VELOCITY/SPEED OF URBANIZATION IN INDIA: AN INTROSPECTIVE STUDY

ABSTRACT

Towns/Cities become more concentrated centres of economic activity and innovation serving as hubs for trade, transportation, and information flow, on account of which more and more people tend to live in urban areas migrating from rural areas. The urbanization is continuously growing and expanding. It is a common way to express the degree or level of urbanization. The **objective** of this study is to find out the speed or velocity at which the urbanization is going on. **Methodology:** This study is descriptive type by nature based on secondary sources. The data are collected from various census reports, books, articles, websites and web-based journals published in different times. **Results and Discussion:** The census data for 110 years with effect from 1901 to 2011is used to calculate to see the speed/velocity and trend of urbanization in India.**Findings:** Through different way of presentations, mathematically and diagrammatically, it is found that the urbanization in India is expanding from the very beginning, 1901 census to 2011 census but at different velocity at different census year. **Conclusion:** Urbanization velocity, which includes both direction and speed, can be used to estimate the rate of growth and the geographic expansion of urban areas in India

Keywords: Urbanization, Economic, Innovation, Velocity, Mathematically, Diagrammatically.

I. INTRODUCTION

The process of urbanization is a multifaceted socio-economic phenomenon that involves the alteration of the built environment, the conversion of rural areas into urban settlements, and the relocation of people from rural to urban areas. It involves adjustments to the prevalent vocations, way of life, culture, and behaviour, which modifies the social and demographic makeup of both urban and rural areas. An important effect of urbanization is an increase in the quantity, area, and population of urban settlements as well as in the proportion of urban residents to those living in rural areas. Infrastructure and building investments made by the public and private sectors, together with spatial and urban planning, all influence urbanization.Cities become more concentrated centres of economic activity and innovation, serving as hubs for trade, transportation, and information flow. Additionally, cities develop into locations with the best quality public and private services, as well as places where basic services are frequently easier to access than in rural areas. The percentage of the population that lives in urban areas, as defined by national government criteria for defining urban and rural areas for the purposes of this report, is a common way to express the degree or level of urbanization.

In actuality, urbanization refers to the rise in the proportion of the population living in urban areas as well as the corresponding increases in the population living in cities, their sizes, and the total area occupied by urban settlements (United Nations, 2018).The world has been rapidly urbanizing in recent decades. Just 30% of people on the planet lived in cities in 1950; by 2018, that number had increased to 55%. Significant regional variations in urbanization levels are hidden by the global urbanization rate.With 82% of its population living in urban areas, North America is the most urbanised region. By contrast, Asia is about 50% urban, and Africa is primarily rural, with only 43% of its population living in urban areas as of 2018 (United Nations,

2018). The question of whether some regions urbanise faster or slower is raised by regional differences in urbanization levels. In order to answer this question, the analysis that follows contrasts historical trends of urbanization in the more developed regions with the rise in the percentage of people living in urban areas in a number of less developed regions between 1950 and 2015. The analysis across regions compares the rate of urbanization at equal levels of the percentage of the population that is urban because the pace and level of urbanization are related (United Nations, 2018).

With the exception of Northern Africa and South-Central Asia, some less developed regions have experienced faster rates of urbanization since 1950 when compared to the experiences of more developed regions. Economic transformation and spatial planning, which includes housing, infrastructure, and service delivery, are closely related to the degree and pace of urbanization as well as the underlying demographic drivers (United Nations, 2018).In terms of demography, urbanization is the gradual rise in the share of the population living in urban areas relative to the overall population. Urbanization is defined as an increase in the proportion of the total population living in urban areas. In the 20th century, there has been a global phenomenon of rapid urbanization. Urban poverty, which is essentially an extension of rural poverty, makes urbanization a more pressing issue in developing nations like India. Urbanization is a result of development, modernization, and migration and is indicative of periodic changes in technology, institutions, education, communication, industry, and organization. It also has a close relationship to the social and economic change of a state or area. Economic growth and urbanization mutually stimulate each other through significant structural changes.

