Chapter 2
Material and Methods

2. MATERIAL AND METHODS

2.1. Introduction:

As a result of rapid growth in population, most of the townships in the country are converted into unplanned growth centres, which sooner or later face environmental problems due to urbanisation, industrialisation and degradation of natural resources (Corson, 1990). Noise pollution has been one such problem, rather new and ignored. The general assumption is that, the phenomenon of noise pollution is prevalent only in the large cities and metropolitans. However its status in the growing towns in India is unknown.

India has around 400 big towns growing into cities. People have been pouring in from countryside to the urban areas in search of job opportunities and better standards of living. This can be attributed to the rapid transformation of large villages and towns into urbanisation. The bulging concentration of population in the urban areas has brought about along with the other changes, an addition in the number of vehicles, as a result to the urban sprawl and increased income in the middle class families.

India is a country with a rich tradition and culture. There has been the practice of use of musical instruments and crackers during festivals. Today, with the changing life styles, there are more occasions for celebration particularly in the neo rich class of people. This style is now

related proportionately with more scope for making noise. The use of loud speakers for social, political and cultural gatherings has become an integral part of almost every occasion.

Some of these aspects, characteristic of the changing urban environment has gradually and unknowingly created the problem of increased noise levels in the growing towns, which earlier had calmer environment. Kolhapur is one such growing town, a district capital. The assumption is that, this well planned princely residential town, known for a lot of greenery is almost free of noise pollution. Therefore, Kolhapur city was chosen for the study on noise pollution, as it is representative of the large number of growing towns in India.

.2.2. Kolhapur – A Profile:

Kolhapur is an ancient Indian town located almost at the southern border of the state of Maharashtra. It has a history of more than 2000 years and is located on the banks of the river Panchanga. In the Hindu mythology, the city of Kolhapur has been mentioned with the name, Karvir; and in about the 3rd century BC, Kolhapur was an important Buddhist centre (Vishwanath, 1998). It originally was a cluter of seven villages viz. Brahmapuri, Uttareshwar, Kholkandoba, Rankala, Panhala, Ravaneshwar and Laxmiwadi. It is known as Dakshin Kashi and is an important pilgrimage center with the famous temple of goddess Mahalaxmi. The princely town has been known as a center for religion,

art and culture in south Maharashtra. In the last century it has come to be known for sports, education, trade, commerce and industry.
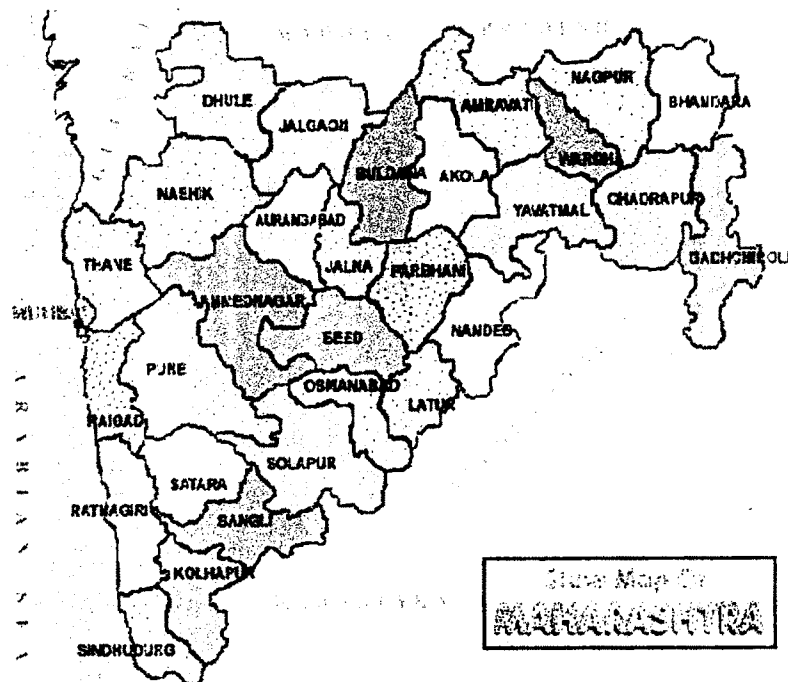

