Dhanya John “Impact of urbanization on sustainable environment in Kerala - a study based on Thrissur district.” Thesis. Research and Post Graduate Department of Economics, St. Thomas’ College (Autonomous), University of Calicut, 2019.

CHAPTER- 3

TRENDS AND PATTERN OF URBANIZATION AND ITS IMPACT ON ENVIRONMENTAL QUALITY

CHAPTER- 3

TRENDS AND PATTERN OF URBANIZATION AND ITS IMPACT ON ENVIRONMENTAL QUALITY

3.1 Introduction

Urbanization is the progressive concentration of population in urban units (Davis, 1965). It is the process of population moving towards towns and cities from rural areas, and taking up the culture and work prevailing in the urban areas. The country's population is spread over villages and also towards their nativity with formal occupation, mostly agricultural or its allied ones, making their living with or without ancestral property like lands or houses. An analysis of distribution of population between rural and urban areas of country will reveal the extent of urbanization. Deteriorating quality of urban and suburban environment is to a great extent the result of injudicious land use and is a threat to the whole socio-economic system. Thus planned cities are as necessary as planned farms (Tyler Miller, 1992).

According to the Encyclopedia of social sciences (1971), urbanization is characterized by movement of people from small communities concerned chiefly or solely with agriculture to other communities generally larger, whose activities are primarily centered in Government, trade manufacture or allied interests. Thus Urbanization can be said to be characterized by such self evident factor as;

i. Mobility of population from agricultural to non - agricultural areas ;
ii. Concentration of populace in a new place of habitation or a place characterized by a new way of life.
iii. Variety of professions other than agriculture and continued mobility in these occupations, mobility both - vertical and horizontal.
iv. A particular mode of habitation and non - agricultural (i.e., industrial, commercial etc.) pattern of economy.

In simple words, urbanization usually refers to the process of concentration of people in the densely populated settlements where majority of the people derive their

livelihood from non-primary occupations (Chaudari 2001). It is treated as an index of modernization and one of the chief ingredients which reflects growth.

3.2Pattern of urbanization in the world

Rapid urbanization has been a worldwide phenomenon in the 21st century. According to the United Nations (2011), the world population is estimated to be 9.2 billion by 2050 from7 billion in 2011. Between 2011 and 2050, the world population is expected to increase by 2.3 billion, passing from 7.0 billion to 9.3 billion (UN, 2011). At the same, the population living inurban areas is projected to gain 2.6 billion, passing from 3.6 billion in 2011 to 6.3 billion in 2050.

Some striking differences existed between the More Developed (MD) and Less Developed (LD) countries with respect to their pattern of urbanization. The developed countries achieved the higher degree of urbanization to a great extent with the industrial revolution of the 19th century. Urbanization is emerged around the time of industrial revolution in the case of developing countries and keeps fastest growing compared to the developed nations. This is shown in table 3.1.

The table gives a clear picture regarding the rate of urbanization of the world. Here the entire nations are divided into two categories-the more developed regions (MDR) and the less developed regions (LDR). In the year 1950 proportion of urban population in total population was 29.8 percent, and in the case of MDR it was 54.9 percent. In the case of LDR it was 17.8 percent. Since then, this trend shows an increasing rate. During 2015 urban population in percentage was 53.7 that clearly depicts that half of the total world population is urban. In the case of MDR the percentage of urban population was 78.6 and that of LDR it was 48.6. Similarly, the rate of urbanization in the world was marked as 1.22 percent, and that for MDR and LDR were 1.12 and 1.91 respectively in 1950-1955. The rate shows a fluctuating trend since 1965 were there is diminishing trend for W and MDR. But LDR shows increasing trend upto 2015-2020. This shows that the rate of urbanization is higher in case of less developed regions as compared to that of more developed regions.

Table 3.1

Proportion of Urban Population and Rate of Urbanization of the World-The More Developed Regions and the Less Developed Regions 1950 - 2050.

Proportion of Urban(In Percentage)				Urbanization Rate(%)			
Year	W	MDR	LDR	Period	W	MDR	LDR
1950	29.8	54.9	17.8	1950-955	1.22	1.12	1.91
1955	31.7	58.0	19.6	1955-1960	1.23	1.14	1.91
1960	33.7	61.4	21.6	1960-1965	1.07	1.02	1.80
1965	35.5	64.6	23.6	1965-1970	0.68	0.92	1.23
1970	36.8	67.7	25.1	1970-1975	0.64	0.68	1.29
1975	37.9	70.1	26.8	1975-1980	0.88	0.42	1.82
1980	39.6	71.5	29.3	1980-1985	0.90	0.33	1.79
1985	41.5	72.7	32.1	1985-1990	0.95	0.29	1.76
1990	43.5	73.7	35.0	1990-1995	0.82	0.23	1.44
1995	45.3	74.6	37.7	1995-2000	0.84	0.21	1.39
2000	47.2	75.4	40.4	2000-2005	0.86	0.25	1.33
2005	49.3	76.3	43.1	2005-2010	0.86	0.29	1.24
2010	51.5	76.8	45.9	2010-2015	0.84	0.32	1.16
2015	53.7	78.6	48.6	2015-2020	0.81	0.33	1.07
2020	55.9	79.9	51.3	2020-2025	0.77	0.34	0.98
2025	58.1	81.3	53.9	2025-2030	0.72	0.32	0.90
2030	60.2	82.6	56.4	-	-	-	-

Source: United Nations, World Urbanization Prospects (2011).
Note: W- World, MDR - More Developed Regions, LDR - Less Developed Regions

Population growth is becoming largely an urban phenomenon concentrated in the Developing world (David Satterthwaite, 2007), Asia in particular is projected to see its urban population increased by 1.4 billion, Africa by 0.9 billion, and Latin America and the Caribbean by 0.2 billion. The rate of urbanization by major areas of the world is shown in table 3.2.

Table 3.2

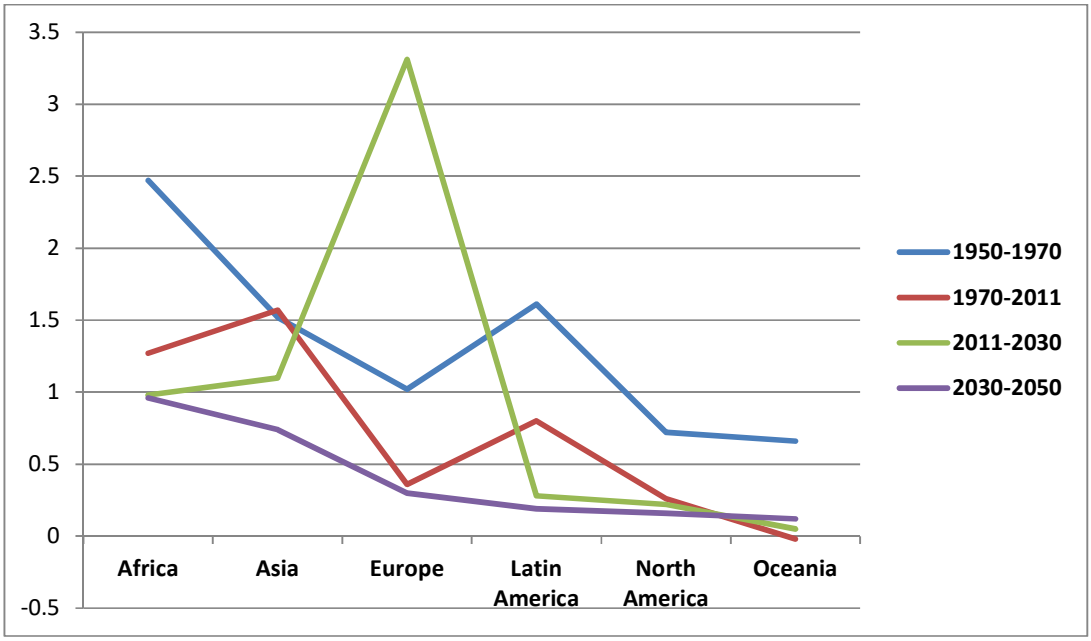
Rate of Urbanization by Major Areas

Major Areas	Rate Of Urbanization (%)			
	1950-1970	1970-2011	2011-2030	2030-2050
Africa	2.47	1.27	0.98	0.96
Asia	1.52	1.57	1.10	0.74
Europe	1.02	0.36	3.31	0.30
Latin America	1.61	0.80	0.28	0.19
North America	0.72	0.26	0.22	0.16
Oceania	0.66	-0.02	0.05	0.12

Source: UN, World Urbanization Prospects, 2011.

Figure 3.1

Rate of Urbanization by Major Areas



The table and figure shows that in the period 1950-1970 highest rate of urbanization was found in Africa and lowest in Oceania. Asia region marked 1.52 percent of urbanization which is higher than that of Europe. During the period 2011-2030 the

urbanization rate shows highest in Europe which is 3.31 percent and in the case of Asia it is 1.10 percent which show that Asian region shows a trend that is not so much fluctuating compared to the other regions of the world.

Table 3.3

Total Urban and Rural Population 1950-2050

Development Group	Population (billion)					Average annual rate of change (%)			
	1950	1970	2011	2030	2050	1950-70	1970-2011	2011-30	2030-50
Total Population									
World	2.53	3.70	6.97	8.32	9.31	1.89	1.55	0.93	0.56
MDR	0.81	1.01	1.24	1.30	1.31	1.08	0.51	0.23	0.06
LDR	1.72	2.69	5.73	7.03	7.99	2.23	1.85	1.07	0.65
Urban Population									
World	0.75	1.35	3.63	4.98	6.25	2.98	2.41	1.66	1.13
MDR	0.44	0.67	0.96	1.06	1.13	2.09	0.89	0.52	0.29
LDR	0.30	0.68	2.67	3.92	5.12	4.04	3.33	2.02	1.34
Rural Population									
World	1.79	2.34	3.34	3.34	3.05	1.36	0.87	-0.01	-0.44
MDR	0.37	0.34	0.28	0.23	1.18	-0.48	-0.48	-0.92	-1.14
LDR	1.42	2.01	3.07	3.11	2.87	1.74	1.03	0.07	-0.40

Source: UN, World Urbanization Prospects, 2011.

Note: MDR-More developed Regions, LDR-Less Developed Regions

The Table 3.3 gives us the clear idea about urban-rural share of total population in more developed and less developed regions. In 1950 total world population was 2.54 billion in which 0.81 billion are from more developed regions and 1.72 billion from less developed regions. Since then, up to the projected estimate of 2050, population shows a drastic change to 9.31 billion in which major share is from less developed regions (7.99 billion). Similarly, the share of urban population is higher in the case of less developed regions which is marked as 2.67 billion in 2011 than 0.96 billion of more developed regions. In 2050 it will be 5.12 billion for LDR and only 1.13 billion for MDR. In case or rural population, more developed regions contributed 0.37 billion and less developed regions 1.42 billion to total rural population of the world. In 2011,

the major share of rural population to total population is from less developed region which is marked as 3.07 billion.

