

Prognostication of Urbanisation Growth and Level in Pune District of Maharashtra State an Using GIS Technique

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ABSTRACT

The most important factors behind urbanization are industrialization, commercialization, urban change and employment. The two most important factors are push and pull. Urbanization is a process in which people move to live in cities permanently. Economic development or personal economic advancement of human being is an important objective for urbanization or this process. Due to economic activity, a large number of people from rural areas or people from other cities migrate to big cities. Urbanization is primarily a process of transformation from rural areas to industrialized urban area. In terms of urbanization in India, 11.4 per cent people lived in urban area in 1901 census period, 28.53 per cent in 2001 census period and 31.28 per cent in 2011 census and 34.47 per cent in 2019 year as well as India's urban growth rate is 2.07%. This research paper is based on the secondary data information. This data is taken from District Census of Pune form 1991 to 2011 census periods. The main objective of this research is geographical and analytical analysis of urbanization in Pune district.

Keywords: Urbanization, Trend, Level, Prognostication, Migration.

INTRODUCTION

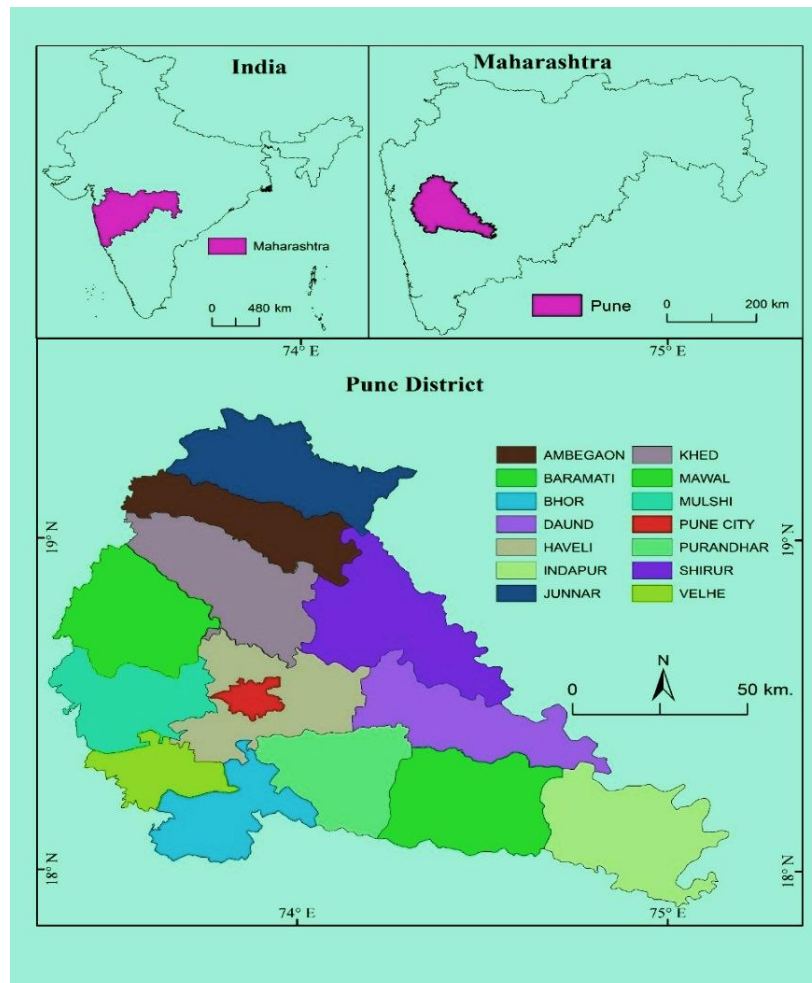
Urbanization refers to the process by which a growing proportion of a population comes to live in cities and other urban areas and the ways in which this affects society and the environment. It is a global phenomenon that has been driven by a variety of factors, including economic development, technological change, and population growth. Urbanization is influenced by economic, social, political, environmental, infrastructural and demographic factors. The most important of these factors is the economic factor. Apart from the political factor, all these factors are considered important, but among them, the economic factor is the most important and effective. National migration does not affect the total population of a country but increases or decreases the population of a geographical area. If the population increases, there is a great strain on the natural resources and facilities in that geographical area and on the administrative units. This creates various problems in such an area and greatly increases the cost of natural resources and amenities. If unemployment in a rural area or a geographical area is high, people from such areas migrate to other geographical areas or move to urban areas for job creation or seeking employment. Thus, it helps in urbanization in urban areas. Migration is an economic process that human beings migrate to urban areas for their economic development. Therefore, people from rural areas come to urban areas for various businesses and employment, education etc. which helps in economic development of themselves and their families and helps in raising their standards of living [10]. Social and economic development of any geographical area takes place. Along with this development, the factor of

