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Assessment of the Environmental Noise Level of Tirunelveli City, Tamil Nadu, India

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Abstract: The recognition of noise as an environmental pollution is placed after air and water pollution respectively. The society is totally unaware of the seriousness of noise pollution. The present study was carried out at 33 locations in different zones with sound level meter to assess daytime and night time noise levels of Tirunelveli city during August – October 2013. Tirunelveli is well known for education and commercial city located on the southern part of Tamil Nadu, India. The results show that the noise level values in urban area of the city exceed the standards set by central pollution control board throughout most of its area. Public education, traffic management and structural designing appear to be the most effective tool to control noise pollution.

Keywords: Noise pollution, Impact, Sound level meter, urban areas, Leq dB (A), Tirunelveli city.

1. Introduction

Noise is an unwanted and undesirable continuous or intermittent sound for recipient normal hearing. The noise level in urban areas reflects the life quality in modern cities. The recognition of noises an environmental pollution is placed after air and water pollution respectively. The society is totally unaware of the seriousness of noise pollution. This is less understood and less recorded. It is the process which happens unaware. It deserves proper monitoring. Measurements of noise level in cities have become a necessity due to its impact both on community and occupational environment.

Tirunelveli (8^o44'00" N and 77^o42'00" E) Administrative capital of district located within the state of Tamil Nadu, is well known for education and commercial city, which encompasses an area of 108.65 sq.km has a population of 4.75 lakhs according to 2011 census and a floating population of over a quarter of lakh. Tirunelveli is a developing city with good facilities for education, medical, market for vegetables and grains and other commercial commodities. Numerous noise surveys treating the problem of noise pollution in many cities throughout the world have been conducted.

Most of this research has been concerned with the impact of noise on the auditory system. Social survey data has shown that annoyance, sleep disturbance and cardiovascular problems are considered to be the most important environmental noise effects. Several noise

factors that influence sleeping are the level of noise, fluctuations, number of exposures, type, time and information content. The night time average sound level is to be kept below 45 DB for good sleep. Noise may cause mental disorder, deafness, high blood pressure, dizziness, nervous breakdown and insomnia. The workers exposed to high noise levels have high incidents of circulatory problems, cardiac diseases, hypertension, pepticulcelr and neuro sensory.

In city environmental noise mainly arises from the transportation system. Various types of vehicles, automobiles, tractors, trucks, ready mix concrete trucker etc. create tremendous noise at various points of this city. The present study deals with the assessment of environmental noise in the city with objectives to identify different sources of noise pollution, to the measure the ambient day and night time noise levels and find out the suitable solution for abatement of noise pollution effectively.

1.1. Sources of Noise

A chief source of noise in the city is traffic noise from the motors and exhaust systems of automobiles. In addition noise from the roadway is generated by commercial activity, construction, 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.

2. Materials and Methods

Noise assessment is the actual measurement of the noise levels. The noise equivalent level was measured continuously at each monitoring sites (Table 1) using sound level meter. The portable precision digital sound meter, model TES 1352H used in this study, was manufactured by TES Electrical Electronics Corp. Taipei, Taiwan, has measuring rang 30-130dB with 0.1dB resolution. The sound level meter was calibrated before taking the measurements according to the user manual. Continuous sound level measurements during daytime (0600–2100 hrs.) and nighttime (2100- 0600 hrs.) was carried out in Tirunelveli city areas. The sound pressure level (SPL) results of each location were statistical analysis and the results are presented in terms of average L_{de}, L_{ne} for different study areas.

The noise level in Tirunelveli city was observed during different time intervals at different selected study locations. The study locations were identified and grouped into five different zones namely Silent Zone, Commercial Zone, Residential zone, Industrial Zone and Traffic Zone.

The silent zone is incorporated with educational institutions, hospitals, places of worship and so on. Commercial zone is fully occupied with several types of business establishments like Rmkv, Chennai silks, Vegetable Markets present in both areas of Tirunelveli Town and Palayamkottai and Aryas Supermarket at Palayamkottai. The traffic zone consists of Junction Bus-stand, Railway station, Roundana Vannarpettai, Thachanallur main road, By-pass Bridge near KTC Nagar, Sankarnagar Main road, Melapalayam main bazaar, New Bus-stand and in front of Government Engineering College.