Similarly, the average annual rate of change of urban population in 1950-70 is marked as 2.98 percent. MDR marked 2.09 percent growth, while LDR marked 4.04 percent. The interesting fact is that the average annual rate of change of rural population for the world, MDR and LDR shows negative rate that gives the idea of increasing trend of urbanization. In 2011-30, the rate is -0.01 percent for the world and – 0.92 percent for more developed regions. LDR marked 0.07 percentage change during that period.

3.3Pattern of Urbanization in India

The Asian Region has been very dynamic as revealed by the diversified level of urbanization. Among the Asian Regions, India's urban population is second highest in the world after China and higher than the total population of all countries (HDR, 2000).

In India the definition of urban is substantially dynamic in nature. The major changes in the definition of urban in India took place between 1951 and 1961. As a result, about 810 towns of 1951 were reclassified as rural in 1961 and after that the definition of urban place in the Indian Census has remained more or less stable. Since 1971, Urban Agglomeration (UA); a concept is used by census of India to explain urbanization. Urban agglomeration is a continuous urban spread constituting a town and its adjoining urban outgrowths (OGS) or two or more physical contiguous towns together and any adjoining urban outgrowth of such towns. Examples of OGS are Railway colonies, University Campuses, Port areas that may come up near a city or statutory towns, outside revenue limit of a village or villages contiguous to the town or city.

The definition of 'Urban' given by Census of India includes two classifications. The First category is known as Statutory Tows. These towns are notified under low by the concerned State/Union Territory Government and have local bodies like Municipal Corporation, Municipalities, Municipal committees etc. The second category is Census Town.

According to the 2011 census, an urban area is,

a) All the statutory places with a municipality, corporation, cantonment board or noticed areas exist (Statutory towns).
b) All other places which satisfy the following conditions (Census Towns).
    1. Having a minimum population of 5000
    2. At least 75 percent or more male working population engaged in non agricultural activities.
    3. Having a population density of at least 400 persons per sq.km

The urbanization in India is taking place at a faster rate than the rest of the world. This is because India is in a phase of rapid economic and demographic transition. Urban areas account for about 60% of the GNP of the country. The table 3.4 gives the trends in urbanization in India.

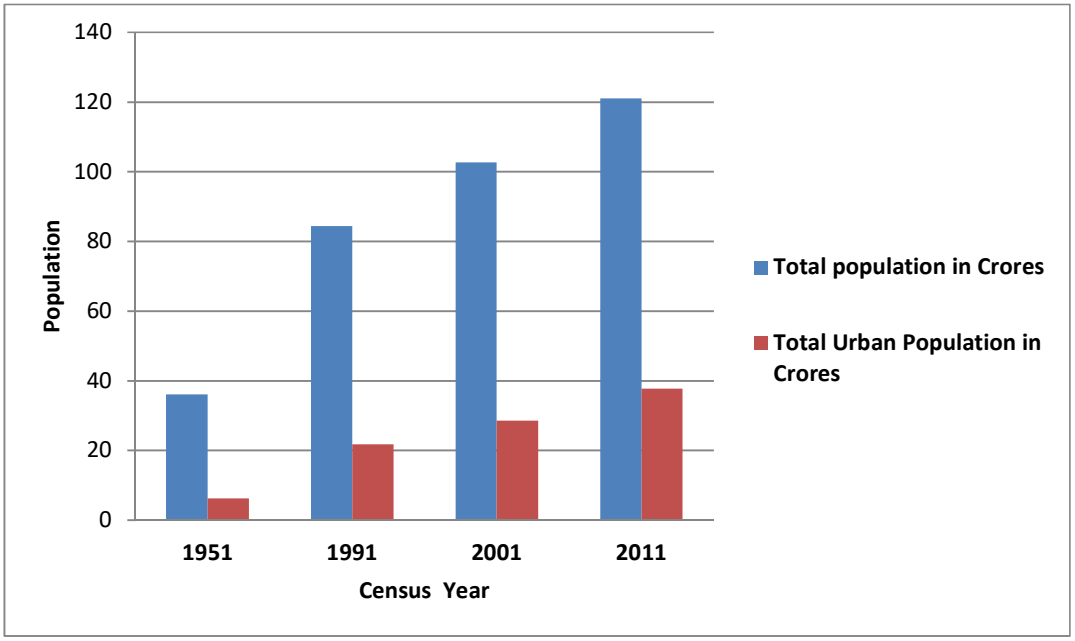
Table 3.4

Trends in Urbanization in India

Year	Total population in Crores	Total Urban Population in Crores	% of Urban population	% of Rural Population	Urban – Rural Ratio (%)
1901	23.84	2.58	10.84	89.15	12.16
1911	25.21	2.59	10.29	89.71	11.47
1921	25.13	2.81	11.17	88.82	12.58
1931	27.89	3.35	12.00	88.01	13.63
1941	31.87	4.41	13.86	86.14	16.08
1951	36.10	6.24	17.29	85.71	20.91
1961	43.92	7.89	17.97	82.03	21.91
1971	59.81	10.91	19.91	81.76	22.31
1981	68.33	15.95	23.34	76.66	30.44
1991	84.43	21.72	25.72	74.28	34.63
2001	102.70	28.61	27.86	72.22	38.47
2011	121.01	37.71	31.16	68.84	45.26

Source: Census of India Various Years, Office of the Registrar General & Census Commissioner, India.

Figure 3.2Trends in Urbanization in India



The above table shows that in the year 1951, total population of the country was 36.10 crores out of which 17.29 percent was urban population. The share of urban population to total population has grown from 10.84 percent in 1901 to 31.16 percent in 2011, whereas percent rural has shown gradual decrease from 89.15% to 68.84%. The urban rural ratio increased significantly from 12.16 percent in 1901 to 45.26 percent in 2011. This implies that for every 100 rural population there are 45 urban people in India. These data show the acceleration trend of urbanization in India since 1950.

Table 3.5

Urban Rural Population Growth Differentials

Decade	Rural (%)	Urban (%)	Urban – Rural Differential (Annual exponential growth rate %)
1971-1981	1.76	3.79	2.03
1981-1991	1.80	3.09	1.29
1991-2001	1.69	2.75	1.06
2001-2011	1.15	2.76	1.61

Source: Census of India various years, Office of the Registrar General & Census Commissioner, India.

The table 3.5 exhibits that urban – rural differential in annual exponential growth rate show a decreasing trend from 2.03 in 1971-1981to 1.61 percent in 2001-2011. This

shows that there is an increasing trend of urbanization in subsequent decades. Similarly, the total urban rural population, male, female population and sex ratio (number of females per 1000 males) is expressed in table 3.6.

Table 3.6

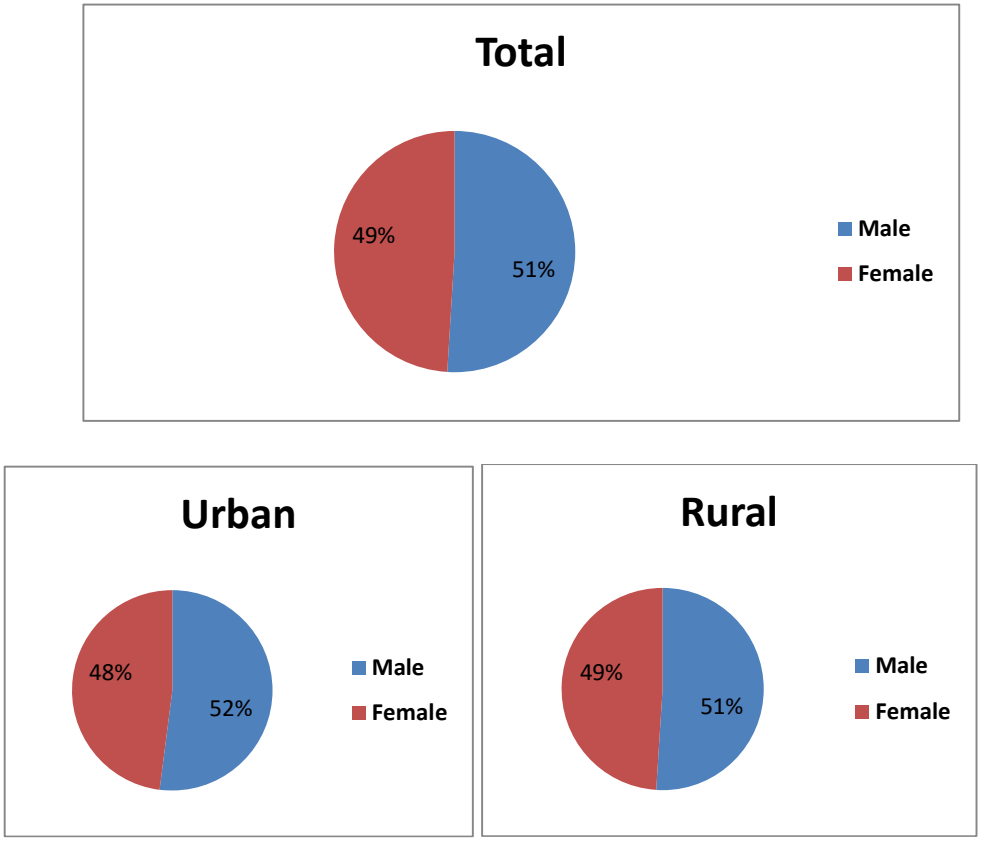
Population of India by Sex and Residence: 2011

India	Male(%)	Female(%)	Total(%)	Sex ratio
Urban	52	48	100	926
Rural	51	49	100	947
Total	51	49	100	940

Source: Census 2011, Office of the Registrar General & Census Commissioner, India.

Figure 3.3

Population of India by Sex and Residence: 2011



The Census report of 2011 shows that, the percentage of urban male was 52 and rural male was 51. Similarly female population was 51. Similarly female population percentage in total population is 48 in urban areas and 49 in rural areas. The total sex ratio is 940 females for males and it is 926 females in urban areas and 947 in rural areas.

Table 3.7 exhibits the total number of UAs/ towns in India since 1901. Total number of towns was 1827 in 1901 and it slightly declined to 1825 in 1911. Later during all the census years the number showed an increasing trend. During 2001, total number of towns was 5161 and it reached to 7935 in 2011 census. Hence, the table gives a clear picture regarding the growth of number of towns in the country.

