

AMBIENT NOISE LEVELS IN AN INDUSTRIALIZED SUBURB OF CHENNAI, INDIA

by

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Abstract

Year-round survey of ambient noise levels monitored at eight locations in Manali, Chennai, are presented. The study area is distinguished by the presence of a cluster of several industries called the Manali Industrial Complex. The cluster includes a large petroleum refinery and several downstream industries. Densely populated residential and commercial localities, besides sensitive institutions like hospitals and schools co-exist with the industries in the area. The survey reveals that ambient noise levels are higher than the statutory limits for most of the time during the day.

1. Introduction

Ambient noise is known to be a chronic stresser but it constitutes a dimension of environmental pollution which has been studied with much lesser intensity than other forms of pollution (Abbasi, 1999). In an attempt to cover this knowledge gap a long-term study on ambient noise prevailing in a typical industrialized suburb has been carried out.

1.1 The study area

The studies pertain to the area of Manali, a Northern suburb of the Chennai metropol is (Figure I). The area houses Manali Industrial Complex which incorporates a large petroleum refinery - the Madras Refineries Limited (MRL), now known as Chennai Petroleum Corporation Limited (CPCL) - and several major downstream petrochemical industries (Figure I). The industries exist shoulder to shoulder with residential colonies, shops, hospitals, schools and various public amenities. In many ways Manali Industrial Complex typifies the way Industrial growth has occurred in India - industries have either come up in very close proximity with densely populated neighborhoods or townships have grown around industrial establishments to take advantage of the opportunities of employment and commerce that arise due to the industrial activity. By either mechanism, distinction between designated industrial areas and residential-commercial localities often gets quite blurred. This can have tragic consequences of catastrophic proportions, as has happened at Bhopal (Abbasi and Abbasi, 2005) and elsewhere (Abbasi and Abbasi, 2007 a, b, c; 2008; Tauseef *et al.*, 2011 a, b, c).

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In the Manali Industrial Complex, each of the industries has been established on the basis of individual environmental impact assessment (EIA), including risk assessment (RA), and each is supposedly meeting with the stipulated standards of air, water, and solid waste discharges arising from its operations. But the collective impact of the industries appears to be far from benign. Indeed Manali has been regarded as one of India's most polluted areas since several years and is currently among the top 20 'critically polluted areas' in India as per a list released by India's Central Pollution Control Board (CPCB, 2011).

2. Experimental

The ambient noise levels and the frequency of vehicular traffic were monitored during different seasons at 8 different locations (Figure 2) covering the entire study zone. The sampling points were selected to represent both industrial and residential areas of the region.

The noise levels were measured as dB(A) using a hand-held noise level meter at each location at five different times of the day (early morning, late morning, mid-day, evening and night). These studies were conducted during near-absence as well as during peak movement of vehicular traffic. A representative set of results is given in Tables 1-8.

The frequency of vehicular movement was monitored on the highways as well as the interior roads. The vehicular traffic was classified into three groups: (i) heavy vehicles (trucks, lorries and buses), (ii) light vehicles (jeeps and cars) and (iii) two/three wheelers.

3. Results and discussion

3.1 Noise pattern: Pre-monsoon

Barring the locations MN2 (Vayakkadu) and MN3 (Aulavoil), the ambient noise levels at other stations are often higher than the limits set for industrial (75 dB)/commercial (65 dB)/residential (55 dB) localities (Table 9). In 9 out of 280 samples the noise levels were even higher than the USEPA criteria of 'maximum allowable doze' (i.e. the doze above which harmful effects are certain to occur on persistent exposure: 90 dB). And in 3 of these 9 samples the noise levels were significantly above 90 dB.

The noise levels at night (after 20 hrs) were within the limit of 75 dB (A) in all but one instance. The zonation of noise levels is illustrated in Figure 3.

The traffic density was at its peak during 9-11 and 16-19 hours but the highest average noise levels didn't necessarily occur during these hours.

3.2 Noise pattern: Monsoon

The noise levels near the residential areas were in the range of 50 - 65 dB(A) with night levels on the lower side. The noise levels near the industrial areas were typically in the range of 70 - 85 dB(A). In this season, too, the majority of samples exceeded the ambient standards.