Meanwhile, there will be an increase in megacities, big cities, and new cities due to ongoing rural-urban migration and urban expansion.Due to increased demands on infrastructure construction, material production, appropriation, and consumption brought on by an increase in human social and economic activity, rapid urbanization typically results in small-scale changes and shifts in environmental systems (Grimm, N.B. and et al. 2008). Thus, a better understanding of the rate of urbanization across geographic ranges is essential for tracking land change, urban growth, ecological responses to the spread of urban-related activities, and environmental shift in the context of sustainable development and political decision-making (Irwin, E.G.; Bockstael, N.E., 2007). The three pillars of sustainable development—economic, social, and environmental—are intimately linked to urban growth. A growing number of city dwellers may have potential negative effects on the environment and other aspects of society, but the benefits of agglomeration can be maximised with careful management of urbanization that is guided by long-term population trends.

The speed at which urbanization is occurring also differs greatly amongst nations. There is variation in the rate of urbanization in a few highly populated nations situated in distinct regions. China and Indonesia had very similar urbanization trajectories, beginning at nearly the same levels in 1950.While Egypt's trend has been flat since the 1970s, Brazil has experienced rapid urbanization, while Egypt's levels were comparable in 1950. This difference in trajectory can be attributed to the official definition of cities failing to account for the recent urbanization of rural settlements. In comparison to other countries with comparable percentages of the population living in urban areas, India's urbanization has advanced more slowly because of a sluggish process of reclassifying rural areas as urban. Ethiopia, on the other hand, has experienced comparatively rapid urbanization, both when compared to other developing nations at comparable levels of urbanization and to the historical experience of the more developed regions, having started from a very low level of urbanization in 1950.

Objective: To find out the velocity of urbanization in view of increase in towns and urban population.

II. METHOD AND MATERIALS

This study is descriptive type by nature based on secondary sources.

Sources of Data: The data are collected from various census reports, books, articles, websites and web-based journals published in different times.

Analysis: The many resources gathered from various sources have been examined, validated, and methodically arranged under the proper heading to support the necessary presentation and conclusion.Such interpolation or extrapolation to 1950 is based on the urban-rural ratio (URR_t), defined as the ratio of the urban to the rural population, that is:

$$URR_t = \frac{U_t}{R_t}$$

Where U_t and R_t denote the size at time t of the urban and the rural populations respectively. The urban-rural ratio at time t is directly related to the percentage urban (PU_t) because:

$$PU_t = \frac{U_t}{R_t + U_t} \times 100 = \frac{URR_t}{1 + URR_t} \times 100$$

III. RESULTS AND DISCUSSION

A large urban cluster where the urban areas of several cities are spatially connected by ongoing built-up development is referred to as an urban agglomeration or city, and is commonly associated with the term conurbation. Different concepts related to urbanization, growth, sprawl, and expansion have led to a great deal of confusion in multidimensional urban systems analysis. Urban population growth, physical expansion, the quality of urban layout, land and housing regulations, and other factors are all commonly described by the term "urban expansion," which has no set definition (Angel, et al, 2005). Urbanization, growth, sprawl, and expansion are closely related concepts that are difficult to distinguish in most real-world scenarios. Thus, urbanization velocity is the generally recognized and utilised metric for quantifying urbanization. The annual growth rate of an urban area over a given period is known as urbanization velocity, also known as urban expansion speed (Chunzhu Wei, et al., 2017, p. 2).

Here we have tried to explore the velocity of urbanization, where we have calculated: (1) Census wise increase of towns. (2) Census wise increase of urban population.

CENSUS WISE GROWTH OF TOWNS/CITIES FROM 1901 TO 2011

Census wise the number of total towns/cities is depicted in Table-1 and Fig.-1 for 110 years with effect from 1901 to 2011.

Table-1: Census wise Number of Urbanagglomeration/Town from 1901 to 2011

Census years	Number ofUrban Agglomerations/Towns
1901	1827
1911	1815
1921	1949

1931	2072
1941	2250
1951	2843
1961	2363
1971	2590
1981	3378
1991	3768
2001	5161
2011	7935