Table 3.7

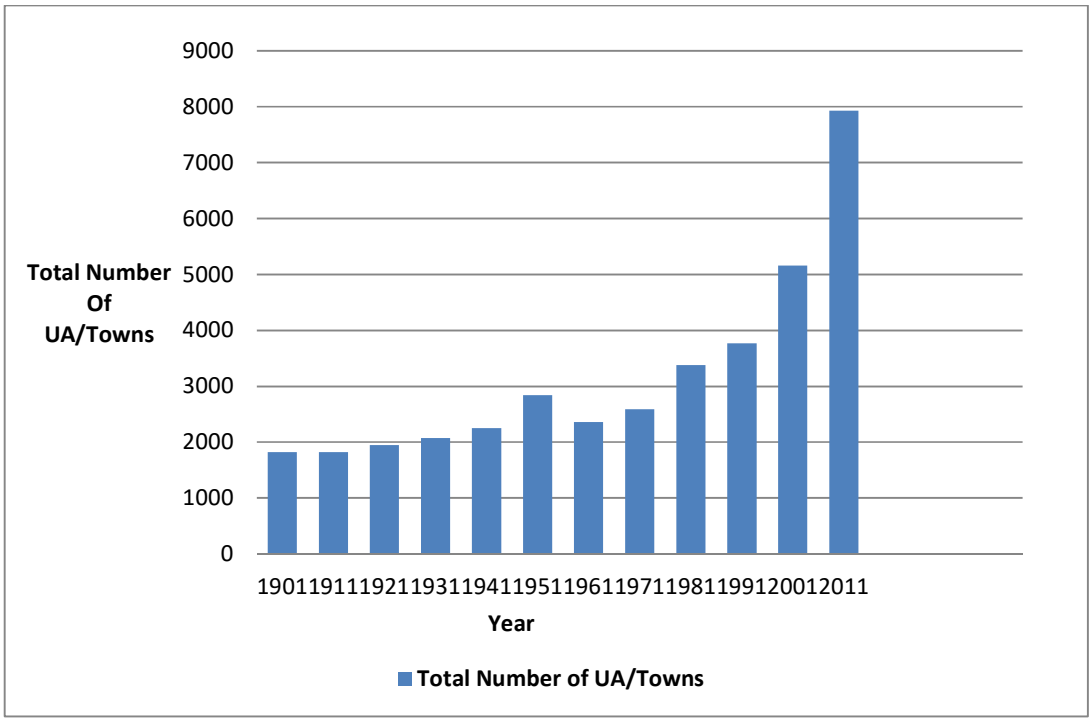
Total Number of UAs/Towns in India

Year	Total Number of UA/Towns
1901	1827
1911	1825
1921	1949
1931	2072
1941	2250
1951	2843
1961	2363
1971	2590
1981	3378
1991	3768
2001	5161
2011	7935

Source: Census of India various years, Office of the Registrar General & Census Commissioner.

Figure 3.4

Total Number of UAs/Towns in India



The percentage of total urban population of India residing in million plus cities has increased drastically from 1901. The growth of population according to the 2011 census in million plus cities is furnished in table 3.8.

The number of million plus cities that is the cities having the population of one million and more, in India had shown considerable growth in 2011. According to the census report of 2011, there are 55 million plus cities in India. It is estimated that the Thrissur city recorded the highest growth rate which accounts for 894.1 percent during 2001-2011. This data shows the importance of studying this phenomenon of Thrissur city. Similarly, the second highest urban growth among the million plus cities is accounted for Kozhikode (463.6 percent) whereas the Kannur recorded urban growth at 243.7 percent in 2011. It is interesting to note that except all the metropolitan cities all other cities have significantly increased the urban population in this period. This may be due to the rural-urban migration which results in the expansion of urban cities. As a result of the increasing urbanization, most of the cities face severe environmental issues and related health aspects.

Table 3.8

Growth of Population of Million Plus Cities

S.N	Cities	2001	2011	Growth Rate(%)
1	Mumbai	16.46	18.39	11.7
2	Delhi	13.85	16.34	18.0
3	Kolkata	13.20	14.05	6.4
4	Chennai	6.56	8.65	31.9
5	Bangalore	5.70	8.52	49.5
6	Hyderabad	5.74	7.67	33.6
7	Ahmedabad	4.52	6.35	40.5
8	Pune	3.76	5.05	34.3
9	Surat	2.81	4.59	63.3
10	Jaipur	2.32	3.04	31.0
11	Kanpur	2.71	2.92	7.7
12	Lucknow	2.24	2.90	29.5
13	Nagpur	2.12	2.49	17.5
14	Ghaziabad	0.96	2.37	146.9
15	Indore	1.50	2.17	44.7
16	Coimbatore	1.46	2.13	45.9
17	Thriruvananthapuram	1.35	2.11	56.3
18	Patna	1.69	2.04	20.7
19	Kochi	1.65	2.02	22.4
20.	Bhopal	1.45	1.88	29.7
21	Kozhikode	0.33	1.86	463.6
22	Vadodara	1.49	1.82	22.1
23	Agra	1.33	1.76	32.3
24	Visakapatnam	1.34	1.72	28.4
25	Thrissur	0.17	1.69	894.1
26	Malappuram	0.88	1.67	89.8
27	Kannur	0.49	1.64	234.7
28	Ludhiana	1.39	1.61	15.8
29	Nasik	1.15	1.56	35.7
30.	Vijayawada	1.03	1.47	42.7
31	Madurai	1.20	1.46	21.7
32	Varanasi	1.20	1.43	19.2
33	Meerut	1.16	1.42	22.4
34	Faridabad	1.05	1.41	34.3
35	Rajkot	1.00	1.39	39.0
36	Jamshedpur	1.10	1.33	20.9
37	Srinagar	0.98	1.26	28.6
38	Jabalpur	1.09	1.26	15.6
39	Asansol	1.06	1.24	17.0
40	Bhiwandi	0.71	1.12	57.7
41	Vasasi-Virar	0.69	1.22	76.8
42	Allahabad	1.04	1.21	16.3
43	Dhanbad	1.06	1.19	12.3

S.N	Cities	2001	2011	Growth Rate(%)
44	Aurangabad	0.89	1.18	32.6
45	Amritsar	1.00	1.18	18.0
46	Jodhpur	0.86	1.13	31.4
47	Ranchi	0.86	1.12	30.2
48	Kollam	0.38	1.11	192.1
49	Gwalior	1.05	1.10	4.8
50	Bhilainagar	0.92	1.06	15.2
51	Chandigarh	0.80	1.02	27.5
52	Trichi	0.86	1.02	18.6
53	Kota	0.70	1.00	42.9
54	Raipur	0.70	1.01	44.3
55	Guntur	0.78	1.05	34.6

Source: Census of India, 2011 Office of the Registrar General & Census Commissioner, India**.**

Table 3.9 shows the number and percentage of population in million plus cities in India.

Table 3.9

Million Plus Cities in India Since 1951

Census year	No. of City	Population (in millions)	Population Per Million Plus City (in millions)	Percent to Urban Population
1951	5	11.75	2.35	18.81
1961	7	18.10	2.58	22.93
1971	9	27.83	3.09	25.51
1981	12	42.12	3.51	26.41
1991	23	70.66	3.07	32.54
2001	35	107.80	3.08	38.60
2011	55	162.40	2.95	50.53

Source: Census of India 2011, Office of the Registrar General & Census Commissioner, India.

Figure 3.5

Million Plus Cities in India Since 1951

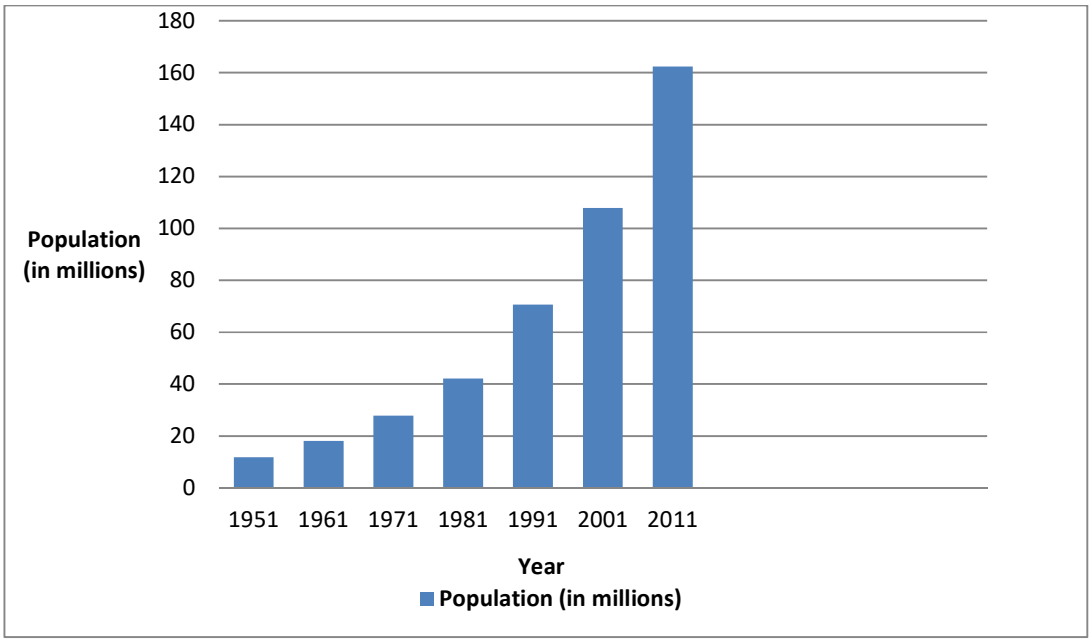


Table 3.9 and the figure indicate the number and percentage of population in million plus cities in India. During 1951, there were 5 million plus cities in India and it increased tremendously to 55 in 2011. It shows the significant expansion of the rate of growth of urban areas and urban population as more people are moving towards cities in search of high standard of living. The urban population is recorded 50.5 percent growth in 2011 compared to 18.81 percent growth of 1951. The data pinpoints the positive association between growth of urban cities and growth of urban population in the country.

The pattern of urban growth across states and union territories of India is showing different trends compared to the levels of urbanization. The level of urbanization at the State and Union Territory level and the share of urban population in each of these is clear from table 3.10. During 2011, Goa occupies the first position with 62.17 percentage of urban population followed by Mizoram (51.51), Tamil Nadu (48.45) and Kerala (47.72). Goa's percentage share in India's urban population is only 0.24 and that of Kerala is 4.22. The state Himachal Pradesh has the lowest proportion of urbanization among the other states. It has only 10.04 percentage of urban population to total population.