3.3 Noise pattern: Post-monsoon

The pattern was similar to the one observed in other seasons. The ambient noise levels often crossed the permissible limits at times even going beyond the USEPA limit of 90 dB for 'maximum allowable noise levels.' The hours of peak noise level did not always coincide with the hours of peak traffic movement.

4. Summary and Conclusion

Year-round surveys on ambient noise levels were carried out at Manali, Chennai. Eight locations were continuously monitored across the area. It is seen that, all-in-all, ambient noise in the study area are often higher than the statutory limits, at times even higher than the limits of 90 dB above which adverse effects are certain to occur. With continued industrial expansion, and consequent increase in traffic flow, the situation may turn for worse.

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Table 1: Noise levels, dBA, at MRL Gate (MN1)

Time, hrs	Noise level at location							Minimum	Maximum	Average
	1	2	3	4	5	6	7			
6 – 7	75.3	80.2	78.2	70.25	66.8	57.9	63.1	57.9	80.2	70.25
9 – 10	77.4	83.1	90.5	76.1	64.6	72.8	68.2	64.6	90.5	76.1
13 – 14	62.7	58.3	67.2	70.75	76.4	78.0	81.9	58.3	81.9	70.75
16 – 17	81.3	84.1	78.9	77.58	72.3	68.9	80.0	68.9	84.1	77.58
20 – 21	62.1	56.3	61.8	60.15	58.9	67.3	54.5	54.5	67.3	60.15

Table 2: Noise levels, dBA, at Vayakkadu (MN2)

Time, hrs	Noise level at location							Minimum	Maximum	Average
	1	2	3	4	5	6	7			
6 – 7	56.5	58.65	56.9	63.2	68.6	51.4	55.3	51.4	68.6	58.65
9 – 10	59.3	61.6	54.8	68.6	59.8	61.3	65.8	54.8	68.6	61.6
13 – 14	51.3	53.87	64.1	56.9	50.8	49.9	50.2	50.2	64.1	53.87
16 – 17	62.6	60.73	58.9	64.5	60.8	56.3	61.3	56.3	64.5	60.73
20 – 21	54.2	54.65	60.8	58.3	51.3	53.2	50.1	50.1	60.8	54.65

Table 3: Noise levels, dBA, at Amulavoil (MN3)

Time, hrs	Noise level at location							Minimum	Maximum	Average
	1	2	3	4	5	6	7			
6 – 7	53.0	50.1	58.9	62.3	55.82	53.9	56.7	50.1	62.3	55.82
9 – 10	60.3	58.4	63.5	59.0	61.98	66.8	63.9	58.4	66.8	61.98
13 – 14	58.1	52.6	59.2	65.0	60.27	66.4	60.3	52.6	66.4	60.27
16 – 17	54.5	58.9	64.0	59.1	60.45	62.8	63.4	54.5	64.0	60.45
20 – 21	51.3	52.8	60.1	58.5	54.17	50.8	51.5	50.8	60.1	54.17

Table 4: Noise levels, dBA, near TPL (MN4)

Time, hrs	Noise level at location							Minimum	Maximum	Average
	1	2	3	4	5	6	7			
6 – 7	90.7	83.2	86.3	68	54.0	79.68	95.9	54.0	95.9	79.68
9 – 10	72.9	90.7	87.9	72.1	80.1	81.90	87.7	72.1	90.7	81.90
13 – 14	74.6	82.6	65.2	79.3	60.7	71.80	68.4	60.7	82.6	71.80
16 – 17	71.4	82.5	72.9	68	90.7	76.15	71.4	68	90.7	76.15
20 – 21	60.8	75.6	68.4	65.2	73.2	68.25	66.3	60.8	75.6	68.25

Table 5: Noise levels, dBA, at IOCL Gate (MN5)

Time, Hrs	Noise level at location							Minimum	Maximum	Average
	1	2	3	4	5	6	7			
6 – 7	73.1	62.8	72.9	88.4	75.6	89.2	60.7	60.7	89.2	74.67
9 – 10	67.0	68.9	83.1	78.8	84.3	88.3	89.0	67.0	89.0	79.91
13 – 14	65.2	63.6	67.8	69.2	73.0	80.3	74.9	63.6	80.3	70.57
16 – 17	69.9	81.0	78.3	70.8	74.2	60.3	70.5	60.3	81.0	72.14
20 – 21	56.3	58.9	64.1	68.2	59.1	66.9	63.2	56.3	68.2	62.39