Fig. 2.1: Map of Maharashtra showing the location of Kolhapur. (Source: www.Kolhapur.com)

The city of Kolhapur, situated on the eastern side of the western ghats, commomnly known as Sahyadri mountain ranges, is surrounded from two sides by river panchganga. It has many small and big temples and has some beautiful palaces and forts. Figure 2.1 shows the location of Kolhapur district in the map of Maharashtra.

Kolhapur had been a Princely state before and during British rule. At the time of independence Kolhapur Merged in India Republic along with most of other Princely states. The climate in Kolhapur is pleasant. Its winters are mild and misty, and offer day trips to several interesting places nearby. It is endowed with extremely fertile soil, plenty of water

and hard working people. It is also well known in the world for the products like jaggary, leather goods, jewellery, agro-machinery, engines etc. Today, the town has quickly progressed from a predominantly traditional farming and trade town to a major educational centre and industrial city. The town at present has a per capita income, which is probably one of the highest in the country (www.Kolhapur.com, Internet).

The Kolhapur Muncipal corporation administers an area of around 67 sq. Kms. proposed to expand to 200 sq. Kms.) with a population of a little more than 5 lakh (Census 1991). 11 Major hospitals, 42 gardens, 162 schools, 27 colleges and a university are located in the city. There are about 45 medium size industries and around 5000 small diverse industrial units located in Kolhapur (Vishwanath, 1998). This therefore should make it as a representative of the growing towns in the country.

2.3. Objectives:

The main objectives of the study are as follows

- To find out the present status of sound levels in Kolhapur city.

- To study the noise levels with respect to the different zones viz. commercial area, residential area, silent area and industrial area.

- To compare the existing sound levels with the standard noise levels laid down by the pollution control board.

- To find out the sound levels in the town, during festivals.

- To identify the reasons for noise pollution in the city.

- To find out the general awareness of the public about this problem.

2.4. Methodology:

The monitoring of noise levels were carried out from the four zones viz. industrial, commercial, residential and silent; as specified by the pollution control board (C.P.C.B. Manual, 1995). Twenty localities from identified and monitored, these were representative of the four zones. These twenty areas, distributed around the city consisted of 135 sampling stations. All the monitoring has been done in the exterior, and not inside any building. The sampling stations included the main roads, sublanes, educational institutions, hospitals, industries and road junctions of the defined study area.

Table 2.1: Distribution of Sampling stations in different categories.

Category	No. of Sampling Stations
1. Sublanes	39
2. Junctions	38
3. Main roads	27
4. Educational Institutions	22
5. Hospitals	4
6. Industries	5

The monitoring was carried out with the help of a digital sound level meter (Lutron 4010). The sound level meter (SLM) was positioned at a height of about 1.5m above the ground level and the sound pressure

levels were measured in the A-weighting network i.e. dB(A). The noise

levels were monitored at an interval of every two hours (± ten minutes)

viz. 5:00 a.m., 7:00 a.m., 9:00 a.m., 11:00 a.m., 1:00 p.m., 3:00 p.m.,

5:00 p.m., 7:00 p.m., 9:00 p.m., 11:00 p.m., 1:00 a.m., and 3:00 a.m. at

all the sampling stations. At each station, six readings were taken at an

interval of ten seconds. Care was taken to keep a distance of atleast 10-

15 feet from the source of sound.

The different identified areas for the study were as follows:

1.	New Shahupuri	11.	Mangalwar Peth
2.	Tarabai Park	12.	Shivaji Peth
3.	Shahupuri	13.	Rajarampuri
4.	Shivaji Park	14.	Vidyanagar
5.	Shivaji Road	15.	Pratibhanagar
6.	Bhausinje Road	16.	Bawada
7.	Mahadwar Road	17.	Line Bazar
8.	Gangavesh	18.	Sadar Bazar
9.	Laxmipuri	19.	Kadamwadi
10.	Udyam Nagar	20.	Ruikar Colony

Figure 2.2 shows the areas identified for the study on the map of

Kolhapur City.