Table 3.10

Position of India's States and Union Territories based on Percentage of Urban Population 2011

Sl. No	State/UT	Percentage of Urban Population to Total Population	Percentage Share in India's Urban Population
1	Goa	62.17	0.24
2	Mizoram	51.51	0.15
3	Tamil Nadu	48.45	9.27
4	Kerala	47.72	4.22
5	Maharashtra	45.23	13.48
6	Gujarat	45.58	6.82
7	Telangana	38.66	4.21
8	Karnataka	38.57	6.25
9	Punjab	37.49	2.75
10	Haryana	34.79	2.34
11	Andhra Pradesh	33.49	3.31
12	West Bengal	31.89	7.73
13	Uttaranjal	30.55	0.82
14	Manipur	30.21	0.22
15	Nagaland	28.97	0.15
16	Madhya Pradesh	27.63	5.32
17	Jammu & Kashmir	27.21	0.91
18	Tripura	26.18	0.25
19	Sikkim	24.97	0.04
20	Rajasthan	24.89	4.53
21	Jharkhand	24.05	2.10
22	Chhattisgarh	23.24	1.57
23	Arunachal Pradesh	22.67	0.08
24	Uttar Pradesh	22.28	11.79
25	Meghalaya	20.08	0.16
26	Orissa	16.68	1.86
27	Assam	14.08	1.16
28	Bihar	11.30	3.11
29	Himachal Pradesh	10.04	0.18
Union Territories			
1	Delhi	97.50	4.33
2	Chandigarh	97.25	0.27
3	Lakshadweep	78.08	0.01
4	Daman & Diu	75.16	0.05
5	Pondicherry	68.31	0.23
6	Dadra & Nagar Haveli	46.62	0.04
7	Andaman & Nicobar Islands	35.67	0.04

Source: Census of India, 2011 Office of the Registrar General & Census Commissioner, India.

Among the union territories, Delhi tops the list with 97.50 percentage of urban population followed by Chandigarh (97.25) and Lakshadweep (78.08). Among the states, Uttar Pradesh is having the highest percentage share in India's urban population with 11.79 percent.

The urban scenario in the post independence period was characterized by dualism. The developed states attracted more population in urban areas due to industrialization and infrastructural investment. This phenomenon was largely in and around large cities and upcoming industrial centers. Hence, the backward states too experienced rapid urban growth, due to higher urbanization in their backward districts and small and medium towns. All these show the acceleration trend of urbanization in India.

3.4 Urbanization in Kerala

As per the 2011 Census report, the population of Kerala is 3,33,87,677 of which 1,74,55,506 belong to rural areas and 1,59,32,171 people belong to urban areas. In other words the rural population constitutes 52.26 percent and urban 47.74 percent of the total population. It is interesting to note that Kerala is considered to be a model for other states in development aspects. Kerala has the lowest population growth rate compared to other states; its share in the total population of India is 2.76 percent as per the census report of 2011. The density of population of Kerala as a whole was 859 persons per km square. But the urban population of Kerala is higher than the national average of 31.16 percent.

Urbanization process in Kerala is mainly due to increase in urban population growth, which is positively linked with the development of service sector. Sector wise annual growth of GSDP (at 2004-05) for the subsequent periods from 2008 to 2011 is shown in table 3.11.

The table reveals the fact that among the three sectors tertiary sector shows significant contributions to GSDP of 11.57 percent in 2010-2011. The contribution of primary sector is marginal, which is only 0.64 percent of GSDP during the same year. Hence the growth of service sector is positively associated with urbanization in Kerala.

Table 3.11

Sector wise Annual Growth of GSDP (at 2004-05)

Period	Primary (%)	Secondary (%)	Tertiary (%)
2008-09	2.18	0.30	8.07
2009-10	0.01	7.51	11.17
2010-11	0.64	6.12	11.57

Source: Government of Kerala (2011), Economic Review, State Planning Commission.

The development indicators of Kerala are considered as a model to other states in India. As per the 2011 census report, the literacy rate of Kerala for male is 96.02 and that for female is 91.98 which are higher than the national level of 82.14 for males and 65.46 for females. Similarly, birth rate is 28.8 in India, and 14.6 in Kerala, which shows lower population growth. Infant mortality rate and life expectancy in Kerala are 12 and 74 respectively. In India they are 50 and 63. These indicators show the development of social indicators in Kerala which is shown in table 3.12.

Table 3.12

Trends in Development Indicators, 2011

Indicators	India	Kerala
Literacy		
Males	82.14	96.02
Females	65.46	91.98
Birth rate (1000)	28.8*	14.6*
Infant Mortality rate(1000)	50*	12*
Life Expectancy (year)	63*	74*

Source: Government of Kerala (2011), Economic Review, State Planning Commission. **Note: *** denotes 2008.

The growth of urbanization in Kerala marked significant since 1980. More than one fourth of the population in Kerala live in urban area, and occupies third among the states in India having the highest share of urban population. The population and its growth from 1901 to 2011 along with urban and rural classification are given in the table 3.13.

Table 3.13

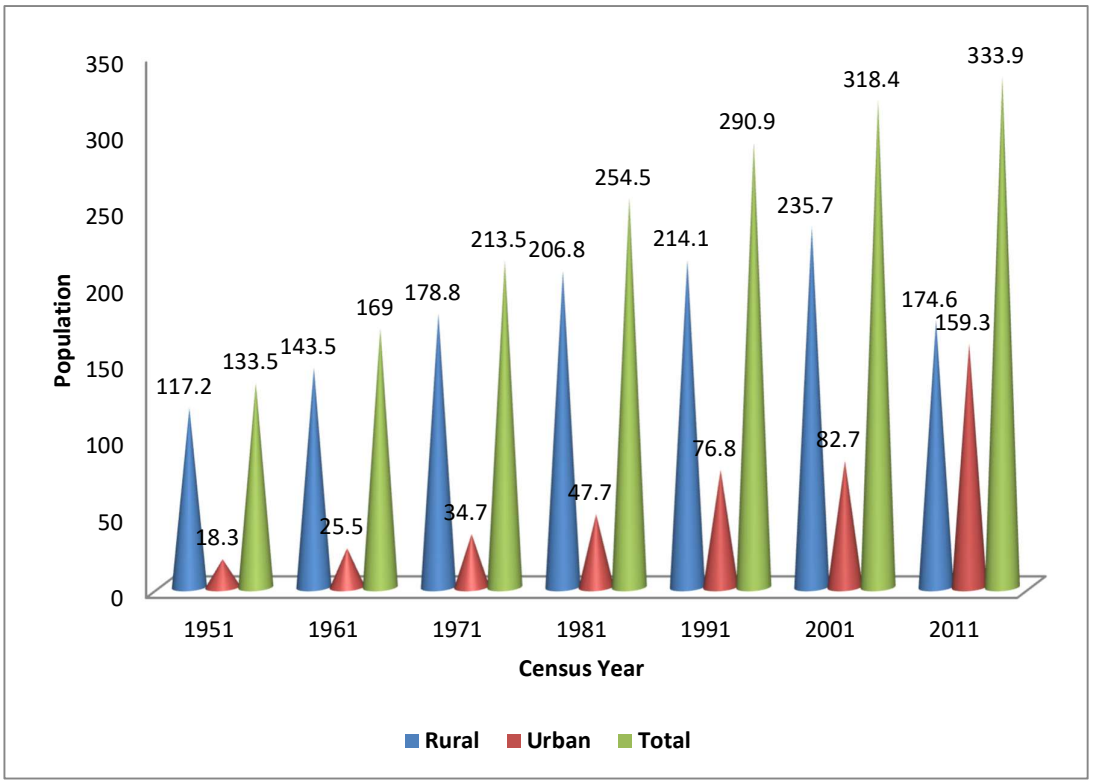
Population and its Growth from 1901-2011 in Kerala

Year	Population in Lakhs				Decadal Growth	
	Rural	Urban	Total	Decadal growth rate	Rural	Urban
1901	59.4	4.5	63.9	-	-	-
1911	66.2	5.3	71.5	11.8	11.5	17.8
1921	71.2	6.8	78.0	9.09	7.6	28.3
1931	85.9	9.2	95.1	21.92	20.6	35.3
1941	98.3	12.0	110.3	15.98	14.4	30.4
1951	117.2	18.3	133.5	22.85	19.2	52.5
1961	143.5	25.5	169.0	24.72	22.4	39.3
1971	178.8	34.7	213.5	26.33	24.6	36.1
1981	206.8	47.7	254.5	19.20	15.7	37.5
1991	214.1	76.8	290.9	14.30	3.5	61.0
2001	235.7	82.7	318.4	9.45	10.7	7.64
2011	174.6	159.3	333.9	4.86	-25.86	92.72

Source: Census of India, 2011 Office of the Registrar General & Census Commissioner, India.

Figure 3.6

Population and its Growth from 1951-2011 in Kerala



The table and the figure above exhibited the population growth of Kerala from 1901 to 2011. During 1911 total population of the state was 71.5 lakhs and it increased to 333.9 lakhs in 2011. The decadal growth rate of population marked an increasing trend since 1921, with a growth rate of 9.09, and increased till 1971. Since 1981, there is a declining trend of decadal growth rate of population and it reached to 4.86 percent in 2011. Similarly, the rural urban share in population is 174.6 lakhs and 159.3 lakhs respectively in 2011. The decadal growth of rural urban population shows some interesting facts that, the growth of rural share shows a declining trend since 1981and it reached to -25.96 percent in 2011 and this influenced the growth rate of urban population to an increasing trend for all the census years. It reached to 92.72 percent in 2011.

The table 3.14 reveals the fact that there is significant increase in the growth of urban population in Kerala. Urbanization trends in Kerala show that, during all the census years from 1951 to 2011, there is considerable increase in total number of urban towns from 94(25) to 520(59). Similarly, total urban population is increased from 0.18 crores in 1951 to 1.59 crores in 2011. Hence, the percentage of urban population increased considerably and reached to 47.74 percent in 2011.

Table 3.14

Trends in Urbanization in Kerala 1951-2011

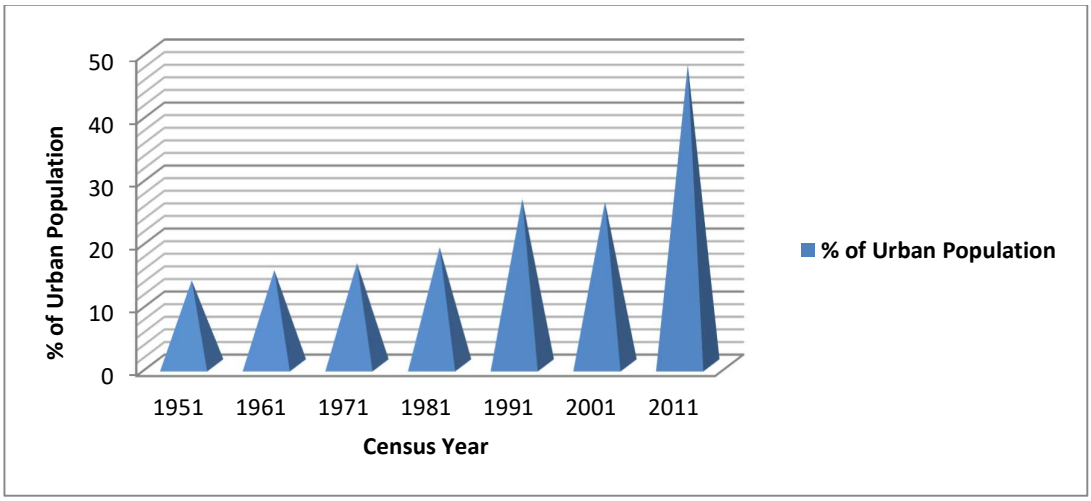
Census Year	Total No. of Urban Town	Total population in crores	Total Urban Population in crores	% of Urban Population
1951	94(25)	1.35	0.18	13.48
1961	92(30)	1.69	0.25	15.11
1971	88(32)	2.13	0.35	16.24
1981	106(48)	2.55	0.48	18.74
1991	197(65)	2.91	0.77	26.39
2001	159(60)	3.18	0.83	25.96
2011	520(59)	3.33	1.59	47.74

Source: Census of India various years, Office of the Registrar General & Census Commissioner India.