urbanization is also developing. Migration is the most important factor influencing the development of urbanization. People are migrating from rural areas or small towns to big cities. This migration is mainly organized for economic development, also people migrate to change the way of life of the people and the most important factor is to get employment. Urbanization or urban life is the physical growth of urban areas as a result of global change. Urbanization is closely linked to the sociological processes of modernization, industrialization and rationalization. Urbanization can describe a particular state, in which the total population or area is the proportion of time. Hence the term urbanization can verbally refer to the relative urban level. It can represent the rate at which population or urban population is growing. Individual and cooperative efforts to reduce time and costs in society naturally lead to urbanization and improve employment opportunities, education, housing, and transportation.

Urbanization is an increasing proportion of a population living in urban areas. It symbolizes the migration of people from rural to urban areas or natural increase the excess of births over deaths [11]. Rainfall is considered to be important for human settlement in areas where water is available [7,8,9]. In short, rainfall or water is one of the most important resources for economic development or for human beings [21,22]. Human resources are a resource, through their technology and knowledge, are developing economically and building facilities in urban areas [15,16,17]. On the one hand, pollution is a major problem in urban areas. There are advantages as well as disadvantages of urbanization e.g. water problem in these urban areas rising land prices, lack of electricity, lack of water and pollution as well as social problems etc. Although there are various reasons for urbanization, this growing population is one of the main reasons why the rate of urbanization is higher in developing nations than in developed countries as the level of urbanization is higher in developed nations. Therefore, the level of urbanization is higher in developed countries but the rate of urbanization is faster in developing countries. Population growth has led to large-scale changes in land use and land cover, which has led to a decline in vegetation [5,6,14]. The process of becoming urban of complex process of change affecting both people and place main dimensions are a progressive concentration of people and activities in the town and city thereby increasing the general scale of urban settlement for change in the economy of a country or region nearby non-agricultural activities become the dominant change in the structural characteristics of populations for example low birth rate, higher death rates, for positive migration balance etc. spread of urban reason behind the build-up areas of towns and cities nearby indexing ruler difficult times the transmission or diffusion of change economic social technological etc. down the urban hierarchy and into rural areas [18]. The key factors for economic inequality in any geographical region are the geographical, social and political factors. Economic inequality depends primarily on resources [4,7]. Although many factors are important for urbanization, transportation is considered to be an important factor as it increases connectivity, which in turn increases migration, which in turn leads to greater urbanization. Therefore, it has been decided to conduct a study for urbanization of Pune district. This study is a geographical analytics. While conducting this study, trend and levels of urbanization have been calculated using census data. Therefore, a geographical study of the trend and pattern of urbanization according to the tehsil of Pune district will be done in this. Therefore, the following study methods, methodology have been considered. The main objective of this study is urbanization in Pune district.

Study area

The total geographical area of Pune district is 15642 sq. km, which is 5.10 percentage of the state of Maharashtra. Pune district lies between latitudes 17° 54' N and 19° 24' N and longitudes between 73° 19' E and 75° 10' E. As per 2011 census, Pune district has a total population of 94.29 lakhs. The total population in Pune district is 60.99% of the population lives in urban areas and 39.1% of the population lives in rural areas. There are a total of 14 Tehsil in Pune district, According to the 2011 census, the population density of Pune district is 603 per square kilometre and sex ratio is 915. The total literacy rate is 86.15%, literacy rate is 80.98% in rural areas and 89% and 45% literacy rate in urban areas. According to 2011 census, Pune district has 1866 villages with 13 Panchayat Samities and 1407 gram Panchayats.



Map 01: Location map in Study Area

Amis and Objective

The main aim of the said research is to study the urbanization in Pune district. Following objectives have been achieved for the completion of said aim.

1. To study the pattern and trend of urbanization in Pune district
2. To estimate the level of urbanization in the study area in the future.
3. To study the level of urbanization according to tehsil of Pune district.

Database and Methodology

The data taken for this research paper is dependent on the secondary source of information. Various methods and materials are used in determining the transformation of Urbanization of the study region. The research methods can be then summarized as follows.