Residential zone covers the areas of Baraninagar, Maharaja nagar, Tirunelveli town, Palayamkottai and

KTC Nagar. Industrial Zone comprises of Crusher industry, Batching Plant at Ponnakudy, Central Mixing plant, Sawmill at Seevalaperi road, and construction activities in Tirunelveli city. To measure the environmental noise levels and to assess the noise pollution in the Tirunelveli area predominantly due to traffic mobility, the standard procedure using calibrated sound pressure level meter was used. This instrument is primarily designed for community noise surveys. A large digital display gives a single value indication of the maximum 'A' weighted sound pressure level measured during the previous second. It is equipped with high sensitivity Pre-polarized Condenser Microphone. Measurements from 30-130 dB (A) can be carried out with this instrument. Noise measurements were taken and followed the prescribed procedure stipulated in the manual of the manufacturer of Sound Pressure Level meter. The results were noted 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 night-time and day-time in the different specified zones such as Commercial zone (55 - 60 dB), Silent zone (40 - 50 dB) Residential zone (50 - 55 dB), Industrial zone (65 - 70 dB) and Traffic zone (80 - 85 dB). The researcher every day visited the chosen sites of study area with this instrument and taken data from morning 6 am to 10 pm and 10 pm to 6 am. Continuous data for an hour was collected with an interval of 15 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, evening and night 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 Comparison of Noise Level in dB(A) at Various Zones of Tirunelveli City.

Zone/ Location Name	Sound level dB(A) at day time L _{de}	Sound level dB(A) at night time L _{ne}	Ranges dB(A)	Percentage of increase of noise level	
				Day	Night
Residential Zone - Noise level(dB) standard for residential area for day=55 & for night=45					
Barani Nagar, Vannarpettai	66.74	60.43	50.4-68.4	21.35	48.31
Maharaja Nagar	62.03	57.00	55.9-66.3	12.78	37.84
Tirunelveli Town Area	64.73	60.52	51.4-67.3	17.69	43.84
Palayamkottai streets	65.76	68.52	60.5-68.1	19.56	46.13
KTC Nagar	64.20	60.68	57.7-68.6	16.73	42.67
Commercial Zone - Noise level(dB) standard for Commercial area for day=65 & for night=55					
Chennai Silks, Vannarpettai	80.74	78.56	62.1-86.2	24.22	42.84
RMKV, Vannarpettai	83.50	81.05	72.3-88.5	28.46	47.36
Vegetable Market, Palayamkottai	74.72	76.88	65.8-79.8	14.95	39.78
Aryas Super Market	78.42	76.17	66.2-83.4	20.65	38.49

Vegetable Market, Town	75.45	81.19	68.4-84.8	16.08	47.62
Silence Zone- Noise level(dB) standard for Commercial area for day=50 & for night=40					
St.Xaviers School, Vannarpettai	76.63	77.11	56.4-80.1	53.26	92.78
Mary Sargent School, Murugankurichi	74.81	79.28	68.7-82.1	49.62	98.2
STC School, Palayamkottai	80.61	75.63	57.5-86.4	61.22	89.08
Galaxy Hospital, Vannarpettai	72.64	73.71	67.2-76.5	45.28	84.28
High Ground Hospital	79.70	78.46	68.5-82.1	59.4	96.15
Infront of Nellaiapparkovil, Town	79.67	73.92	63.2-82.3	59.34	84.8
Post Office, Junction	75.07	59.01	52.5-78.3	50.14	47.53
Patrick Church Murugankurichi	77.59	81.20	59.1-84.2	55.18	103
Traffic zone – Noise level (dB) in heavy traffic zone 80-85					
Junction Bus Stand	87.37	85.83	65.2-89.4	2.79	7.29
New Bus Stand, Veinthankulam	90.52	86.43	69.6-92.8	6.49	8.04
Railway Station, Junction	101.50	87.72	86.4-106.2	19.41	9.65
Near RTO office NGO colony	88.13	84.53	61.8-91.2	3.68	5.66
Roundana, Vannarpettai	97.35	83.08	57.8-101.4	14.53	3.85
Thachanallur Main Road	89.19	87.02	58-92.3	4.93	8.78
By Pass Bridge, Near KTC Nagar	88.54	87.30	85.1-89.8	4.16	9.13
In-front of IndiaCements, Main Road, Sankar Nagar	87.17	89.34	76.8-91.8	2.55	11.68
Main Bazaar, Melapalayam	87.94	88.58	85.0-91.8	3.46	10.73
Opposite to Government Engineering College	87.84	87.06	79.1-89.6	3.34	8.83

