

Unveiling the Changing Sex Ratio Trends in Karnataka, India: A Spatial Analysis

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Abstract: *This paper investigates the shifting trends and spatial patterns of the sex ratio among the districts of Karnataka state, India, encompassing both rural and urban areas. The sex ratio, a crucial indicator of population composition and women's status in society, serves as a key index for assessing regional development. The study reveals the impact of underlying socio-economic and cultural factors on the sex ratio, which has been consistently declining in the country. The research highlights the disparities in sex ratio not only at the overall level but also in rural and urban sectors. Understanding this disparity is essential to comprehend employment, consumption patterns, and social needs within communities. The study discloses an imbalanced sex ratio in Karnataka, with a continuous decline from 1901 to 2011, except for marginal improvements, leading to significant shortages of females in both urban and rural areas.*

Keywords: Sex Ratio, Rural and Urban Sector, Variations, Literacy, Regions and Spatio – Temporal

1. Introduction

Sex ratio of the human population is one of the basic demographic characteristics, which is extremely vital for any meaningful demographic analysis. Changes in sex ratio largely reflect the underlying socio-economic and cultural patterns of a society in different ways. Sex ratio defined here as the number of females per 1000 males in the population, is an important social indicator to measure the extent of prevailing equity between males and females in a society at a given point of time. It is mainly the outcome of the interplay of sex differentials in mortality, sex selective migration, sex ratio at birth and at times the sex differential in population. The sex ratio is an index of the economy prevailing in an area and is a useful tool for regional analysis (Franklin, 1956). So, a proper understanding of the sex composition of any population is essential.

The precise term *sex* may be described as an anatomical and psychological characteristic that symbolizes biological 'maleness' and 'femaleness' (Stoller, 1968). In geographical studies, the sex composition is expressed in terms of a ratio between the numerical strength of males and females in the total population. The possible balance in the number of men and women is an ideal condition for the population (Singh, 2010). Interestingly, even in nature, differences in male and female population size are not an issue of worry, but when these differences convert into inequality owing to the relevance of socially and ethnically assembled surroundings and chronological conditions, then it becomes a matter of great concern for every discipline. This drastic dissimilarity in both sexes leads to adverse demographic and social impacts (NIPCCD, 2008). As the two sexes play partly contrasting and corresponding roles in economy and society, the study of sex composition presumes additional importance for population geographers (Chandna, 1996).

Despite being one of the leading economies in the world, India is still burdened with a dilapidated sex ratio in both the child and adult populations. The UN organisation, in its report titled '*Sex Ratios and Gender Biased Sex Selection:*

History, Debates, and Future Directions, has also noticed this crisis and warned that there is a need for pressing deeds to assuage the moribund sex ratio, which has already reached emergency proportions (Dawn and Basu, 2015). In India, with growing prosperity, the tendency to have small families, mainly in urban areas, is continuously increasing in the new emerging society. The preference of a smaller number of children, especially males, as a security of their old, educated parents is more associated with determining the antenatal sexual category (Atkins, 1997; Brogen *et al.*, 2009; and Kalantry, 2013). It has been observed that new medical technology is widely used for illegal abortion rather than to assess the health status of the foetus (Arnold *et al.*, 2002), which supports the fact that sometimes the advancement of any technology can be a double-edged sword (Sharma, Kumar, and Kavita, 2018; Shetty & Shetty, 2014). Surprisingly but truly, the 2011 census of India found that there are many shocking incidences of atrocious killings (by poisoning, drowning, dumping in garbage, or starvation) of female children after birth with the active participation of female family members in some rural areas of the country (Majumdar, 2014). At the household level, certain domestic norms primed by society lead to giving healthier care to sons than daughters. This fact of giving a petite worth to girls adds to under nutrition and the unintentional results of excess female mortality and morbidity (Dasgupta, 1987). So, it is requisite to mitigate this disquieting deficiency of females because no nation, society, or commune can assert to be part of the civilised world and affirm cranium height while condoning the practice of prejudice against one significant half of the community.

The sex ratio is one of the important attributes of population composition. It is the best indicator of the status of women in society and an index to study the level of development in a region. It has recorded a continuous decline in the country. The declining sex ratio has already become a serious social problem and a rude shock to the demographers. The present study is coupled with the state of Karnataka, which is recognised not only for its economic development but also for being far behind in sexual characteristics. The main

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motive of this paper is to analyse the spatio – temporal analyses in sex ratio in Karnataka and its rural - urban dimensions. There is no doubt that the state having the satisfactory sex ratio compare with national average. As far as the sex ratio of rural and urban populations is concerned, it represents a contrastingly different pattern in comparison to western countries. Even our state, Karnataka, is showing more rural - urban differentials in the sex ratio. The study of this differential is essential for understanding the employment and consumption patterns, social needs, etc. of a community. Thus, the present study tries to analyse the in total, rural - urban differential in sex ratio in Karnataka state over space and time. It has been found that the sex ratio in the state is imbalanced and is continuously going to decline from 1901 to 2011 with slight variations, and both urban and rural areas are facing severe shortages of females over males. Hence, by analysing the sex ratio in districts of the state from the 1991 to 2011, our study intends to not only study the spatio - temporal analysis of the sex ratio but also its changes in rural and urban dimensions over the past three decades.

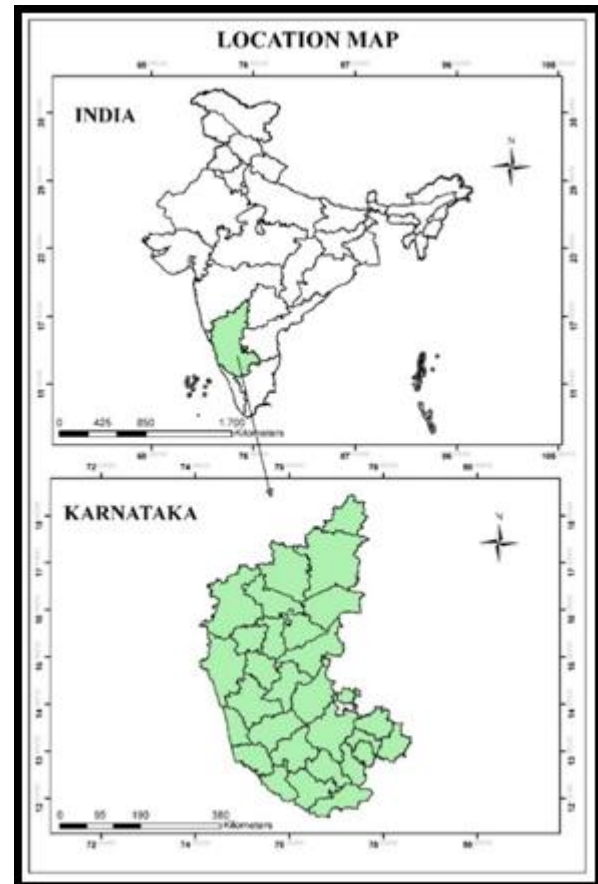
2. Objectives

The study of sex composition has vital significance for understanding the population structure and its eccentricity within any territorial area. Keeping this in mind, the present paper aims to find out the following objectives:

- To analyse the trends in sex ratio in Karnataka and India from 1901 to 2011.
- To examine the spatial and temporal variations in sex ratio in Karnataka between rural and urban areas and to find out the causes behind those variations.