Source: Census of India for different years

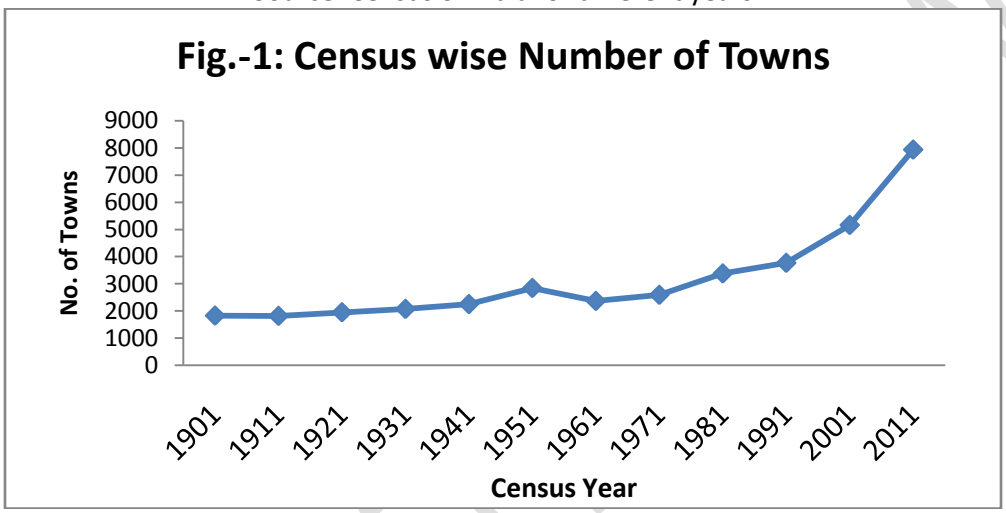


Fig.-1 is drawn on the basis of Table-1.

Explanation of Table-1 and Fig.-1: From the Table-1 and Fig.1, it is seen that the number of census cities/towns are increasing from 1901 to 2011 and the curve is upward rising with up and down. The curve is simply drawn on the basis of census wise number of towns/cities. In 1961, the number of towns/cities is lesser than that in 1951 on account of which the curve is downward moving and then upward. In this Figure, it is seen that the number of towns in each census periods from 1901 to 2011 was increasing with fluctuations i.e., the curve is also upward rising but not smoothly. Its number increased drastically to 2827 in 1951 from 2250 in 1941 and again, the number of towns decreased to 2365 in 1961. That is why, the curve increases from 1941 to 1951 and again decreases to from 1951 to 1961. In 2011 census the number of towns increased to 7935 accounted for 31.16 per cent urban population. It reflects a gradualincreasingtrendofurbanization.Indiaisat accelerationstageoftheprocessofurbanization. To get confirmation of rising trend, Decadal and Annual Growth Rate of Towns/Cities are to be calculated.

DECADAL AND ANNUAL GROWTH RATE OF TOWNS/CITIES

The Decadal Growth Rate of Census Towns in terms of percentage or the percentage Growth of Census Towns is calculated by the following formula. It is defined as the difference between the number of towns of initial census and the number of towns of final census divided by the number of towns of initial census and then multiplied by 100. Again annual growth rate of census towns is obtained by dividing decadal growth rate of towns by 10. The formulae of Percentage of

Decadal Growth Rate of Towns/cities and Percentage of Annual Growth Rate of Census Towns/cities for 110 years with effect from 1901 to 2011 are shown below.

$$\text{Percentage of Decadal Growth Rate of Towns} = \frac{\text{No. of Towns in initial Census} - \text{No. of Towns in Final Census}}{\text{No. of Towns in initial Census}} \times 100$$

$$\text{Percentage of Annual Growth Rate of Census Towns} = \frac{\text{Percentage of Decadal Growth Rate}}{10}$$

The Decadal and annual Growth Rates of Census Towns/cities in terms of percentage are constructed in Table-2.

Table-2: Census Wise Percentage of Decadal and Annual Growth Rate of Towns/Cities from 1901-2011

Census year	Number of Towns	Percentage of Decadal Growth Rate of Towns*	Percentage of Annual Growth Rate of Towns*
1901-1911	1815	-0.6568	-0.0656
1911-1921	1949	7.3829	0.7382
1921-1931	2072	6.3109	0.6310
1931-1941	2250	8.5907	0.8590
1941-1951	2843	26.3555	2.6355
1951-1961	2365	-16.8132	-1.6813
1961-1971	2590	9.5137	0.9513
1971-1981	3378	30.4247	3.0424
1981-1991	3768	11.5452	1.1545
1991-2001	5161	36.9692	3.6969
2001-2011	7935	53.7492	5.3749

Source: Census of India for different years. N.B.: * = self calculated.