Table .2 Noise levels dB(A) - Industrial area

Type of Industries	Date & Time	Noise levels dB(A)						Sound level dB(A) at day time L_{de}	Percentage of increase of noise level (day time)
		84.2	76.4	101.2	94.1	82.1	87.6		
Crusher industry	06. 08. 13, 2 pm to 3 pm	84.2	76.4	101.2	94.1	82.1	87.6	94.47	25.96
Batching plant at Ponnakkudy	06.08.13, 12 pm to 1pm	79.8	86.6	88.4	83.6	96.1	86.9	90.03	20.04
C M plant Ponnakkudy	10.08.13, 8.30 to 9.30 am	79.8	84.3	89.3	82.1	82.6	83.62	84.75	13
Saw Mill, seevalaperi road	06. 08. 13, 2 to 3 pm	84.2	88.4	93.2	94.1	82.1	88.4	90.33	20.44
Construction activities: Drilling machine sound	19.08.13, 10 to 10.30 am	98.8	92.6	93.1	82.4	86.2	90.62	93.42	24.56
Compressor motor	07. 08.13, 2 to 3 pm	84.2	86.1	85.6	79.8	82.6	83.66	84.10	12.13
SPT soil test, vannarpettai	12.08.13, 8 to 11 am	88.6	79.8	82.2	68.6	86.5	81.14	84.18	12.24
Borewell sound	17.08.13, 10am to 2 pm	108.6	89.8	92.7	95.9	93.5	96.1	101.54	35.39
Vibrator at concrete work	08.08.13, 11am to 12pm	76.5	68.8	79.2	75.6	65.4	73.1	75.13	0.17

3. Results and Discussion

The Present study reveals the need of a awareness regarding adverse effect of noise among public. During the survey of noise level at different location in various zone recorded the values higher than that of standards from 4th Aug. 2013 to 10th Oct. 2013. It was observed that in these locations the noise level varies considerably due to traffic, commercial and movement of people. The sound levels recorded from different zones of Tirunelveli were presented in table 1

3.1. Silent Zone

The observed sound level was fall between 52.5 -86.4 dB in all the places chosen under silent zone. The maximum sound level observed was 86.4 dB during 1-2 pm at S.T.C school, Palayamkottai and the minimum sound level observed in study area was 52.5 dB during 5-6 am at post office, Junction. Even though the study area is demarked as silent zone the sound level observed showed a significant increase in almost all time intervals.

3.2. Commercial Zone

All the places under the commercial zone recorded fairly higher noise level than the prescribed limit. Five important locations were taken into account for this study includes the various types of commercial activities in cluster.

Among the five location studied the maximum sound level was observed in RMKV vannerpettai area during all the time of study (72.3- 88.5 dB). The minimum sound level was observed in chennai silk vannerpettai area (62.1 dB), that also during hours (5-6am) in which there was no commercial activities.

3.3. Residential Zone

All the selected places of the residential Zones in Tirunelveli recorded except Bharani nagar and Town more than 55 dB during day time. The minimum noise level at Bharani nagar and Town was 50.4dB and 51.4dB respectively during 5-6 am. All other places had values that ranged between 55.9 -68.6dB.

3.4. Traffic Zone

In the traffic zone, the noise pollution was mainly by the heavy flow of vehicles especially heavy vehicles such as Lorries and trades. The maximum day time sound level (L_{dc}) is observed at Junction Railway station (101.5 dB(A)). The Maximum night time sound level (L_{ne}) is observes at opposite to India cements, Sankar nagar (89.34 dB(A)). The minimum day time sound level (L_{de}) and night time sound level (L_{ne}) were India cement sankar nagar (87.17 dB (A)) and Roundana Vannarpetai 83.08 dB(A) respectively.

3.5. Industrial Zone

The results obtained from the industrial zone in the present study were shown in Table 2. The Bore well work contributes maximum noise pollution in 108.6 dB(A) during its operation. None of Industries in Tirunelveli region recorded below the prescribed limit.

4. Conclusion

In India the growth of industrial, Commercial and residential zones is unplanned, unstructured and unzone. This leads to housing being built alongside factories and industries, increasing the risk of exposures to high noise levels. The honing of horns, flows of ill-maintained vehicles and poor road condition on road sides that cause traffic congestion were found to be the reasons for high noise level in Tirunelveli city.

The present study shows that all the selected places in Tirunelveli city suffering from higher level of noise level due to traffic. For the minimization of higher level of noise in Tirunelveli city following recommendations are suggested to tackle the situation.

- (i) Use of horns and music system facilities in vehicles should be minimized or banned.
- (ii) The traffic volume should be reduced by diversion of traffic.
- (iii) Automatic traffic signals should be installed all junctions.
- (iv) A wide green belt of thick vegetation can be produced along the roadway.
- (v) Structural designing of building to minimum the noise level to recipient.
- (vi) Isolation by partition of sound producing machines.
- (vii) The awareness program should be initiated to aware people about long term health risks associate with noise pollution.

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