3. Study Area

Karnataka is one of the developed states of India. It is located in the south - western part of the Indian peninsula and lies between $11^{\circ}31'$ to $18^{\circ}45'$ Northern latitude and $74^{\circ}12'$ to $78^{\circ}40'$ Eastern longitude. The state is bounded by Maharashtra and Goa from the north, Tamil Nadu and Kerala from the south, the Arabian Sea from the west, and Andhra Pradesh from the east (Map - 1). The Karnataka state extends for about 750 km from north to south and about 400 km from east to west. The total land area is 1.91.791 sq. km. It accounts for 5.83% of the total area of the country (32.88 lakh sq. km) and ranks 8th among the major states of India in terms of size. In 2011, the state had 30 districts, 176 Taluks, 29340 villages, 347 towns, and 22 Urban Agglomerations. The predominance of rural populations makes the state's economy primarily agrarian. More than 65 percent of the state's workforce, however, is still dependent on agriculture and its allied activities for their livelihood. The economic development and prosperity of the masses depend mainly on agriculture. It has witnessed rapid industrialization in the recent past, particularly after the launch of policies of economic liberalisation in the state.



Map 1: Location Map of Karnataka State in India

Karnataka state had a total population of 6, 10, 95, 297 in 2011, out of which 3, 09, 66, 657 were males and 3, 01, 28, 640 were females. The state occupies 9th place (5.05% of the country's total population) in India in terms of population. Out of thirty districts, only seven have registered decennial growth rates higher than the state average of 15.60 percent. Of the remaining 23 districts, as many as 14 districts have registered a growth rate below 10 percent. The population density was 319 persons per sq. km, and the level of urbanisation was 38.67 percent in 2011. The state has a 75.36 percent literacy rate, with a differential of 82.47 percent male literacy and 68.08 percent female literacy. The corresponding figures for urban and rural literacy rates are 85.78 and 68.73 percent, respectively. Among the districts of the state, Dakshina Kannada District, with an overall Literacy rate of 88.57 percent, retains its top position, closely followed by Bangalore District (87.67 percent) and Udupi District (86.24 percent). The lowest overall literacy rate of 51.83 percent is recorded in the newly created Yadagir district, preceded by Raichur district, which has recorded 59.56 percent. Apart from these two districts, all the remaining 28 districts have registered more than 60 percent literacy rates.

The sex ratio in the state has improved from 965 in 2001 to 973 females per thousand males, which is more than the national average; the rural sex ratio has improved from 977 in 2001 to 979; and the urban sex ratio has enhanced from 942 in 2001 to 963 in 2011, respectively. The increase in total sex ratio by 8 points and rural sex ratio by 2 points against the urban sex ratio increase of 21 points has a substantially larger gap in rural - urban differential sex ratio

in Karnataka state. It varies from 1094 in Udupi to 916 in Bangalore district. Out of thirty districts, 10 districts have a high sex ratio compared to the state average, while 20 districts are below the state average. Disparities in sex ratio exist not only overall but are also displayed in rural as well as urban sex ratios.

4. Materials and Methods

This study is based on secondary sources of data. Mainly, the following documents are used to obtain the required data related to the selected variables, such as the data about decadal change of sex ratio from 1971 to 2011, total, rural, and urban sectors in light of growth and distribution of the population of Karnataka state from the decades 1991 to 2011, collected from Karnataka PCA 1991, 2001, and 2011, Indian Census Handbook 1991, Indian Census Report 2001, and Census of India 2011, PCA Data Highlights, Series 30, Karnataka State, and other related reports. Many books, articles, various websites, dissertations, and published and unpublished works from different sources have been used.

The district has been considered the smallest unit of study. In 2011, the Karnataka state comprised 30 districts, but the information required for the present study was not available for the newly formed three districts, i. e., Ramanagar, Chikkaballapur, and Yadagir, in the 2001 census. Hence, the study has been used to restructure the 2001 population

census data into 30 districts instead of the old classification of 27 Districts in Karnataka state. After collecting data, these were compared and analysed suitably by using simple statistical and cartographic techniques along with Microsoft Excel and STATA 12. The analysis and inferences were finally carried out in textual and tabular formats, followed by maps with descriptions of the study results.

5. Results and Discussions

1) Trends of Sex Ratio in Karnataka and India:

Table - 1 and Fig. - 1 depict the overall and rural - urban differentiation in sex ratio in Karnataka and India. In 1901, the census statistics put the figure at 972, 979, and 910 females and 1000 males in total in rural and urban areas, respectively, whereas in Karnataka, this numeral was 983, 984, and 976 females. The successive censuses also recorded a fall in the sex ratio, with an increasing difference in rural and urban areas. In 1951, the overall sex ratio of India was 946 females per 1000 males, with a great decline of 26 females in total as compared to 1901, whereas it was 965 and 860 in rural and urban areas in that order. At the same time, the state had registered 966 females per 1000 males overall, 974 females in rural areas, and 941 females in urban areas. In India, the female - male ratio was 935 in total, 952 in rural areas, and 880 per 1000 males in urban areas in 1981, while these figures were 963, 978, and 926 females in Karnataka state at the same time.

Table 1: Rural - Urban Sex Ratio in Karnataka and India, 2001 – 2011

Census Years	Karnataka				India			
	Total	Rural	Urban	Rural - Urban Differentials	Total	Rural	Urban	Rural - Urban Differentials
1901	983	984	976	8	972	979	910	69
1911	981	984	960	24	964	975	872	103
1921	969	975	936	39	955	970	846	124
1931	965	972	927	45	950	966	838	128
1941	960	965	935	30	945	965	831	134
1951	966	974	941	33	946	965	860	105
1961	959	973	913	60	941	963	845	118
1971	957	971	913	58	930	949	858	91
1981	963	978	926	52	935	952	880	72
1991	960	973	930	43	927	939	894	45
2001	965	977	942	35	933	946	900	46
2011	973	979	963	16	943	949	929	20

Source: Primary Census Abstract, Karnataka, 2011.

