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Assessment of Noise Pollution in Thoothukudi City

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Abstract: Thoothukudi is one of the most important major ports of India and is also an Industrial city, established with several Industries and thickly populated with several lakhs of people. Every day several thousands of heavy vehicles operated between Thoothukudi and other cities and towns of Tamilnadu and India resulted in heavy traffic congestion and severe noise pollution in the city. Most of the arterial roads in Thoothukudi town are flooded with heavy vehicular traffic all the time and cause inconvenience to the general public. In order to study the noise level generated in and around Thoothukudi city, this work has been planned. The noise level was observed during different time intervals (8-10am, 1-2pm and 4-6pm) at different study areas using the Sound Level Meter. The study areas were demarked as Silent Zone, Commercial Zone and Heavy Traffic Zone and the sound level prevailed in these areas, were analyzed and it was observed that in all the study areas the observed sound level exceeded from the normal permissible level (i.e. Silent Zone (40-50 dB), Commercial Zone (55-60 dB), Heavy Traffic Zone (80-85 dB)) to a greater significant extent.
Keywords: Noise Pollution, Sound level meter, Silent Zone, Commercial Zone, Heavy Traffic Zone.

Introduction

In the modern world, development in technology, commerce, communication and education has enhanced the urban growth both in developed and developing countries. With global urbanization, there has been occurrence of many environmental problems causing pollution and environmental degradation. Out of many environmental problems, noise has emerged as one of the major urban environmental pollution[1.] Noise can be defined as any unwanted, disturbing or harmful sound that impairs or interferes with hearing, causing stress, hampers concentration and work efficiency or cause accidents[2-4].

Noise pollution in urban cities is steadily increasing over the years. Proportion of people exposed to noise is greatly increasing. In earlier research, investigators also tended to assume that noise produced direct health effects, such as hearing loss with noise exposures above 90 decibels, and paid little attention to individual differences in response to noise, and noise as a stressor[5.] Poor urban planning may give rise to noise pollution. Side-by-side construction of industrial and residential buildings can result in noise pollution in the residential area. Motor vehicles cause various types of noise, includes engine acceleration, tire/road contact, braking, horns and vehicle theft alarms. Heavy vehicles can cause vibration and infrasound and every vehicle is a source of harmful noise[6.]

Road traffic noise is a major source of noise in urban areas[7,8.] There are many vulnerable groups of people who are most affected by noise pollution such as the young, elderly, and the hospitalized. Occupational noise that result in the damage of the hair cells of the cochlea in the inner ear[9.] The evidence for a cause-effect relationship between noise and hearing loss is considered sufficient in the scientific

community. There is consensus that sound levels less than 75 dBA are unlikely to cause permanent hearing loss and that sound levels above 85 dBA with exposures of 8 hours per day will produce permanent hearing loss after many years[10.] Many studies have been carried out to study these effects in different categories of population exposed to high intensity and frequencies of sound in their workplaces[11-13.] The World Health Organization has recommended a nighttime average level of 35-40 dB for undisturbed sleep.

In general, exposure to levels above 80 dB is associated with increased aggressiveness when combined with alcohol, provocation or existing anger and hostility[14-15.] The automobiles are an important source of not only air pollution but also of a significant proportion of noise pollution. The traffic police engaged in controlling traffic, particularly at heavy traffic junctions, belong to the high-risk group to be affected by the health hazards of noise and air pollution[16-18.]

The permitted noise level in different zones during different time is well marked in the following table. Source:[19,20]

Ambient Noise Levels Zone	Day-time dB	Night-time dB
Silent Zone	<50	<40
Residential Zone	<55	<45
Commercial Zone	<65	<55
Industrial Zone	<70	<70

Vehicular traffic and pressure hours are the main cause of noise pollution in the city[21]. The noise levels prevailing in commercial areas of some city had been investigated[22]. Traffic noise is probably the most serious and pervasive type of noise pollution and it has become a serious problem now because of inadequate urban planning in the past[23-25]. Homes, schools, hospitals, churches, libraries and other community buildings were routinely built on main roads without buffer zones or adequate soundproofing. The problem has been compounded by increases in traffic volumes for beyond the expectations of our early urban planners.

