

# Population at Stabilisation in Districts of India

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## Abstract

A district in India is the lowest administrative unit for governance and for planning and programming development and welfare activities. Estimating district population at stabilisation, therefore, has implication for planning for a sustainable future society. This paper presents, for the first time, estimate of the population at stabilisation in 640 districts of the country as they existed at the 2011 population census, following the population growth modelling approach. The sum of the population at stabilisation in 640 districts of the country closely approximates the most likely upper limit of population growth in India projected by the United Nations. The time when the population of the district stabilises is, however, different in different districts as districts are at distinct stages of population transition. The paper also highlights the inter-district variation in the density of population and male-female balance in the population at stabilisation in each of the 640 districts.

## Background

A district, in India, is the third tier of the population and development administration system. Population and development policies India are conceptualised and programmed at the national level, customised at state/Union Territory level but implemented at the district level. The progress of population and development programmes and interventions at state/Union Territory level and national level is simply an aggregation of the progress at the district level. The Constitution of India mandates formation of District Planning Committee in each district to prepare district development plan in recognition of the inter-district diversity in all aspects of population and development with emphasis on the integration of population factors in the development planning process.

The only source of data about population and other demographic characteristics in India is the population census. India had the unbroken series of decennial population since 1881 through 2011. This unbroken series is now broken as the 2021 decennial population census could not be carried out because of the COVID-19 pandemic. In the absence of the 2021 population census, demographers, planners, and other stakeholders face the challenge of estimating the growth of district population. The usual approach to project district population beyond 2011, the last population census, is to apply the

population growth rate during 2001-2011 in each district to estimate population beyond 2011. This approach, however, does not reflect the complex empirical reality as the population growth rate may have changed with time. Estimating and projecting the population size and ascertaining the growth of population at the district level, however, is important for district level population and development planning and for monitoring the progress of the implementation of development and welfare activities.

In the absence of the 2021 decennial population census, attempts have been made in recent years to forecast or project district population beyond 2011 (Chaurasia, 2023; Dhar, 2022; ESRI India, 2023). These attempts have followed different approaches. Chaurasia (2023) has followed the modelling approach in which the population growth pattern in the district during 1951-2011 is modelled using the logistic growth curve and the resulting model has been used to forecast the population of the district for different years of the period 2011-2041. Dhar (2022), on the other hand, has used the ratio method (Smith et al, 2013) which expresses the population of a district as a proportion of the population of the country or the state/Union Territory to which each district belongs. The method used by Dhar (2022) apportions the population of the country projected by the Government of India after the 2011 decennial population census (Government of India, 2020) to estimate the population of districts for the period 2011-2036. The ESRI India (2023), on the other hand, has used the ratio of population change method to estimate district population with the population of the population projected by the Government of India as the reference. Verma (2023) has reviewed these three approaches of forecasting or projecting district population in India and has recommended the approach adopted by Chaurasia (2023) for forecasting or projecting district population as the approach is based on historical data on district population growth.

An advantage of the approach followed by Chaurasia (2023) is that it permits to obtain an estimate of the population of the district at stabilisation. Estimating the population at stabilisation is important for understanding the implications of long-term population growth for the economic and social well-being as well as safeguarding the environment at the district level. It is well-known that the environment that sustains the life on the planet Earth is being endangered primarily by human-driven processes and their synergistic interactions (Brooks et al, 2008). It is, therefore, imperative that the population at stabilisation in the districts is estimated to plan for a sustainable future society. Population stabilises when it stops growing. The upper limit of population size, therefore, is the population size at stabilisation. There has yet to be an attempt to estimate population at stabilisation in districts of India. The National Population Policy 2000 of India envisions stabilising population growth by the year 2045 at a level consistent with the requirements of sustainable economic growth, social development, and environmental protection by achieving the replacement fertility by the year 2010 (Government of India, 2000). The Policy is, however, silent about the size of the population at stabilisation. The population projections carried out by the Government of India, after the 2011 population census, project population of the country and its states and Union Territories up to the year 2036. Yet, the Policy is silent about the forecasted size of the population at stabilisation. This paper, makes, for the first time, an attempt to estimate the population at stabilisation in 640 districts of India as they existed at the 2011 population following the modelling approach adopted by Chaurasia (2023).

The present paper is divided into five sections including this background. The next section of the paper describes the data source used in the analysis. We have used male and female population enumerated at different decennial population censuses since 1951 in 640 districts of India as they existed at 2011 population census made available by the Registrar General and Census Commissioner of India. The third section of the paper outlines the approach adopted for estimating the population of the district at stabilisation. The approach is based on modelling population growth during the 70 years between 1951 and 2011 in each district. Estimates of the population at stabilisation in 640 districts are presented in section four of the paper. Section five presents the variation in the density of population at stabilisation across the 640 districts while section seven analyses the variation across districts in the sex ratio of the population of the district at stabilisation. The last section of the paper summarises the main findings and discusses their policy and programme imperatives.

## The Data

A major problem in modelling population growth in the districts of India is the increase in the number of districts at different decennial population censuses due to administrative reasons. At the 1951 population census, there were 316 districts in the country. This number increased to 640 at the 2011 population census and, today, there are 785 districts in the country (Government of India, 2024). The Registrar General and Census Commissioner of India has recently provided enumerated population of 640 districts, as they existed at the 2011 population census, at different population censuses beginning 1901. This district population dataset, spanning over a period of more 110 years, provides, for the first time, an opportunity to model district population growth and use the model to estimate the population at stabilisation in the districts of the country.

The present paper is based on the modelling of population growth in the 640 districts of the country during the period 1951-2011. We have not used the population of districts enumerated before 1951 for the purpose of modelling population growth for two reasons. First, enumerated population in many districts prior to 1951 has not been made available by the Registrar General and Census Commissioner of India. Second, the population growth pattern during 1901-1951 is found to be different from the population growth pattern during 1951-2011 in majority of the districts possibly because of the demographic discontinuity before and after 1951. Since the objective of the present paper is to estimate the size of the population of the district at stabilisation, we have modelled the district population growth based on the population enumerated at decennial population censuses beginning 1951 through 2011.

The population enumerated at decennial population censuses in India is known to be associated with several errors, including the error of omission and duplication at the time of enumeration. The Registrar General and Census Commissioner of India undertakes a post-enumeration survey after every decennial population census to estimate the error of omission and duplication at the time of the enumeration of the population. The post enumeration survey conducted after the 2011 population census has revealed that there was a net omission of around 23 persons for every 1000 persons enumerated at the 2011

population census (Government of India, 2014). There was an estimated undercount of 23.08 persons for every 1000 persons enumerated which was offset by an estimated duplication of 0.10 persons for every 1000 persons enumerated. The post enumeration survey, however, revealed that there was no statistically significant difference in the net omission rate by sex, although the net omission rate was comparatively higher in females than the net omission rate in males. The post enumeration survey has also revealed that the net omission rate was markedly higher in urban (29 persons per 1000 persons enumerated) as compared to the rural (20 persons per 1000 persons enumerated) areas of the country. A comparison of the net omission rate in the 2011 population census with that in the 2001 population census also reveals that there has been little change in the net omission rate in the enumeration of the population at the two decennial population censuses.

The Registrar General and Census Commissioner of India has not provided estimates of the net omission rate in the enumeration of the population for the states/Union Territories and districts of the country but provides estimates of the net omission rate for the five zones of the country – north zone, west zone, south zone, east zone, and central zone. These estimates suggest that the net omission rate in the 2011 population census was the lowest in the eastern zone but the highest in the central zone of the country (Government of India, 2014) and it is likely that the net omission rate varies widely from the zonal average across districts of each zone. The Registrar General and Census Commissioner of India has also not made any attempt to adjust the enumerated population for the estimated net omission error derived from the post enumeration survey. Since, district level estimates of the net omission rate are not available for different population censuses in the country beginning 1951, it is not possible to make any adjustment in the population of districts at different population census. We have, therefore, used the data made available by the Registrar General and Census Commissioner of India to model population growth in the districts of the country without any adjustment about the error of omission and duplication in population enumeration in different population censuses since 1951.

There are also some gaps in the population of districts enumerated at the 1951 and 1961 population censuses made available by the Registrar General and Census Commissioner of India. The enumerated population at the 1951 population census is not available for 42 of the 640 districts as they existed at the 2011 population census, whereas in 10 districts, the population enumerated at both 1951 and 1961 population censuses is not available. The population growth modelling exercise in 32 districts of the country has been based on the population enumerated at the 1961 through 2011 population censuses, whereas, in 10 districts, the modelling exercise is based on the population enumerated at the 1971 through 2011 population censuses. Since 1971, the enumerated population is available for all the 640 districts as they existed at the time of 2011 population census except for 27 districts in Assam where the 1981 population census could not be carried out. We have, therefore, estimated the population of the 27 districts of Assam in 1981 as the average of the population enumerated at the 1971 population census and the population enumerated at the 1991 population census. to estimate the population of the 27 districts of Assam for the purpose of modelling population growth.

## The Method

The method that we have followed assumes that population growth in a district follows an S-shaped growth trajectory which has three phases – an initial phase in which population increases exponentially; a middle phase in which population increases linearly; and a final phase in which population growth slows down and approaches an upper limit. The upper limit of population growth is the size of the population at stabilisation. There are different mathematical models that can characterise the S-shaped trajectory of population growth. These include, among others, the logistic growth model, the Gompertz growth model and the generalised logistic growth model. The logistic growth model is the simplest description of an S-shaped trajectory of population growth. It was first developed by Verhulst (1838) and later re-discovered independently by Pearl and Reed (1920). The model assumes that population grows exponentially under the constraint of an upper limit (Lotka, 1956). Application of the logistic growth model to describe population growth has a long history. It was a popular method of population forecasting in the past. Several studies have shown that the application of the logistic growth curve may often provide reasonably accurate forecast of the growth of the population (Dorn, 1950; Leach, 1981). In recent years, there has been a renewed interest in the logistic growth model to describe and forecast population growth (Hrytsiuk et al, 2023; Marchetti et al, 1996; Burg and Ausubel, 2023; Mondol et al, 2018; Shariff Ullah et al, 2019). Bhat (1999) had used the logistic growth model to forecast population of Delhi, the capital city of India. If the population growth in a district empirically follows the initial stages of the logistic growth curve, then the upper asymptote of the logistic growth model may provide a good estimate of the upper limit for district population growth which may be taken as the size of the population of the district at stabilisation.