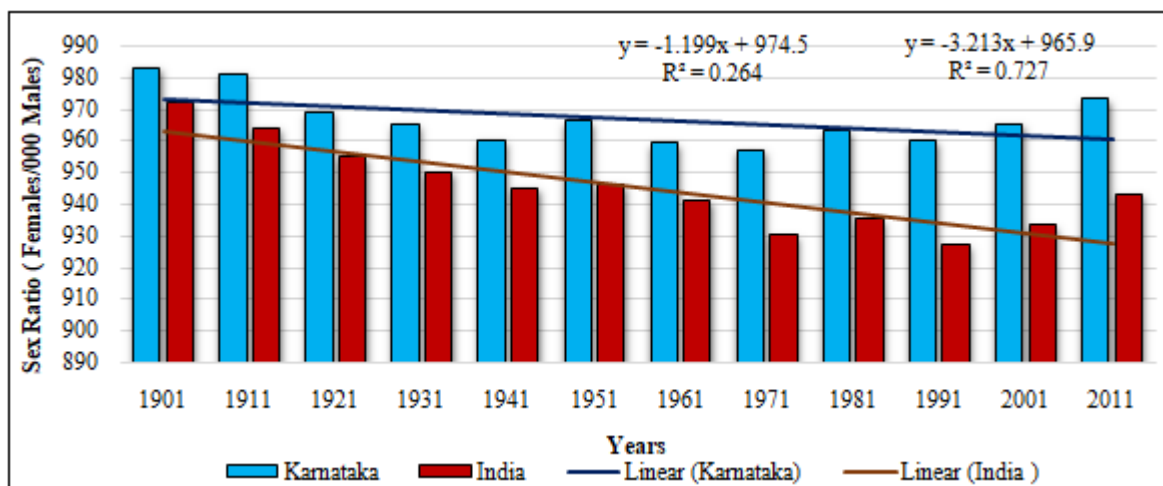


Figure 1: Sex Ratio in Karnataka and India; 1901 - 2011

The enumeration of the 2011 census revealed a minor improvement in the number of females per thousand males in all categories in India and Karnataka. It has been recorded that in 2011, the overall sex ratio of India was 943 females, compared to 933 females in 2001. The rural (949 females in 2011 from 946 females in 2001) and urban (929 females in 2011 from 900 females in 2001) sex ratios also increased, minimising the rural - urban difference of 26 females from 2001 (46 females) to 2011 (20 females). In 2011, there were recorded 973 females per 1000 males, compared to 965 in 2001 in total in the state. Rural and urban areas have also shown an upward trend in 2011 and 2001 and registered a

number of 979 and 963 females per 1000 males, respectively.

Fig.2 clearly reflects that continuously, the sex ratio has remained against women from 1901 to 2011 in both countries and states, and a slight difference in the sex ratio in all groups prior to independence has been recognised with severe gender discrimination after independence. The high female mortality due to famine and outbreaks of epidemics such as plague and influenza has been attributed to the fall in the sex ratio in the decades of 1901 to 1921.

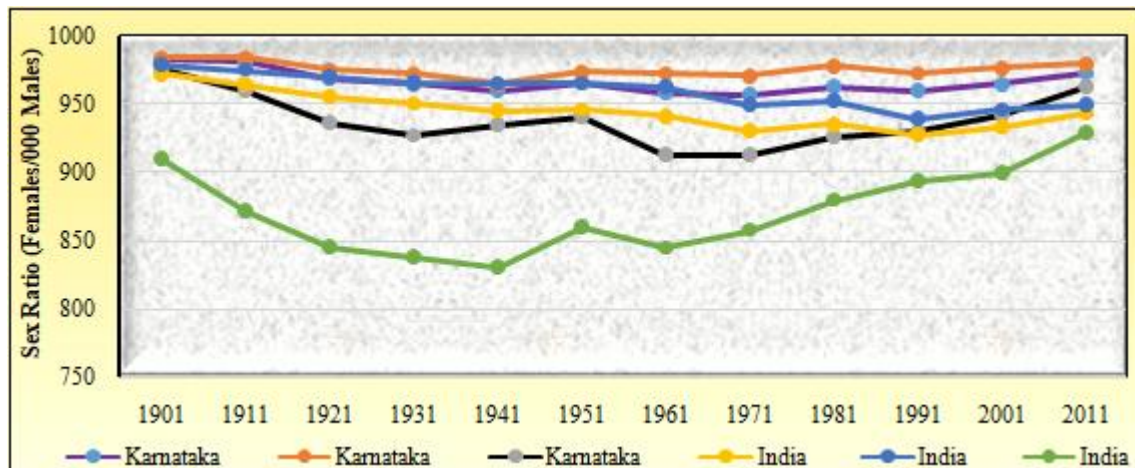


Figure 2: Rural-Urban Sex Ratio in Karnataka and India, 1901-2011

Further, the ignorance towards girl children and psychological and communal problems with women, which later lead to high mortality in adolescence and high maternal mortality, have been observed as major reasons behind the continuous failing sex ratio. The predetermination of sex and abortion following a prenatal diagnostic test is widely believed to be responsible contributors to this occurrence, and incidences of honour killing in some socially backward areas also support this. In the recent census, the availability of better medical facilities, living conditions, more attention to girls, and social change have contributed to some improvement in the sex ratio in the study area.

2) Spatio - Temporal Analysis of Sex Ratio in Karnataka:

The sex ratio in the country had always remained unfavourable to females. Moreover, barring some interruptions, it has shown a long term declining trend. The state not only has the lowest sex ratio in the country but has also observed an incessant fall in the number of females per thousand males. Table 2 depicts that there is a wide spatial disparity in total, rural, and urban sex ratios in the districts of Karnataka state. The state has witnessed marginal growth in the total and rural sex ratios and maximal growth in the urban sex ratio over the past decades. In continuation of the trend witnessed during the previous decades, the total sex ratio of the state has improved from 960 (927) in 1991 to 973 (943); the rural sex ratio has improved from 973 (939) in 1991 to 979 (949); and the urban sex ratio has enhanced from 930 (894) in 1991 to 963 (929) in 2011, respectively. The increase in total sex ratio by 13 points and rural sex ratio by 6 points against the urban sex ratio increase of 33

points has a substantially larger gap in rural - urban deferential sex ratio in Karnataka state.

The district - wise profile displays that in 1991, the overall sex ratio was highest (1133) in Udipi district, against the state average of 960 females (14 Districts above the state average). The highest ratio has been followed by Dakshina Kannada (1015), Hassan (999) and Bagalkot (982) districts, whereas the lowest proportion of sex ratio was recorded in Bangalore (903), Davanagere (933) and Dharwad (935) districts of the Karnataka state (Table 2). In rural areas, Udipi (1169) district again registered the highest sex ratio, followed by Dakshina Kannada (1024), Hassan (1012) and Raichur (989), whereas the lowest sex ratio is in Bangalore (906) followed by Haveri (934) and Dharwad (942) districts of the state. In urban districts, Udipi (1013) and Tumkur (893) have been listed as first and last districts of the state respectively.

The district - wise outline of the sex ratio shows that in 2001, the total sex ratio was again highest (1130) in Udipi district, against the state average of 965 (18 Districts above the state average) of the Karnataka state. The highest ratio has been followed by Dakshina Kannada (1022), Hassan (1004) and Kodagu (996) districts, whereas the lowest proportion of sex ratio was recorded again in Bangalore (908), Haveri (944) and Bangalore Rural (945) districts of the Karnataka state (Table 2). In rural sector, Udipi (1151) district again registered the highest sex ratio, followed by Dakshina Kannada (1033), Hassan (1013) and Kodagu (1003), whereas the lowest sex ratio is in Bangalore (913) followed by Haveri (942) and Dharwad (946) districts of the state. In urban sector, Udipi (1040) and Bangalore (907)

have been listed as first and last districts of the state respectively. Some of the important reasons are; Neglect of the girl child resulting in their higher mortality at younger

ages, High maternal mortality, Sex selective female abortions, Female infanticide and Change in sex ratio at birth.

