

## Spatio-Temporal Assessment of Selected Demographic Characteristics in Pune Administrative Division

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### Abstract

*Demographic structure of any region plays an important role in the process of development. The significant increase in the population lead to several problems and also creates burden on the existing resources. The total population of Pune Administrative Division has approximately 21% share in the total population of Maharashtra State. The rapid urbanisation in the districts like Pune and Kolhapur leading to change the population structure of an entire division. People tends to migrate from rural to urban areas to have better educational attainment, employment, quality of life etc. which basically changes the population structure of any region. The population of India has been increased by 37.71 crores from the year 1901 to 2011. Maharashtra has the highest level of urbanization in India at 45.23 percent compared to 29.5 per cent as the all India average. The present study seek to understand the spatial and temporal distribution of population by using 2001 and 2011 census. It also highlights the variability of the population distribution and analyses the reasons that are responsible for the uneven distribution of population.*

**Keywords:** Population, Sex Ratio, Density, Occupation, Urbanisation.

### 1. Introduction

The inequality within the spatial development of the region is that the combined results of a natural surroundings, its resources, and also the existing demographic structure and spatial pattern of population within the region. An associate analysis of assorted aspects of population i.e. growth, distribution, density, sex ratio, literacy, activity structure and urbanization etc. provides a transparent understanding of the issues within the region that should be taken for rational regional and intra-regional planning. Within the past two decades, vast changes have occurred in many aspects of life in every country of the world. Perhaps the most significant has been the recognition, that rapid rate of population growth influences every sector of economic and social development. Human settlements has toughened through dramatic amendments viz. survivalization, centralization, urbanization, decentralization, and ruralization and each that area unit is characterised by completely different crucial factors. Population increases rapidly in the areas where there is scope for economic development and many other factors favours human settlement. In the areas where conditions are favourable for the development of agriculture, industry, transportation and trade, the carrying capacity of land is high. Such areas can accommodate more people. Many studies have also explained that the conditions suitable for human health plays an important role in influencing distribution of population. It is estimated that the world population will reach to 9 billion people and most of the contribution of this population will concentrated in developing nations like India. According to United Nations projections the population of India will cross the line of 1.4 billion people by 2022 (UN, 2019). This will not only create various socio-economic problems to the country but also will have drastic impacts on the available resources. The growth and distribution of population are the two key aspects in any population studies (Rubenstein, 2010, p. 28). In his theory, Malthus argued that the population growth is inversely related with the food stock and also ripostes to wage that goes negatively with population growth (Costabile and Rowthorn, 1985). The growth of Population has been recognised as a leading factor to augment adverse socio-economic and environmental issues. At regional level the population growth along with limited resources tempt to have severe community vulnerabilities (Neumann et al., 2015) and can lead to food insecurities and livestock depletion (Godber & Wall, 2014) or may also go ahead to have water scarcity (Falkenmark, 2013) and burdens on utility services (Nagarale and Telang,

2020) and on health care facilities (Dall et al., 2013). The demographic profile, size of household, education attainment, income level and distribution of resources and services can be attributed to its crucial function for the implementation of any planning strategy (Nagarale and Telang, 2020).

Maharashtra is a leading state in terms of GDP driven by the State's economy and also expanding in terms of population at a faster rate. The population of India has been increased by 37.71 crores from the year 1901 to 2011. Maharashtra has the highest level of urbanization in India at 45.23 percent compared to 29.5 per cent as the all India average. According to Unique Identification Aadhar India, the population of Maharashtra is estimated to be 124.7 Million (12.47 Crores) in the year 2021. Its second populous state in India after Uttar Pradesh, approximately 9% of the India's population lives in Maharashtra. Pune Administrative Division is one of the six administrative divisions having approximately 21% share in the total population of Maharashtra State. The rapid urbanisation in the districts like Pune and Kolhapur leading to change the population structure of an entire division. People tends to migrate from rural to urban areas to have better educational attainment, employment, quality of life etc. which basically changes the population structure of any region. The present study seek to understand the spatial and temporal distribution of population by using 2001 and 2011 census. It also highlights the variability of the population distribution and analyses the reasons that are responsible for the uneven distribution of population.