The logistic growth model is defined as:

$$P_t = \frac{U-L}{1+e^{-r(t-t_m)}} + L \quad (1)$$

where

$P_t$  = the population at time  $t$

$L$  = lower asymptote of the model

$U$  = upper asymptote of the model

$r$  = intrinsic population growth rate

$t_m$  = the time of inflexion or the time when the population reaches half of the upper asymptote.

The intrinsic population growth rate  $r$  representing the “steepness” of the growth trajectory can be calculated from the time required for the population to grow from 10 per cent to 90 per cent of the upper asymptote,  $U$ , of the logistic growth model and is termed as the “characteristic time”, or  $\Delta t$  (Meyer et al, 1999). If  $P_1$  is 10 per cent of the upper asymptote,  $U$ , of the model, then

$$0.1 = \frac{P_1}{U} = \frac{1}{1+e^{-r(t_1-t_m)}} \text{ or } 9 = \frac{1}{e^{-r(t_1-t_m)}} \quad (2)$$

Similarly, if  $P_2$  is 90 per cent of  $U$ , then,

$$0.9 = \frac{P_2}{U} = \frac{1}{1+e^{-r(t_2-t_m)}} \text{ or } 9 = e^{-r(t_2-t_m)} \quad (3)$$

Equation (2) and (3) suggest that.

$$9 \times 9 = 81 = \frac{e^{-r(t_2-t_m)}}{e^{-r(t_1-t_m)}} = e^{r(t_2-t_1)} = e^{r \times \Delta t} \quad (4)$$

so that

$$r = \frac{\ln(81)}{\Delta t} \quad (5)$$

The upper asymptote,  $U$ , of the logistic growth model can be estimated using the three critical phases of logistic growth. There are several methods available to determine the critical points of the logistic growth curve (Passos et al, 2012). These include accelerating growth function method, tangent at the inflexion point method, segmented regression method; modified segmented regression method; non-significant difference method; and non-significant difference by simulation method (Passos et al, 2012). We have used the tangent at the point of inflexion method, as found by the first derivative, to estimate the parameters of the logistic growth model (1). If  $s$  is the slope of the population growth trajectory when the population growth is maximal, then the size of the population at the point of intersection of the tangent at the inflexion point with the upper asymptote,  $K$ , can be approximated by

$$K = \frac{4 \times s}{r} \quad (6)$$

$K$  is, however, an underestimate of the upper asymptote  $U$  of the model (1) or the upper limit of population growth. Forecasting population growth using  $K$  as the upper asymptote of the model (1) has, therefore, substantial impact on the population forecast based on the logistic growth model (Smith et al, 2013). It can, however, be shown for the logistic curve that (Passos et al, 2012)

$$U = K \times (1 + \exp(-2)) \quad (7)$$

We have used the open source Loglet software package to fit the logistic growth model (1) to the population growth data (Burg et al, 2023). The fits were performed for each of the 640 districts for the period 1951-2011. The software provides estimate of  $K$  for each district from which the upper asymptote of the model (1) or the population at stabilisation in each of the 640 districts in conjunction with equation (7). The software also provides estimates of mean absolute percentage error (MPAE), goodness-of-fit statistics (RSS and RMS) and the coefficient of determination,  $R^2$ , to test the appropriateness of the logistic growth model (1) in describing the pattern of population growth in each of the 640 districts of the country. Although,  $R^2$  is not regarded as an appropriate measure for ascertaining the appropriateness of the fit in nonlinear models such as the logistic growth model (Spiess and Neumeyer, 2010), yet it can be used to test the appropriateness of fit in the present case because the logistic growth model can be transformed into a linear model through the Fisher-Pry transformation (Fisher and Pry, 1971). We found that the model has provided good fit to population growth during 1951-2011 in all but a few districts of the country so that the upper asymptote of the model represents an estimate of the upper limit of district population growth or population of the district at stabilisation.

## Modelling District Population Growth

We have applied the logistic growth model (1) to model population growth during 1951-2011 in each of 640 districts of India. Detailed results of the modelling exercise are given elsewhere (Chaurasia, 2023). In each district, male and female population growth was modelled separately. The parameters of the model (1) as well as the mean absolute per cent error (MAPE) and the coefficient of determination  $R^2$  is found to varied across districts. Table 1 summarises variation in  $R^2$  and in MAPE across districts which suggests that the model has provided very good fit to population growth during 1951-2011 in all but a few districts. The MAPE is less than 0.05 in the male population in 578 districts and in 575 districts in the female population. Similarly, the linear  $R^2$ , is 0.90 and more in the male population in 620 districts and in 611 districts in the female population. There are only 3 districts where linear  $R^2$  is less than 0.80 in the male population and in 4 districts in the female population. Out of these 7 districts, 4 are in the north-eastern part of the country while 3 are in Nagaland alone. Similarly, the MAPE is found to be 10 per cent and higher in 10 districts in case of male population and in 8 districts in case of female population. One reason of relatively poor goodness of fit statistics of the logistic growth model (1) to population growth during 1951-2011 in these districts is either very rapid increase or very rapid decrease in the population enumerated at successive decennial population censuses. For example, in district Kiphire in Nagaland, the enumerated population more than doubled between the 1991 and the 2001 decennial population censuses but the increase in population slowed down considerably between the 2001 and 2011 decennial population censuses, On the other hand, in two districts in the National Capital Territory of Delhi – Central district and New Delhi district – the enumerated population has either remained virtually unchanged or even decreased during the 60 years between the 1951 and the 2011 population censuses. It appears that the imperfect fit of model (1) to population growth in these districts is due to very large fluctuation in the population enumerated at different population censuses since 1951. We have, however, assumed in the present analysis that population growth during 1951-2011 in these districts has also followed the logistic growth model and used the upper asymptote of the logistic growth model to obtain the size of the population at stabilisation in these districts.

Table 1: Results of fitting of the logistic growth model to population growth in districts, 1951-2011. Variation in MAPE and  $R^2$  across districts.

MAPE			$R^2$		
Range	Males	Females	Range	Males	Females
<0.02	206	202	>=0.95	558	520
0.02-0.04	315	305	0.90-0.95	62	91
0.04-0.06	80	94	0.85-0.90	10	19
0.06-0.08	21	22	0.80-0.85	5	4
0.08-0.10	8	7	<0.80	3	4
>= 0.10	10	8			
No data	2	2	No data	2	2
Total	640	640	Total	640	640

Source: Authors

## Population of Districts at Stabilisation

Estimates of the size of the population at stabilisation in 640 districts of the country are presented in the appendix table. The population of district Thane in Maharashtra is expected to stabilise at around 18 million which will be the largest population at stabilisation among the 640 districts of the country. On the other hand, the population of district Dibang Valley in Arunachal Pradesh is expected to stabilise at less than 9 thousand, which will be the smallest at stabilisation among the 640 districts. In 8 districts of the country, the size of population at stabilisation is likely to be more than 10 million whereas in 15 districts, the size of the population at stabilisation will be less than 100 thousand. The proportionate increase in population between the population enumerated at the last 2011 population census and the population estimated at stabilisation will be the highest in district Kurung Kumey of Arunachal Pradesh but the lowest in district Mamit of Mizoram. In majority of districts, however, the proportionate increase in population between the population enumerated at the 2011 population census and the population at stabilisation is expected to range between 20-40 per cent. There are only 24 districts in the country where the proportionate increase in population between the population enumerated at the 2011 population census and the population at stabilisation will be more than 60 per cent. There are only 7 districts, where the population at stabilisation will be more than two times the population enumerated at 2011 population census. These districts are Gurgaon in Haryana, Gautam Budh Nagar in Uttar Pradesh, Kurung Kumey in Arunachal Pradesh, Senapati in Manipur, Daman in Daman and Diu, Dadra and Nagar Haveli, and Yanam in Puducherry.

Aggregating the estimated population at stabilisation of the 640 districts, the population at stabilisation of the country India is estimated to be around 1620 million – around 828 million males and 792 million females (Table 2). This estimate of the population at stabilisation of the country is very close to the estimate of the population the country when it stops increasing according to the medium variant of the population projection for India prepared by the United Nations (2022) and the population of the country projected by Kulkarni (2021). According to the most likely medium variant of the population projection for India prepared by the United Nations, the population of the country is projected to peak to around 1697 million (United Nations, 2022). On the other hand, Kulkarni (2021) has projected that the population of the country will peak at around 1660 million. The closeness of our estimate of the upper limit of population growth or the population at stabilisation in the country based on through the bottom-up approach of adding population at stabilisation in the districts of the country with the likely upper limit of population growth in India projected by the United Nations (2022) and by Kulkarni (2021) provides the credence to the modelling approach adopted in this paper for estimating the size of the population at stabilisation in the districts of the country. Our estimates suggest that at stabilisation, the population of the country is expected to be around 409 million more than the population of the country enumerated at the 2011 population census, or the population of the country is likely to increase by more than 37 per cent from the population enumerated at the 2011 population census before it will stop increasing or will stabilise. This increase in population will be more than the population of the country enumerated at the 1951 population census.