Table 2: Spatio - Temporal Pattern of Sex Ratio in Karnataka; 1991 - 2011

Districts	1991			2001			2011		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
Bagalkot	982	987	968	980	984	970	989	987	994
Bangalore	903	907	902	908	913	907	916	877	920
Bangalore Rural	948	951	933	945	949	933	946	945	950
Belgaum	954	958	940	960	963	950	973	970	979
Bellary	965	972	948	969	975	957	983	980	988
Bidar	952	966	899	949	956	923	956	961	941
Vijayapur	948	953	925	950	951	950	960	954	981
Chamarajanagar	953	958	924	971	971	970	993	991	1003
Chikkaballapur	956	961	941	966	970	950	972	970	980
Chikkamagalur	977	985	938	984	990	960	1008	1008	1011
Chitradurga	951	957	919	955	957	948	974	969	994
Dakshina Kannada	1015	1024	997	1022	1033	1005	1020	1020	1020
Davanagere	933	951	910	952	957	939	972	970	977
Dharwad	935	942	928	949	946	951	971	948	989
Gadag	969	973	960	969	970	968	982	971	1001
Gulbarga	954	969	916	958	972	929	971	973	968
Hassan	999	1012	941	1004	1013	964	1010	1012	1003
Haveri	936	934	947	944	942	948	950	946	968
Kodagu	979	986	938	996	1003	955	1019	1022	1002
Kolar	973	976	964	977	977	977	979	973	992
Koppal	981	986	955	983	985	971	986	983	998
Mandya	963	969	935	986	990	967	995	993	1004
Mysore	953	957	946	964	962	967	985	978	996
Raichur	978	989	948	983	992	958	1000	1004	989
Ramanagar	943	945	935	964	969	945	976	976	975
Shimoga	960	969	937	978	983	967	998	995	1002
Tumkur	959	972	893	967	975	938	984	983	984
Udupi	1133	1169	1013	1130	1151	1040	1094	1114	1046
Uttara Kannada	966	968	959	971	971	969	979	977	982
Yadagir	979	983	962	982	986	965	989	990	984
State	960	973	930	965	977	942	973	979	963
India	927	939	894	933	946	900	943	949	929

Source: Computed from PCA Data Highlights, Series30, Karnataka State 1991, 2001 and 2011 published by Registrar General and Census Commissioner, GoI, New Delhi.

• **Distribution of Districts by Range of Sex Ratio of Total, Rural and Urban Karnataka State in 2001 & 2011:**

Table - 3 provides the distribution of districts by the different ranges of sex ratio and their share in the total population of the total, rural, and urban Karnataka state in 2001 and 2011. It can be clearly seen that the distributions of the number of districts and their share of population at the two decadal censuses have not been equitable in all ranges of sex ratio in Karnataka state. It is interesting to note that although the number of districts with a sex ratio less than 925 remains almost the same, the percentage share of this population has increased from about twelve percent to about sixteen percent. In contrast, the number of districts falling within the range of 926–950 slightly decreased from five to

two, and the share of the population extremely dropped from around fourteen percent to just four percent. Both the number of districts and share of the population falling within the range of 951–975 declined from twelve to eight and from around forty - two percent to twenty - nine percent, respectively. Similarly, the number of districts falling within the range of 976–1000 increased from nine to fourteen, but the share of this population also increased from around 23 percent to forty percent. Lastly, the number of districts falling within the range of more than 1001 and above marginally alters from three to five, but the share of this population elevates from around nine percent to eleven percent (Table - 3). The contribution of these last three groups of districts appears to be the acceptable reason for the increase in the total sex ratio in Karnataka state.

Table 3: Distribution of Districts by Range of Sex Ratio of Total, Rural and Urban Karnataka State in 2001 & 2011

Range of Sex Ratio	Share of Karnataka State					
	No of Districts	2001		No of Districts	2011	
		Population			Population	
1	2	Absolute	%	5	Absolute	%
Total	30	52850562	100.00	30	61095297	100.00

< 925	1	6537124	12.37	1	9621551	15.75
926 - 950	5	7203628	13.63	2	2588591	4.24
951 - 975	12	22421467	42.42	8	17933698	29.35
976 - 1000	9	11956701	22.62	14	24215546	39.64
1001 & above	3	4731642	8.95	5	6735911	11.03
Rural	30	34889033	100.00	30	37469335	100.00
< 925	1	777137	2.23	1	871607	2.33
926 - 950	3	2521066	7.23	3	2761830	7.37
951 - 975	14	18959851	54.34	9	13613926	36.33
976 - 1000	8	8666486	24.84	11	14075003	37.56
1001 & above	4	3964493	11.36	6	6146969	16.41
Urban	30	17961529	100.00	30	23625962	100.00
< 925	2	6104862	33.99	1	8749944	37.04
926 - 950	10	4350222	24.22	2	694696	2.94
951 - 975	15	6166289	34.33	3	1458811	6.17
976 - 1000	1	404501	2.25	15	9208733	38.98
1001 & above	2	935655	5.21	9	3513778	14.87

Sources: Computed from PCA Data Highlights, Series30, Karnataka State 1991, 2001 and 2011 published by Registrar General and Census Commissioner, GoI, New Delhi.

It would be interesting to note that the number of districts and their share of population with a sex ratio less than 925 and a range of 926–950 remained almost the same in 2001 and 2011 in rural Karnataka state. The number of districts falling within the range of 951–975 declined from fourteen to nine, but the share of this population sharply decreased from around fifty - four percent to thirty - six percent. In contrast, the number of districts falling within the range of 975–1000 increased from eight to thirteen, but the share of this population sharply increased from around twenty - five percent to thirty - eight percent. Similarly, the number of districts falling within the range of more than 1001 and above increased from four to six, but the share of this population slightly increased from around eleven percent to sixteen percent (Table 4). The contribution of these three groups of districts appears to be the realistic reason for the increase in rural sex ratio in Karnataka state.

It would be interesting to note that the number of districts with a sex ratio less than 925 changes from two to only one, and the percentage share of this population has increased from about 34 percent to about 37 percent in 2001 and 2011 in urban Karnataka state. Both the number of districts falling within the range of 926–950 and the range of 951–975 drastically declined from ten to two and fifteen to three, and the share of the population also decreased from around twenty - four percent to three percent and thirty - four percent to six percent, respectively. Similarly, both the number of districts and the percentage share of the population in the range of 976–1000 and more than 1001

and above augmented largely from only one to fifteen and from two to nine from about two percent to about thirty - nine percent and five percent to fifteen, respectively (Table 4). The contribution of these two groups of districts appears to be the plausible reason for the increase in urban sex ratio in Karnataka state.