1. Literature survey: A vast amount of literature is present that explains urban population/Urbanization and its distribution. The first phase of this study is to find the available literature and understand the materials, methods and models that have been extensively used in the published literature.

2. Data Collection: The second phase of this research is the collection and compilation of database essential for this study. The Urban population/Urbanization data of the study area is gathered from Census of India online platform for the years 1991 and 2011. Secondly the spatial data that includes the shape file of the study area is gathered from online GIS platform. The other database includes various websites, news, journal articles that are extensively surveyed and incorporated in the present study.

3. Analysis of Data and Statistical Methods: The gathered population data for each district which is a part of the study area is compiled using MS-excel and SPSS. The data for various urban population/Urbanization are then extracted from the huge database and analyzed using different statistical techniques.

Table 01: Statistical Techniques

No	Indices/ Methods	Formula	Where
1	Population Decadal Growth Rate (DGR)	$\left(\frac{P_2 - P_1}{P_1} \right) \times K$	P2= Population of current decade or Year. P1= Population of current Previous decade or Years K= 100
2	Level of Urbanization	$\frac{U_p}{T_p} \times K$	U _p = Urban Population T _p = Total Population, K= 100

4. Level of Urbanization:

Five groups have been formed to study urbanization level. Very low, low, moderate, high, and very high urbanization level groups have been created in this, and these groups have been drawn according to percentages.

Table 02: Urbanization level in %

level of Urbanization in %	Types of level
00	Very Low level
< 25.0	Low
25.01-50.0	Moderated
50.1 – 75.0	Progressive
>75.1	High level

5. GIS Technique

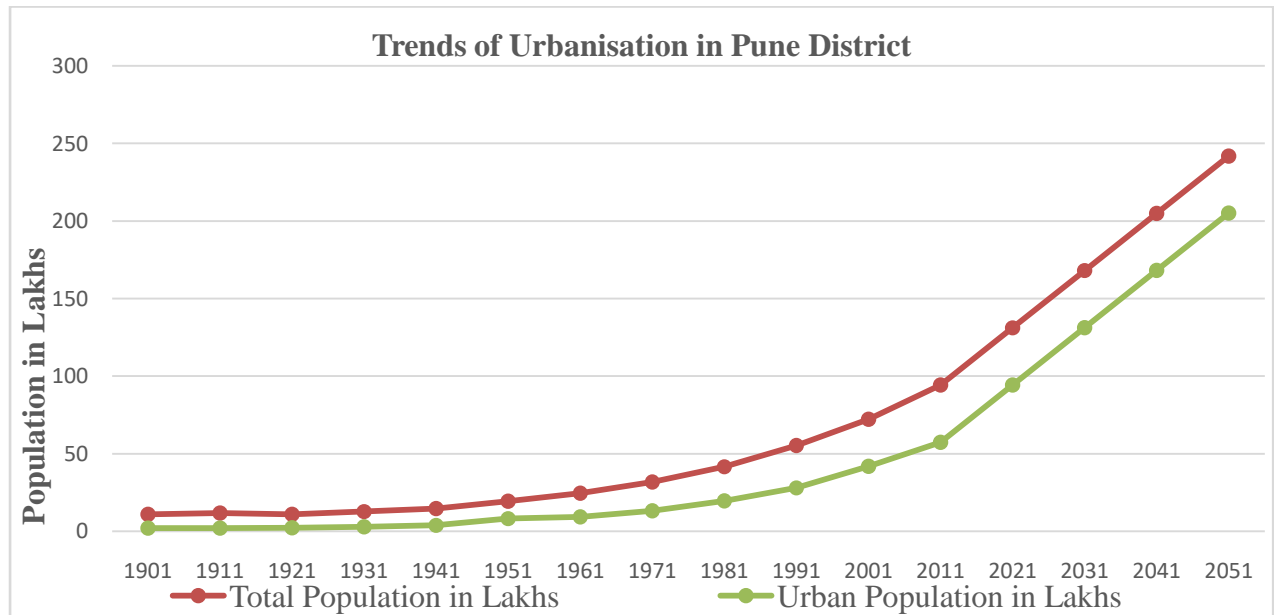
Maps have been prepared by GIS method to show geographical distribution of level of urbanization in Maharashtra state and to convert numerical data into qualitative Cartography or Maps.