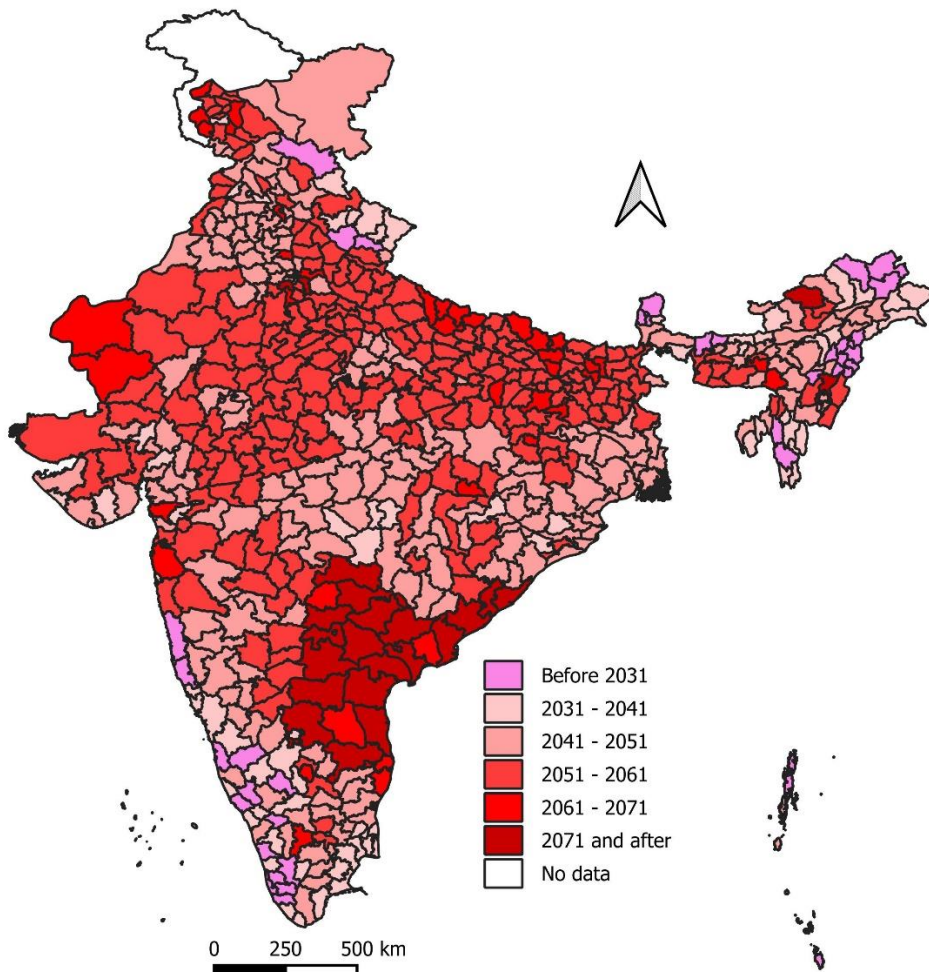


Figure 1: The year when 99 per cent of the upper limit of population growth will be achieved in districts of India.

Source: Author

Table 2 gives the population at stabilisation in states and Union Territories of the country. The population at stabilisation in Uttar Pradesh, the most populous state of the country, is estimated to be around 280 million whereas population at stabilisation in Bihar will be around 150 million. On the other hand, population at stabilisation in the Union Territory of Lakshadweep is likely to be around 78 thousand. In Dadra and Nagar Haveli, Arunachal Pradesh, Daman, and Diu, the population at stabilisation is expected to around 150 per cent higher from the population enumerated at the 2011 population census. In 6 states/Union Territories, the population at stabilisation is expected to be more than 40 per cent higher than the population enumerated at the 2011 population census. It is also estimated that more than 40 per cent of the increase in population of the country before it

stops increasing would be confined to only three states – Uttar Pradesh (20 per cent), Bihar (11 per cent), and Maharashtra (9 per cent). By comparison, the increase in population by the time it stabilises or stops increasing in Kerala and Jammu and Kashmir is estimated to account for less than 1.5 per cent of the increase in the population at stabilisation of the country or before the population stops increasing. The differential contribution of the increase in the population of different states and Union Territories to the increase in the population of the country before it stops increasing will be different in different states as states/Union Territories are at distinct stages of population transition.

Table 2: Population at stabilisation (million) in the states and Union Territories of India and increase in population (million) since 2011.

Country/State/Union Territory	Male	Female	Person	Increase since 2011	
				Number	%
Jammu and Kashmir	9.731	8.568	18.298	5.757	45.9
Himachal Pradesh	4.372	4.231	8.603	1.738	25.3
Punjab	18.642	16.677	35.319	7.576	27.3
Chandigarh	0.768	0.637	1.406	0.350	33.2
Uttarakhand	6.761	6.780	13.541	3.455	34.2
Haryana	19.458	17.126	36.585	11.233	44.3
National Capital Territory of Delhi	11.849	10.603	22.453	5.665	33.7
Rajasthan	48.831	45.809	94.640	26.092	38.1
Uttar Pradesh	143.462	136.91	280.373	80.560	40.3
Bihar	77.872	72.306	150.178	46.078	44.3
Sikkim	0.388	0.349	0.737	0.127	20.7
Arunachal Pradesh	1.825	1.718	3.543	2.159	156.1
Nagaland	1.333	1.241	2.574	0.595	30.1
Manipur	2.067	2.068	4.135	1.279	44.8
Mizoram	0.669	0.676	1.345	0.248	22.6
Tripura	2.304	2.210	4.514	0.840	22.9
Meghalaya	2.143	2.180	4.323	1.356	45.7
Assam	19.634	19.151	38.785	7.579	24.3
West Bengal	58.455	55.814	114.269	22.993	25.2
Jharkhand	23.123	22.094	45.217	12.229	37.1
Odisha	26.202	25.741	51.942	9.968	23.7
Chhattisgarh	16.778	16.715	33.492	7.947	31.1
Madhya Pradesh	50.124	47.396	97.52	24.893	34.3
Gujarat	42.875	38.164	81.039	20.600	34.1
Daman and Diu	0.415	0.187	0.602	0.359	147.6
Dadra and Nagar Haveli	0.597	0.286	0.884	0.540	157.1
Maharashtra	77.684	72.676	150.36	37.986	33.8
Andhra Pradesh	53.758	53.574	107.332	22.751	26.9
Karnataka	40.524	39.600	80.124	19.029	31.1
Goa	0.887	0.874	1.761	0.303	20.7
Lakshadweep	0.040	0.038	0.078	0.014	21.5
Kerala	18.898	20.612	39.51	6.104	18.3
Tamil Nadu	44.423	47.155	91.578	19.431	26.9
Puducherry	0.894	1.084	1.977	0.729	58.4
Andaman and Nicobar Islands	0.257	0.225	0.482	0.101	26.7
India	828.043	791.476	1619.519	408.664	33.7

Source: Authors

## Population Density at Stabilisation

The Northeast district in the National Capital Territory of Delhi will be having the highest density of population at stabilisation – more than 46 thousand persons per square Kilometre compared to 36 thousand persons per square Kilometre in 2011 (Figure 2). In 14 districts, density of population at stabilisation will be more than 10 thousand persons per square Kilometre. In districts Yanam, Chandigarh, Hyderabad, Mumbai, Mumbai Suburban, Kolkata, and Chennai, the density of population at stabilisation will be exceptionally high which will have implications for the demand of resources, development of necessary infrastructure and facilities, and the environment. By contrast, density of population at stabilisation will be less than 100 persons per square Kilometre in 47 districts and will be just around 1 person per square Kilometre in district Dibang Valley of Arunachal Pradesh.

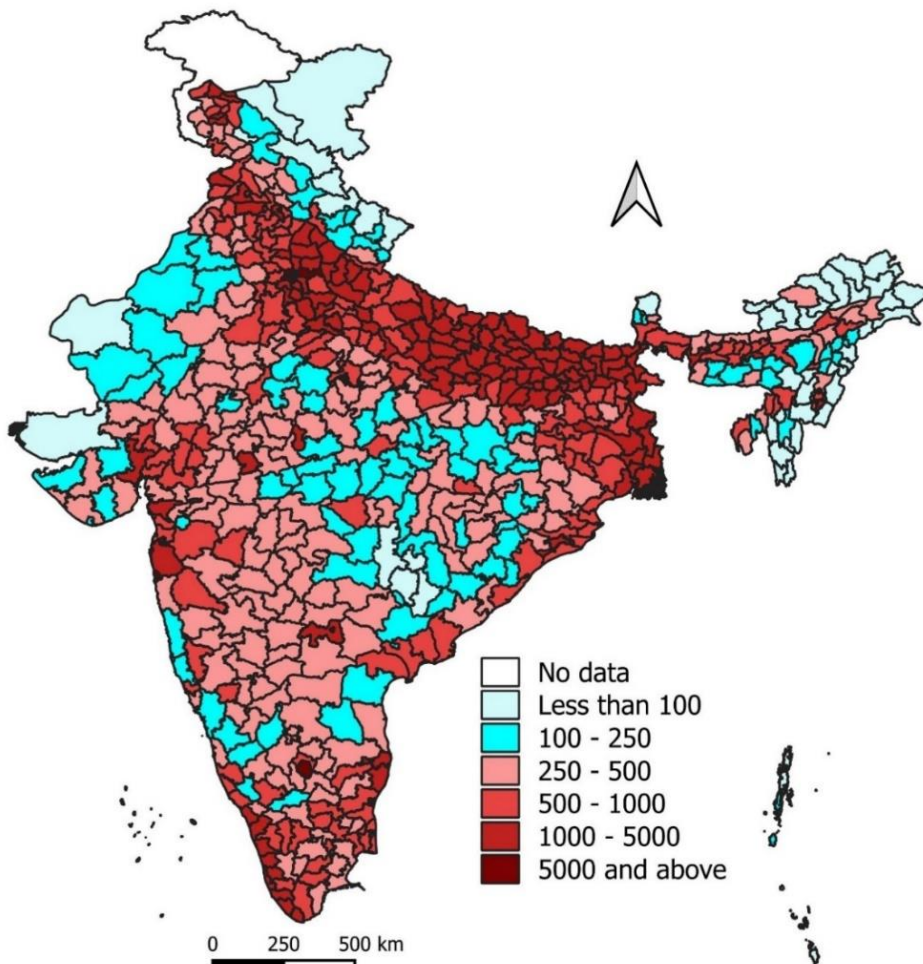


Figure 2: Population density at stabilisation in districts of India.

Source: Authors

## Population Sex Ratio at Stabilisation

In 118 districts, there will be very high male advantage in the population at stabilisation but in 18 districts, there will be very high female advantage. In most of the districts, however, the sex ratio of population at stabilisation will vary between 95-105 males for every 100 females so that sex ratio of population at stabilisation of the country will be around 105 males for every 100 females but there will be variation across states/Union Territories. The population at stabilisation of Union Territories of Daman and Diu and Dadra and Nagar Haveli is likely to have very high male advantage whereas the population at stabilisation of the Union Territory of Puducherry is likely to have very high female advantage. There will be female advantage in the population at stabilisation in the southern region but male advantage in the northern region of the country.

