AI-ML : END-SEM PROJECT:TEAM REEvolution

Visualize noise pollution data and identify patterns across various locations:

DATA : Noise Mapping Data of Mumbai

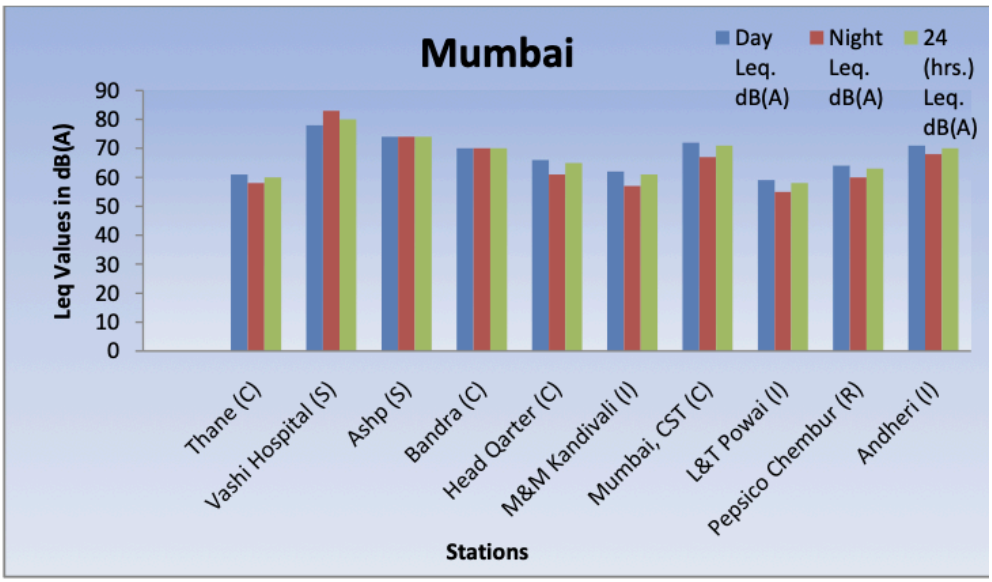
Mumbai, the capital of Maharashtra, is located at 18.9750° N, 72.8258° E, and lies in west coast
of India and has a deep natural harbor. Mumbai is spread over an area of 603.4 sq. kilometers. In

location Category Latitude Longitude
No.

1. Thane Commercial Zone 19º0' 57.38" N 72º51' 29.24" E
2. Vashi Hospital Silence Zone 19º4' 45.49" N 73º0' 0.12" E
3. Acworth Hospital Silence Zone 19º1' 15.83" N 72º51' 33.24" E
4. Bandra Commercial Zone 19º3' 20.77" N 72º49' 49.41" E
5. MPCB Head Quarter Commercial Zone 19º6' 42.73" N 73º0' 43.80" E
6. M&M Kandivali Industrial Zone 19º12' 3.87" N 72º52' 12.14" E
7. Ambassador Hotel Commercial Zone 18º56' 0.67" N 72º49' 29.61" E
8. L&T Powai Industrial Zone 19º7' 18.31" N 72º53' 34.27" E
9. Pepsico Chembur Residential Zone 19º2' 52.89" N 72º54' 37.12" E
10. Bisleri Andheri Industrial Zone 19º6' 44.49" N 72º51' 20.71" E


M & M Kandivali
Thane
Bisleri Andheri
L & T Powai
MPCB HQ
Navi Mumbai Vashi Hospital
Bandra
Pepsico Chembur
Ashp
Ambassador Hotel

STATION	Day Leq. dB(A)	Night Leq. dB(A)	24 (hrs.) Leq. dB(A)
Thane(C)	61	58	60
Vashi Hospital(S)	78	83	80
Ashp(S)	74	74	74
Bandra(C)	70	70	70
MPCB, Head Quarter(C)	66	61	65
M&M Kandivali(I)	62	57	61
Ambassador Hotel(C)	72	67	71
L&T Powai(I)	59	55	58
Pepsico Chembur(R)	64	60	63
Andheri(I)	71	68	70



Stations	Thane		Vashi Hospital		Acworth Hospital		Bandra		MPCB HQ	
Month	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
January	78	79	68	69	65	61	54	53	85	92
February	75	75	68	67	65	61	54	53	85	93
March	75	75	67	67	65	60	54	53	68	58
April	72	72	70	71	69	67	63	55	79	86
May	73	74	68	68	71	69	62	55	85	93
June	73	73	72	71	62	55	60	55	68	61
July	71	71	72	72	66	59	54	53	73	72
August	72	72	71	71	65	59	59	53	77	76
September	73	74	73	71	65	59	63	61	75	67
October	72	73	71	71	64	58	65	63	75	71
November	75	73	71	71	64	59	65	64	70	61
December	73	74	70	70	65	60	64	64	74	77