• **Spatial Distribution of Sex Ratio in Karnataka; 2011:** Again, there are large variations in total, rural, and urban sex ratios in different districts of the Karnataka state. According to 2011 census figures, the state has 973 total sex ratios with a differential of 979 in rural and 963 in urban ratios; among the districts, it varies from 1094 in Udupi followed by Dakshina Kannada (1020), Hassan (1010), Chikkamagalur (1008) and Raichur (1000) districts to 916 in Bangalore district. Out of thirty districts, 20 districts have a high sex ratio, while 10 districts are below the state average. Disparities in sex ratio exist not only total but are displayed in rural as well as urban sex ratio also (Table 2). In rural sector, Udupi (1114) district again registered the highest sex ratio, followed by Kodagu (1022), Dakshina Kannada (1020), Hassan (1012) and Chikkamagalur (1008), whereas the lowest sex ratio is in Bangalore (877) followed by Bangalore (945), Haveri (946) and Dharwad (948) districts of the state. In urban sector, Udupi (1046) and Bangalore (920) have been listed as first and last districts of the state respectively. The graded distribution of sex ratio in Total, Rural and Urban Karnataka state as given in Table 4.

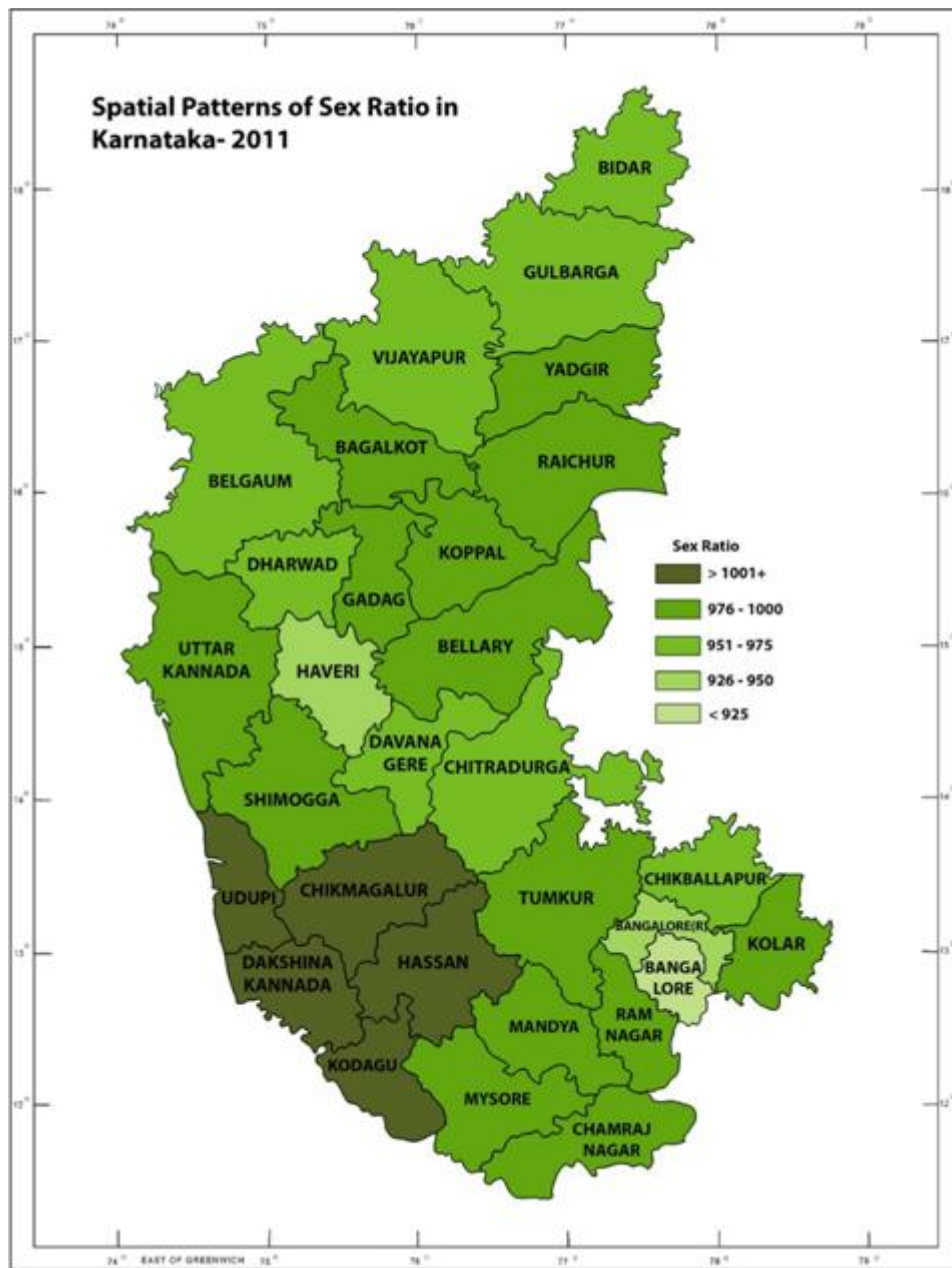
Table 4: Category wise Sex Ratio in Karnataka (2011)

Total Sex Ratio		Rural Sex Ratio		Urban Sex Ratio	
Ranges of Sex Ratio	No. of Districts	Ranges of Sex Ratio	No. of Districts	Ranges of Sex Ratio	No. of Districts
Very Low < 925	1 (3.33)	Very Low < 925	1 (3.33)	Very Low < 925	1 (3.33)
Low 926 - 950	2 (6.67)	Low 926 - 950	3 (10.00)	Low 926 - 950	2 (6.67)
Moderate 951 - 975	8 (26.67)	Moderate 951 - 975	9 (30.00)	Moderate 951 - 975	3 (10.00)
High 976 - 1000	14 (46.67)	High 976 - 1000	11 (36.67)	High 976 - 1000	15 (40.00)
Very High 1001 & above	5 (16.67)	Very High 1001 & above	6 (20.00)	Very High 1001 & above	9 (30.00)
Total	30		30		30

Sources: Based on Table - 3 and prepared by Author.

Out of thirty districts, only ten districts in the state have a higher total sex ratio than the state average, while the remaining twenty districts have a lower total sex ratio than the state average. These variations may be conveniently grouped into five grades (Table - 3 and Map - 2) to appreciate the spatial patterns in the total sex ratio in Karnataka state. The graded distribution of total sex ratio as given in Table 3 shows that only five districts (20.00 percent) of the state fall under the very high grade (1001 and above), covering the districts of Chikkamagalur (1008), Hassan (1010), Kodagu (1019), Dakshina Kannada (1020), and Udupi (1094) in the south - western part of the state and forming a perfect compact region. These districts have very high sex ratios, which are more than 37 to 121 points above the state average (973). The reasons for this high sex ratio are the high level of literacy, no discrimination among male and female babies due to educational facilities in rural areas,

and the fact that the rural population is more aware of the benefits of literacy. Fourteen districts (40.00 percent) of the state with a high sex ratio of 976 to 1000 form four separate regions in the eastern, southern, western, and extreme south - eastern parts of the state. The eastern region, which is relatively large, comprises the Gadag (982), Bellary (983), Koppal (986), Yadagir (989), Bagalkot (989), and Raichur (1000) districts of the state. The other five districts located in the southern part, namely Ramanagar (976), Tumkur (984), Mysore (985), Chamarajnagar (993), and Mandya (995) of the same grade, are compact in nature and form a definite region in the state. The Uttara Kannada (979) and Shimoga (998) districts of the state, also in the same grade, formed a definite region in the western part of the state. One only district placed in the extremely south - eastern part, namely, Kolar (979), of the same grade, is scattered in nature and fails to form a definite region in the state.