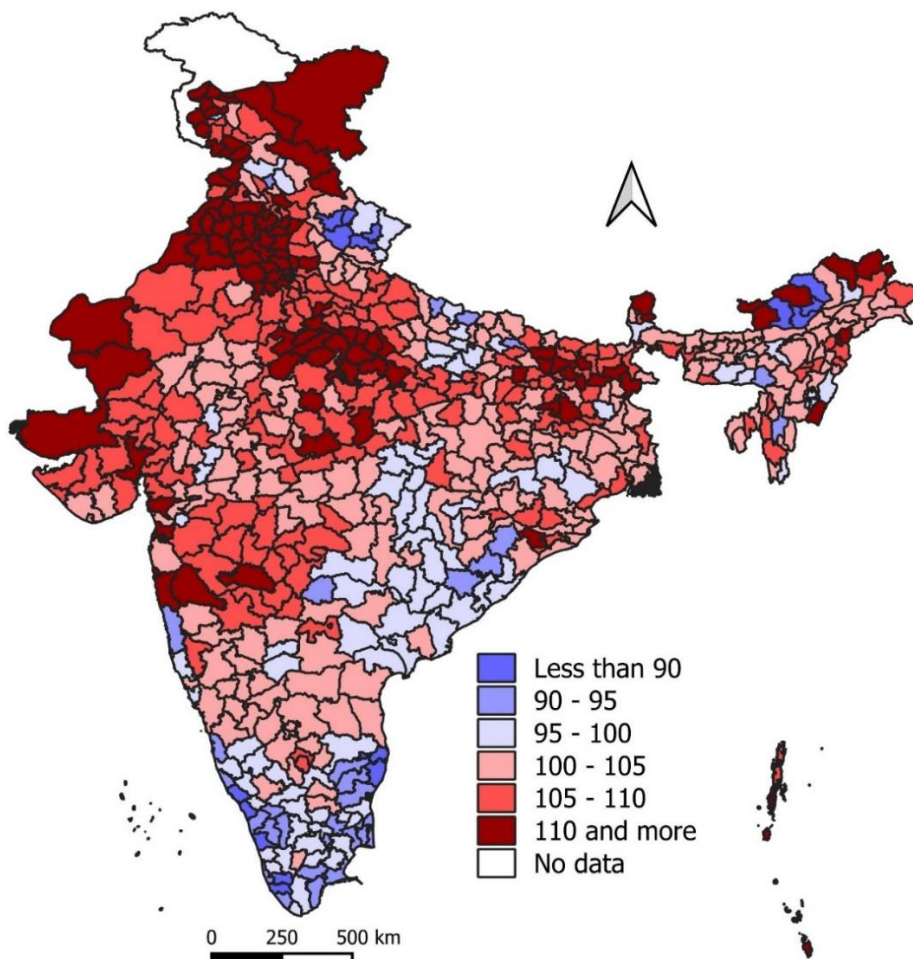


Figure 3: Population sex ratio at stabilisation in districts of India.  
Source: Authors

Table 3: Distribution of sex ratio of population at stabilisation (number of males per 100 females) in the districts of India, and in the districts of states/Union Territories of the country.

		Number of districts having						
Country/State/Union Territory	Sex ratio	Female advantage at stabilisation			Male advantage at stabilisation			Total
		High <90	Moderate 90-95	Average 95-100	Average 100-105	Moderate 105-110	High ≥110	
Andaman & Nicobar Islands	114	0	0	0	0	1	2	3
Andhra Pradesh	100	0	1	11	9	2	0	23
Arunachal Pradesh	106	4	0	1	4	2	5	16
Assam	103	0	0	2	23	2	0	27
Bihar	108	0	1	0	10	18	9	38
Chandigarh	121	0	0	0	0	0	1	1
Chhattisgarh	100	0	0	9	8	1	0	18
Dadra & Nagar Haveli	209	0	0	0	0	0	1	1
Daman & Diu	222	0	0	1	0	0	1	2
Delhi	112	0	0	0	0	2	7	9
Goa	102	0	0	1	1	0	0	2
Gujarat	112	0	0	1	7	14	4	26
Haryana	114	0	0	0	0	4	17	21
Himachal Pradesh	103	0	1	2	3	3	3	12
Jammu and Kashmir	114	0	0	1	1	6	14	22
Jharkhand	105	0	0	3	12	7	2	24
Karnataka	102	0	1	8	18	3	0	30
Kerala	92	5	5	4	0	0	0	14
Lakshadweep	106	0	0	0	0	1	0	1
Madhya Pradesh	106	0	0	6	18	19	7	50
Maharashtra	107	0	1	1	11	17	5	35
Manipur	100	0	0	5	3	0	1	9
Meghalaya	98	0	1	2	3	1	0	7
Mizoram	99	0	1	1	4	2	0	8
Nagaland	107	0	0	0	3	6	2	11
Odisha	102	0	3	6	15	5	1	30
Puducherry	82	2	2	0	0	0	0	4
Punjab	112	0	0	0	2	4	14	20
Rajasthan	107	0	0	1	10	16	6	33
Sikkim	111	0	0	0	1	1	2	4
Tamil Nadu	94	2	12	15	3	0	0	32
Tripura	104	0	0	0	3	1	0	4
Uttar Pradesh	105	0	2	9	19	29	12	71
Uttarakhand	100	5	0	3	5	0	0	13
West Bengal	105	0	0	1	12	4	2	19
India	105	18	31	94	208	171	118	640

Source: Authors

The regional pattern in the sex ratio of population at stabilisation will remain quite marked. There will be high male advantage in the population at stabilisation. In 45 of the 63 districts of Jammu and Kashmir, Punjab, and Haryana, whereas in 14 districts, there will be moderate male advantage. There is no district in these states where there will be either moderate or high female advantage in the population at stabilisation. All these states are located in the north-west corner of the country. On the other hand, in 13 states/Union Territories, there is no district where there will be high male advantage in the population at stabilisation. There are 18 districts where there will be high female advantage in the population at stabilisation and these districts are in only 5 states/Union Territories, four of which are in the southern part of the country. There will be either high or moderate female advantage in the population at stabilisation in 10 of the 14 districts of Kerala and in 14 of the 32 districts of Tamil Nadu. In 12 districts of Uttar Pradesh, 7 districts of Madhya Pradesh and 6 districts of Rajasthan which constitute a geographic cluster, there will be high male advantage in the population at stabilisation. In 9 geographically contiguous districts of Bihar also there will be high male advantage in the population at stabilisation.

## Conclusions

In this paper, we have followed the population growth modelling approach to estimate the population at stabilisation in 640 districts of India as they existed at the 2011 decennial population census. This is the first time any attempt has been made to estimate the population at stabilisation in the districts of the country. We have found that population growth during the period 1951-2011 can be modelled through the logistic growth model in all but a few districts of the country. This means that the upper asymptote of the logistic growth model provides an estimate of the upper limit of population growth or the size of population at stabilisation in each of the 640 districts of India. Interestingly, we have also found that the aggregate of the population at stabilisation in the 640 districts is a close approximation of the medium variant of the most recent population projection for India by the United Nations based on the cohort-component method (United Nations, 2022). The closeness of our results to the industry standard validates the approach presented here. Population stabilisation has been a key agenda in the development discourse of country right since independence. The present paper provides, for the first time, estimate of population at stabilisation in the districts of the country. A district in India is the lowest administrative unit for development planning and programming directed towards improving the quality of life of the people and for controlling population growth. In view of the social, cultural, economic, and environmental diversity of the country India, there has always been emphasis on the decentralised district-based development planning and programming. Estimating the population at stabilisation of a district is expected to significantly contribute to estimating the long-term development and welfare needs of the people and to analysing the long-term impact of population growth on development and environment at the local level.

The present analysis suggests that the long-term implications of population growth to social and economic development and the environment will be different in different districts of the country. For example, the population density, the single most important

indicator of the population pressure on the environment at the local level, is likely to increase to more than 46 thousand persons per square kilometre in district Northeast in the National Capital Territory of Delhi, the highest in the country. Similarly, even in the long run, the present male-female imbalance is likely to remain highly advantageous to males in many districts of the country even when the population stabilises. This seems to be the case despite all efforts of social and economic development including efforts to reduce the male-female ratio inequality. At the national level, however, the male-female imbalance is likely to normalise to around 105 males for every 100 females at stabilisation.

Attempts to forecast district population in India are rare and there has yet been any attempt to estimate population at stabilisation in the districts or even in the states and Union Territories of the country. This is critical since the size and the composition of population is an essential input to development planning and programming in India at national and local (district) levels. Population stabilisation has repeatedly been and continues to be stressed as necessary in the development discourse of the country for the accelerated social and economic progress, but this is the first attempt to provide a methodology to derive insight on this issue. Estimating the limit to population growth or population at stabilisation is a necessary input for estimating long-term development and welfare needs of the people of the district including the demand for water, energy, and housing, and for assessing the long-term impact of population on natural resources at the local level. One reason, of course, has been the paucity of district level data necessary for forecasting or projecting population growth. This research makes first attempt in this direction and shows that the long-term implications of population growth will be different in different districts of the country.

The estimate of district population at stabilisation is derived following the data driven approach which makes no explicit assumption about future trends in fertility, mortality, and migration. It is based on the characterisation of the population growth pattern in the district observed during the period 1951-2011 as revealed through the population enumerated in the district in different decennial population census since 1951. This pattern of population growth may change with the arrival of new data which will then lead to new model describing the pattern of district population growth and hence new estimate of the upper limit of population growth or population at stabilisation. The arrival of new data may also lead to more than one population growth patterns in the same district, one confined to one sub-period and the other to another sub-period. There is also a possibility that one model depicts the increase in population while the other depicts the decrease in population as population starts decreasing when the upper limit of the population is achieved. Eventually, district population growth may be more complex than the one which can be described by single wave logistic growth model. However, the extant data appear to support the hypothesis of a logistic growth trend alluding to the macro-scale population inertia and the resulting trajectories may conserve the S-curve pattern.

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Appendix Table: Size of the population at stabilisation (000), increase in population before population stops increasing, population sex ratio (males for every 100 females) and population density (number of persons per square Kilometre) at stabilisation in 640 districts of India as they existed at the 2011 population census.

