Goripalayam signal	T2	89	90	79	72	86	83	91	87	85	89
	East gate signal	T3	89	81	83	87	76	85	84	81	83	87
	Kalavasal signal	T4	84	86	78	77	88	89	85	90	89	86

CONCLUSION

In this study, evidently reported that the noise level is beyond much more than the permissible limit in commercial and silent zones and sometimes in residential zones which fallout in noise pollution. This is due to the factors like unplanned roadways, lack of traffic rules in-obedience, lack of vegetation, honking share autos in plying excess, loudspeakers in marriage halls and temple festivals with increased volumes. Some other suggestions such as planting trees on both sides of the road, banning hydraulic horns, improvement and reformation of roads and parking system, banning of high sound producing vehicles, industries and public awareness would also be helpful in reduction of the present noise level in Madurai. The role of NGOs, researchers and professionals, media and concerned individuals is significant in reducing the environmental vulnerability of noise pollution. It is recommended that the necessary impede measures to reduce the noise levels in these areas should be enabling in order to get better the present status of human health and environment of the Madurai City.

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