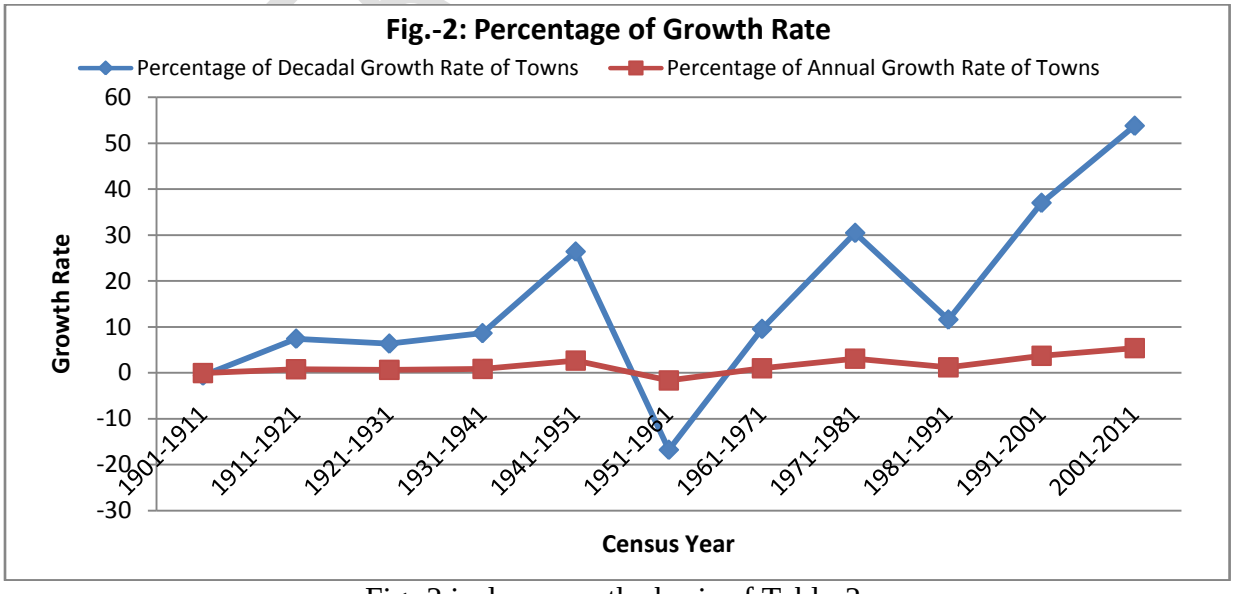


Fig.-2 is drawn on the basis of Table-2.

Explanation of Table-2 and Fig.-2: The Fig.-2 is drawn on the basis of Table-2. The curve shows the census wise Percentage of Decadal Growth Rate of Towns/cities, which is more or less upward rising from 1911 to 2011. But the number of towns/cities in 1951 census is 2843 while that in 1961 is 2365. That is, the number of towns/cities has decreased from 2843 to 2365. As a result the percentage of Decadal Growth Rate of Towns became negative in 1961, on account of which the curve is moving downward from the X-axis and become negative growth. But the Percentage of Annual Growth Rate of Towns is lying below the curve of Percentage of Decadal Growth Rate of Towns starting from below of the origin having negative value and slowly upward moving while the curve moves slightly downward below the origin having negative value in 1951-1961. But the overall trend of urbanization is positive. That is, the speed of urbanization is going on at different rate at different census year.

URBAN AND RURAL POPULATION
CENSUS WISE TOTAL POPULATION, URBAN POPULATION, RURAL POPULATION AND NUMBER OF TOWNS FROM 1901 TO 2011

Census wise TotalPopulation, Total Urban Population, and Total Rural Population for 110 years with effect from 1901 to 2011 censuses are depicted in Table-3 against their corresponding total towns/cities.

Table-3: Census Wise Total, Urban and Rural Population from 1901-2011 against the Towns/Cities

Census year	Number of Towns	Total Population	Urban Population	RuralPopulation
1901	1827	238396327	25851873	212544454
1911	1815	252093390	25941633	226151757
1921	1949	251321213	28086167	223235046
1931	2072	278977238	33455989	245521249
1941	2250	318660580	44153297	274507283
1951	2843	361088090	62443709	298644381
1961	2365	439234771	78936603	360298168
1971	2590	548159652	109113977	439045675
1981	3378	683329097	159462547	523866550
1991	3768	844324222	217177625	627146597
2001	5161	1027015247	285354954	741660293
2011	7935	1210193422	377105760	833087662

Source: Census of India for different years.