RESULT AND DISCUSSION

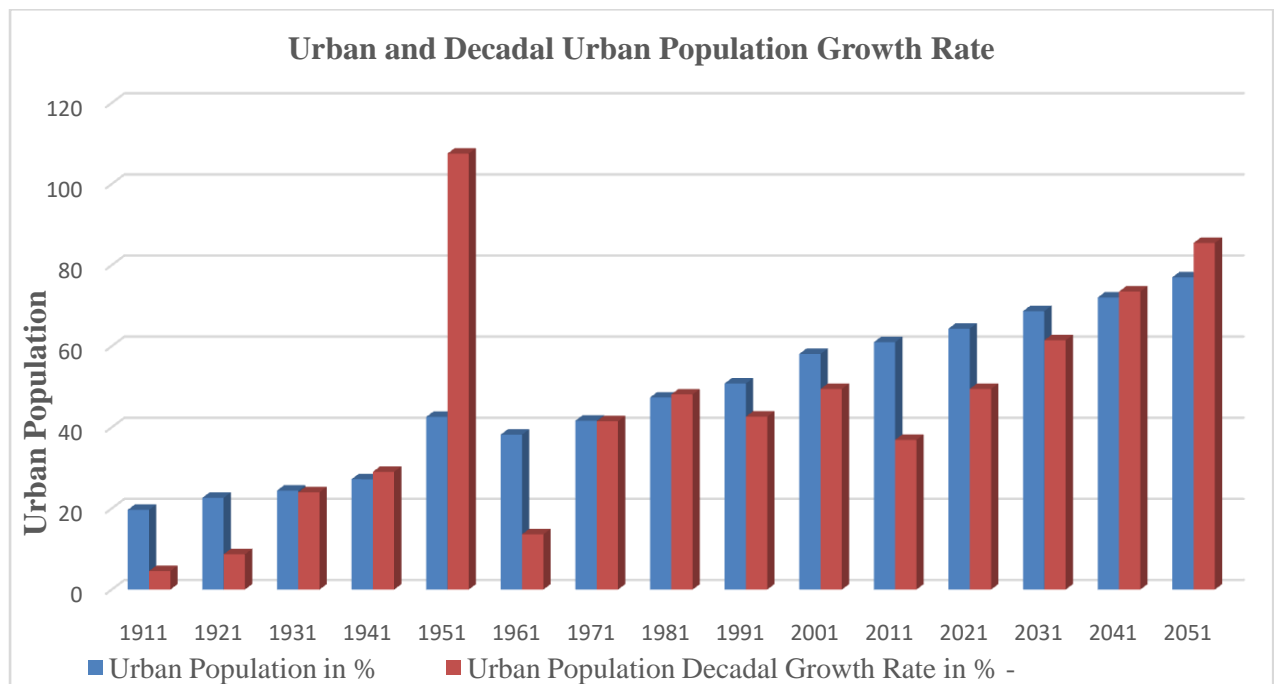
Graph No. 01 shows the trend of urbanization in Pune district. The trend is between 1901 and 2011 census periods. The population in this group is also shown in lakhs. From these figures, it can be that the total population of Pune district has progressed significantly after 1951 years. Before 1951 year that it has increased peacefully till 1901. This means that the rapid population growth after the 1951 census because the post-1951 migration and birth rate in Pune shows the increasing population of urbanization here as well as the industrialization in these Pune districts as it generates a lot of jobs. Increasing urbanization in Pune district is mainly due to various factors such as educational facilities and development of industries, transportation facilities, attracting people here and creating new jobs. In short, the population of Pune district was 10.96 lakhs in 1901, then it increased to 19.51 lakhs in 1951 census year and from 72.33 lakhs in 2001 census year and in 2011 census year it was 94.29 lakhs population. However, the total urban population of Pune district is more than half of the population living in urban areas above the 2011 census year and more than half of the population was living in urban areas even in the year 2001 census year. Before 1951 census year, the number of people living in urban areas in Pune district was less than the total population. In 1901, 2.2 lakh people were living in urban areas. In 1951, the population was 8.3 lakh, in 1971 it was 13.3 lakh and in 1981 it was 19.7 lakh. This shows that the urban population of Pune district has increased rapidly after 1991 census years. Briefly, from 1991 to 2011, more than 50 per cent of the total population lived in urban areas, 50 as per 1991 Census. 81 percentage of the population lived in urban areas compared to 58 in the 2001 census. 2 percentage and as of 2011 60.99% of the people of Pune district live in urban areas. On the other hand, the highest annual growth rate is in 1951 census year. In short, the total annual growth rate was 31.3 per cent in 1941 and 107.1 per cent in 1951. This means that you can see almost double increase in population these census periods. After 1950, you can see that the annual increase in urban population has been declining sharply since 1961. It has increased since 1971 and 1981, but again you can see how much it has decreased since 1991. It also shows an increase in the 2001 census year and a decrease in 2011 census periods. The study of how much urban population can be in the future in the census year 2021 to 2051 in Pune district.