Table 6: Noise levels, dBA, at MFL Gate (MN6)

Time, hrs	Noise level at location							Minimum	Maximum	Average
	1	2	3	4	5	6	7			
6 – 7	64.3	69.2	82.3	66.8	71.9	68.8	58.3	82.3	68.8	
9 – 10	67.6	90.4	83.7	72.0	84.6	78.43	67.6	90.4	78.43	
13 – 14	75.1	62.3	72.1	65.9	66.4	66.85	59.3	75.1	66.85	
16 – 17	63.2	87.5	81.9	73.2	61.2	72.13	61.2	87.5	72.13	
20 – 21	52.9	58.3	55.1	63.2	55.7	57.73	52.9	63.2	57.73	

Table 7: Noise levels, dBA, at TNEB substation (MN7)

Time, hrs	Noise level at location							Minimum	Maximum	Average
	1	2	3	4	5	6	7			
6 – 7	65.3	77.8	85.4	72.62	60.7	70.2	76.3	60.7	85.4	72.62
9 – 10	77.9	84.3	90.3	80.82	88.8	61.5	82.1	61.5	90.3	80.82
13 – 14	65.3	66.4	80.2	70.4	71.6	70.4	68.5	65.3	80.2	70.4
16 – 17	72.1	74.5	88.1	77.95	89.3	77.6	66.1	66.1	89.3	77.95
20 – 21	62.1	65.3	53.8	61.57	66.9	63.2	58.1	53.8	66.9	61.57

Table 8: Noise levels, dBA, at Manali market (MN8)

Time, hrs	Noise level at location							Minimum	Maximum	Average
	1	2	3	4	5	6	7			
6 – 7	85.3	70.3	73.7	94.1	86.4	81.2	76.4	70.3	94.1	81.06
9 – 10	74.4	70.1	68.1	72.1	88.3	79.2	80.3	68.1	88.3	76.07
13 – 14	73.3	80.1	91.2	80.7	67.4	97.4	69.4	67.4	97.4	79.93
16 – 17	70.2	78.1	83.2	81.6	89.2	76.2	72.1	70.2	89.2	78.66
20 – 21	69.0	72.3	60.2	77.5	69.3	74.8	67.9	60.2	77.5	70.14

Table 9: Percentage of observations of noise levels when the levels were beyond acceptable limits[#]: pre-monsoon

Time, hrs	Location	Percentage of samples crossing the limit [#] for		
		Industrial area	Commercial area	Residential area
6 – 7	Near MRL gate (MN1)	42.86	71.4	100
9 – 10	“	57.14	85.71	100
13 – 14	“	42.86	71.42	100
16 – 17	“	71.42	100	100
20 – 21	“	0	14.29	85.71
6 – 7	Vayakadu (MN2)	0	14.29	85.71
9 – 10	“	0	28.57	85.71
13 – 14	“	0	0	28.57
16 – 17	“	0	0	100
20 – 21	“	0	0	28.57
6 – 7	Amulavoil (MN3)	0	0	57.1
9 – 10	“	0	14.2	100
13 – 14	“	0	14.2	85.7
16 – 17	“	0	0	85.7
20 – 21	“	0	0	28.5

[#] Ambient air quality standards [Amendment of Environment (protection) act, 1986 (29 of 1986)]

Continued.....

