1.1 INTRODUCTION

In most of the countries, the urban population is increasing at an alarming rate. The global urban population was estimated at 2.96 billion in 2000 (World Urbanization Prospects UN, 1993), but 50 million people are added to the world's urban population and 35 million to the rural population each year. The share of world's population living in urban centers increased from 5 percent in 1800 to 39 percent in 1980 and further to 48 percent in 2000. It is estimated to reach 65 percent by 2030. The developed countries have shown a higher urbanization level (76 percent) in 2000 compared with the developing countries (40 percent). The urbanization level has almost stabilized in the developed countries (about 3 percent increase in the level of urbanization during 1990-2000), whereas the increase in the level of urbanization was faster in developing countries (6 percent) during the same period (Bhagat, 1992).

Urban centers are unable to provide a variety of services like public transportation system, water and sewage services, a great variety of educational and recreational facilities. For the growth of urban population healthcare facilities and housing facilities are found inadequate. Many cities are characterized by slum and homeless population.

India is among the countries of low level of urbanization. Population residing in urban areas has increased from 2.58 crores in 1901 to 28.53 crores in
2001. Number of urban agglomeration/towns has grown from 1827 in 1901 to 5161 in 2001. According to 1991 census, in India two third (65 percent) of the towns population lived in class-I cities (with more than 100,000 population). In 2001, it got increased to 69 percent. Over the years, there has been continuous concentration of population in class-I cities. On the other hand, the concentration of population in medium and small towns has either fluctuated or declined (Kundu, 1994). The basic reason for increase in class-I cities is uplifting of lower ordered towns into class-I categories. During 1901, there were only 25 class-I cities and the number went upto 423 in 2001. The correlation between percentage of urban population and percentage of urban population living in class-I cities is highly significant. Hence, urban population is highly concentrated towards class-I cities.

Rapid urbanization and increase in the population has resulted in depletion of the natural resources. A developing country like India is facing many problems related to urban development. Development puts pressure on the basic amenities. Number of Slums have increased in metropolitan cities due to acute shortage of space for housing added by increasing poverty. Lack of adequate sewage treatment facilities, drinking water, encroachment of open space, polluted garbage in the streets and polluted water have increased the problem of modern urban development particularly in Asian region. Transportation is the most important component in shaping the urban development and style of living.
Among many areas of urban research, formulation of models to study city growth and dynamics is found to be an important area of research. Considerable literature has been accumulated to generalize the growth of cities, but so far no success has been made to predict the city growth process (Gibrat, 1931; Zipf, 1949; Champernowne, 1953; Simon, 1955; Rosen and Resnick, 1980; Henderson, 1982; Mills and Becher, 1986; Gabaix, 1999). Gibrat Law (1931) is the earliest literature which states that, for a fixed number of cities, over a period of time, their size grows stochastically with common mean and variance, the growth rate equal to mean city size growth rate of cities of different sizes.

Zipf model (1949) for cities is another most conspicuous fact having a strong empirical support, and it constitutes a minimum criterion of admissibility for any model of local growth, and is described as the probability that the size-S of a city, greater than some x is proportional to 1/x, Pareto distribution fits well to a particular class of cities, namely, the cities tending to attain urban maturity. In the Indian context, Class-I cities are of this nature. More or less, they have attained urban maturity, and are about to reach equilibrium conditions as their growth in population size is more or less governed by the economic development (Megeri, 2002). Zipf Model (1949), which belongs to Pareto family, is based on rank size rule, well approximated by Pareto distribution (Rosen and Resnick, 1980), and it has been chosen to fit the city size distribution of Class-I cities.

In most of the studies, the parameter value is estimated by ordinary least square method (OLS), but here I have used the non-linear regression method, because the traditional linear regression method is restricted only to estimate
parameters of the linear models, whereas the nonlinear regression method can estimate models with arbitrary relationships between independent and dependent variables. This method allows us to specify a starting value for the parameter, preferably as close as possible to the expected final solution. Another important aspect of the thesis that I propose is a new methodology for projecting the proportion of urban population of the world, region and country, at 2030 A.D.

1.2 OBJECTIVES OF THE PRESENT STUDY

Considering these facts, an attempt is being made in the present study to analyse some such problems associated with urbanization in less developed countries with special attention to India. The data is derived from United Nations publications, Census data, up to date enumerated and projected data on population and socio economic indicators published by National and International Agencies.

The following are the main objectives of the present study:

1. Growth and Distribution of Slum Population in Indian Cities.

2. Social, demographic conditions and Problems of Slum Population.

3. Application of Statistical Models to study growth of Cities in India.

4. Formulation of new method for urban population projection as an alternative to UN hypothetical urban-rural growth difference method.
1.3 PLAN OF THE THESIS

The thesis consists of two parts, each part consisting of two chapters. The first part explains urban growth and problems associated with urban population. The second part deals with the application of statistical models.

In the first part in Chapter-II, we propose to discuss the size and structure of slum population in Indian cities. Many of the demographic, social and economic characteristics of slum population have been studied. Here we present the analysis of slum population in India and its distribution over cities of different size. A special attention has been given to the study of slum population in cities with a million plus population. The composition of SC and ST population, sex composition in cities and slum areas are also presented. A comparative study of literacy rates in slum and non slum areas and also working slum population in million plus cities has also been made.

Chapter-III deals with other problems and challenges posed by growing cities in the developing countries like India. Rapid urbanization and increase in the population has resulted in depletion of the natural resources. The technological and industrial boom has brought enormous problems to urban citizens causing degradation of the environment. We have discussed the problems related to housing, scarcity of water. The supply and distribution of water to different local areas are discussed. Problems concerned with sanitation and infections of diseases are presented. Industrial pollution and pollution from different vehicles have also been studied.
In the Second Part of the thesis, Chapter-IV deals with the Application of Statistical Models for predicting the growth of pattern of cities in India. Here we study the growth and distribution of cities in India using both probabilistic and deterministic (including economic) models. An attempt has been made to fit three non linear statistical models to different class of cities.

Chapter-V deals with the projection of urban population in different countries/regions using a Piecewise-Polynomial Model instead of UN method. Using both Polynomial and UN methods, an effort is made to study the urban population in different regions and also in some specific countries. Comparative study of the urban population in different regions in the World has been undertaken.