According to the 2021 census, the total population of Pune district will be 131.2 Lakhs out of which 94.42 Lakhs will be urban. According to 2031 census, 168.11 lakh populations will belong to Pune district out of which 131.33 lakh population will be urbanized. According to 2041 census this year out of 205.02 lakh population 168.24 lakh population will be urban and according to 2011 census the total population this year will be 241.93 lakh out of which 205.15 lakh population will be urban. From this it is clear that the number of resources required in Pune district will be many times higher in the future. Mainly in this,

water, electricity, roads are the major needs to be provided here in the future. For this, the government may need a new dam to store water for the future in a big way, new space will be needed for factories, new plans and planning for transportation will be required for Pune district in the future.



Graph 01: Trends of Urbanisation in Pune District from 1901 - 2051



Graph 02: Urban and Decadal Urban Population Growth Rate in % (1901 – 2051)

Graph no 02 shows that the growth of urbanization in Pune district will be 49.47% in census year 2021, 61% in 1931 census, 73% in 2041 and 85% in census year 2011. According to this or to the extent that urbanization is increasing, various facilities such as water, electricity, transport will be required here. From this it is clear that the population of Pune district and various tehsils is increasing from the point of view of the increasing population, according to the increasing population, there will be stress on the resources here. Therefore, in the future, there will be stress on the educational facilities, health facilities, police system, Defence, administrative staff, administrative buildings, offices, etc. Planning the

government needs to prepare a plan now that planning will be done or required in view of the increasing urbanization.

Level of Urbanization in Pune District (1991-2011 Census Periods):

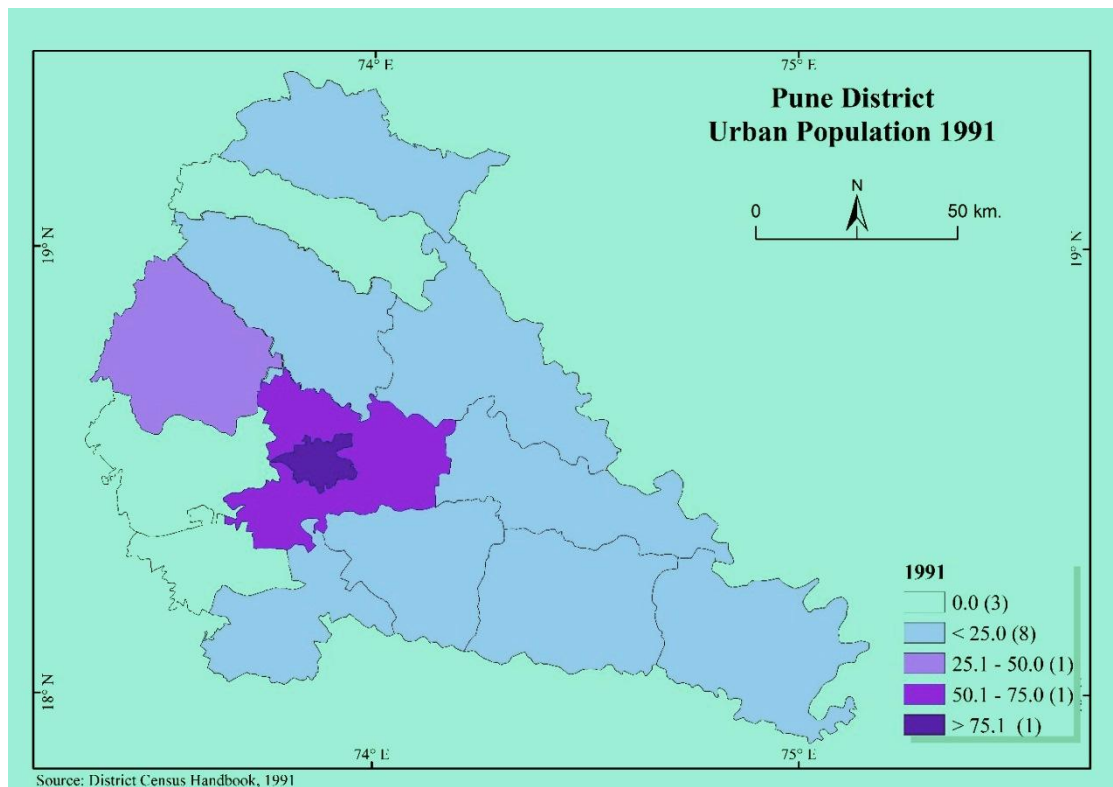
Five groups have been formed to calculate the level of urbanization in Pune district. These groups depend on the percentage of the population. The level of urbanization is derived from the percentage of the urban population. The first Very low urban population area (Zero Percentage), second low urban population area (less than 25 Percentage) third Moderated level (25.01 to 50 Percentages) fourth Progressive level (50.1 – 75.0 Percentage) five number High level of urbanization (more than 75 Percentage).