Materials and Methods

The noise level in Thoothukudi city was observed during different time intervals at different selected study locations. The study locations were identified and grouped into three different zones namely Silent Zones, Commercial Zones and Heavy Traffic Zones. The silent zones were incorporated with residential area, educational institutions, hospitals, places of worship and so on. Commercial zone is fully occupied with several types of business establishments while the Heavy traffic zone is the highway linking the city with other parts of the state and our country.

To measure the environmental noise levels and to assess the noise pollution in the Thoothukudi area predominantly due to traffic mobility, the standard procedure using calibrated sound pressure level meter was used.

The noise level assessing meter is a portable precision digital sound level meter (Model-LT-Lutoon-SL-401, made in Taiwan) assess the sound level to the accuracy of 0.5 to 1dB. This instrument is primarily designed for community noise surveys. A large digital display gives a single value indication of the maximum 'A' weighted RMS (root mean square) sound pressure level measured during the previous second. It is equipped with high sensitivity Bruel and Kjaer Prepolarized Condenser Microphone Type 4226. Measurements from 30-130 dB(A) can be carried out with this instrument.

Noise measurements were taken following the prescribed procedure stipulated in the manual of the manufacturer of Sound Pressure Level meter. The results were filled in at the spot of measurement in pre-designed formats. The interpretation of noise levels and the cut-off level to which the measured noise levels were compared with the prescribed basic noise level during day-time in the different specified zones such as Commercial zone (55-60 dB), Silent zone (40-50 dB) and Heavy Traffic zone (80-85 dB).

The researcher every day visited the chosen sites of study area with this instrument and taken data from morning 8 am to evening 6 pm. Continuous data for an hour was collected with an interval of 2 minutes. So several numbers of primary raw data were obtained in one spot itself. Obtained raw data were pooled together and classified as morning, afternoon and evening sound levels. In order to identify the magnitude of increased level of sound than the ambient permissible sound level the percent increase was also calculated and incorporated in the results.

Table 1. Variations observed in the noise level (dB) from different locations of Thoothukudi city at different time intervals. The values indicated in the parenthesis are the percent increase of noise level than the permissible level in the study area