Country/State/Union Territory/District	Population at stabilisation			Increase since 2011		Population	
	Male	Female	Person	Number	%	Sex ratio	Density
Jammu and Kashmir							
Kupwara	859	609	1468	598	68.7	141	617
Badgam	581	514	1094	341	45.2	113	804
Leh (Ladakh)	113	67	179	46	34.2	169	4
Kargil	105	83	188	47	33.5	126	13
Punch	400	352	751	275	57.6	114	449
Rajouri	539	446	986	343	53.5	121	375
Kathua	431	381	811	195	31.6	113	324
Baramula	761	671	1432	424	42.0	113	337
Bandipore	313	280	593	201	51.2	112	1718
Srinagar	914	838	1752	515	41.6	109	885
Ganderbal	268	221	490	192	64.6	121	1890
Pulwama	418	375	793	232	41.4	111	730
Shupiyan	197	198	394	128	48.1	99	1264
Anantnag	942	935	1876	798	73.9	101	525
Kulgam	274	260	534	110	25.9	105	1303
Doda	308	288	595	185	45.2	107	67
Ramban	219	205	424	140	49.3	107	319
Kishtwar	165	153	318	87	37.8	107	193
Udhampur	418	356	774	219	39.4	118	293
Reasi	225	207	431	117	37.1	109	251
Jammu	1064	942	2006	476	31.1	113	856
Samba	221	188	409	90	28.3	117	452
Himachal Pradesh							
Chamba	329	327	656	137	26.4	101	101
Kangra	921	929	1850	340	22.5	99	322
Lahul & Spiti	20	17	37	5	17.1	118	3
Kullu	304	290	594	156	35.7	105	108
Mandi	599	606	1205	206	20.6	99	305
Hamirpur	266	281	547	93	20.4	95	490
Una	345	325	669	148	28.4	106	435
Bilaspur	235	229	464	82	21.6	103	398
Solan	415	364	779	199	34.2	114	402
Sirmaur	354	329	683	153	29.0	108	242
Shimla	529	488	1017	203	24.9	108	198
Kinnaur	55	45	100	16	18.7	122	16
Punjab							
Gurdaspur	1503	1324	2827	529	23.0	113	796
Kapurthala	525	469	994	179	22.0	112	609
Jalandhar	1441	1319	2760	566	25.8	109	1052
Hoshiarpur	985	958	1943	356	22.5	103	574
Shahid	365	358	723	111	18.1	102	564
Fatehgarh Sahib	394	342	736	136	22.6	115	624
Ludhiana	2445	2108	4553	1054	30.1	116	1273
Moga	649	572	1221	225	22.6	113	545
Firozpur	1393	1210	2604	575	28.3	115	491
Muktsar	594	533	1127	225	25.0	112	435
Faridkot	410	363	773	155	25.2	113	530
Bathinda	934	808	1741	353	25.4	116	519
Mansa	498	446	944	174	22.6	112	429

## POPULATION AT STABILISATION IN DISTRICTS OF INDIA

Country/State/Union Territory/District	Population at stabilisation			Increase since 2011		Population	
	Male	Female	Person	Number	%	Sex ratio	Density
Patiala	1252	1110	2362	466	24.6	113	710
Amritsar	1766	1581	3347	857	34.4	112	1248
Tarn Taran	744	693	1437	317	28.3	107	595
Rupnagar	448	409	857	172	25.2	110	632
Sahibzada Ajit Singh Nagar	809	757	1565	571	57.4	107	1431
Sangrur	1097	969	2066	411	24.8	113	570
Barnala	390	348	738	143	24.0	112	498
Chandigarh							
Chandigarh	768	637	1406	350	33.2	121	12330
Uttarakhand							
Uttarkashi	215	207	422	92	27.8	104	53
Chamoli	232	242	474	82	21.0	96	59
Rudraprayag	135	158	294	51	21.2	85	148
Tehri Garhwal	348	391	739	120	19.4	89	203
Dehradun	1253	1210	2462	766	45.1	104	797
Garhwal	376	420	796	109	15.8	90	149
Pithoragarh	285	290	576	92	19.1	98	81
Bageshwar	145	161	306	46	17.8	90	137
Almora	335	387	722	100	16.0	87	230
Champawat	158	161	318	59	22.7	98	180
Nainital	686	672	1358	403	42.3	102	319
Udham Singh Nagar	1184	1134	2318	669	40.6	104	912
Hardwar	1410	1345	2756	865	45.8	105	1168
Haryana							
Panchkula	397	365	761	200	35.6	109	848
Ambala	791	675	1466	337	29.9	117	931
Yamunanagar	855	750	1605	391	32.2	114	908
Kurukshetra	637	562	1199	234	24.3	113	784
Kaithal	706	622	1328	254	23.6	113	573
Karnal	1019	917	1935	430	28.6	111	768
Panipat	963	844	1807	602	49.9	114	1425
Sonipat	984	848	1832	382	26.3	116	863
Jind	888	769	1657	322	24.2	115	613
Fatehabad	607	548	1155	213	22.6	111	455
Sirsa	851	767	1618	323	24.9	111	378
Hisar	1195	1048	2243	499	28.6	114	563
Bhiwani	1100	977	2078	443	27.1	113	435
Rohtak	709	605	1314	253	23.8	117	753
Jhajjar	654	552	1207	248	25.9	118	658
Mahendragarh	625	551	1177	255	27.6	113	620
Rewari	644	554	1197	297	33.0	116	751
Gurgaon	2526	2085	4611	3096	204.4	121	3665
Mewat	1017	958	1975	886	81.3	106	1310
Faridabad	1508	1406	2915	1105	61.0	107	3933
Palwal	782	724	1507	464	44.5	108	1109
National Capital Territory of Delhi							
Northwest	2650	2319	4970	1313	35.9	114	11218
North	635	586	1221	333	37.5	108	20020
Northeast	1507	1364	2871	629	28.1	110	46302
East	1159	1055	2215	505	29.6	110	35151
New Delhi	78	64	142	0	0.0	122	4057
Central	308	274	582	0	0.0	112	27730
West	1750	1590	3340	797	31.3	110	25693
Southwest	1822	1610	3432	1139	49.7	113	8152
South	1940	1741	3680	949	34.7	111	14901

Country/State/Union	Population at stabilisation			Increase since 2011		Population	
Territory/District	Male	Female	Person	Number	%	Sex ratio	Density
<b>Rajasthan</b>							
Ganganagar	1344	1204	2548	579	29.4	112	232
Hanumangarh	1179	1067	2246	471	26.5	110	233
Bikaner	1831	1682	3513	1149	48.6	109	116
Churu	1399	1305	2704	664	32.6	107	195
Jhunjhunun	1387	1338	2724	587	27.5	104	460
Alwar	2737	2489	5226	1551	42.2	110	624
Bharatpur	1804	1642	3446	898	35.2	110	680
Dhaulpur	914	809	1723	516	42.8	113	568
Karauli	1099	967	2066	608	41.7	114	374
Sawai Madhopur	939	865	1804	469	35.1	109	401
Dausa	1243	1148	2391	757	46.3	108	697
Jaipur	5054	4662	9717	3090	46.6	108	872
Sikar	1843	1747	3591	913	34.1	106	464
Nagaur	2311	2172	4483	1176	35.5	106	253
Jodhpur	2717	2563	5281	1593	43.2	106	231
Jaisalmer	596	540	1137	467	69.7	110	30
Barmer	2128	1914	4042	1438	55.2	111	142
Jalor	1316	1251	2567	738	40.4	105	241
Sirohi	750	709	1460	423	40.8	106	284
Pali	1280	1266	2546	509	25.0	101	206
Ajmer	1776	1719	3495	912	35.3	103	412
Tonk	954	929	1883	462	32.5	103	262
Bundi	741	708	1449	338	30.4	105	251
Bhilwara	1633	1625	3258	849	35.3	101	312
Rajsamand	748	736	1484	327	28.3	102	319
Dungarpur	955	945	1900	512	36.9	101	504
Banswara	1266	1198	2464	667	37.1	106	545
Chittaurgarh	991	975	1966	422	27.3	102	251
Kota	1380	1302	2683	732	37.5	106	514
Baran	834	807	1641	418	34.2	103	235
Jhalawar	945	895	1839	428	30.4	106	296
Udaipur	2153	2038	4191	1123	36.6	106	357
Pratapgarh	584	589	1172	304	35.1	99	263
<b>Uttar Pradesh</b>							
Saharanpur	2436	2255	4691	1224	35.3	108	1272
Muzaffarnagar	2842	2641	5483	1340	32.3	108	1368
Bijnor	2549	2452	5001	1318	35.8	104	1096
Moradabad	3531	3387	6919	2147	45.0	104	1861
Rampur	1646	1572	3218	882	37.8	105	1359
Jyotiba Phule Nagar	1348	1299	2647	807	43.8	104	1177
Meerut	2366	2148	4514	1071	31.1	110	1764
Baghpat	855	756	1611	308	23.6	113	1220
Ghaziabad	4553	4297	8851	4169	89.0	106	7507
Gautam Buddha Nagar	1932	1764	3696	2048	124.3	110	2883
Bulandshahr	2309	2145	4454	955	27.3	108	987
Aligarh	2678	2477	5155	1481	40.3	108	1412
Mahamaya Nagar	1057	956	2012	448	28.6	111	1094
Mathura	1868	1733	3601	1054	41.4	108	1078
Agra	3295	2991	6286	1867	42.3	110	1556
Firozabad	1839	1674	3513	1015	40.6	110	1459
Mainpuri	1277	1169	2446	577	30.9	109	886
Budaun	2673	2533	5206	1524	41.4	106	1007
Bareilly	3233	3122	6356	1907	42.9	104	1543
Pilibhit	1443	1331	2775	744	36.6	108	753