## 2. Methods and Materials

The populations studies are mainly focus on the demographic characteristics and its distribution. A variety of methods and models has been used to project the population changes, its distribution and causes. The present study reveals the spatial and temporal changes in the population structure of the study area. Various methods and materials are used in determining the transformation of demography of the study region. The research methods can be then summarised as follows:

**2.1 Literature survey:** A vast amount of literature is present that explains demographic characteristics and its distribution. The first phase of this study is to find the available literature and understand the materials, methods and models that has been extensively used in the published literature. It also gave an idea to handle population based data in a scientific way. The literature survey is been conducted by using various global population indices, government reports, published research works and articles as well as censuses. It helped in determining the global scenario of population distribution and correlating it with the regional population scenario of the study area.

**2.2 Data Collection:** The second phase of this research is the collection and compilation of database essential for this study. The population data of the study area is gathered from Census of India online platform for the years 2001 and 2011. Secondly the spatial data that includes the shapefile 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.

**2.3 Analysis of Data:** 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 demographic characteristics are then extracted from the huge database and analysed using different statistical techniques. The location data of the study area is processed by using Global Mapper and Arc Map 10.3 GIS software. The analysis part includes time series analysis, averages, drawing the maps and diagrams etc.

## 3. The Study Area

For the present research Pune Administrative Division has been selected as a study area. The study area lies between 15° 45' N to 19° 24' N latitudes and 73° 19' E to 76° 15' E longitudes and comprises 57,235 sq. km. area. There are five districts in Pune Administrative Division i.e. Pune, Satara, Solapur, Sangali and Kolhapur district comprising total 58 tehsils. The study area is surrounded by Karnataka State in the south, Konkan division in the west, Nashik division in the north and the north eastern boundary is surrounded by Aurangabad division. The total population of the

region was 19,973,761 in 2001 which have been increased to 2,34,49,049 as per 2011 census. Though the study area selected for the present research is in general, homogeneous in many geographical aspects, there are many underlying diversities as far as population factor is considered. Growth and distribution of population, sex ratio, literacy, patterns of urbanisation, occupational structure and many other aspects show diversity, the topic of actual research is to throw light on these diversities.