The sound levels are expressed in energy equivalent sound levels

(Leq); the unit of which is decibel. It is determined by using the equation,

$$L_{eq} = 10 \log_{10} (\Sigma \ fi \ 10^{Li/10})$$

Where, fi = Fraction of time for which the constant SPL persists

Li = Sound pressure level

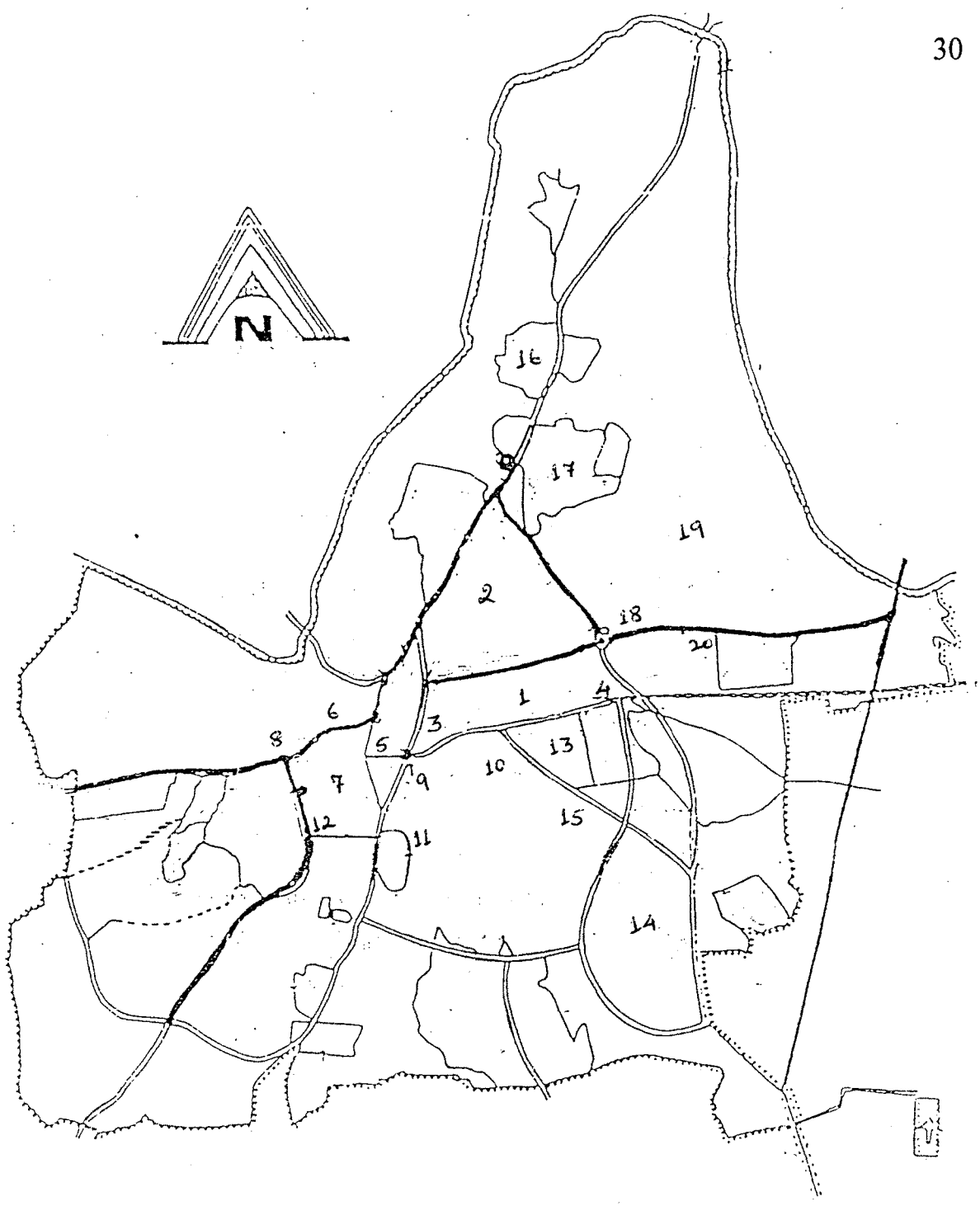|	
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Fig. 2.2 Map of Kolhapur city showing the identified areas of study