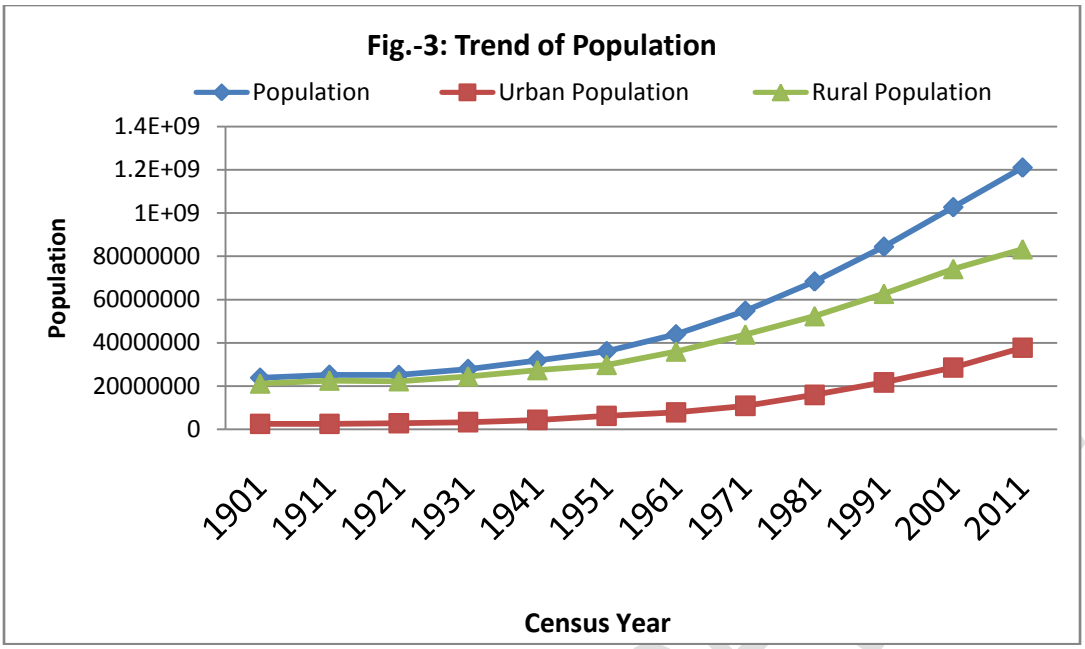
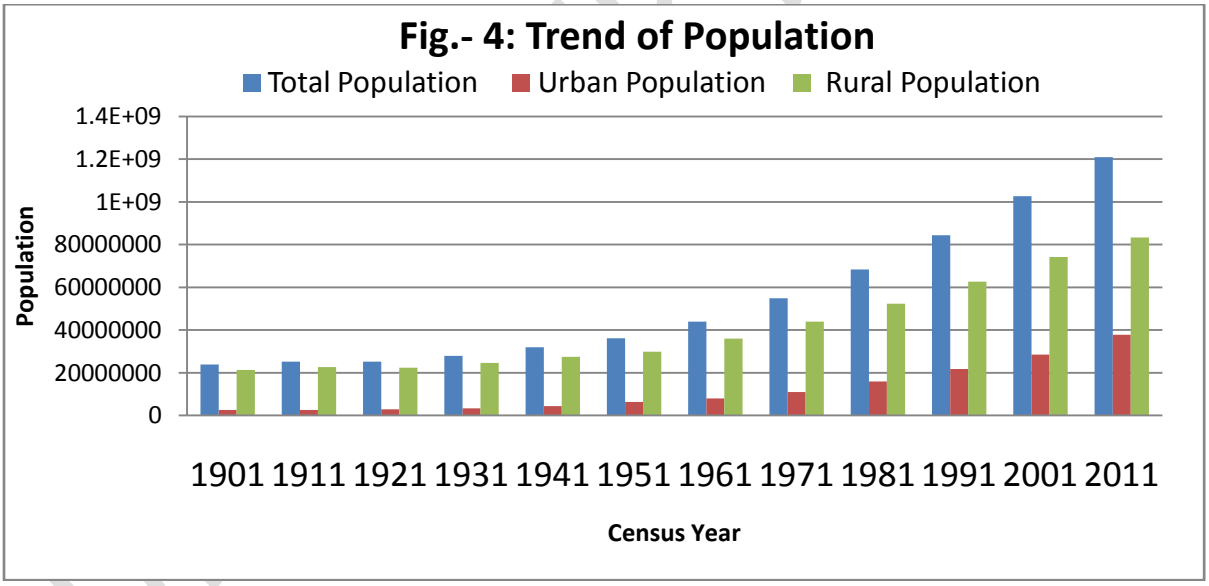