Note: Figures in bracket represent the number of statutory towns.

Figure 3.7

Trends in Urbanization in Kerala 1951-2011



Classification of towns in Kerala and India according to their status is depicted in table 3.15. It helps to get a clear picture of the trend in urbanization in Kerala. Total number of towns of Kerala increased from 197 to 520 in between 1991 to 2011. The number of census towns increased from 132 in 1991 to 461 in 2011. This shift was due to the inclusion of villages as towns but they are outside of the statutory jurisdiction of the concerned towns. At the same time during this period statutory towns witnessed a declining trend, as it declined from 65 in 1991 to 59 in 2011. Similarly, the rate of growth of total towns in Kerala from 2001 to 2011 is 227.04 percent than growth of towns in India (53.75).

Table 3.15 Classification and Growth of Towns in Kerala and India According to their Status

Census Year	Kerala				India			
	Statutory	Census	Total	Growth of Total Towns in %	Statutory	Census	Total	Growth of Total Towns in %
1991	65	132	197	-	2987	1702	4689	-
2001	59	99	158	-19.29	3799	1362	5161	10.07
2011	59	461	520	227.04	4041	3894	7935	53.75

Source: Census of India various years, Office of the Registrar General & Census Commissioner India.

3.4. (i) District Wise Pattern of Urbanization in Kerala

Kerala is known as a unique state among the other Indian states as it has shown many developmental aspects which are different from that of other states. Almost all districts of the state reveal significant growth in urbanization and related growth of cities. As per the census of 2011, in the district wise urban population in Kerala, Ernakulam district has the highest urban population with 22.32 lakhs population, followed by Thrissur (20.90 lakhs), Kozhikode (20.75 lakhs) and Kannur (16.43 lakhs). Similarly, the percentage of urbanization is lowest in Wayanad with 3.81 percent and it is highest in Ernakulam with 68.09 percent followed by Thrissur (67.18%). Wayanad and Idukki districts record relatively small urban population compared to other districts. This is shown in table 3.16.

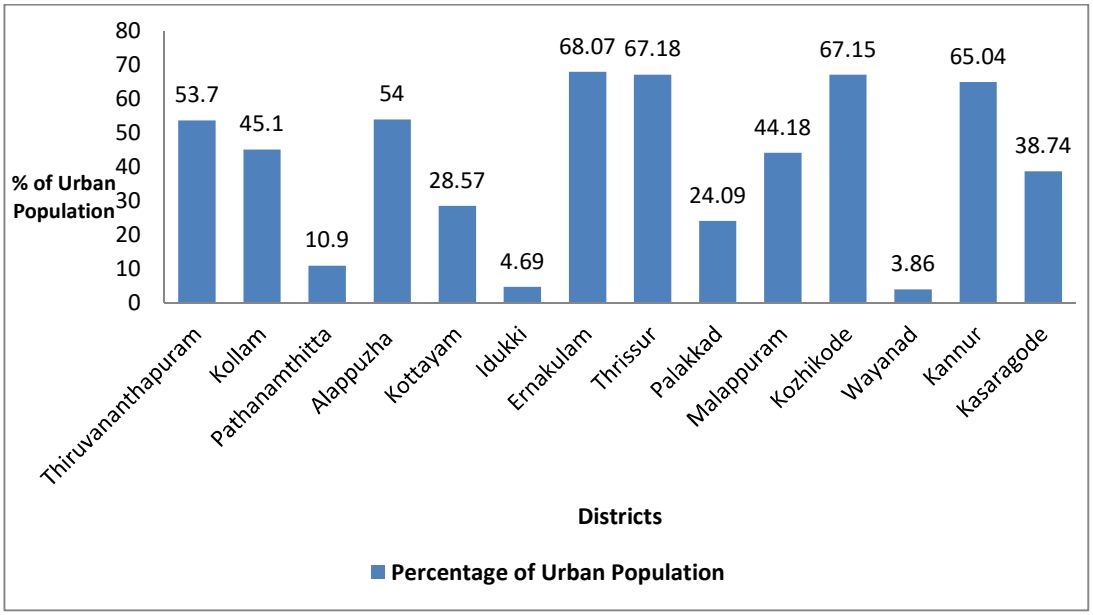
Table 3.16

Trend and Pattern of Urbanization across Districts in Kerala (2011)

Districts	Urban Population (in lakhs)	Percentage of Urban Population
Thiruvananthapuram	17.79	53.7
Kollam	11.86	45.1
Pathanamthitta	1.31	10.9
Alappuzha	11.47	54.0
Kottayam	5.65	28.57
Idukki	0.52	4.69
Ernakulam	22.32	68.07
Thrissur	20.90	67.18
Palakkad	6.77	24.09
Malappuram	18.16	44.18
Kozhikode	20.75	67.15
Wayanad	0.31	3.86
Kannur	16.43	65.04
Kasaragode	5.05	38.74

Source: Census of India various years, Office of the Registrar General & Census Commissioner India.

Figure3.8 Trends and Pattern of Urbanization across Districts in Kerala (2011)



Ranking of districts in Kerala on the basis of percentage of urban population in census years of 2001 and 2011 is expressed in table 3.17.

Table 3.17 Ranking of Districts by Percentage of Urban Population in Kerala 2001-2011

Districts	Degrees of Population		Ranks	
	2001	2011	2001	2011
Thiruvananthapuram	33.78	53.7	4	6
Kollam	18.02	45.1	8	7
Pathanamthitta	10.03	10.09	11	12
Alappuzha	29.36	54.0	5	5
Kottayam	15.35	25.57	9	10
Idukki	5.10	4.69	13	13
Ernakulam	47.65	68.07	1	1
Thrissur	28.21	67.18	6	2
Palakkad	13.68	24.09	10	11
Malappuram	9.82	44.18	12	8
Kozhikode	38.25	67.15	3	3
Wayanad	3.79	3.86	14	14
Kannur	50.46	65.04	2	4
Kasaragode	19.41	38.07	7	9

Source: Census of India 2001& 2011, Office of the Registrar General & Census Commissioner, India.

The table shows that Ernakulam is the most urbanized district in Kerala followed by Thrissur, Kozhikode and Kannur. In 2011, the districts Ernakulam, Thrissur and Kozhikode marked higher degree of urban population. Districts like Ernakulam, Thrissur, Kozhikode and Kannur occupies higher ranks in two census years. A tremendous change is shown in the case of Thrissur district as it came to the second position in 2011 compared to the sixth position in 2001. Wayanad has the lowest degree of urbanization in two periods with fourteenth rank among the districts.

The number of statutory and census towns in Kerala with district wise classification are given in table 3.18. The number of statutory towns shows a declining trend from 2001 to 2011. Hence, the number of census towns in almost all districts marked significant growth in both 2001 and 2011 census years.

Table 3.18 District Wise Classification of Towns in Kerala

State/Districts	2001			2011		
	Statutory towns	Census towns	Total	Statutory towns	Census towns	Total
Thiruvananthapuram	5	-	5	5	26	31
Kollam	3	-	3	3	24	27
Pathanamthitta	3	-	3	3	1	4
Alappuzha	5	6	11	5	33	38
Kottayam	4	2	6	4	13	17
Idukki	1	-	1	1	-	1
Ernakulam	9	16	25	9	47	56
Thrissur	7	21	28	7	128	135
Palakkad	4	1	5	4	17	27
Malappuram	5	-	5	5	39	44
Kozhikode	3	10	13	3	48	52
Wayanad	1	-	1	1	-	1
Kannur	7	38	45	7	60	67
Kasaragode	2	5	7	2	25	27
Kerala	**59**	**99**	**158**	**59**	**461**	**520**

Source: Census of India 2001& 2011, Office of the Registrar General & Census Commissioner, India.

The table 3.18 also highlights that Idukki and Wayanad districts lag behind in case of number of salutatory as well as census towns. Thrissur district has shown tremendous growth in census towns. In Thrissur there are 128 census towns in 2011 than 21 of 2001. Similarly districts like Ernakulam, Kannur and Kozhikode witnessed sharp increase in the number of urban towns during the period between 2001 and 2011.

Thus, the above analysis reveals the fact that, there is rapid urbanization in the world, in the country, in the state and in the district. The urbanization process has become concentrated in developing regions of the world and in our country it is in larger cities and towns. In India, the process of urbanization is mounting very fast in million plus cities. This may be due to the rural – urban migration which results in the expansion of urban cities. As far as Kerala is concerned, about 48% of the total population is categorized as urban, where there is tremendous increase in statutory as well as census towns in the state. Hence, spatial and demographic urban growth is characterized by the deterioration of physical, economic and social living conditions for a large and increasing part of urban population. Urbanization and its allied activities have severe impact on the environmental aspects of the country.

3.5 Impact of Urbanization on the Environment

The process of urbanization has made a profound impact on the environment of the country in the form of deterioration in the quality of available environmental goods. It has been accepted by the United Nations that, it is quite impossible for developing countries to provide in advance, the urban planning and design because it is not possible to project the urban growth accurately. Through the rapid urbanization is taking place, but the town planning and socio infrastructural and institutional facilities are far behind and inefficient to meet the need of growing urban population, there has been acute shortage of housing in urban areas, which results in fast growing slums in all urban centers throughout the nation.

3.5.(i) Growth of Slum Settlements

One of the major impacts of growing urbanization is increasing slums and slum population. The Govt. of India slum areas (improvement and clearance) Act of 1954 defines a slum “as any predominantly residential areas, in which light or sanitary facilities or any combination of these factors are detrimental to the safety, health or

morals". The table 3.19 reflects the growth of urbanization and growth of slums in India. During 1981 total urban population in the country was 15.95 crores and identified slum population was 2.79 crores. This showed an increasing trend with growing urban population during 1991, 2001 and 2011 census years. During 2011, total slum population in India is marked 6.56 crores.