Map 2

About eight districts (30.00 per cent), which are close to the sex ratio of the state average (973) ranging from 951 to 975 points, are found to be grouped into a moderate grade of sex ratio regions, of which the important region covers Bidar (956), Vijayapur (960), Gulbarga (971), Dharwad (971), and Belgaum (973) districts in the north and north - western part of the state and forms a compact region. Another region located in the eastern part of the state comprises Davanagere (972) and Chitradurga (974) districts and forms a distinct region. One only district placed in the extremely south - eastern part, namely, Chikkaballapur (972), of the same grade, is scattered in nature and fails to form a definite region in the state.

Only two (6.67 percent) districts fall under the low grade of 926 to 950 sex ratios in the state. These districts are found to be grouped into two distinct regions, of which Bangalore Rural (946) district is in the south - eastern part of the state. The second region, though less prominent, lies in the central part and covers the entire Haveri (950) district of the state. The other district, viz., Bangalore (916) falls in the very low sex ratio grade (less than 925), is scattered in nature, and fails to form a notable region in the state.

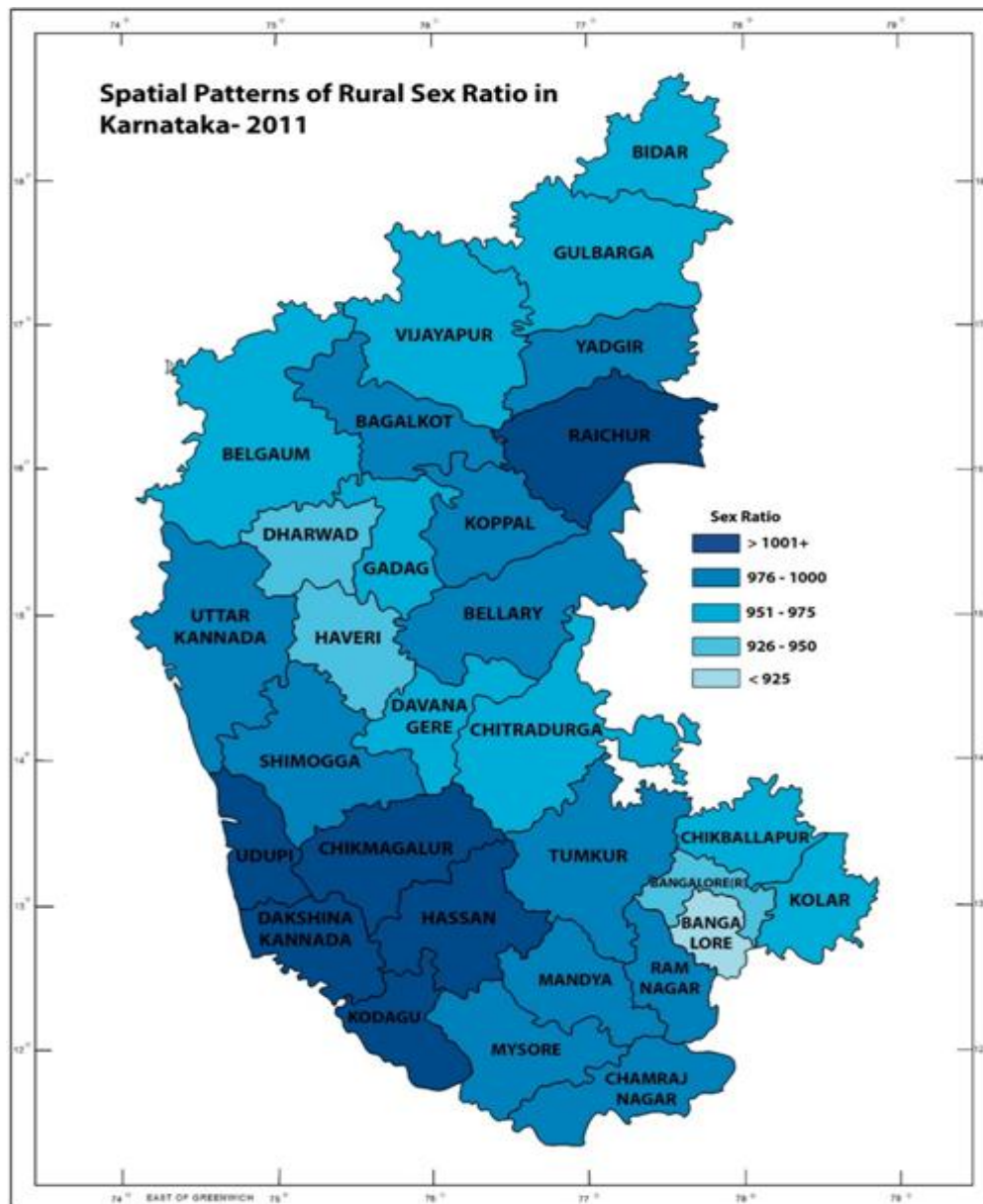
• **Spatial Distribution of Sex Ratio in Rural Karnataka; 2011:**

The sex ratio in rural areas is also marked by notable variations in its distribution among the districts of Karnataka state. The value of the sex ratio varies from 1114 in Udupi to 877 in Bangalore district, while the state average is 979. The value of the sex ratio in the rural sector of sixteen districts is

higher than the state average, while the rest are below the state average. The sex ratio in rural areas reflects a positive scenario in Karnataka state, which shows a sharp escalation from 977 in 1991 to 979 in 2011. These variations of sex ratio in rural areas may be conveniently grouped into five categories to understand the spatial patterns in rural areas of the state (Table - 4 and Map - 3).

The graded distribution of sex ratio in the rural sector as given in Table 2 shows that only six districts (20.00 percent) of the state fall under the very high grade (1001 and above) ratio and form two diverse regions in the state. One compact region is in the south - western part of the state, comprising the districts of Chikkamagalur (1008), Hassan (1012), Dakshina Kannada (1020), Kodagu (1022), and Udupi (1114); another only has one district, i. e., Raichur (1004), in the north - eastern part of the state and falls in the same grade but fails to form a definite region.

About eleven (40.00 percent) districts fall under the high grade of 976 to 1000 sex ratio in the rural sector of the state. These districts are found to be grouped into several regions, of which the most prominent one covers the Mandya (993), Chamarajnagar (991), Ramanagar (976), Mysore (978), and Tumkur (983) districts in the south - western part of the state. The second region lies in the eastern part and comprises Bagalkot (987), Koppal (983), and Bellary (980) districts of the state. The third region falls in the western part and covers Shimoga (995) and Uttara Kannada (977) districts of the state. The Yadagir (990) district, located in the north - eastern part, lies in a similar grade, but it fails to form a definite region in the state.