..... Table 9, continued

Time, hrs	Location	Percentage of samples crossing the limit # for		
		Industrial area	Commercial area	Residential area
6 – 7	TPL (MN4)	71.4	85.7	85.7
9 – 10	“	71.4	100	100
13 – 14	“	28.5	85.7	100
16 – 17	“	42.8	100	100
20 – 21	“	14.2	85.7	100
6 – 7	IOCL Gate (MN5)	42.8	71.4	100
9 – 10	“	71.4	100	100
13 – 14	“	14.2	85.7	100
16 – 17	“	28.5	85.7	100
20 – 21	“	0	28.5	100
6 – 7	MFL Gate (MN 6)	14.29	71.42	100
9 – 10	“	57.14	100	100
13 – 14	“	14.29	71.42	100
16 – 17	“	28.57	71.42	100
20 – 21	“	0	0	85.71

Ambient air quality standards [Amendment of Environment (protection) act, 1986 (29 of 1986)]

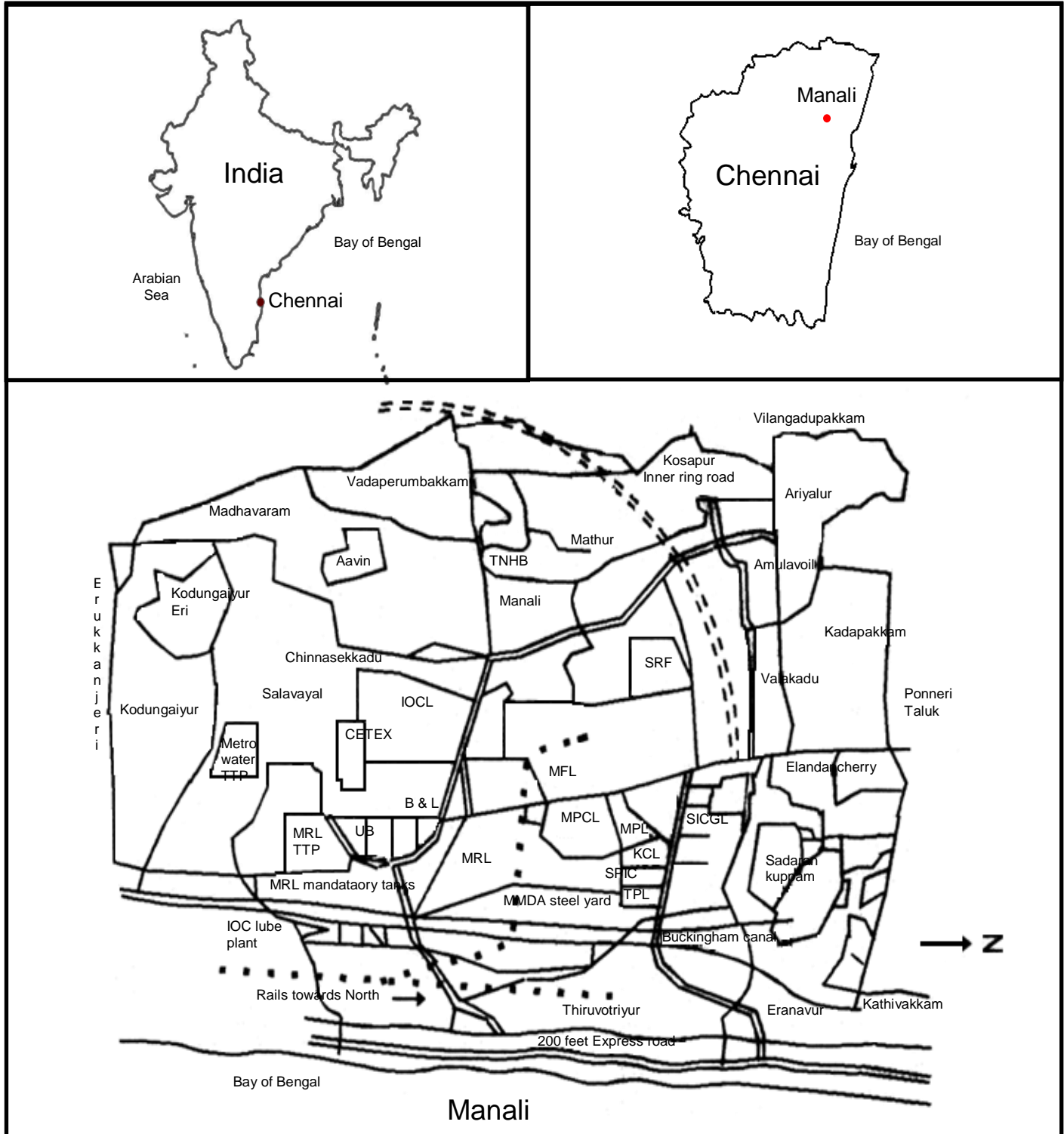
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Time, hrs	Location	Percentage of samples crossing the limit # for		
		Industrial area	Commercial area	Residential area
6 – 7	TNEB Substation (MN7)	42.8	85.7	100
9 – 10	“	85.7	85.7	100
13 – 14	“	14.2	100	100
16 – 17	“	57.1	100	100
20 – 21	“	0	28.5	85.7
6 – 7	Manali Market (MN8)	71.43	100	100
9 – 10	“	42.86	100	100
13 – 14	“	57.14	100	100
16 – 17	“	71.43	100	100
20 – 21	“	14.29	85.71	100