Zones	Locations	Time (hours)														
		8-9 am			9-10 am			1-2 pm			4-5 pm			5-6 pm		
		Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
S.Z *(P.L: 40 - 50dB)	T.R	79	82.8	**80.9** ±1.2 (61.8%)	82	88	**85.3** ±2.3 (70.6%)	81.7	83.8	**82.8** ±0.7 (65.6%)	75.2	88.6	**80.6** ±5.0 (61.2%)	71.3	76.1	**74** ±1.9 (48%)
	G.H.R	70	73.3	**71.5** ±1.3 (43%)	70	75.9	**71.8** ±2.0 (43.6%)	68.9	72	**70.7** ±1.2 (41.4%)	72.5	76.1	**74.5** ±1.5 (49%)	74.2	79.2	**75.6** ±1.9 (51.2%)
	P.R	70	73.3	**71.8** ±1.3 (43.6%)	70	73.4	**72** ±1.1 (44%)	70.6	72.5	**71.4** ±0.6 (42.8%)	70.3	72.3	**71.2** ±0.7 (42.4%)	72.2	75.4	**73.3** ±1.8 (46.6%)
	A.V.M.H.R	68	73	**71.4** ±2.0 (42.8)	73	75.2	**73.3** ±1.1 (46.6%)	60.9	65.8	**76.4** ±1.4 (52.8%)	60.4	66.2	**63** ±1.9 (26%)	74.5	78.6	**63.2** ±1.8 (26.4%)
C.Z *(P.L: 55-60dB)	S.R	66	74	**70** ±2.8 (20%)	69	78.2	**72.6** ±3.5 (15.2%)	68.3	78.1	**73.2** ±3.3 (26.4%)	67	76.5	**72.4** ±3.6 (24.8%)	58.8	65.6	**61.8** ±2.5 (3.6%)
	B.V.K.S	71	72.5	**72.1** ±0.5 (24.2%)	71	73	**71.9** ±1.2 (23.8%)	72.7	75.1	**73.7** ±1.0 (27.4%)	73.3	76.9	**74.4** ±1.5 (28.8%)	74.1	78.7	**76.7** ±1.5 (33.4%)
	V.V.D. R	80	82.3	**80.7** ±1.1 (41.4%)	84	89.3	**87.5** ±2.1 (55%)	79	86.4	**82.6** ±2.4 (45.2%)	78.1	99.3	**79.5** ±1.6 (39%)	88.8	91.8	**89.8** ±1.1 (59.6%)
	F.M.R	70	74.1	**71.8** ±1.7 (23.6%)	78	82.3	**80.2** ±1.5 (40.4%)	75.4	79.7	**76.6** ±1.6 (33.2%)	61.3	63.6	**62.6** ±0.9 (5.2%)	60.7	62.6	**61.7** ±0.8 (3.4%)
H.T.Z *(P.L: 80-85dB)	O.B.S	88	89.9	**89.1** ±2.8 (4.8%)	94	98	**96.2** ±0.7 (13.1%)	87.2	89.4	**88.3** ±2.8 (3.9%)	86.9	89.9	**88.4** ±0.7 (4%)	99	104	**101.5**±1.5 (19.4%)
	N.B.S	86	89.4	**87.9** ±2.4 (3.4%)	87	89.8	**88.6** ±3.1 (4.2%)	82.1	89.3	**85.7** ±2.4 (0.8%)	86.3	88.9	**87.6** ±2.0 (3.1%)	88.9	98.4	**93.6** ±1.8 (10.1%)
	B.P. R	98	101	**99.7** ±3.1 (17.3%)	102	106	**104.1** ±2.8 (22.4%)	85.2	98.1	**91.7** ±2.3 (7.9%)	95.8	98.5	**97.2** ±2.5 (14.3%)	106	110	**108** ±1.2 (27.1%)
	M.R	95	98.8	**97.1** ±2.6 (14.2%)	87	96.1	**91.4** ±3.2 (7.5%)	76.4	84.9	**80.7** ±4.9 (21.4%)	86.2	96.5	**91.4** ±2.6 (7.5%)	96.2	109	**102.4**±3.5 (20.5%)

S.Z - Silent Zones, T.R - Thiruchendur Road, G.H.R - Government Hospital Road, P.R - Palai Road, A.V.M.H.R - A.V.M. Hospital Road, C.Z -Commercial Zones, S.R -Santhai Road, B.V.K.S -Bala Vinayagar Kovil Street, V.V.D.R -V.V.D. Road, F.M.R -Flower Market Road, H.T.Z - Heavy Traffic Zones, O.B.S - Old Bus Stand, N.B.S - New Bus Stand, B.P.R - Bye pass Road, M.R - Madurai Road, P.L – Permissable Limit. * - Noise and microbial pollution. H.P.Sing- Environmental Education Course, Punjab University 2005-06.

Result and Discussion

In the present study the areas choosen under Silent zone were the Government hospital road, Thiruchendur Road, Palai Road and A.V.M. Hospital Road. In all these areas the observed sound level was fall between 70-85 dB. The maximum permissible sound limit for Silent Zone area is only 40-50 dB[19,26]. But the result obtained during the study period from this area exceeded this permissible limit in almost all time intervals studied. The minimum sound level observed in this study area was 70.7 dB during 1-2 pm and the maximum level observed was 75.6 dB during 5-6 pm.