Map 3

Nine districts (30.00 per cent) that are close to the sex ratio in rural localities of the state average (979) ranging from 951 to 975 points are found to be grouped into a number of moderate regions, of which the most important region covers Vijayapur (954), Bidar (961), Belgaum (970), Gadag (971), and Gulbarga (973) districts in the north and north - western part of the state and formed a compact region. Another region located in the western part of the state comprises Chikkaballapur (970) and Kolar (973) districts and forms a distinct region. The other two districts located in the western part of the state, namely Chitradurga (969) and Davanagere (970), are of similar grade and form a distinct region.

Only three districts (6.67 percent) are located in the central part, namely Haveri (946), Dharwad (948), which have a low sex ratio in the rural sector of 926 to 950 and form a definite region, and Bangalore Rural (945), which falls in the same grade but fails to form a definite region in the state (Table 4). The districts of very low sex ratio (< 925) cover only one district (3.33 percent), namely Bangalore (877),

and have failed to form a region in the south - eastern part of the state.

• Spatial Distribution of Sex Ratio in Urban Karnataka; 2011:

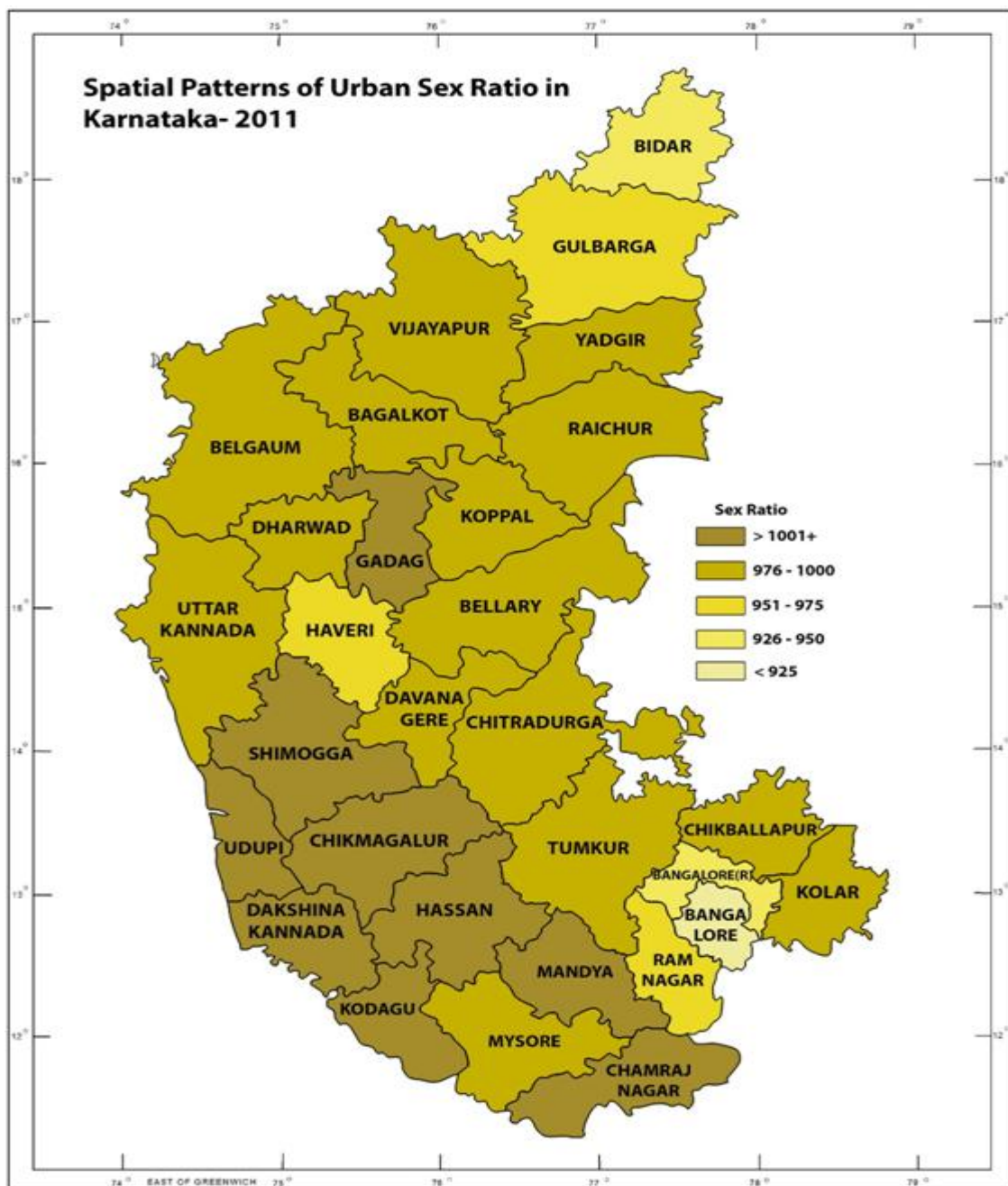
The sex ratio in the urban sector varies from 1046 in Udupi to 920 in Bangalore, with a state average of 963 in 2011. Out of thirty districts, only three districts in the state have a higher sex ratio in urban areas than the state average, while twenty - seven districts have a lower sex ratio in urban areas than the state average. Districts are grouped into five categories on the basis of the sex ratio in urban areas to realise the spatial patterns in the sex ratio in urban areas in Karnataka state (Table - 4 and Map - 4).

About nine (30.00 percent) districts fall under the very high grade of 1001 and above in the urban sector of the state. Except for Mysore, all others, such as Shimoga (1002), Kodagu (1002), Hassan (1003), Chamarajnagar (1003), Mandya (1004), Chikmagalur (1011), Dakshina Kannada (1020), and Udupi (1046), are in the central and south -

western parts of the state and form the most dominant region in the state. Gadag (1001) is the only district that falls under the same grade and is from an isolated region in the northern part of the state.

Fifteen districts (50.00 percent) of the state, i. e., Davanagere (977), Belgaum (979), Chikkaballapur (980), Vijayapur (981), Uttara Kannada (982), Yadagir (984), Tumkur (984), Bellary (988), Raichur (989), Dharwad (989), Kolar (992), Chitradurga (994), Bagalkot (994), Mysore (996) and Koppal (998), have a high (976 to 1000) sex ratio in the urban sector. These districts are found to be grouped into large and isolated regions, of which the most popular one covers fourteen districts located in the entire north (except Gadag and Haveri) and south - eastern parts of the state. The second region of the same grade, though isolated in nature, lies in the south and comprises the Mysore (996) district only of the state.