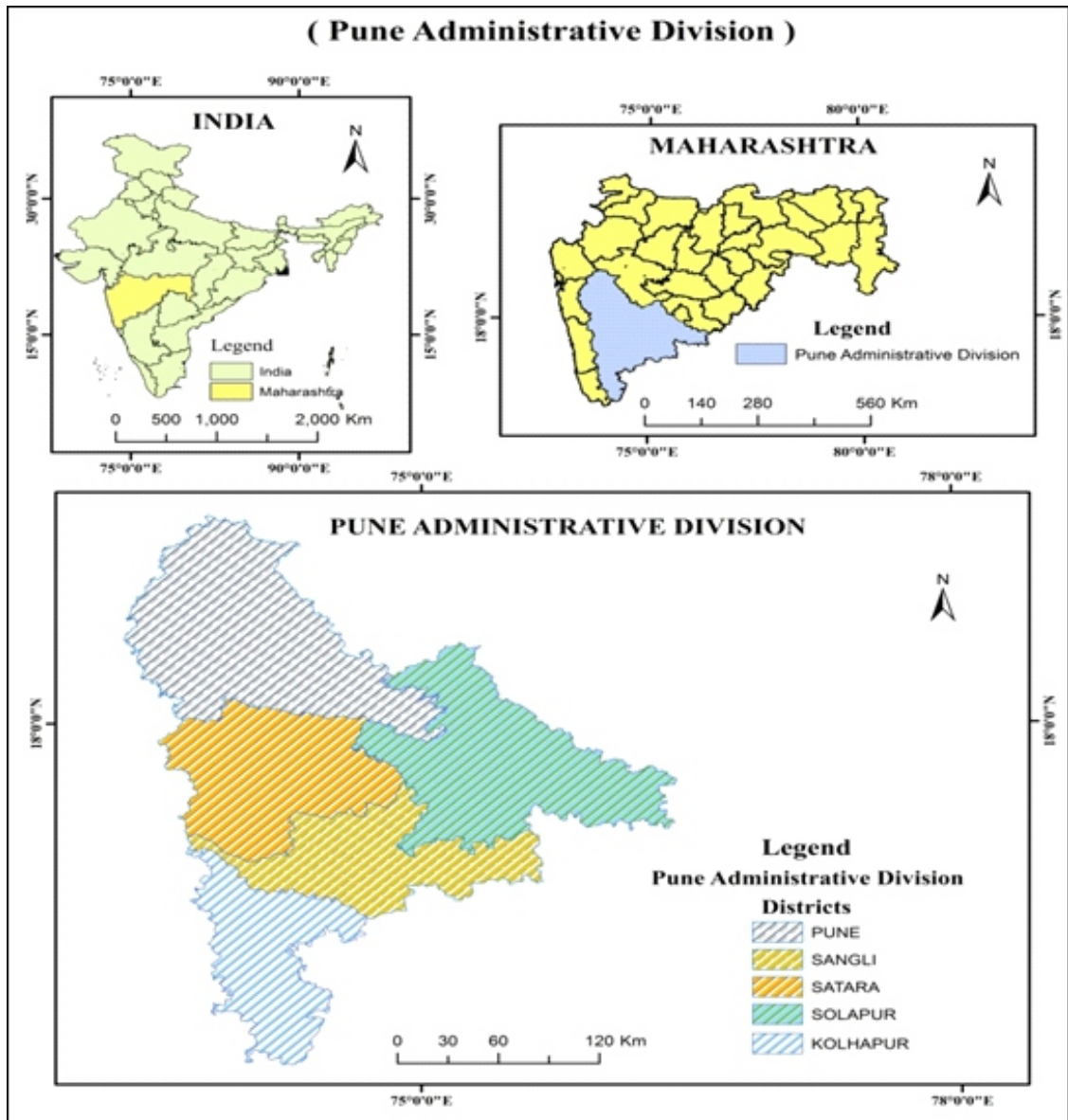


Figure 1: Location Map of the Study Area

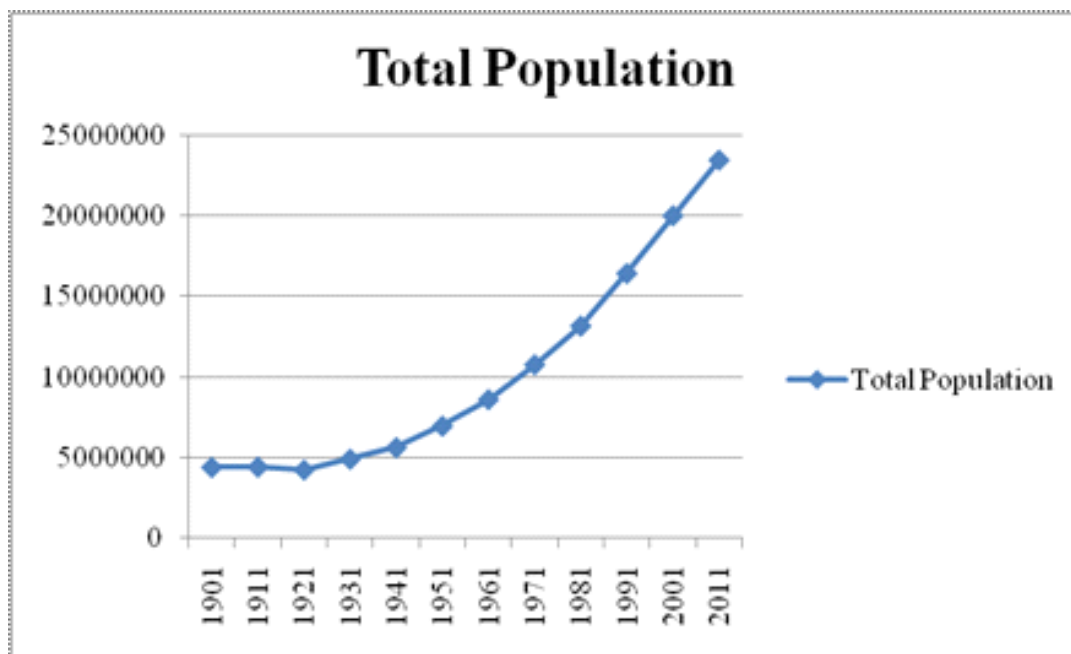
#### 4. Results and Discussion

The demographic structure of Pune Administrative Division has transformed over the years. The total population keeps on increasing and reached to 23449049 persons as per the census 2011 (Table 1). An increasing trend of total population can be observed from the year 1901 to 2011 (Fig. 2). Although there is an increasing trend still the growth rate is seen to have decreased over the years. The highest growth rate is reported in 1971 census i.e. 25.19% which is been decreased to 21.83 % and 17.26 % in 2001 and 2011 census respectively. The decline in overall growth rate is characterised by the decline in birth rate and improvements in socio-economic conditions as increased literacy.

**Table 1: Changes in the Total Population of Pune Administrative Division: 1901 to 2011**

Year	Total Population	Growth Rate	
		Absolute	Percentages
1901	4374757	-	-
1911	4399276	24519	0.56
1921	4216929	-182347	-4.14
1931	4885202	668273	15.85
1941	5599578	714376	14.62
1951	6939802	1340224	23.93
1961	8584313	1644511	23.7
1971	10747114	2162801	25.19
1981	13150833	2403719	22.37
1991	16413956	3263123	24.81
2001	19997778	3583822	21.83
2011	23449049	3451271	17.26

Source: Census of India of concerned year and concerned district



**Figure 2: Changes in Total Population**

The density of population in the study area have been transformed over the years. The density of population in Pune Division was ranging from 75.2 to 99.6 persons per km. in the pre-independence period which has been drastically changed after independence (Table 2). In the census year 2001 and 2011 it is been reported that the density of population is increased to 344.6 and 402.6 persons per km. The district wise distribution of population shows that Pune district has highest population density of 603 persons per km. followed by Kolhapur district i.e. 504 persons per km. This phenomena is characterised by the early industrialisation and urbanisation in the concerned districts that lead to increase in migration of people for better lifestyle and employment.