Table 56: Monthly Avg. Sound level of remaining 05 stations of Mumbai

Stations	Kandivali		Powai		Chembur		Andheri		CST	
Month	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
January	68	63	58	53	65	55	70	66	72	68
February	60	61	57	53	64	55	71	68	72	67
March	62	52	59	53	64	55	71	67	70	66
April	60	53	60	55	65	56	72	67	71	66
May	67	67	60	55	62	55	70	67	70	66
June	62	55	61	57	64	65	73	69	72	69
July	62	56	60	60	66	64	74	71	73	69
August	62	55	60	57	66	66	73	68	72	68
September	61	54	58	55	64	65	70	67	72	67
October	60	52	56	51	61	55	69	65	72	67
November	60	53	56	51	62	55	70	66	72	67
December	60	53	57	52	63	57	70	67	72	67

Sr No	Location	Highest value	Lowest Value	Average (dB)	Std Dev + or -	Std Error	Variance	Leq	NC	Lnp (NPL)
1	Churchgate	80.6	64.5	72.00	3.06	0.38	9.38	79.65	8.02	87.49
2	Marine Lines	80.3	70	75.68	2.31	0.36	5.35	80.69	5.89	86.61
3	Charni Road	82.5	70.2	75.42	2.34	0.30	5.45	82.10	5.37	88.08
	Grant Road	91.4	59.9	71.00	5.93	0.77	35.19	82.97	13.46	98.15
5	Mumbai Central (Tardeo)	84.3	62.3	71.24	5.07	1.31	25.74	74.90	14.50	87.89
6	Haji Ali	84.2	66.3	74.18	4.68	1.10	21.89	77.47	13.76	89.45
7	Mahalakshmi	94.0	63.2	74.97	6.67	0.84	44.51	87.36	17.66	104.44
8	Dr. E. Moses Road	86.6	64.7	75.26	5.85	0.97	34.20	82.91	18.17	97.89
9	Lower Parel	104.0	68.8	78.03	6.55	0.79	42.89	94.02	15.90	110.78
10	Matunga	89.7	66.5	74.80	4.30	0.33	18.52	88.14	12.14	99.16
11	Mahim	85.9	63.3	73.55	4.43	0.41	19.59	88.14	11.30	99.47
12	Turner Road (Bandra)	94.9	61.0	75.04	5.18	0.59	26.80	86.63	13.15	99.88
13	Bandra (W) SV Road	86.7	72.1	79.04	4.59	1.33	21.08	80.13	13.40	91.89
14	Khar(W) SV Road	91.6	62.9	75.86	5.67	0.67	32.14	86.70	13.21	100.84
15	Santacruz(W) SV Road	120.0	59.9	79.52	6.80	0.60	46.25	108.32	13.50	125.73
16	Vile Parle(W) SV Road	95.5	61.0	80.76	4.78	0.51	22.83	90.89	10.72	103.12
17	Andheri(W)	82	79.3	80.7	0.86	0.19	0.73	82.20	2.39	84.39
18	Mulund(W), J.S.D Road	74.8	56.5	67.44	5.94	0.89	35.34	74.95	16.04	90.00

Noise Map of Mumbai showing Lnp (NPL) Levels

Abstract:

Noise Mapping is a study made to differentiate the city into zones according to different Noise levels. It records Noise as is actually present in a location and compares it to the ideal

noise levels, as stipulated by the standards given. A study was conducted on the roads of Mumbai city using a Sound Level Meter (SLM). This data was tabulated to demarcate the city into different noise zones. The Leq, Noise Climate, and Noise pollution levels were calculated . This was further represented in the form of cartographic maps for easy understanding. It was found that the noise levels in overall city were very high and above the permissible limits. The average values throughout were 70-80dB.