Only three districts (10.00 percent) of the state, i. e., Haveri (968), Gulbarga (968), and Ramanagar (975), have a moderate (951–975) sex ratio in the urban sector. These districts are found to be grouped into three small, isolated regions located in the central, north, and south - eastern parts of the state and scattered in nature, failing to form a notable region in the state. Only two (6.67 percent) districts fall under the low grade of 926 to 950 sex ratio in the urban sector of the state. Bidar (941) and Bangalore Rural (950) each fall under the same grade and are from an isolated region in the northern and south - eastern parts of the state. The very low grade (< 925) sex ratio in the urban sector is shown only in one district (3.33 percent), namely Bangalore (920), and forms an isolated region in the south - eastern part of the state.



Map 4

• **Changes in Sex Ratio in Karnataka State; 1991 - 2001 and 2001 - 2011:**

Table - 5 and Fig. - 3 shows the districts by the different ranges of changes of sexratio in the total, rural and urban Karnataka state in 1991 - 2001 and 2001 - 2011. It can be clearly seen that the changes of sex ratio in districts at two decadal census have not equitable in total, rural and urban sector of the Karnataka state. It is interesting to note that the number of districts with the changes of sex ratio more than - 15 was none of the district in 1991 - 2001 but only one district namely Udupi declined with 32 points in 2001 -

2011. In contrast, the number of districts falling within the range of changes between - 15 to 0 slightly decreased from four to only one district namely Dakshina Kannada declined with 4 points during the study period. The number of districts falling within the range of changes 0 to 15, marginally declined from twenty to eighteen, which shows, there is no visible alerts in the districts of the total sex ratio of the state. Similarly the number of districts falling within the range of changes 15 – 30, increased from six to ten districts of the Karnataka (Table - 5).

Table 5: Changes of Sex Ratio in Total, Rural and Urban Karnataka State; 1991 - 2001 and 2001 – 2011

Changes of Sex Ratio	1991 - 2001			2001 - 2011		
	No of Districts			No of Districts		
	Total	Rural	Urban	Total	Rural	Urban
More Than - 15	--	1	--	1 Udupi	2 Udupi & Bangalore	--
- 15 - 0	4	6	1	1 Dakshina Kannada	5	--
0 - 15	20	19	14	18	19	3 Udupi Bangalore, Uttar Kannada
15 - 30	6	4	11	10	4	10
30 & above	--	--	4	--	--	17
Total	30	30	30	30	30	30

Table - 5 also highlights the changes of sex ratio in the rural and urban sector of Karnataka state during the last two decades. It can be clearly seen that, there is no noticeable changes in rural sector compare to urban sector. In urban sector, the number of districts falling within the range of changes 30 and above increased from four to seventeen districts of the Karnataka state.

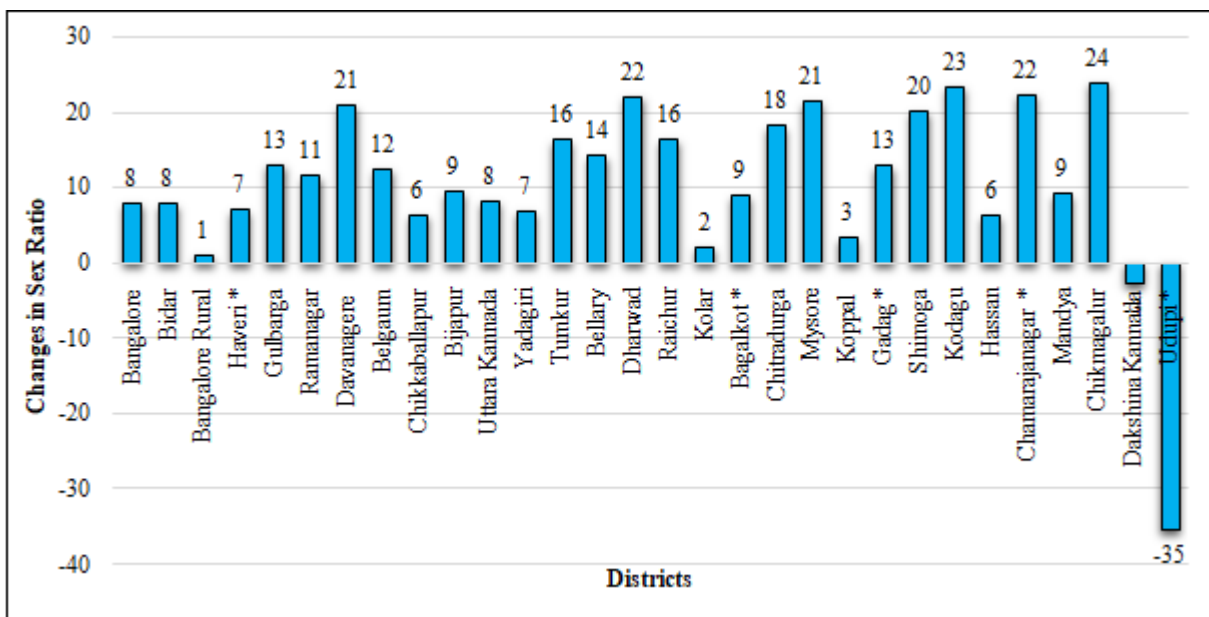


Figure 3: Changes in Sex Ratio in Total Karnataka State; 2001-2011

6. Conclusion

The sex ratio in Karnataka State improved from 960 in 1991 to 973 in 2011. The change in sex ratio in individual districts, however, is not uniform, and there is significant regional variation. Female literacy has a positive bearing on the sex ratio, and states that have a higher literacy rate show faster movement towards gender parity. Therefore, the higher the female literacy rate in a state, the greater the improvement in the sex ratio for every percent increase in female literacy. The above discussion is precise with the results that, during different decades, the state has witnessed a satisfied with sex ratio but also the slightly declining rate. Though there was some augmenting in female proportion

during the 2011 census, it does not mean that the current situation is less shocking because, in any category, not a single district of the state, has recorded sex ratio higher than the national average. Based on 2011, the state has 973 total sex ratio with a differential of 979 in rural and 963 in urban ratios; among the districts, it varies from 1094 in Udupi to 916 in Bangalore district. Out of thirty districts, 20 districts have a high sex ratio, while 10 districts are below the state average.

Disparities in sex ratio exist not only total but are displayed in rural as well as urban sex ratio also. In rural sector, Udupi (1114) district again registered the highest sex ratio, whereas the lowest sex ratio is in Bangalore (877) districts of the

state. In urban sector, Udupi (1046) and Bangalore (920) have been listed as first and last districts of the state respectively. The districts of the western and southern parts of the state, which are more developed in terms of many health and education indexes, have a superior sex ratio as compared to the northern and eastern districts, which are not only highly facilitating industrialization and urbanisation but also have a cluster of low literacy rates and are socially attentive.

The rural and urban sector in all districts also have a significant gap in the sex ratio. On one side, in urban areas and educated societies, sex - selective abortion is common, and several girls' children are not allowed to be born, while on the other side, in rural areas, the murder of girls is frankly prevalent under the names of dowry and fake honour, which is normally known as 'honour killing'. So, it has been summarised that a balanced demographic structure in terms of sex ratio in the state can be achieved only when women are empowered in assorted socio - economic and political arenas and every person in different social and cultural societies has a real and firm determination to stop discrimination between male and female children at home.

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