1. **Very low urban population area (Zero Percentage):** The period taken to measure the level of urbanization in Pune district is from 1901 to 2011 census years. As per 1991 census, Ambegaon, Mulshi, and Velhe has urbanization level in these three tehsils which means no urbanization in these areas. But in 2001 only Velhe tehsil was included in 2001 but in 2011 the entire Velhe tehsil was not urbanized but you can see the economic development of Ambegaon and Mulshi tehsils as this tehsil was transformed urbanization level into 2001 and 2011 census years. In short, the economic development of the two tehsils of Ambegaon can be seen here, even though the process of urbanization is slow and that economic development has attracted a large number of people. Map No. 2, 3 and 4 shows the level of urbanization in Pune district with tehsil wise.
2. **Low urban population area (< 25 Percentage):** In some tehsils of Pune district, the level of urbanization is less than 25%. In the year 1991 census, this level includes eight tehsils, mainly Junnar, Shirur, Khed, Daund, Purandar, Bhor, Baramati and Indapur. This means that the economic development of this tehsil was low in this census year so that the percentage of urbanization here was less than 25 percent. But in the census year 2001, this low-level urbanization included ten tehsils, mainly the two new tehsils are included of Haveli and Mulshi. This means that the level of economic development and urbanization of these two tehsils has decreased in 2001 census year and in the tehsils of 1991 census year, there has been no change in the form of urbanization. But in the 2011 census, it included nine tehsils. In 2001, it included ten tehsils. But in the 2011 census of Khed tehsil, you can see that it has changed to a moderate level. In short, the nine talukas included in 2011 were mainly Junnar, Ambegaon, Shirur, Mulshi, Daund, Purandar, Bhor, Baramati and Indapur, but Khed was not included. This means that the level of urbanization is higher in Khed talukas than in other talukas. This means economic development and various jobs have been created in this tehsil. Map No. 2, 3 and 4 shows the level of urbanization in Pune district with tehsil wise.
3. **Moderated level (25.01 to 50 Percentage):**
The level of moderator urbanization is mainly between 25 to 50 percentages. In 1991, the moderated level included only one tehsil, is Mawal, then in 2001 census year is same tehsil, but in the census of 2011, only two tehsils were involved namely Khed, Mawal. This means that the level of urbanization or group of Bawal tehsil seems to be stable but Khed tehsil has been newly included in this level in 2011. This means that urbanization has increased in Kheda tehsil. In short due to economic development and employment creation must be urbanized.
4. **Progressive level (50.1 – 75.0 Percentage):**
The level of Progressive Urbanization includes cities between 50.1 - 75%. This level includes Haveli Tehsil in 1991 but does not include any tehsils in 2001 census year. But Haveli Tehsil has been re-incorporated in 2011 census year and there is a huge possibility in next census year in developed level of Urbanization. This means that the educational, economic development in these areas and the creation of a large number of new jobs here should attract a large number of people.
5. **High level of urbanization (>75.1 Percentage):**
High Level of Urbanization in Pune City the level criteria is more than 75% peoples living in area. Pune city is in high level of urbanization from 1991 to 2011 census years. Because educational development, employment generation, various businesses, banking facilities, transport connectivity were developed on a large scale. Due to the high facilities, people are attracted for new jobs and business. In the near future, Pune City may experience 100% urbanization, which could put a strain on a large number of government facilities in these areas, mainly road and transport, electricity, water supply, educational facilities and health facilities. In short, in this Pune City, various facilities will have to be increased for the future. Map No. 2, 3 and 4 shows the level of urbanization in Pune district with tehsil wise.