Table 3.19

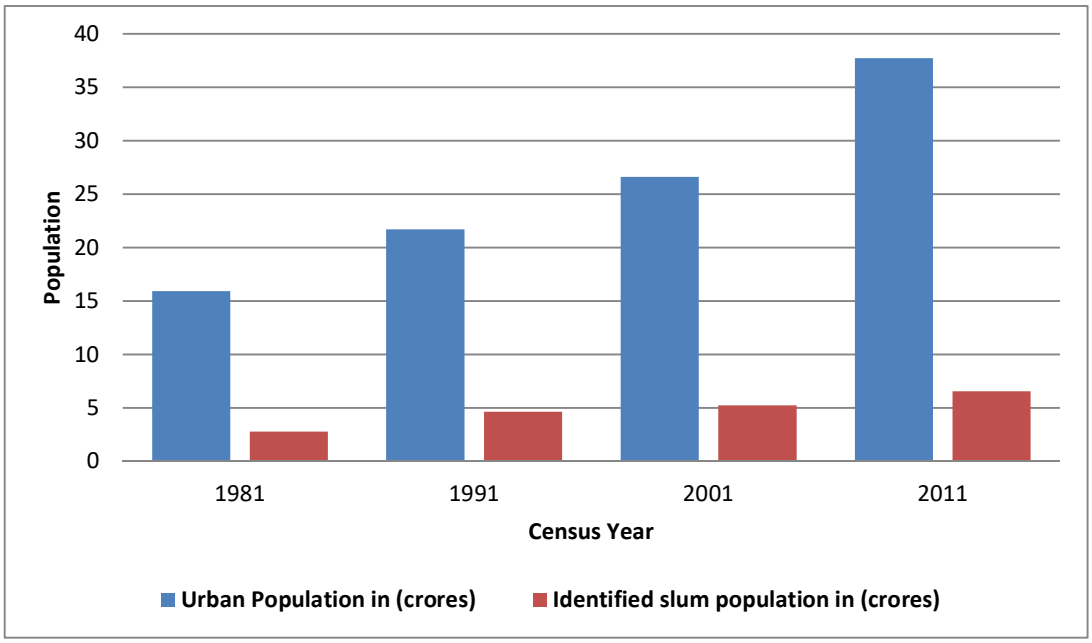
Urbanization and Growth of Slums in India

Year	Urban Population in (crores)	Identified slum population in (crores)
1981	15.95	2.79
1991	21.72	4.62
2001	26.61	5.24
2011	37.71	6.56

Source: Census of India 2011, Office of the Registrar General & Census Commissioner, India.

Figure 3.9

Urbanization and Growth of Slums in India



Kerala is believed as a rural –urban continuum and there are arguments suggesting that there are differences between rural and urban Kerala. Urbanization of Kerala is found to be a little different from other parts of the country. In Kerala, it is not limited

to the designated cities and towns, but except a few panchayaths in the hilly area and some isolated areas the entire state exhibits the picture of urban rural continuum. A large portion of Kerala can be termed as urbanized. The increased density of urban population is mainly due to the overcrowding, migration and the extensive growth of population in urban area.

In India, most of the large slums are located in metropolitan cities. Hence, a fewer amount of slums can be found in Kerala too. A comparison of number of statutory town and slum reported towns with number of slum population in India as well as in Kerala is depicted in table 3.20. In 2011, total number of statutory towns in India was 4,041 and in Kerala it was 59. Slum reported towns were 2,613 and identified slum population were, 2,28,28,135 in India. But in Kerala there were only 19 towns categorized as slum reported towns and identified slum population was 6,998.

Table 3.20

Number of Statutory and Slum Reported Towns in India & Kerala (2011)

Sl. No	Towns/Slum Population	India	Kerala
1	Statutory towns	4,041	59
2	Slum reported towns	2,613	19
3	Total population	6,54,94,604	2,02,048
4	Identified slum population	2,28,28,135	6,998

Source: Primary Census Abstract for Slum 2011, Office of the Registrar General & Census Commissioner, India.

A town- wise analysis of slums in Kerala in 1985 and 1996 is given in table 3.21. The table shows that during 1985, total number of slum in Kerala was 705 and it mounted up to 1169 in 1996. Highest number of slums is reported in Ernakulam with 148 slums in 1985 and it increased to 339 during 1996. Palakkad, Thiruvananthapuram, Alappuzha, Kozhikode and Malappuram districts marked higher number of slums in 1996, whereas Kasargode and Idukki districts had fewer slums in Kerala. Hence, the table shows the existence of slums in Kerala with increasing trend of urbanization.

Table 3.21

Slums in Kerala (1985, 1996)

Sl.No	Towns Reporting Slums	No. of Slums	
		1985	1996
1	Kannur	15	24
2	Kozhikode	79	89
3	Malappuram	57	83
4	Palakkad	34	124
5	Trichur	57	57
6	Ernakulam	148	339
7	Idukki	25	17
8	Kottayam	62	66
9	Alappuzha	97	92
10	Kollam	36	71
11	Thiruvananthapuram	95	122
12	Kasargode	-	6
13	Wayanad	-	28
14	Pathanamthitta	-	51
15	**Kerala**	**705**	**1169**

Source: Statistics Division, Town planning Department, Kerala**.**

Table 3.22 shows the census report of 2011, which emphasizes slum populations in towns of Kerala. In 2011, total number of slum households in 19 towns is 45417 with total slum population of 202048. There are 97429 males and 104619 females in total slum population. There is a huge amount of slum population in Thrissur and Kozhikode Municipal Corporations with 79801 and 50343 slum populations respectively. In Thrissur district, Kunnamkulam and Chavakkad Municipalities also recorded the presence of slum population. This data throws light on the impact of unplanned urbanization pushed by the unabated migration which created an imbalance situation in environment in the cities.

Table 3.22

Slum Population in Kerala – 2011

Name of Towns Reporting Slums	Total Number of Slum Households	Total Slum Population	Male Population	Female Population
Kerala	**45417**	**202048**	**97429**	**104619**
Kasargode (M)	1101	6321	3048	3273
Kannur (M)	278	1501	718	783
Vadakara (M)	472	3105	1455	1650
Kozhikode (M. Corp + OG)	9039	50343	24075	26268
Palakkad (M)	3404	15238	7419	7819
Kunnamkulam (M)	362	1381	653	728
Chavakkad (M)	175	900	390	510
Thrissur (M. Corp)	19629	79801	38545	41256
Kochi (M. Corp + OG) (part)	1594	5184	2648	2536
Thrippunithura (M)	738	2936	1462	1474
Kayamkulam (M)	1974	8410	4004	4406
Chengannur (M)	222	931	426	505
Mavelikkara (M)	184	763	384	379
Kollam (M.Cop+OG)(part)	2761	11659	5688	5971
Paravoor (M)	230	981	461	520
Attingal (M)	579	2306	1082	1224
Nedumangad (M)	962	3593	1713	1880
Thiruvananthapuram(M.Corp+ OG) (Part)	834	3320	1634	1686
Neyyatinkara (M)	879	3375	1624	1751

Source: Census of India, 2011 Office of the Registrar & Census Commissioner, India.

3.5.(ii) Water Pollution

Water is a free gift of nature and is one of the most important natural resources essential for the survival of living organisms. Water as a commodity generates concern for being an exhaustible resource and also because of the environmental issues related to its degradation. Pollution of water may take place due to natural causes such as organic wastes of plants and animals, minerals leaching through soils, thermal pollution etc. It may also be due to the discharge of domestic and industrial waste waters.

The major driving forces of water pollution are urbanization and industrialization. In India water pollution is a serious problem as almost 70 percent of its surface water resources and a growing percentage of its ground water reserves are contaminated by biological, toxic, organic, and inorganic pollutants. This degraded water quality can contribute to water scarcity as it limits its availability for both human use and for the ecosystem.

The level of water pollution in the country can be examined by the status of water quality around India. The water quality monitoring results carried out by Central Pollution Control Board (CPCB) particularly with respect to the indicator of oxygen consuming substances Biochemical Oxygen Demand (BOD) and the indicator of pathogenic bacteria (total coli form and fecal coli form) show that there is gradual degradation in water quality (CPCB, 2009). The study revealed the fact that almost all sampling stations (in 19 states) reflect unacceptable levels of BOD. Thus the water quality monitoring results obtained by CPCB during 1995 to 2009 indicate that organic and bacterial contamination was critical in the water bodies. The main cause for such contamination is discharge of domestic and industrial wastewater in water bodies mostly in an untreated form from urban centers.

In Kerala, water availability and water contamination aspects are a little different from that of all India level. Kerala has been considered as a model to show, how it is possible to achieve both growth and improved income distribution through human development.

The source wise availability of drinking water in Kerala is given in table 3.23. In Kerala 78 percentage of the people availed drinking water from their own premises, 14 percent of the people depending upon near the premises and 8 percent away from the premises. The table and graph also reveal that almost all the districts show similar trend where there is easy availability of drinking water within the premises. The all India average is 47 percent, 36 percent and 18 percent in drinking water availability within the premise, near the premise and away from the premise respectively. While considering the status of the districts Kollam, Thiruvananthapuram, Thrissur, Malappuram, Kannur, Ernakulam and Pathanamthitta exhibited higher percentage of water availability within the premises. In this case the lower percentage is represented by Idukki (41%). The district also represented higher percentage in

availability of water away from the premise (27%) which is higher than the all India rate.