## POPULATION AT STABILISATION IN DISTRICTS OF INDIA

Country/State/Union	Population at stabilisation			Increase since 2011		Population	
Territory/District	Male	Female	Person	Number	%	Sex ratio	Density
Shahjahanpur	2241	2080	4321	1314	43.7	108	985
Kheri	3126	2914	6040	2018	50.2	107	786
Sitapur	3348	3079	6427	1943	43.3	109	1119
Hardoi	2923	2709	5632	1539	37.6	108	941
Unnao	2088	1930	4018	910	29.3	108	882
Lucknow	3489	3433	6921	2332	50.8	102	2738
Rae Bareli	2400	2295	4695	1289	37.9	105	1019
Farrukhabad	1317	1230	2546	661	35.1	107	1168
Kannauj	1135	1038	2173	517	31.2	109	1038
Etawah	1057	946	2003	421	26.6	112	867
Auraiya	916	815	1732	352	25.5	112	859
Kanpur Dehat	1208	1058	2266	470	26.2	114	750
Kanpur Nagar	3151	2748	5899	1318	28.8	115	1870
Jalaun	1153	1034	2187	497	29.4	111	479
Jhansi	1351	1220	2570	572	28.6	111	512
Lalitpur	908	892	1800	578	47.3	102	357
Hamirpur	734	636	1370	266	24.1	115	341
Mahoba	587	543	1130	254	29.0	108	359
Banda	1230	1098	2327	528	29.3	112	528
Chitrakoot	723	665	1388	397	40.0	109	432
Fatehpur	1752	1625	3376	744	28.2	108	813
Pratapgarh	2167	2193	4360	1151	35.9	99	1173
Kaushambi	1179	1087	2265	666	41.6	108	1273
Allahabad	4253	4013	8265	2311	38.8	106	1508
Bara Banki	2378	2277	4655	1394	42.8	104	1057
Faizabad	1680	1649	3329	858	34.7	102	1422
Ambedkar Nagar	1614	1655	3269	871	36.3	98	1391
Sultanpur	2570	2688	5257	1460	38.5	96	1185
Bahraich	2759	2641	5400	1913	54.8	104	1031
Shrawasti	905	955	1860	743	66.5	95	1134
Balrampur	1611	1673	3284	1135	52.8	96	981
Gonda	2592	2561	5153	1719	50.1	101	1287
Siddharthnagar	1928	2093	4021	1462	57.1	92	1389
Basti	1652	1705	3358	893	36.2	97	1249
Sant Kabir Nagar	1198	1185	2382	667	38.9	101	1447
Mahrajganj	1982	1967	3950	1265	47.1	101	1338
Gorakhpur	3040	2961	6001	1560	35.1	103	1807
Kushinagar	2646	2570	5215	1651	46.3	103	1795
Deoria	2056	2093	4149	1048	33.8	98	1633
Azamgarh	3142	3219	6361	1747	37.9	98	1569
Mau	1571	1527	3098	892	40.4	103	1809
Ballia	2220	2094	4314	1074	33.2	106	1447
Jaunpur	2908	3043	5951	1457	32.4	96	1474
Ghazipur	2461	2433	4895	1274	35.2	101	1449
Chandauli	1407	1319	2727	774	39.6	107	1073
Varanasi	2564	2434	4998	1321	35.9	105	3256
Sant Ravidas Nagar	1008	1055	2064	486	30.8	96	2033
Mirzapur	1799	1698	3497	1000	40.0	106	794
Sonbhadra	1379	1352	2731	868	46.6	102	395
Etah	1236	1143	2379	605	34.1	108	979
Kanshiram Nagar	992	936	1928	491	34.2	106	986
Bihar							
Pashchim Champaran	2962	2835	5797	1862	47.3	104	1109
Purba Champaran	4106	3777	7883	2784	54.6	109	1987
Sheohar	563	545	1108	452	68.8	103	3174

Country/State/Union	Population at stabilisation			Increase since 2011		Population	
Territory/District	Male	Female	Person	Number	%	Sex ratio	Density
Sitamarhi	2753	2629	5383	1959	57.2	105	2346
Madhubani	3354	3157	6510	2023	45.1	106	1860
Supaul	1560	1466	3027	798	35.8	106	1248
Araria	2082	1909	3991	1179	41.9	109	1410
Kishanganj	1221	1173	2394	703	41.6	104	1270
Purnia	2385	2265	4650	1386	42.5	105	1440
Katihar	2331	2097	4428	1357	44.2	111	1449
Madhepura	1548	1421	2970	968	48.4	109	1661
Saharsa	1488	1345	2833	932	49.0	111	1679
Darbhanga	2940	2709	5649	1712	43.5	109	2479
Muzaffarpur	3786	3280	7066	2265	47.2	115	2227
Gopalganj	1715	1855	3571	1009	39.4	92	1756
Siwan	2400	2272	4672	1341	40.3	106	2105
Saran	2804	2715	5520	1568	39.7	103	2090
Vaishali	2802	2392	5194	1699	48.6	117	2551
Samastipur	3183	2876	6059	1797	42.2	111	2086
Begusarai	2276	2065	4341	1370	46.1	110	2263
Khagaria	1324	1210	2534	867	52.0	109	1705
Bhagalpur	2230	1984	4213	1176	38.7	112	1640
Banka	1517	1395	2912	877	43.1	109	964
Munger	941	847	1788	420	30.7	111	1260
Lakhisarai	717	659	1376	375	37.5	109	1121
Sheikhpura	449	431	879	243	38.2	104	1276
Nalanda	1961	1804	3765	888	30.8	109	1599
Patna	4330	4021	8351	2513	43.0	108	2608
Bhojpur	1987	1768	3755	1026	37.6	112	1568
Buxar	1212	1175	2387	681	39.9	103	1402
Kaimur (Bhabua)	1253	1213	2466	839	51.6	103	740
Rohtas	2074	1951	4025	1065	36.0	106	1037
Aurangabad	1972	1844	3817	1277	50.3	107	1155
Gaya	3250	3141	6391	2000	45.5	103	1284
Nawada	1698	1553	3251	1032	46.5	109	1304
Jamui	1345	1289	2634	873	49.6	104	850
Jehanabad	849	774	1623	498	44.3	110	1744
Arwal	503	463	966	265	37.8	109	1514
Sikkim							
North District	29	22	51	7	16.1	133	12
West District	83	80	163	26	19.2	104	139
South District	92	85	178	31	21.0	108	237
East District	184	162	346	63	22.0	114	363
Arunachal Pradesh							
Tawang	46	29	75	25	49.6	160	34
West Kameng	56	48	103	19	22.8	117	14
East Kameng	48	58	106	27	34.4	83	26
Papum Pare	135	153	288	111	62.9	88	83
Upper Subansiri	54	65	120	36	43.4	83	17
West Siang	68	66	134	22	19.5	104	16
East Siang	59	60	119	20	19.7	97	33
Upper Siang	22	19	41	5	15.4	115	6
Changlang	95	91	187	39	26.0	105	40
Tirap	69	67	136	24	21.2	104	57
Lower Subansiri	63	75	138	55	66.1	85	39
Kurung Kumey	962	850	1813	1721	1868.6	113	300
Dibang Valley	5	4	9	1	9.6	129	1
Lower Dibang Valley	33	32	65	11	20.2	106	17

POPULATION AT STABILISATION IN DISTRICTS OF INDIA

Country/State/Union Territory/District	Population at stabilisation			Increase since 2011		Population	
	Male	Female	Person	Number	%	Sex ratio	Density
Lohit	96	91	187	41	28.2	105	36
Anjaw	13	12	25	4	18.9	106	4
Nagaland							
Mon	160	142	302	52	20.8	112	169
Mokokchung	129	117	246	52	26.5	110	152
Zunheboto	89	86	175	34	24.3	104	139
Wokha	103	101	204	37	22.5	102	125
Dimapur	270	254	525	146	38.5	106	566
Phek	103	100	203	39	23.9	104	100
Tuensang	128	118	246	49	25.0	108	97
Longleng	51	46	96	46	91.1	112	172
Kiphire	53	49	103	29	38.5	108	91
Kohima	187	173	360	92	34.3	108	246
Peren	60	55	115	20	20.7	108	70
Manipur							
Senapati	518	512	1030	551	115.0	101	315
Tamenglong	105	102	207	67	47.4	102	47
Churachandpur	182	181	362	88	32.2	101	79
Bishnupur	145	146	291	53	22.5	99	586
Thoubal	265	271	537	115	27.2	98	1044
Imphal West	313	326	639	121	23.4	96	1232
Imphal East	281	287	568	112	24.5	98	801
Ukhrul	137	143	280	96	52.1	96	62
Chandel	121	99	220	76	52.5	122	66
Mizoram							
Mamit	47	44	91	5	5.4	106	30
Kolasib	54	54	109	25	29.6	100	79
Aizawl	240	255	495	94	23.6	94	138
Champhai	78	77	155	29	23.2	100	49
Serchhip	40	40	80	15	23.2	101	56
Lunglei	98	93	191	30	18.3	105	42
Lawngtlai	78	77	155	37	31.4	101	61
Saiha	35	35	70	13	23.3	99	50
Tripura							
West Tripura	1091	1041	2132	406	23.5	105	712
South Tripura	534	516	1049	173	19.8	104	343
Dhalai	234	220	454	76	20.1	106	189
North Tripura	445	433	878	185	26.6	103	431
Meghalaya							
West Garo Hills	467	466	932	289	45.0	100	254
East Garo Hills	234	230	464	146	45.9	102	178
South Garo Hills	106	97	203	61	42.6	109	108
West Khasi Hills	286	290	576	193	50.3	98	110
Ribhoi	208	206	414	155	59.9	101	169
East Khasi Hills	546	575	1121	295	35.7	95	408
Jaintia Hills	297	316	613	218	55.2	94	161
Assam							
Kokrajhar	538	518	1056	168	19.0	104	320
Dhubri	1316	1251	2567	618	31.7	105	1180
Goalpara	642	628	1271	262	26.0	102	697
Barpeta	1072	1026	2098	405	23.9	104	919
Morigaon	612	603	1215	258	26.9	102	783
Nagaon	1753	1768	3521	697	24.7	99	886
Sonitpur	1201	1176	2377	453	23.5	102	457
Lakhimpur	633	630	1263	221	21.2	100	555