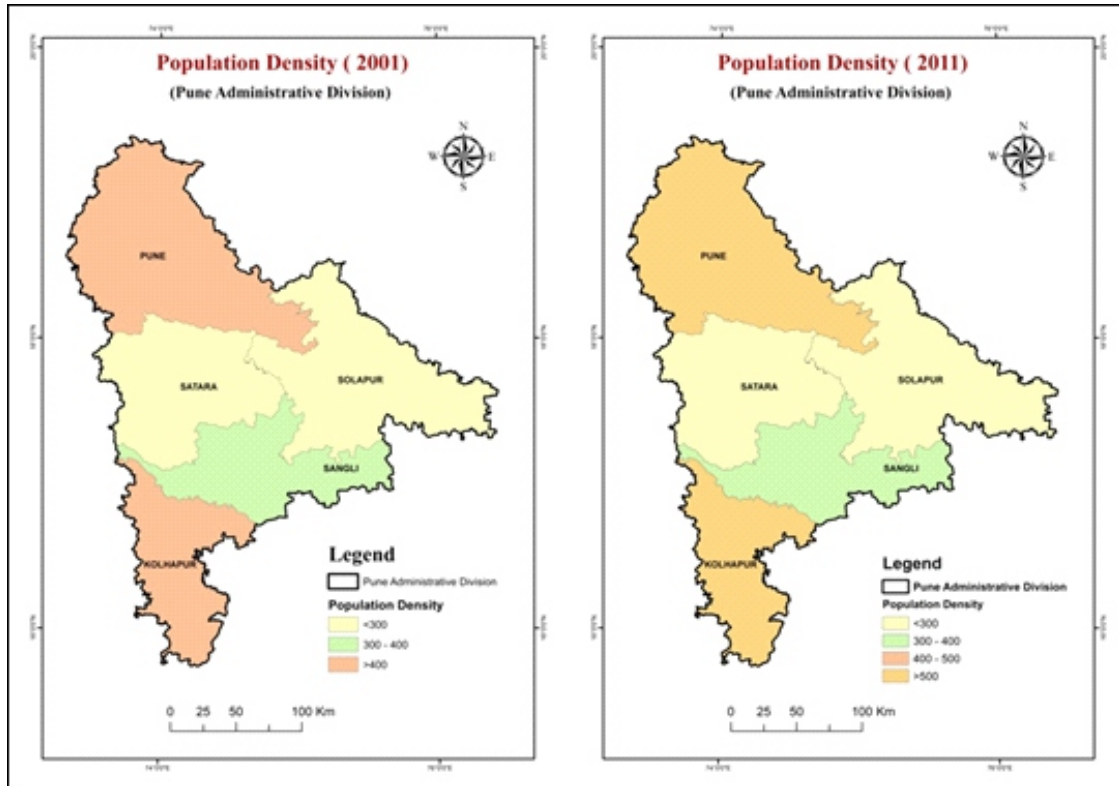
**Changes in the Population Density of Pune Administrative Division: 1901 to 2011**

Sr. No.	Districts	1901	1911	1921	1931	1941	1951	1961	1971	1981	1991	2001	2011
1	Pune	65	75	70	81	94	124	157	203	266	353	462	603
2	Satara	76	79	74	85	96	112	136	164	194	233	267	287
3	Sangli	70	71	69	82	94	116	143	179	213	258	301	329
4	Solapur	60	63	60	71	81	100	123	150	173	215	256	290
5	Kolhapur	105	108	101	116	133	162	198	254	310	370	437	504
6	Pune Division	75.2	79.2	74.8	87	99.6	122.8	151.4	190	231.2	285.8	344.6	402.6

Source: Compiled from Census of India of concerned year and concerned district

The figure 3 shows spatial distribution of population density and its overall shift from the year 2001 to 2011. There were two districts viz. Pune and Kolhapur which had highest population density i.e. more than 400 persons as per the census year 2001 which had been recorded an increased to more than 500 persons in the reference year 2011 (Fig. 3). Other districts in the study area i.e. Sangali, Satara

and Solapur shows no changes in the overall population density. Well the comparatively high density regions of Kolhapur and Pune districts are characterised by the established agricultural belt and supportive climatic and physiographic conditions that are favourable for the large scale development of agriculture and allied activities. Other than that the peak in the urban development in these regions are also responsible for the accumulation of high population densities. Whereas the moderate density areas of Sangli district and low density areas of Satara and Solapur districts lacks the sympathetic conditions for the development of those regions.



**Figure 3: Spatial Distribution of Population Density 2001 & 2011**

The sex ratio is another indicator of socio-economic development of any region. Although having moderate population density the Satara district shows high sex ratio comparative to the other districts in the study region i.e. 995 and 988 in the census year 2001 & 2011 respectively (Fig. 4). Other than that the sex ratio in Sangli district follows the same pattern which records 957 & 966 females per thousand males for the years 2001 & 2011 respectively. This phenomenon can be interpreted on the basis of migration. It has been observed that the sex ratio in Kolhapur and Pune districts is comparatively lower which indicates that mostly the male working population is being migrated for the selective work to these districts than that of females. The traditional view of an Indian society that the females are the caretakers of the homes can also be the responsible factor for having lowest sex ratio in the highly urbanised areas like Pune.