Table 3.23

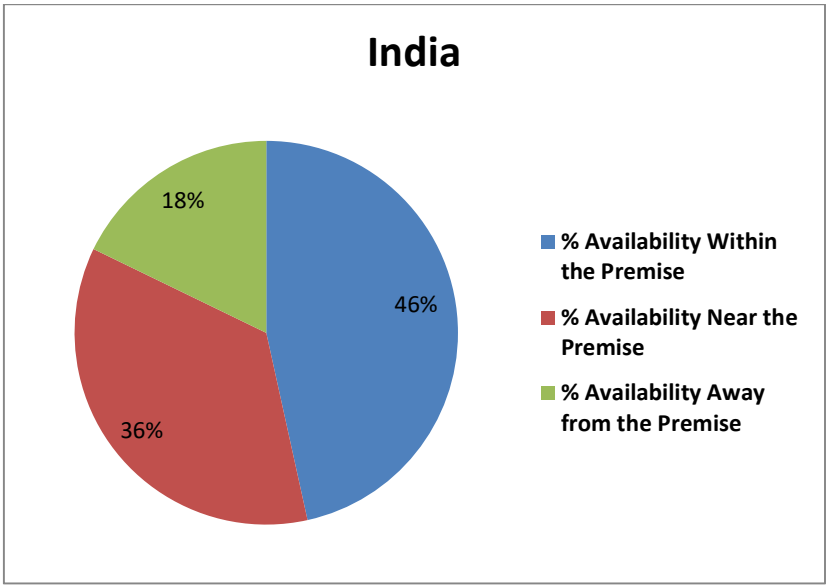
Source Wise Drinking Water Availability in Kerala – 2011

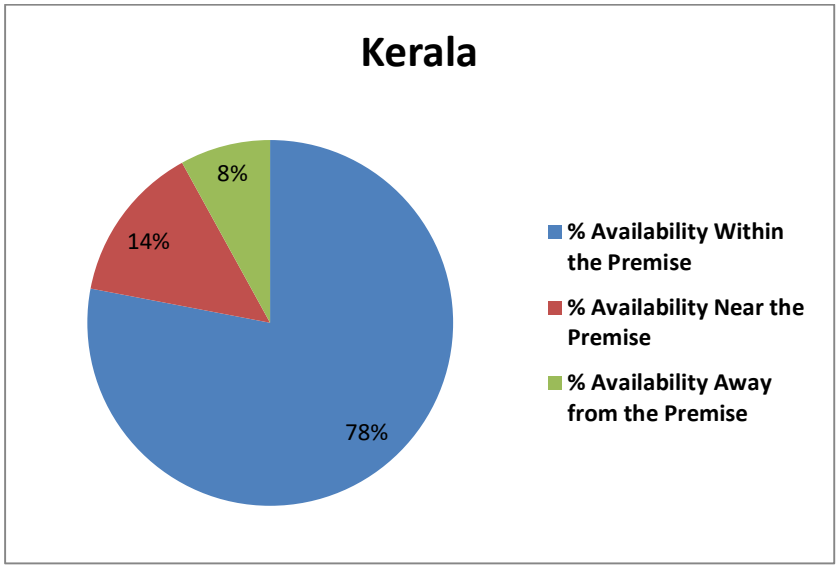
Sl. No	Districts	% Availability Within the Premise	% Availability Near the Premise	% Availability Away from the Premise
	India	**46**	**36**	**18**
	All Kerala	**78**	**14**	**8**
1	Thiruvananthapuram	84	10	6
2	Kollam	86	10	5
3	Pathanamthitta	80	12	9
4	Alappuzha	73	16	11
5	Kottayam	73	15	12
6	Idukki	41	31	27
7	Ernakulam	80	15	5
8	Thrissur	84	12	5
9	Palakkad	72	20	9
10	Malappuram	81	12	7
11	Kozhikode	79	13	8
12	Wayanad	60	24	16
13	Kannur	81	12	7
14	Kasaragode	73	15	12

Source: Housing Census, Census of India, 2011, Office of the Registrar & Census Commissioner, India.

Figure 3.10

Source Wise Drinking Water Availability in Kerala – 2011





In Kerala, the level of contaminated water is increasing in year by year. In 2012, the study conducted by Ministry of Drinking Water and Sanitation highlighted that about 34% of available water is contaminated water in all over Kerala. It increased to 40% within one year period. This shows the serious issue of water pollution. District wise analysis shows that the highest contamination is in Kozhikode as 55% of tested sources indicated bacterial and chemical contamination and Idukki experiences as low level. Except Palakkad, in all the districts the level of drinking water is worsening.

The highest increase in quality affected district in 2012 is Malappuram, where zero level of contamination was reported and in 2013, the indicated contamination was 15 percent. The comparison of the level of water contamination in two subsequent years shows that in Kollam, Kottayam, Thrissur, Malappuram and Kannur the percentage increase of contamination is higher in 2013. This trend is clearly depicted in table 3.24.

Table 3.24

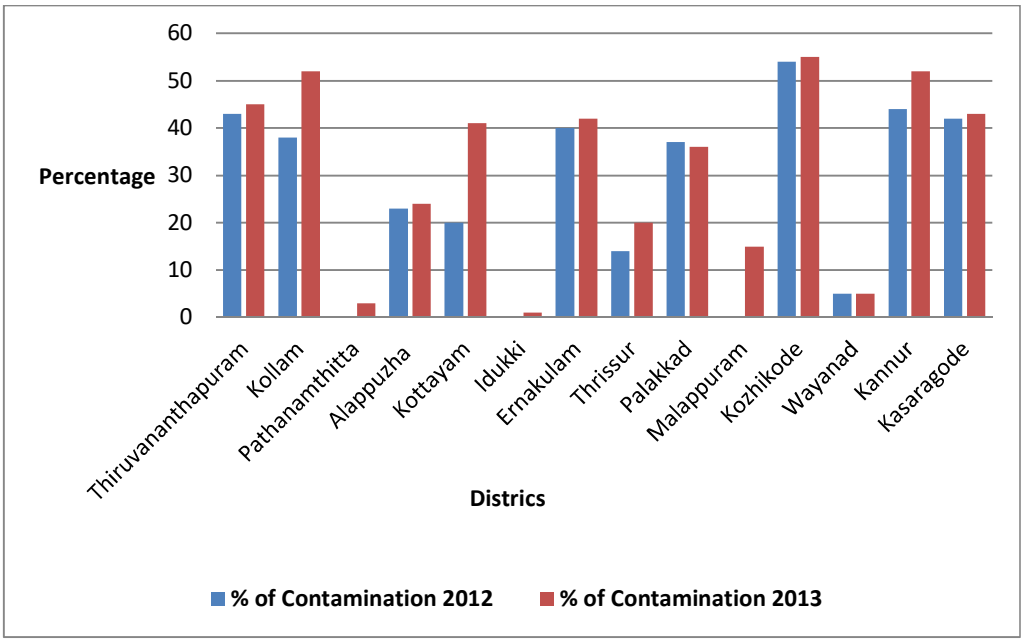
District Wise Indication of Contaminated Water

Sl. No	Districts	% of Contamination 2012	% of Contamination 2013
	Kerala	**34**	**40**
1	Thiruvananthapuram	43	45
2	Kollam	38	52
3	Pathanamthitta	0	3
4	Alappuzha	23	24
5	Kottayam	20	41
6	Idukki	0	1
7	Ernakulam	40	42
8	Thrissur	14	20
9	Palakkad	37	36
10	Malappuram	0	15
11	Kozhikode	54	55
12	Wayanad	5	5
13	Kannur	44	52
14	Kasaragode	42	43

Source: Ministry of Drinking Water and Sanitation, Government of India, 2014 (FTK Test).

Figure 3.11

District Wise Indication of Contaminated Water



Hence, water pollution- one of the major impact of urbanization and industrialization has contributed many issues to living organisms of the environment. Increasing urbanization leads to increased water contamination in all over the world.

3.5.(iii) Solid Wastes and Land Pollution

Rapid urbanization with uncontrolled growth of population and resulting municipal solid waste (MSW) generation is one of the major threats faced by urban areas of India. Unscientific handling of MSW degrades the urban environment as it is mounting up day by day in cities which can causes health hazards. Planning commission report (2014) reveals that 377 million people residing in urban area generate 62 million tons of MSW per annum currently. The report highlighted the fact that by 2031 these urban centers will generate 165 million tonnes of waste annually and by 2050 it could reach 436 million tonnes.

The table 3.25 gives the composition of MSW in overall urban India with special attention to regional variation. In 2012 major contribution of MSW is made by metropolitan cities with 51,402 tonnes per day, followed by east India with 6835 tonnes per day. In MSW major portion is compostable, which accounts for 50 percent,

and moisture is about 45-50 percent. Hence, the major contributor of MSW is the major cities of the country.

Table 3.25 Composition of MSW in India and Regional Variation, 2012

Region /City	MSW(TPD)	Compostable (%)	Recyclables (%)	Inert (%)	Moisture (%)
Metros	51,402	50.89	16.28	32.82	46
Other cities	2,723	51.91	19.23	28.86	49
North India	380	50.41	21.44	28.15	46
East India	6835	52.38	16.78	30.85	49
South India	2343	53.41	17.02	29.51	51
West India	380	50.41	21.44	28.15	46
Overall Urban India	**130000**	**51.3**	**17.48**	**31.21**	**47**

Source: CPCB and Annepu, 2012**.**

Waste generation scenario of Kerala with special attention to per capita waste generation is given in the table 3.26. Total waste generation in 5 Municipal corporations during 2001 is marked as 1096 tons per day. In 53 municipalities, 683 tons of waste is generated and 4126 tonnes of wastes are contributed by 999 panchayats. It is estimated that total waste generation in Kerala is 6506 tonnes / day in 2006, as it was 5878 tonnes / day in 2001.

Table 3.26

Waste Generation Scenario in Kerala – 2006

Region	Population 2001	Per capita waste generation (g)	Total waste generation (TPD)	Projected population 2006	Projected waste generation (g)	Total waste generation 2006 (TPD)
5 Corporations	2456618	435	1096	2543812	465	1183
53 Municipalities	2731093	250	683	2828030	268	758
999 Panchayaths	23574449	175	4126	24411200	187	4565
Total Waste Generation in Kerala			**5878**			**6506**

Source: After KSUDP, 2006.

Table 3.27

Solid Waste Generation in Kerala

Sl. No	Source	% to Total
1	Household Waste	49
2	Hostels, Marriage Halls, Institutions	17
3	Shops and Markets	16
4	Street Sweepings	9
5	Construction	6
6	Slaughter House, Hospitals	3

Source: Malinya Mukta Keralam Action Plan (2007), Government of Kerala**.**

The major sources of solid waste and their contribution in percentage to total solid waste in Kerala are given in table 3.27. Major share of SW is contributed by household sector (49 percent), followed by wastes from hostels, marriage halls, and institutions (17%). Similarly shops & markets, street sweepings, construction and waste from hospitals and slaughter houses had their own contributions to solid waste generation in the state which makes harmful environmental issues.

Table 3.28 Physical Composition of Solid Waste in Kerala

Sl. No	Component	% to Total
1	Biodegradable	71-83
2	Paper	3.5-5
3	Plastic, rubber, glass, metal	5-9
4	Inerts, earth, domestic hazardous	4.9-11.5

Source: Malinya Mukta Keralam Action plan (2007), Government of Kerala.

The major component of solid waste in Kerala is biodegradables (71-83percent). Inert, earth and domestic hazardous wastes marked 4.9-11.5 percent to total waste. Likewise, plastic and other wastes also contribute 5-9 percent to total solid waste which is highlighted in the table 3.28.

In short, with growing urbanization, generation of solid wastes and related environmental problems are mounting up day by day. Hence, proper methods of waste disposal have to be undertaken to ensure that it does not affect the environment

around the living area or cause health hazards to the people living there. At the household – level proper segregation of waste has to be done and it should be ensured that all organic matter is kept aside for compositing which is undoubtedly the best method for the correct disposal of this segment of waste.

3.5. (iv) Growth in Motor Vehicles and Air Pollutions

Air pollution is recognized as a major threat to human health. We can survive without food for several weeks. We can also live without water for a few days. But, we cannot live without breathing air even for a few moments. The air we breathe directly gets into our blood stream. Hence, it is necessary for us to ensure that the air quality is not polluted beyond the threshold limits.