Country/State/Union	Population at stabilisation			Increase since 2011		Population	
Territory/District	Male	Female	Person	Number	%	Sex ratio	Density
Dhemaji	431	410	841	155	22.6	105	260
Tinsukia	812	805	1617	289	21.7	101	427
Dibrugarh	796	782	1579	252	19.0	102	467
Sivasagar	712	686	1398	247	21.4	104	524
Jorhat	656	643	1299	207	18.9	102	456
Golaghat	662	646	1308	241	22.6	103	373
Karbi Anglong	597	580	1178	221	23.2	103	113
Dima Hasao	141	137	278	64	29.8	103	57
Cachar	1129	1097	2226	489	28.2	103	588
Karimganj	816	780	1596	367	29.9	105	882
Hailakandi	434	409	843	184	27.9	106	635
Bongaigaon	474	462	936	197	26.6	103	856
Chirang	281	272	553	71	14.7	103	288
Kamrup	952	916	1868	350	23.1	104	602
Kamrup Metropolitan	848	866	1713	459	36.6	98	1794
Nalbari	462	441	903	131	17.0	105	858
Baksa	564	557	1121	171	18.0	101	456
Darrang	607	581	1188	259	27.9	104	749
Udalguri	494	480	974	143	17.2	103	484
West Bengal							
Darjiling	1194	1200	2393	546	29.6	99	760
Jalpaiguri	2487	2372	4859	986	25.5	105	780
Koch Bihar	1727	1625	3352	533	18.9	106	990
Uttar Dinajpur	2098	1994	4092	1085	36.1	105	1303
Dakshin Dinajpur	1078	1033	2111	435	25.9	104	951
Maldah	2739	2480	5219	1230	30.8	110	1398
Murshidabad	4778	4669	9447	2343	33.0	102	1774
Birbhum	2217	2115	4332	830	23.7	105	953
Bardhaman	4751	4584	9335	1617	21.0	104	1329
Nadia	3325	3141	6466	1298	25.1	106	1646
North Twenty	6473	6231	12703	2693	26.9	104	3103
Hugli	3389	3271	6660	1141	20.7	104	2115
Bankura	2209	2122	4331	734	20.4	104	629
Puruliya	1865	1790	3655	724	24.7	104	584
Haora	3103	2962	6065	1215	25.0	105	4134
Kolkata	2767	2472	5239	743	16.5	112	28320
South 24 Parganas	5391	5187	10578	2416	29.6	104	1062
Paschim Medinipur	3652	3522	7174	1260	21.3	104	766
Purba Medinipur	3214	3046	6260	1164	22.8	106	1328
Jharkhand							
Garhwa	980	937	1917	594	44.9	105	468
Chatra	782	758	1541	498	47.7	103	414
Kodarma	583	525	1107	391	54.6	111	436
Giridih	1905	1649	3554	1109	45.3	116	716
Deoghar	1152	1068	2220	727	48.8	108	896
Godda	949	906	1855	542	41.2	105	819
Sahibganj	812	784	1596	446	38.7	104	774
Pakur	654	653	1307	406	45.1	100	722
Dhanbad	1752	1667	3419	734	27.3	105	1676
Bokaro	1371	1305	2676	614	29.8	105	928
Lohardaga	359	350	709	247	53.4	103	472
Purbi Singhbhum	1462	1425	2886	592	25.8	103	810
Palamu	1436	1343	2779	839	43.2	107	632
Latehar	531	512	1044	317	43.6	104	243
Hazaribagh	1225	1148	2373	638	36.8	107	667



## POPULATION AT STABILISATION IN DISTRICTS OF INDIA

Country/State/Union	Population at stabilisation			Increase since 2011		Population	
Territory/District	Male	Female	Person	Number	%	Sex ratio	Density
Ramgarh	605	588	1193	243	25.6	103	890
Dumka	869	885	1754	432	32.7	98	466
Jamtara	566	538	1104	313	39.6	105	610
Ranchi	2019	1938	3957	1043	35.8	104	776
Khunti	351	351	702	171	32.1	100	277
Gumla	703	661	1364	339	33.0	106	254
Simdega	372	366	738	138	23.1	102	195
Pashchimi Singhbhum	956	998	1953	451	30.0	96	270
Saraikela-Kharsawan	730	741	1471	406	38.1	99	554
Odisha							
Bargarh	898	884	1781	300	20.3	102	305
Jharsuguda	369	359	728	148	25.6	103	344
Sambalpur	637	629	1266	225	21.6	101	191
Debagarh	191	189	380	67	21.5	101	129
Sundargarh	1246	1256	2502	408	19.5	99	258
Kendujhar	1109	1096	2205	403	22.4	101	266
Mayurbhanj	1588	1601	3189	669	26.6	99	306
Baleshwar	1493	1399	2891	571	24.6	107	760
Bhadrak	953	937	1890	384	25.5	102	755
Kendrapara	852	850	1702	262	18.2	100	644
Jagatsinghapur	694	666	1359	222	19.6	104	815
Cuttack	1612	1543	3155	531	20.2	104	802
Jajapur	1150	1115	2265	438	24.0	103	781
Dhenkanal	735	698	1433	240	20.1	105	322
Anugul	821	777	1597	323	25.4	106	251
Nayagarh	597	538	1135	172	17.9	111	292
Khordha	1558	1425	2984	732	32.5	109	1061
Puri	1063	1020	2083	385	22.6	104	599
Ganjam	2217	2171	4388	859	24.3	102	535
Gajapati	340	357	698	120	20.8	95	161
Kandhamal	454	488	942	209	28.4	93	117
Baudh	287	283	570	129	29.3	101	184
Subarnapur	388	369	757	147	24.1	105	324
Balangir	1000	994	1995	346	21.0	101	303
Nuapada	364	368	732	122	20.0	99	190
Kalahandi	1015	1013	2028	452	28.6	100	256
Rayagada	576	617	1193	226	23.3	93	169
Nabarangapur	774	804	1578	357	29.2	96	298
Koraput	858	908	1766	386	28.0	95	201
Malkangiri	364	383	747	134	21.9	95	129
Chhattisgarh							
Koriya	414	408	822	163	24.8	102	124
Surguja	1600	1570	3170	811	34.3	102	202
Jashpur	510	500	1010	158	18.6	102	173
Raigarh	959	958	1917	423	28.3	100	271
Korba	811	803	1614	407	33.7	101	245
Janjgir-Champa	1195	1173	2367	748	46.2	102	614
Bilaspur	1886	1787	3674	1010	37.9	106	444
Kabeerdham	571	584	1155	333	40.4	98	273
Rajnandgaon	959	1000	1959	422	27.4	96	243
Durg	2056	2102	4158	814	24.4	98	487
Raipur	2793	2740	5533	1469	36.2	102	447
Mahasamund	616	624	1240	208	20.1	99	259
Dhamtari	508	521	1029	229	28.6	97	252
Uttar Bastar Kanker	455	461	915	166	22.2	99	128

Country/State/Union	Population at stabilisation			Increase since 2011		Population	
Territory/District	Male	Female	Person	Number	%	Sex ratio	Density
Bastar	881	911	1792	379	26.8	97	171
Narayanpur	93	93	186	46	33.1	100	40
Dakshin Bastar Dantewada	310	322	632	98	18.4	96	76
Bijapur	159	159	318	63	24.6	100	37
Madhya Pradesh							
Sheopur	512	457	969	281	40.9	112	147
Morena	1442	1232	2674	708	36.0	117	536
Bhind	1175	995	2170	467	27.4	118	487
Gwalior	1483	1329	2813	781	38.4	112	617
Datia	540	493	1033	246	31.3	110	356
Shivpuri	1286	1172	2458	732	42.4	110	244
Tikamgarh	1032	949	1980	535	37.0	109	392
Chhatarpur	1264	1166	2430	667	37.9	108	280
Panna	695	643	1338	322	31.7	108	188
Sagar	1603	1463	3066	687	28.9	110	299
Damoh	849	772	1621	357	28.2	110	222
Satna	1548	1452	3000	772	34.6	107	400
Rewa	1691	1570	3261	896	37.9	108	516
Umaria	454	429	883	238	37.0	106	217
Neemuch	535	513	1048	222	26.9	104	246
Mandsaur	871	852	1723	383	28.6	102	311
Ratlam	960	950	1910	455	31.3	101	393
Ujjain	1310	1272	2582	595	29.9	103	424
Shajapur	1025	973	1998	486	32.1	105	323
Dewas	1057	1021	2078	514	32.9	103	296
Dhar	1557	1510	3067	881	40.3	103	376
Indore	2579	2420	4999	1722	52.6	107	1282
Khargone (West Nimar)	1255	1253	2508	635	33.9	100	313
Barwani	1011	1005	2016	630	45.5	101	371
Rajgarh	1084	1062	2146	600	38.8	102	349
Vidisha	993	923	1916	457	31.3	108	260
Bhopal	1753	1699	3452	1081	45.6	103	1245
Sehore	922	851	1773	462	35.2	108	270
Raisen	927	839	1766	435	32.6	110	209
Betul	999	977	1976	401	25.4	102	197
Harda	396	374	770	200	35.0	106	231
Hoshangabad	822	769	1591	350	28.2	107	237
Katni	863	827	1690	398	30.8	104	341
Jabalpur	1589	1488	3077	613	24.9	107	590
Narsimhapur	723	667	1390	298	27.3	109	271
Dindori	431	436	868	163	23.2	99	116
Mandla	655	669	1324	269	25.5	98	228
Chhindwara	1355	1303	2658	567	27.1	104	225
Seoni	869	848	1717	338	24.5	102	196
Balaghat	1012	1027	2039	337	19.8	99	221
Guna	926	887	1814	572	46.1	104	284
Ashoknagar	590	535	1124	279	33.1	110	241
Shahdol	681	671	1352	286	26.8	101	218
Anuppur	471	475	946	197	26.2	99	252
Sidhi	812	787	1599	472	41.9	103	330
Singrauli	944	870	1813	635	53.9	108	320
Jhabua	728	734	1462	437	42.6	99	406
Alirajpur	499	508	1007	278	38.1	98	316
Khandwa (East Nimar)	856	816	1672	362	27.6	105	227
Burhanpur	490	464	954	197	25.9	106	279