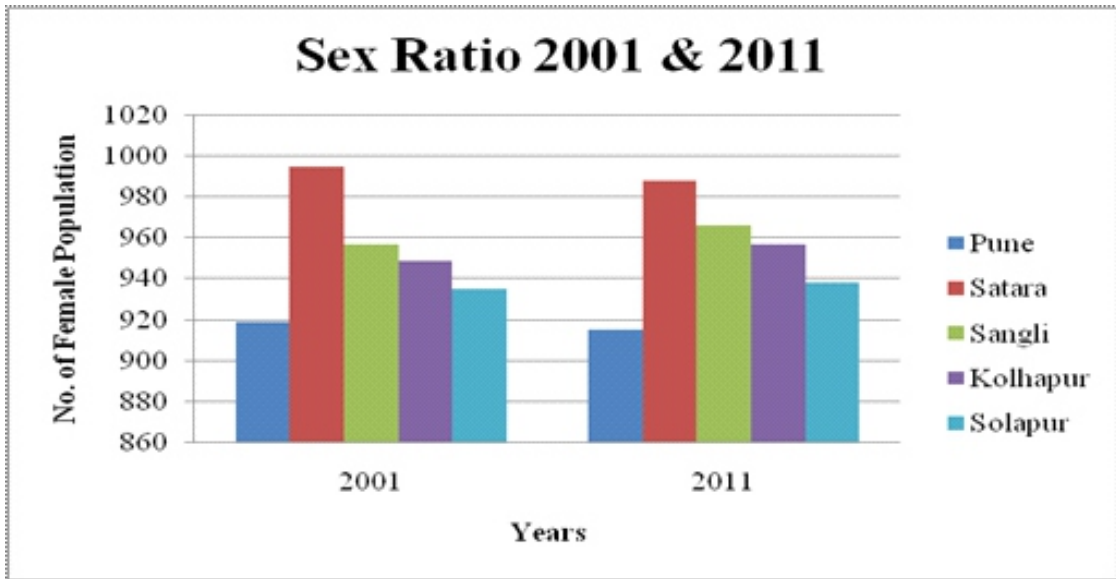


Figure 4: District-wise Distribution of Sex Ratio (2001 & 2011)

The spatial distribution of sex ratio in the reported year 2001 & 2011 shows that there were two districts viz. Satara and Sangli that was having highest sex ratio of more than 955 females per 1000 males.