Ambient air quality standards [Amendment of Environment (protection) act,1986 (29 of 1986)]

Figure 1: The study area



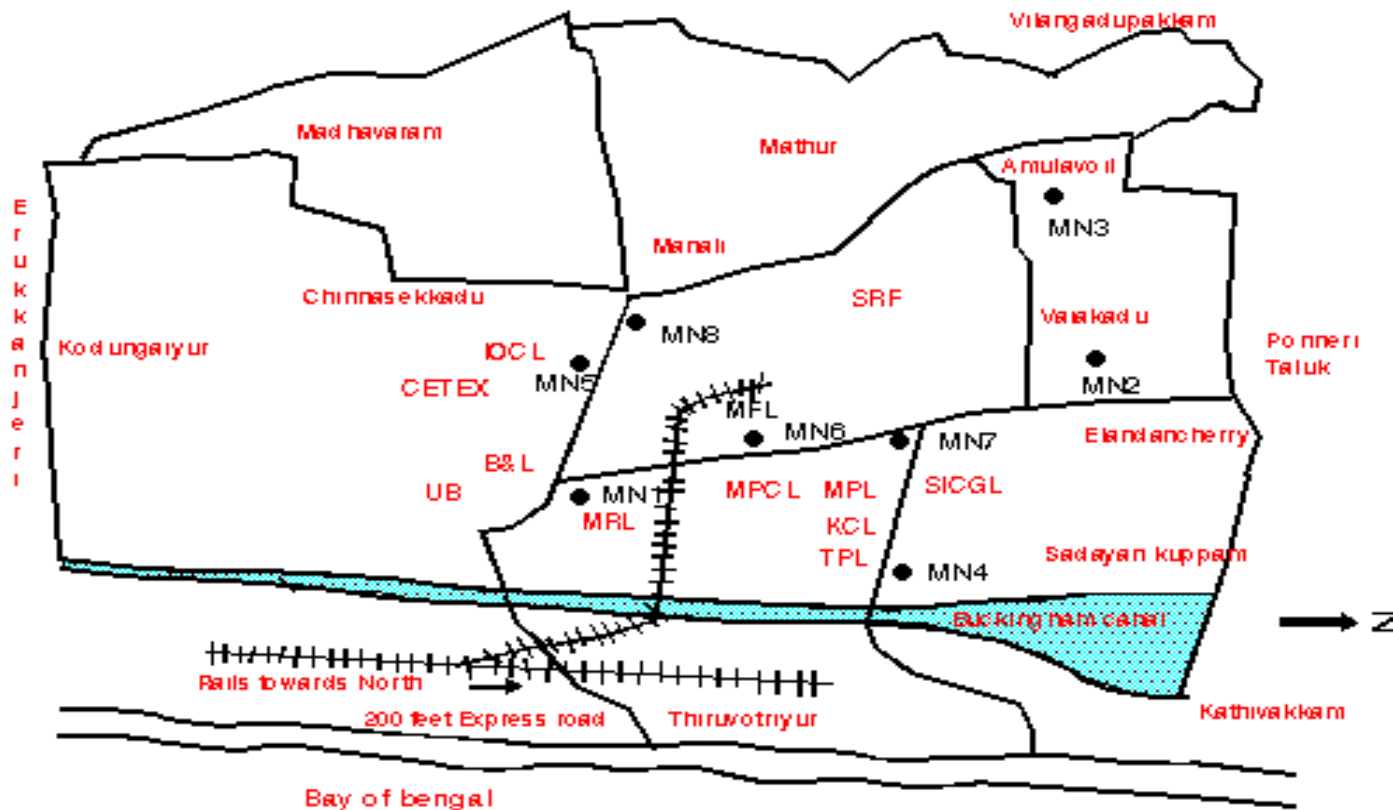
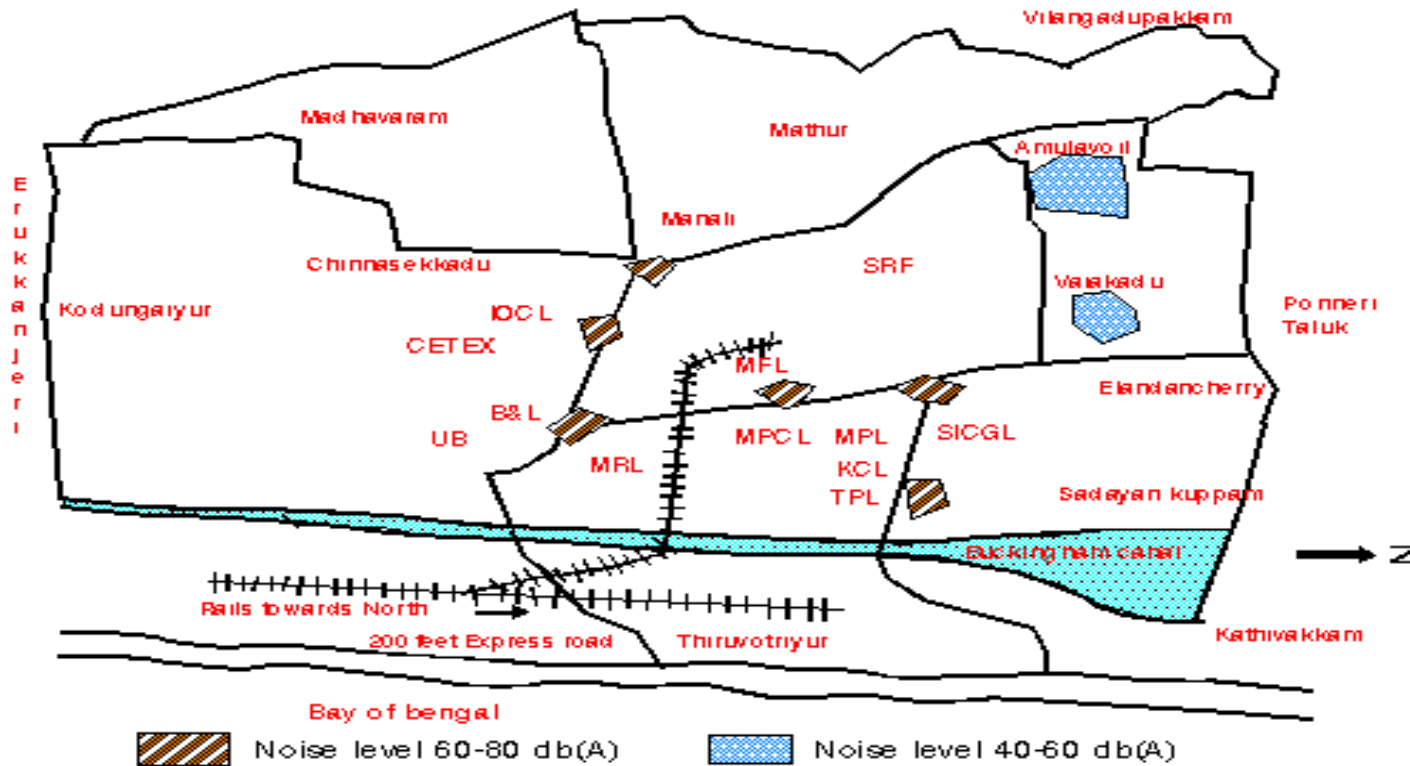


Figure 2: Location of noise level monitoring stations (MN 1 – MN 8; cf Tables 10.1–10.8)



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Figure 3: Ambient noise level at various locations during pre-monsoon