Fig.-3 is drawn on the basis of Table-3.



The Figure-4 is drawn on the Basis of Table-3.

Explanation for Table-3, Fig.-3 and Fig.-4: Both Table-3, Fig.-3 and Fig.-4 show the increase of the total population, urban population and rural population corresponding to the censuses from 1901 to 2011. Both Fig.-3 and Fig.-4 have depicted the trend of census wise increase of population. Fig.-3 shows a time plot line/curve diagram, where both the three curves for total population, urban population and rural population are smoothly upward rising indicating that both population are increasing for every census. The curve of total population stands above the urban and rural populations. The curve for rural population stands at the middle between total and rural populations. All the curves are upward rising.Fig.-5 is a bar diagram for total, urban

and rural populations where every bar for total population than those of rural and urban populations. The lengths of all the bars are rising for every census. It shows that all types of populations are increasing census wise from 1901 to 2011. That is, urbanization is going on. We may get clear picture if we get the shares of urban and rural populations in percentage form.

PERCENTAGE OF URBAN AND RURAL POPULATION IN INDIA FROM 1901 TO 2011

Table-4: Census Wise Trends of Urban and Rural Population in Percentage Form from 1901-2011 against the Census Towns/Cities

Census year	Number of Towns	Population	Urban Population	Percentage of Urban Population*	Rural Population	Percentage of Rural Population*
1901	1827	238396327	25851873	10.8440	212544454	89.15593
1911	1815	252093390	25941633	10.2904	226151757	89.70951
1921	1949	251321213	28086167	11.1754	223235046	88.82459
1931	2072	278977238	33455989	11.9923	245521249	88.00763
1941	2250	318660580	44153297	13.8559	274507283	86.1441
1951	2843	361088090	62443709	17.2932	298644381	82.70679
1961	2365	439234771	78936603	17.9713	360298168	82.02861
1971	2590	548159652	109113977	19.9055	439045675	80.09449
1981	3378	683329097	159462547	23.3361	523866550	76.66387
1991	3768	844324222	217177625	25.7220	627146597	74.27794
2001	5161	1027015247	285354954	27.7848	741660293	72.21512
2011	7935	1210193422	377105760	31.1607	833087662	68.83922

Source: Source: Census of India for different years. N.B.: * = self calculated.