## POPULATION AT STABILISATION IN DISTRICTS OF INDIA

Country/State/Union Territory/District	Population at stabilisation			Increase since 2011		Population	
	Male	Female	Person	Number	%	Sex ratio	Density
Gujarat							
Kachchh	1624	1386	3010	917	43.8	117	66
Banas Kantha	2231	2084	4316	1195	38.3	107	402
Patan	819	764	1583	239	17.8	107	273
Mahesana	1275	1165	2439	404	19.9	109	554
Sabar Kantha	1530	1440	2971	542	22.3	106	402
Gandhinagar	910	836	1746	354	25.4	109	816
Ahmadabad	5034	4562	9596	2382	33.0	110	1184
Surendranagar	1159	1084	2243	486	27.7	107	215
Rajkot	2585	2387	4972	1168	30.7	108	444
Jamnagar	1336	1250	2586	426	19.7	107	182
Porbandar	350	333	683	98	16.7	105	295
Junagadh	1684	1606	3290	547	19.9	105	373
Amreli	895	863	1758	244	16.1	104	238
Bhavnagar	1899	1734	3633	753	26.1	109	362
Anand	1297	1195	2492	399	19.1	109	778
Kheda	1415	1313	2728	428	18.6	108	690
Panch Mahals	1538	1493	3031	640	26.8	103	579
Dohad	1578	1551	3129	1002	47.1	102	859
Vadodara	2679	2522	5200	1035	24.8	106	689
Narmada	362	349	711	121	20.5	104	252
Bharuch	1011	930	1941	390	25.1	109	298
The Dangs	151	155	306	78	34.1	98	173
Navsari	824	792	1617	287	21.6	104	720
Valsad	1266	1124	2390	684	40.1	113	794
Surat	6952	4774	11726	5644	92.8	146	2578
Tapi	473	471	944	137	17.0	100	301
Daman and Diu							
Diu	32	33	65	13	25.0	99	1668
Daman	383	155	537	346	181.1	248	7462
Dadra and Nagar Haveli							
Dadra & Nagar Haveli	597	286	884	540	157.1	209	1799
Maharashtra							
Nandurbar	1137	1099	2236	587	35.6	103	375
Dhule	1322	1245	2567	516	25.2	106	357
Jalgaon	2745	2504	5249	1019	24.1	110	446
Buldana	1713	1599	3312	726	28.1	107	343
Akola	1150	1102	2252	438	24.2	104	397
Washim	787	726	1514	317	26.4	108	309
Amravati	1811	1747	3558	669	23.2	104	291
Wardha	807	755	1562	261	20.1	107	248
Nagpur	3085	2996	6081	1427	30.7	103	615
Bhandara	725	715	1440	240	20.0	102	352
Gondiya	760	758	1518	195	14.8	100	290
Gadchiroli	684	675	1359	286	26.7	101	94
Chandrapur	1368	1327	2695	491	22.3	103	236
Yavatmal	1772	1673	3446	673	24.3	106	254
Nanded	2310	2167	4477	1115	33.2	107	425
Hingoli	798	737	1535	358	30.4	108	318
Parbhani	1244	1171	2414	578	31.5	106	389
Jalna	1352	1254	2606	647	33.0	108	339
Aurangabad	2816	2622	5438	1737	46.9	107	537
Nashik	4394	4081	8475	2368	38.8	108	546
Thane	9534	9431	18965	7905	71.5	101	1984
Mumbai Suburban	6190	5331	11521	2164	23.1	116	25832

Country/State/Union	Population at stabilisation			Increase since 2011		Population	
Territory/District	Male	Female	Person	Number	%	Sex ratio	Density
Mumbai	2064	1625	3689	604	19.6	127	23498
Raigarh	1880	1696	3575	941	35.7	111	500
Pune	7477	6727	14204	4775	50.6	111	908
Ahmadnagar	2929	2776	5704	1161	25.6	106	335
Bid	1765	1590	3355	770	29.8	111	314
Latur	1715	1569	3284	830	33.8	109	459
Osmanabad	1071	978	2049	391	23.6	109	271
Solapur	2830	2648	5478	1161	26.9	107	368
Satara	1835	1802	3637	633	21.1	102	347
Ratnagiri	908	1004	1912	297	18.4	90	233
Sindhudurg	494	503	997	147	17.3	98	191
Kolhapur	2449	2330	4778	902	23.3	105	622
Sangli	1764	1713	3477	655	23.2	103	406
Andhra Pradesh							
Adilabad	1730	1747	3477	736	26.8	99	216
Nizamabad	1515	1596	3111	560	21.9	95	391
Karimnagar	2287	2336	4623	847	22.4	98	391
Medak	1951	1925	3875	842	27.8	101	400
Hyderabad	2423	2283	4705	762	19.3	106	21684
Rangareddy	5319	5056	10374	5077	95.9	105	1385
Mahbubnagar	2607	2532	5140	1086	26.8	103	279
Nalgonda	2113	2135	4248	759	21.8	99	298
Warangal	2159	2138	4297	784	22.3	101	335
Khammam	1696	1730	3426	628	22.5	98	214
Srikakulam	1605	1650	3254	551	20.4	97	558
Vizianagaram	1361	1380	2742	397	16.9	99	419
Visakhapatnam	2656	2728	5384	1093	25.5	97	482
East Godavari	3013	3033	6046	892	17.3	99	559
West Godavari	2308	2305	4613	676	17.2	100	596
Krishna	2743	2749	5492	975	21.6	100	629
Guntur	2902	2924	5826	938	19.2	99	511
Prakasam	2085	2055	4140	743	21.9	101	235
Sri Potti Sriramulu Nellore	1814	1792	3606	643	21.7	101	276
Y. S. R.	1775	1771	3546	663	23.0	100	231
Kurnool	2580	2556	5136	1082	26.7	101	291
Anantapur	2569	2529	5098	1017	24.9	102	267
Chittoor	2548	2624	5173	999	23.9	97	341
Karnataka							
Belgaum	3006	2955	5961	1181	24.7	102	444
Bagalkot	1213	1193	2406	516	27.3	102	367
Bijapur	1437	1402	2839	662	30.4	103	270
Bidar	1128	1061	2189	486	28.5	106	402
Raichur	1261	1278	2539	610	31.6	99	301
Koppal	941	916	1857	467	33.6	103	333
Gadag	646	632	1277	213	20.0	102	274
Dharwad	1142	1131	2272	425	23.0	101	533
Uttara Kannada	854	836	1690	253	17.6	102	164
Haveri	986	960	1946	348	21.8	103	403
Bellary	1640	1617	3256	803	32.8	101	385
Chitradurga	1017	1007	2025	365	22.0	101	240
Davanagere	1190	1169	2360	414	21.3	102	398
Shimoga	1020	1008	2028	275	15.7	101	239
Udupi	649	707	1357	179	15.2	92	379
Chikmagalur	667	678	1345	207	18.2	98	187
Tumkur	1614	1605	3219	540	20.2	101	304

POPULATION AT STABILISATION IN DISTRICTS OF INDIA

Country/State/Union Territory/District	Population at stabilisation			Increase since 2011		Population	
	Male	Female	Person	Number	%	Sex ratio	Density
Bangalore	8473	7878	16351	6730	69.9	108	7446
Mandya	1053	1060	2113	307	17.0	99	426
Hassan	1046	1061	2107	331	18.6	99	309
Dakshina Kannada	1238	1260	2498	408	19.5	98	514
Kodagu	317	326	644	89	16.1	97	157
Mysore	1878	1856	3734	733	24.4	101	592
Chamarajanagar	600	606	1206	186	18.2	99	214
Gulbarga	1684	1656	3340	774	30.2	102	305
Yadgir	801	805	1606	432	36.8	100	305
Kolar	961	944	1905	368	24.0	102	479
Chikkaballapura	771	747	1518	263	21.0	103	358
Bangalore Rural	652	613	1264	273	27.6	106	550
Ramanagara	638	634	1272	189	17.5	101	362
Goa							
North Goa	502	484	986	168	20.5	104	568
South Goa	385	390	775	135	21.0	99	394
Lakshadweep							
Lakshadweep	40	38	78	14	21.5	106	2610
Kerala							
Kasaragod	758	825	1584	276	21.1	92	796
Kannur	1365	1588	2953	430	17.0	86	997
Wayanad	483	494	977	160	19.5	98	459
Kozhikode	1726	1920	3645	559	18.1	90	1555
Malappuram	2454	2713	5167	1054	25.6	90	1454
Palakkad	1614	1734	3348	538	19.1	93	747
Thrissur	1721	1915	3636	515	16.5	90	1201
Ernakulam	1881	1947	3827	545	16.6	97	1250
Idukki	649	655	1304	195	17.6	99	299
Kottayam	1119	1161	2279	305	15.4	96	1033
Alappuzha	1167	1280	2447	319	15.0	91	1729
Pathanamthitta	657	736	1394	196	16.4	89	525
Kollam	1451	1614	3066	430	16.3	90	1235
Thiruvananthapuram	1852	2031	3883	582	17.6	91	1774
Tamil Nadu							
Thiruvallur	2759	3205	5965	2237	60.0	86	1757
Chennai	2748	2844	5593	946	20.4	97	31958
Kancheepuram	2891	3565	6456	2458	61.5	81	1440
Vellore	2398	2534	4932	995	25.3	95	812
Tiruvannamalai	1448	1535	2983	518	21.0	94	482
Viluppuram	2103	2227	4330	871	25.2	94	602
Salem	2179	2151	4329	847	24.3	101	827
Namakkal	1071	1096	2168	441	25.6	98	634
Erode	1341	1399	2741	489	21.7	96	476
The Nilgiris	425	453	878	143	19.4	94	342
Dindigul	1276	1326	2602	442	20.5	96	431
Karur	633	664	1297	233	21.9	95	447
Tiruchirappalli	1574	1694	3268	546	20.1	93	725
Perambalur	345	360	705	140	24.7	96	401
Ariyalur	438	456	894	139	18.5	96	461
Cuddalore	1535	1587	3121	515	19.8	97	843
Nagapattinam	934	986	1920	304	18.8	95	747
Thiruvarur	722	761	1483	219	17.3	95	652
Thanjavur	1369	1489	2858	452	18.8	92	838
Pudukkottai	959	996	1955	337	20.8	96	421
Sivaganga	767	788	1555	216	16.1	97	367

Country/State/Union	Population at stabilisation			Increase since 2011		Population	
Territory/District	Male	Female	Person	Number	%	Sex ratio	Density
Madurai	1785	1849	3633	595	19.6	97	979
Theni	721	704	1425	179	14.4	103	497
Virudhunagar	1165	1230	2395	453	23.3	95	565
Ramanathapuram	766	809	1575	222	16.4	95	384
Thoothukkudi	984	1038	2022	272	15.5	95	426
Tirunelveli	1833	1912	3745	668	21.7	96	560
Kanniyakumari	1055	1100	2155	285	15.2	96	1280
Dharmapuri	948	928	1876	369	24.5	102	417
Krishnagiri	1265	1281	2546	666	35.4	99	496
Coimbatore	2091	2212	4304	846	24.5	95	910
Tiruppur	1893	1975	3868	1389	56.0	96	746
Puducherry							
Yanam	104	214	318	262	471.7	48	10601
Puducherry	643	708	1351	400	42.1	91	4594
Mahe	23	28	51	9	22.6	84	5696
Karaikal	124	134	257	57	28.5	92	1639
Andaman and Nicobar Islands							
Nicobars	25	20	46	9	23.6	123	25
North & Middle Andaman	67	62	129	23	22.0	109	34
South Andaman	165	143	308	69	29.2	115	115

Source: Authors