MATERIALS AND METHODS USED :

Noise levels at different places were recorded using basic Sound xLevel Meter (Model no. SL-4010) on 15th March2012 . The route followed was from Churchgate, Mumbai, India upto Andheri, Mumbai India. A road parallel to the western railway line was studied(Table 1.1). This was maintained to avoid any interferences of rail noise. When the instrument was switched on, a range was selected which was ideal for the surrounding. (The instrument has 3 ranges 35-80dBs, 50-100dBs and 80-130dBs). After the selection of the range the microphone was pointed or faced towards the traffic, which was the noise source. Since the instrument showed fluctuating values depending on the changing noise levels, a method was devised to maintain uniformity. Readings were recorded after every 10 secs. After 10 secs whatever value was displayed on the SLM screen was noted down. Three such readings were noted to calculate the average value. The data was further used to calculate Leq (Eq.1), Noise climate (NC) (Eq. 2) and Noise pollution level (Eq. 3) (Ehrampoush M., 2011). A city

noise map was prepared. This Data was used for making Isopleth maps. Different symbols were used to indicate the different range of noise pollution levels and a noise map is constructed (Fig. 1.0).

Leq was calculated using following formula.

$$Leq,T = 10 \log\left[1/n \sum_{i=1}^{n} 10Li/10\right] \ldots\ldots\ldots (1)$$

Where, Leq = noise levels observed in time interval T and n= nth duration of measurement

Leq is the equivalent continuous equal energy level; and can be applied to any fluctuating Noise Level. It is that constant Noise Level that over a given time expends the same amount of energy as the fluctuating level over the same time period. (MPCB, 2005.,P. Saler, 2012).The readings noted in fractions, were rounded off to nearest integer in the observation tables. To detect the actual rise in the noise level a set of readings was taken on a normal working day. To get better understanding of noise range noise climate (NC) index (Pathak, 2008) was calculated using following formula:

$$NC= L10- L90 \text{ dB (A)} \ldots\ldots\ldots\ldots\ldots (2)$$

Total annoyance caused by noise level was estimated using noise pollution level index (NP) (Ehrampoush M., 2011)

$$LNP= Leq * 2.56\partial \ldots\ldots\ldots\ldots\ldots (3)$$

Where, LNP= Noise pollution level, Leq= equivalent noise level, ∂= standard deviation

Statistical analysis was carried out to analyze the significant difference between festive and a non-festive day.

Introduction:

The city of Mumbai is a commercial capital of India with massive development projects both infrastructural and commercial types taking at a very fast pace. There is an increase in the noise produced on a daily basis. Mumbai is the 3rd noisiest city in the world .Studies on noise pollution was undertaken by maharashtra pollution control board , and central pollution control boards . Regular monitoring however is

undertaken only during festival days by these government agencies . in the past non governmental agencies like the "Awaaz" had monitored noise. The first study was carried out by Vyas (2002) and second such study was conducted by Sumaira Abdul Ali (April 2006) with the support of MMDRA, her project was entitled 'The Mumbai City Noise Mapping Project '. Lot of Geographical work concerning noise has also been done including noise mapping by Vyas (Vyas, 2002). Noise Mapping makes the government aware and hence enables them to take suitable measures in reducing it, thus leading to proper town planning. The idea of Noise mapping was 1st undertaken by Defra, a private research organization in Europe. In India this is fairly a new concept. Noise mapping data can be provided to the relevant authorities for the implementation of right rules and regulation and acts as a basis for future action plans. It is also a great source of information to the citizens. The basic requirements for strategic noise mapping are an existing or a previous or a predicted noise situation, the exceeding of a limit, the estimated number of people location in an area exposed to certain levels of noise, estimated number of dwellings, schools and hospitals in a certain area exposed to specific values of noise indicator. The city of Mumbai has different land use patterns with the eastern parts being more industrial, south Mumbai commercial, central Mumbai being congested and western suburbs a conglomerations of various developments. The traffic pattern and types of vehicles too differ in various parts of the city, with restrictions of public auto rickshaws in the suburbs . Thus it became imperative to study noise levels in the study on a large scale and identify the critical areas.

Along with other types of pollution, noise has become a hazard to quality of life (Davar, 2004). Various studies have revealed that noise levels in some of the Indian cities are

higher than the standards prescribed by CPCB, Central Pollution

Control Board and MoEF, Ministry of Environment and Forest, Govt. of India (Naik, 1999; Mohan, 2000; Gupta, 2003; CPCB, 2012; Joshi, 2012; Mangalekar, 2012; Kumar, 2001). Several studies have been carried out in India on noise levels,

noise climate, Leq, and Lmax (Nikhil kumar et al, 2013; Chaudharyet.al, 2012; Tandel, 2011).

The objective of the study is to assess the noise pollution levels, noise climate, Leq, and Lmax, Noise Pollution Level Index

and Noise Climate in this city and construct a noise map.