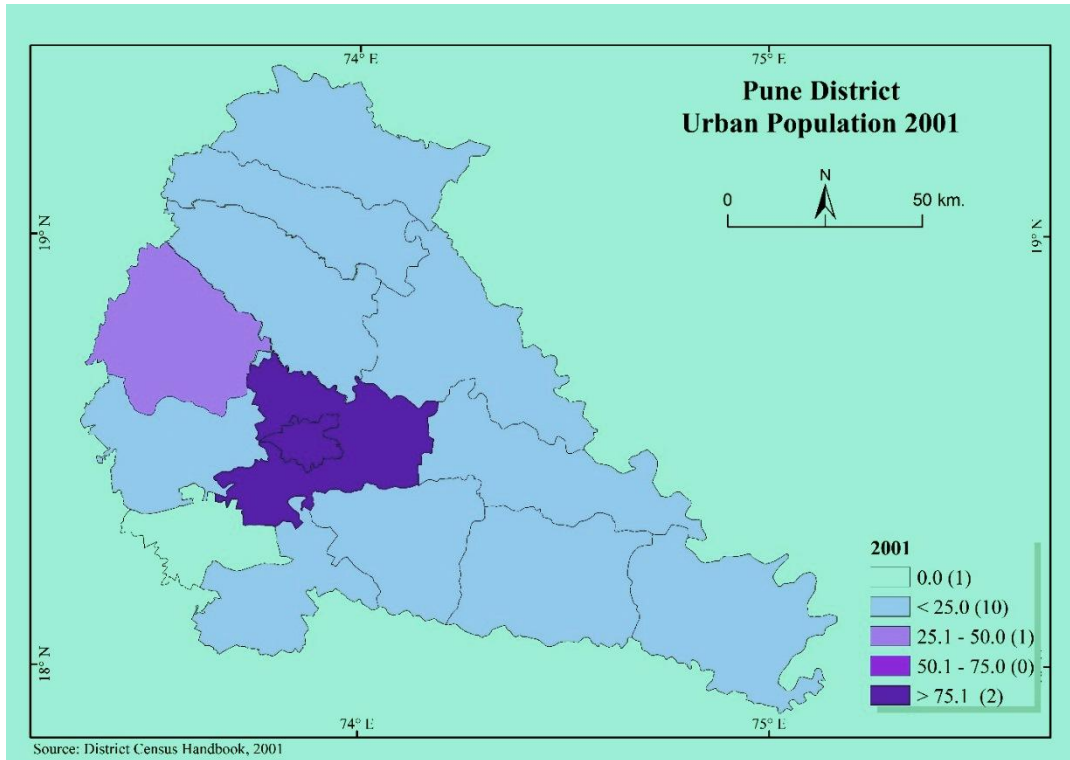
Table 03: Level of Urbanization (Result Table 1901 to 2011 Census Periods)

Census Years	Value of level in %	Types of level	Number of Tehsils	Name of Tehsils
1991	00	Very Low level	03	Ambegaon, Mulshi, Velhe
	< 25.0	Low	08	Junnar, Shirur, Khed, Daund, Purandar, Bhor, Baramati, Indapur
	25.01-50.0	Moderated	01	Mawal
	50.1 – 75.0	Progressive	01	Haveli
	>75.1	High level	01	Pune City
2001	00	Very Low level	01	Velhe
	< 25.0	Low	10	Junnar, Ambegaon, Shirur, Khed, Mulshi, Haveli, Daund, Purandar, Bhor, Baramati, Indapur
	25.01-50.0	Moderated	01	Mawal
	50.1 – 75.0	Progressive	00	-
	>75.1	High level	02	Haveli, Pune City
2011	00	Very Low level	01	Velhe
	< 25.0	Low	09	Junnar, Ambegaon, Shirur, Mulshi, Daund, Purandar, Bhor, Baramati, Indapur
	25.01-50.0	Moderated	02	Khed, Mawal
	50.1 – 75.0	Progressive	01	Haveli
	>75.1	High level	01	Pune City