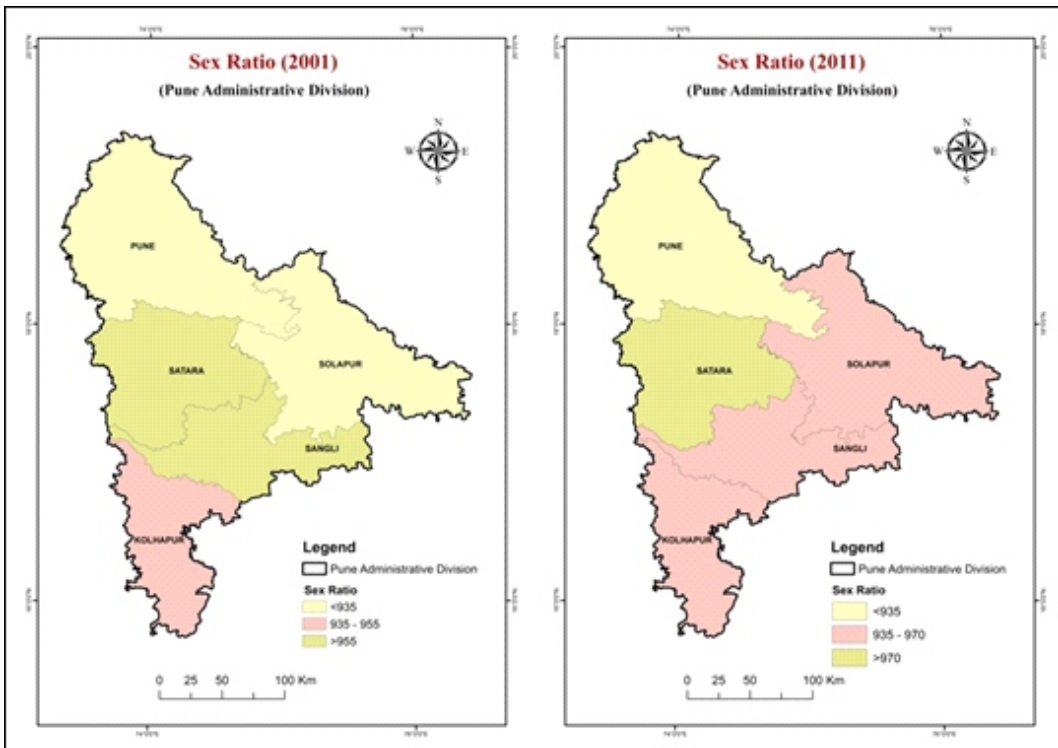
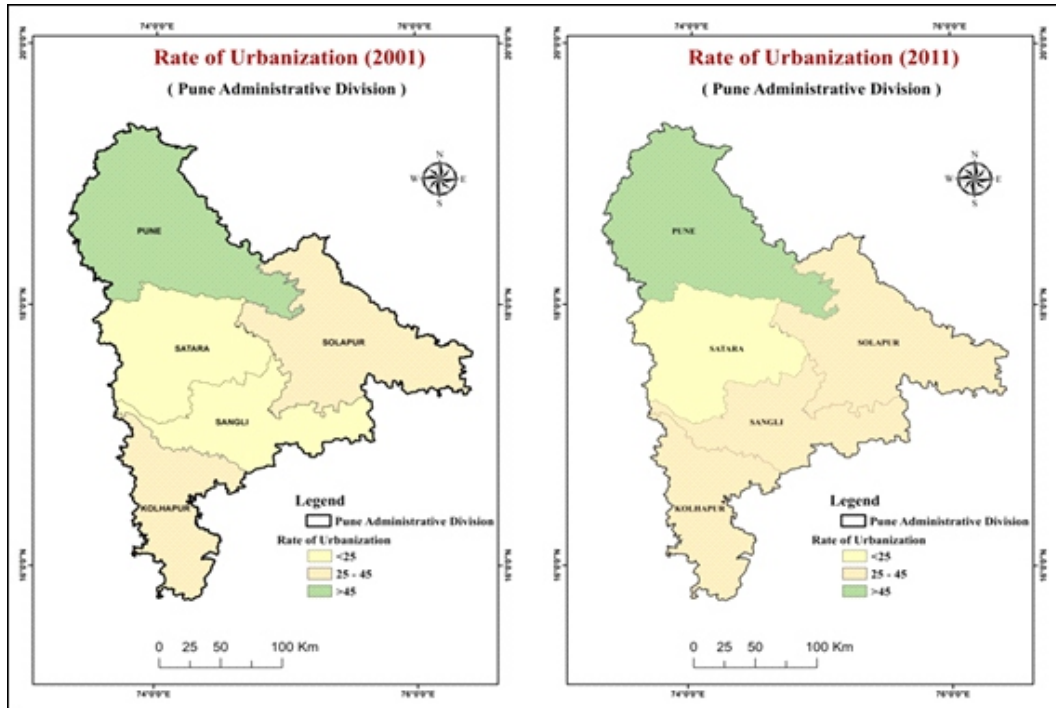


Figure 5: Spatial Distribution of Sex Ratio (2001 & 2011)

The degree of urbanisation is important to understand the spatial and temporal patterns of demographic characteristics. An urbanisation is also regarded as an important index for regional development which brings out socio-economic changes.