Even-though the study area is demarked as Silent Zone, the sound level observed showed a significant increase in almost all the time intervals (Table 1). The increased sound level observed in all Silent zone of the study area may be because of the heavy traffic flooding these roads always. The vehicle users play several types of modern car and blowing horns which also pollute the Thoothukudi environment to a greater extent[7,8].

Another important study area in the present study was the Commercial Zone. The Commercial Zone is planned on the basis of presence of business establishments, banks and so on. Four important areas were taken into account for this study namely Vegetable Market Road, Bala Vinayagar Kovil Street, V.V.D.Road and Flower Market Road. All the study area includes the various types of commercial establishments in cluster.

Among the four areas studied the maximum sound level was observed in V.V.D.Road area during all the time of study (79.5-89.8 dB). The minimum sound level was observed in the Flower Market Road area (61.7 dB), that also during evening hours during in which there was no market activities. When compared to the V.V.D.Road and Bala Vinayagar Kovil Street the observed sound level was less in Vegetable Market Road. But the observation indicated that in all the four study areas, the level of sound observed exceed the permissible limit (55-60 dB) during all the study hours to a greater extent (Table-1). The observed high level of sound in the Commercial area of Thoothukudi was mainly due to heavy movement of heavy vehicles and people in this area[23,24]. The very high sound level (80.7-89.8 dB) observed in V.V.D.Road area in the present study might be influenced by heavy movement of public, public vehicles, trucks and lorries. Since it is one of the main arterial roads connecting the northern part of the city with southern part of the city, the road is always occupied by hundreds of light and heavy vehicles.[27-29].

The Heavy Traffic Zones includes the busy roads that always flooded with vehicles and trucks.The results obtained from the Heavy Traffic Zone in the present study showed the alarming situation that is prevailed in the study area due to noise pollution. The researcher had chosen four important areas for Heavy traffic zone namely Old Bus Stand, New Bus Stand, By Pass Road and Madurai Road for the study. In all the four study area, the observed values exceed the normal permissible limit (80-85 dB) were observed during all the hours of study. The maximum sound level of 108 dB and 102 dB during the peak hours (5-6pm) in By-Pass Road and Madurai Road. Next to this high sound level was noted in Old Bus Stand area during peak hour (96.2 and 101.5 respectively). The minimum sound level observed in all these study area was only 85.7 dB (Table-1).

In the Heavy Traffic Zone, the noise pollution was mainly caused by the heavy flow of vehicles especially heavy vehicles such as lorries and trucks. The By-Pass Road and Madurai Road are the main four lane roads connecting the Thoothukudi port with the other part of the state and country. Every minute several hundreds of vehicles moving out with corgo from the port and hundreds of vehicles enter into the port with cargo for export. During the movement of these vehicles, the engine sound evolved from the vehicles, horn sound, vibrating materials that are shifted, the noise generated due to the rubbing of the tyre with the road generated the high level of sound resulted in pollution[7,8,10] . The speed of vehicles, the traffic road condition and the large number of trucks that use the city roads were also the main factors of traffic noise[6] in Thoothukudi city.

The overall results of the study showed that the noise levels observed at different busy locations of Thoothukudi showed that the average level ranged between 70-108 dB[3]**.** The high sound pollution in Thoothukudi city limit causes so many inconveniences to the general public[30,31]. The environmental noise observed in Thoothukudi, that is generated by heavy traffic could definitely affect the physical and mental health of the individuals in due course[32,33].

The study result concluded that the high level of noise pollution prevailed in Thoothukudi city throughout the day. This resulted in several inconvenience to the public. The observed result indicated that the city is not a suitable place for the healthy survival of the people. Hence it is suggested that the local body and the State Government should provide sufficient road facility for the easy movement of the vehicles and also try to reduce the vehicular movement in the Silent zone to minimize the sound pollution.

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