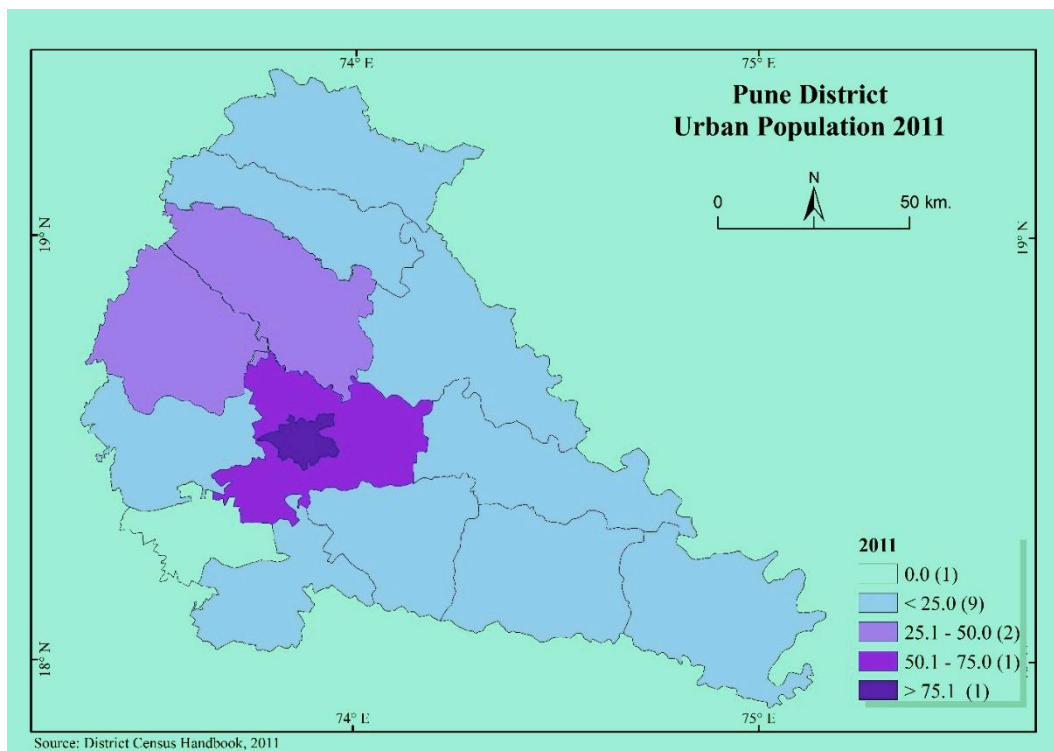
Source: Census of India, 1991 to 2011 and Calculated by Researchers



Map 02: Level of Urbanization in Pune District 1991



Map 03: Level of Urbanization in Pune District 2001



Map no 04: Level of Urbanization in Pune District 2011

From this it is clear that if we consider the future, Pune City is going to be completely **100%** urbanized. Haveli Tehsil has a high possibility of 100% urbanization. Because as the rate of growth of urbanization is increasing, it is very likely that Haveli Tehsil and Pune City will witness 100% urbanization in the future. Due to this, it is necessary to plan for various things like planning, policy, resources, police system, defence, hospitals, business, market for Pune City from this point of view. After that, Haveli Tehsil also needs to be planned for the future in the same way. Khed and Maval tehsils are currently in Moderate but in the future they will move to Progressive. The strain on resources in Khed and Maval tehsils also needs

to be considered. At the same time, planning of industrialization, planning of transportation is necessary. According to the nature, the government or the local training needs to decide a different goal policy and according to the growing population, there may be shortage of many resources in the future, for example, land availability, water availability and clean air should also be planned. This requires new water storage sites or construction of new dams. If Pune City is planned on the same lines as those planned in New Delhi in terms of traffic, it is necessary to plan various plans that will help reduce pollution.

CONCLUSION

In the form in which urbanization is increasing in Pune district, there will be an emphasis on material wealth in the future till the year 2051. Due to this, large amount of water availability, electricity, transport facilities, Education and health have to be provided for Pune district and city. In short, the people here will have to build new dams in the future for their industries and to meet their various water needs. So the government needs to plan for the future now and build those facilities. Also, consideration should be given to people who come daily from other cities or nearby areas and people who come for various reasons. In the future you will see increasing urbanization in Junnar, Bhor, Baramati, Indapur, Puranda, rDaund and Shirurtalukas as industrial development is taking place here due to which there is a lot of scope for urbanization and Khed, Maval and Haveli tehsils can go to high level in future. This research can be used for future urban planning and policies in study area.

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