This parameter has been selected for the reason that, the noise levels were never stable, showing consistent fluctuations in the readings and secondly the noise standards laid down by the pollution control board have been in energy equivalent noise levels (Pandya and Varma, 1997; Nagi and Dhillon, 1999). The results were then compared with the noise standards (Table 2.2) laid down by the Central Pollution Control Board.

Table 2.2: Ambient Noise Standards (Environment, Effluent, Emission & Noise Standards and Guidelines- KPCB, 1997)

Area code	Category of area	Limits in dB (A), L_{eq}	
		Day time	Night time
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silent zone	50	40

The monitoring of noise levels were carried out mainly in two phases. In the first phase, the noise levels existing during a normal day i.e. a day without any particular festive significance was studied. Here, Sundays were also avoided, as it happens to be a holiday, bearing a festive mood to many. In the second phase, the noise levels prevailing during the popular festivals were studied, which included mainly Diwali and Ganesh Utsav. As Diwali celebration lasts for only four days, only two zones were covered in the study, i.e. the commercial area and residential area comprising of 67 sampling stations forming 9 areas.

The analysis of the raw data collected has been done in five stages; viz.

Stage 1 : Average noise levels at each sampling station for each time

    Interval

Stage 2 : Maximum and minimum readings recorded at each sampling

    station during the day and night.

Stage 3 : Ambient noise levels in each area for each time interval.

Stage 4 : Ambient noise levels during the day and the night for each

    Area

Stage 5 : Ambient noise levels during the day and the night for each

    zone.

In stage 1, the mean values of the six readings taken at a particular sampling station at a particular time interval are stated. This gives an overview of the readings recorded at the different time periods throughout the day/night at each sampling station.

Stage 2 states the maximum and minimum readings recorded during the day hours and the night hours at each sampling station. The day hours have been considered from 7:00 a.m. to 9:00 p.m. and the night hours have been considered from 11:00 p.m to 5:00 a.m. This gives an idea of the range of noise levels prevailing at each sampling station.

Stage 3 states the ambient noise levels (Leq) of each area for each time interval. Here the readings taken at all the sampling stations of the area, at that particular time interval is considered for the analysis as per the formula given above. This gives the status of the noise levels

prevailing in the particular area for each time interval throughout the various time intervals of the day and night.

Stage 4 states the ambient noise levels during the day and the night for each area. Here all the readings taken for the day hours and the night hours, from all the sampling stations in the particular area under consideration is taken for analysis as per the formula given above for Leq noise level. This gives the ambient noise levels prevailing in the particular area under study for the day and the night.

Stage 5 states the ambient noise levels existing in the different zones in the city, viz. the commercial, residential, industrial and the silent area. Here, the averages of ambient noise levels for the days and nights are taken of the areas comprising the particular zones. This gives a broad picture of the status of noise levels prevailing in the above mentioned zones.

The results of the stages three, four and five are compared with the noise standards (table 2.2) and are graphically represented. The quantitative increases in noise levels from the standard levels are also represented graphically for the various phases of the study.

The finding of the study are compared with the similar studies on noise pollution from other cities like Bangalore (Wilson, 1998), Gwalior (Rao and Padmaja, 1999), Indore (Joshi and Gunvant,1997) and Nagpur (Pandya and Varma, 1997).

The present study has been carried out during the period 1999-2000.