**Figure 6: Spatial Distribution of Urbanisation (2001 & 2011)**

There is a diversity found at the rate of urbanisation in the study region. The Pune district is highly urbanised supported by high level of industrial and economic activities. After that the Kolhapur district is in its emerging state of being urbanised (Fig. 6). In the year 2001, there were about 58% of population in Pune district living in an urban areas which is then increased to about 61% in the census year 2011. The lowest level of urbanisation i.e. 13.92% & 18.99% for the years 2001 & 2011 respectively is observed in Satara district. The lowest rate of urbanisation in Satara district is confined to its physiography. The Satara district is surrounded by hilly region and the major occupation is agriculture hence the rate of urbanisation seem to be lower than that of other parts of the study region. The occupational structure is dependent on the physiography, climatic characteristics, economic activities and rate of urbanisation in any region. The highly urbanised areas have most of the working population engaged in non-primary activities. Whereas, the favourable climatic and physiographic characteristics are the major aspects of agriculture and allied activities that result in most of the participation of working population in primary activities. In the reported years 2001 & 2011 the occupational structure of the study area shows minor alterations. The proportion of non-working population has been increased slightly by about 1% from the year 2001 to 2011 (Fig. 7).



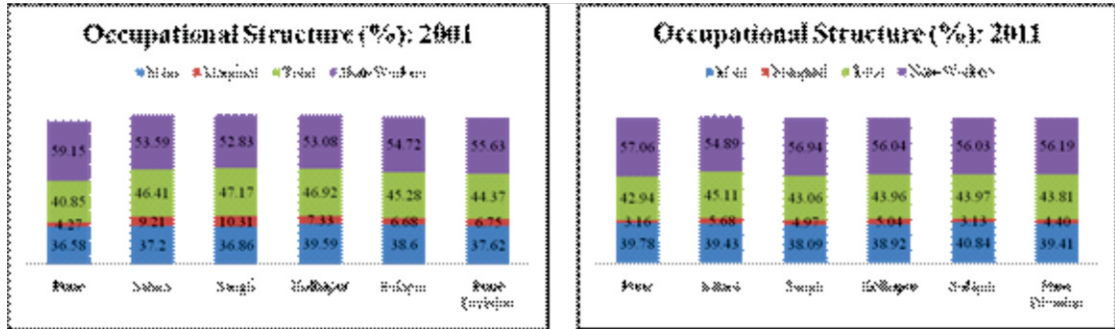


Figure 7: District-wise Occupational Structure (2001 & 2011)

A major proportion of marginal workers declined by about 2% for the reported years. This is because many marginal worker whom are working mostly in primary activities like agriculture shifted towards the non-primary activities.

### Conclusion

The present study reveals spatial and temporal patterns of demographic characteristics in the Pune administrative Division. We looked that there are variation in the reported demographic characteristics of Population Density, Sex Ratio, Rate of Urbanisation and Occupational Structure in the study area. This variation is a result of geographic factors like Physiography and Climate whereas, the other factors like industrial and infrastructural development are also responsible for the uneven distribution of population and density. The occupation structure also changes with the developmental factor which sometimes led to change the sex ration in some regions. Urbanisation is an important indicator of the economic development of any region and it also indicates the growth of secondary and tertiary sector. As far the economic activities are concerned in the present study area, rapid urbanisation is restricted to the central belt including the areas of Pune and Kolhapur districts. Overall it has been observed that the inter-district migration for employment is seems to have major impact on the changing demographic structure of the study area. Hence to overcome this issue there is a need to boost employment opportunities near to the native places so that the inter-district migration may be lowered. Considering the uneven distribution of resources and variation in topography it is recommended to have different developmental plans and programmes for each region so that hilly areas of Satara district, rain shadow regions of Solapur district etc. can be treated separately and hence a stable and even industrial and economic development may persevere.

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