In Indian cities air pollution is one of the serious environmental concerns. Most of the Indian cities are experiencing rapid urbanization and the majority of the country's population is expected to be living in cities within a span of next two decades. It has resulted in a tremendous increase in the number of motor vehicles. Emissions from various sources contribute air pollution in cities. In India the major source of deteriorating the air quality is growth of motor vehicles and related emission.

Table 3.29

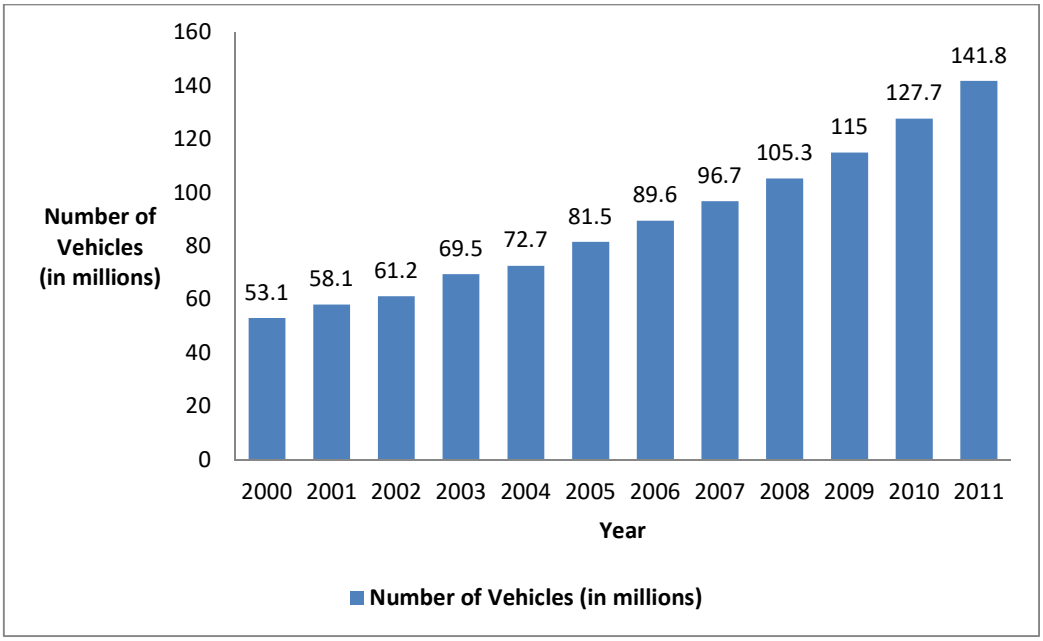
Growth of Motor Vehicles in India, 2000-2011

Year	Number of Vehicles (in millions)	% Increases
2000	53.1	-
2001	58.1	9.4
2002	61.2	5.3
2003	69.5	13.6
2004	72.7	4.6
2005	81.5	12.1
2006	89.6	9.9
2007	96.7	7.9
2008	105.3	8.9
2009	115.0	9.2
2010	127.7	11.0
2011	141.8	11.0

Source: Centre for Pollution Control Board, Ministry of Environment and Forests, Government of India, New Delhi, 2011.

Figure 3.12

Growth of Motor Vehicles in India, 2000-2011



The details of the growth of vehicles in India are furnished in table 3.29. Motor vehicles, which are the main source of vehicular pollution, are constantly increasing since 1990. Since the year 2000, there has been almost three fold increase in the number of motor vehicles in India. On an average 10 percent increase in motor vehicles has been found during a period of 2000-2011, which is a serious reason for air pollution. During 2011, the number of motor vehicles in India has increased to 141.8 million from 53.1 million of the year 2000.

Rapidly increasing industrialization, urbanization, population growth and demand for transportation along with metrological conditions influence air pollution in many India cities. In general, combustion is the chief contributor to outdoor air pollution. In most cities the major source of combustion is fuel use, which tends to increase along with the population size and economic activity.

The air we breathe can become contaminated with pollutants like Sulphur dioxide (SO_2), Oxides of Nitrogen (NO_2), Carbon monoxide (CO), Ozone (O_3) and particulate matter from various natural and manmade sources. In recent years, the focus of ambient air quality largely includes not only criteria air pollutants, but also other toxic air pollutants. The particulate matter (PM) is a complex mixture of suspended solid

and liquid particle in semi equilibrium. The outdoor (ambient) PM size, rages from approximately 0.001 -100 μm in aerodynamic diameter.

The growth of motor vehicles in Kerala from 2008-09 to 2012-13 is given in table 3.30. Total number of motor vehicles increased to 8048673 in 2012-13 from 4853360 in 2008-09. This shows that total number of vehicles in Kerala marked an increase which is almost double. This growth is associated with high vehicular emission which ultimately contributes to air pollution in the state.

Table 3.30

Growth of Motor Vehicles in Kerala 2008-09 to 2012-13

Year	Total Number
2008-2009	4853360
2009-2010	5370955
2010-2011	6045322
2011-2012	6865539
2012-2013	8048673

Source: Transport Commission, Government of Kerala, 2013.

Table 3.31

Air Quality in Important Cities in Kerala 2012-2013(Annual Average mg/m^3)

Sl. No	Districts	SO_2	Air quality	NO_2	Air quality	PM10	Air quality
1	Kochi	3	L	13	L	38	M
2	Kozhikode	2	L	8	L	46	M
3	Thrissur	2	L	14	L	33	M
4	Malappuram	2	L	5	L	30	L
5	Thiruvananthapuram	10	L	23	M	58	M
6	Kollam	4	L	20	L	53	M
SO_2 – Sulphur Dioxide, NO_2 – Nitrogen dioxide, PM10 – Particulate Matter having aerodynamic diameter.							

Source: State Pollution Control Board, Government of Kerala, 2013.

The air quality in major cities of the sate which is shown in table 3.31 gives the fact that in all the cities the air quality is L (low) where there is high presence of sulphur dioxide. Similar is the case in NO_2 level which marked high presence and hence there is low air quality. In case of particulate matter (PM) all other cities; except Malappuram shows medium air quality.

Major air pollutants, their sources, and their impacts of human health are summarized in table 3.32.

Table 3.32

Summary of Health Effects of Basic Air Pollutants

Pollutant	Source	Effect on Human Health
Carbon Monoxide	Incomplete fuel combustion (e.g. two stroke engine)	Heart disorders, head ache, breathing disorders, poor reflexes etc….
Lead (Pb)	Emission from motor vehicles	Kidney damage, reproductive system damage, nervous system damage.
Sulphur Dioxide	Burning of sulfur containing fuel like coal in power plants and oil by vehicles	Heart and lung diseases, respiratory illness like asthma
Nitrogen Oxides	Fuel combustion in motor vehicles, power stations and furnaces.	Lung irritation, head ache, eye burning, chest lightness and discomfort
Ozon	Emission from motor vehicles, photochemical reactions of nitrogen oxides and reactive hydrocarbons.	Respiratory system damage, reduces mental activity, chest discomfort, eye irritation, breathing difficulties, chronic lung diseases etc.
Suspended Particulate Matter	Smoke from domestic, industrial and vehicular sources	Respiratory illness, heart diseases, asthma etc…

Source: Kerala State Pollution Control Board, State Environment Report, 2013, Department of Economics and Statistics.

3.5. (v) Noise Pollution

There are different qualities of sounds. The sounds which are not pleasant to hear are called ‘Noises’ so an excess of noise in the outdoors leads to noise pollution. This can be experienced by too many vehicles honking at the roads, heavy machinery being operated in the open space, trains, clubs, over populated crowds and many more.

The Central Pollution Control Board has prescribed the level of noise which should be accepted in urban areas. In cities the density of population is much higher and this is the main reason behind the growth of transport sector and other activities. Almost all

the cities in the country exhibit the noise levels above the accepted decibel levels. In fact the noise pollution along with the air pollution has made life of the people miserable. The ambient air quality standards, in respect of noise are given in table 3.33.

Table 3.33

Ambient Air Quality Standard in Respect of Noise

Sl. No	Category Area	Limit in dB(A) leq	
		Day Time	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Source: CPCB, 2000

Note:

1. Day time is reckoned from 6 AM to 10 PM.
2. Night time is reckoned from 10PM to 6 AM
3. Silence zone is referred as areas within 100 meters around premises such as hospitals, educational institutions and courts. The silence zones are: to be declared by the competent authority.
4. Use of vehicles, loudspeakers and bursting of crackers shall be banned in these zones.

On the basic of this prescribed standard the average noise levels in various metropolitan cities of India is shown in the table 3.34.

Table 3.34

Average Noise Levels in the Metropolitan Cities

Metropolitan cities	Day /Night	Industrial Area	Commercial Area	Residential Area	Silence Area
Mumbai	Day	76	75	70	66
	Night	65	66	62	52
Kolkata	Day	78	82	79	79
	Night	67	75	65	65
Chennai	Day	71	78	66	63
	Night	66	71	48	49
Delhi	Day	71	72	68	63
	Night	67	68	60	45

Source: CPCB, 1997

In all the metro cities the noise pollution was noticed as much above than the prescribed standard. The highest noise pollution level is exhibited by Kolkata in all

the areas like residential, commercial and industrial in both day and night. Mumbai, Delhi and Chennai also experience similar pollution level in noise. The major threat of this trend is that in silence zones too the situation is worst.

In India, noise pollution seemed to be at an increasing trend year by year due to growing vehicular transport, industrial noise, domestic electric equipments, loud speakers used for party etc… The total effects of noise pollution in human health are summarized in table 3.35.

Table 3.35

Effects of Noise Pollution in Human Health

A. Noise Hazards		B. Noise Nuisance	
Stage I	**Stage II**	**Stage III**	**Stage IV**
Threat to survival	Causing injury	Curbing efficient performance	Diluting comfort and enjoyment
(a) Communication interference	(a) Neural – humeral stress response	(a) Mental Stress	(a) invasion of privacy
(b) Permanent hearing loss	(b)Temporary hearing loss	(b) Task interference	(b) Disruption of social interaction
	(c) Permanent hearing loss	(c) Sleep interference	(c) Hearing loss

Source: Kerala State Pollution Control Board, Department of Economics and Statistics, Government of Kerala, 2013.

It is evident from the various data on urbanization that since last fifty years, there is a tremendous growth in the pattern and trends of urbanization in India. Along with the metropolitan cities, all other cities and towns of every state have shown growth in urban population due to rural- urban migration. Kerala too witnessed surprising growth in urbanization as about half of the total state population belongs to the category of urban population. Thrissur city among all cities of India achieved the top most position in growth of urban population, where there is 894.1 percent growth in 2001-2011. With growing urbanization, the environmental issues are growing at a faster rate. Increase in slums, soil pollution, water pollution, air pollution and noise pollution are the main issues coming from this unplanned urban growth. These pollutions have affected the entire people adversely in the form of various health hazards.