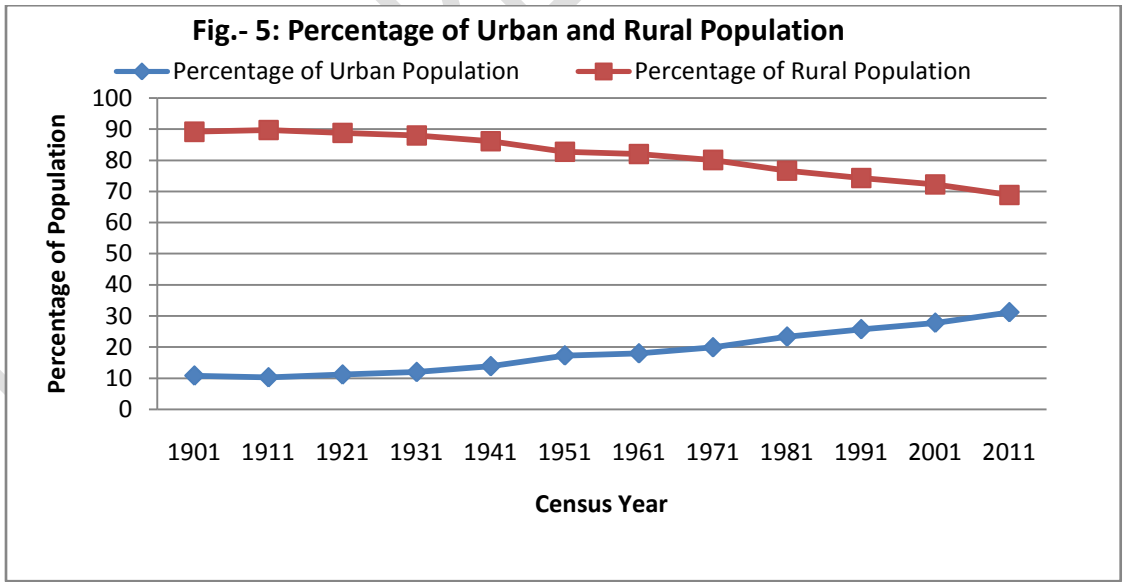


Figure-5 is drawn on the Basis of Table-4.

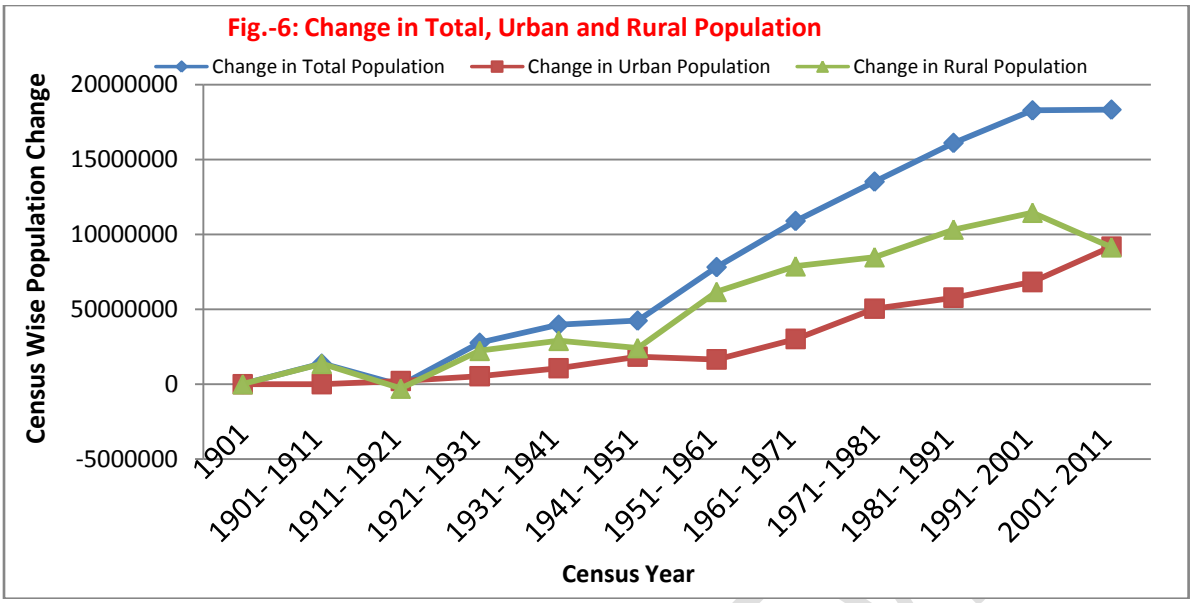
Explanation of Table-4 and Fig.-5: In the Figure both of percentages of urban population and rural population are depicted. The curve for Percentage of Urban Population is gradually upward

rising from beginning to the end while the curve for Percentage of Rural Population is gradually falling. It means that the share of rural population is decreasing while the share of urban population increasing. But at the beginning, the percentage of Urban Population of 1911 is slightly less than that of 1901 in the Table-4 on account of which the curve for urban population is slightly downward at 1911 census.But the trend of urban population is positive and upward rising while the percentage of rural population is downward sloping. As a result both the curves tend to meet each other and will meet at a point when the share of population for both urban and rural will be equal i.e., 50 percent. We may get clear picture if we get census wise change in populations. Now the urban population is 31.16 percent while rural population is 68.84 per cent. The curve of urban population will cross the curve of rural population and will go upward when the percentage of urban population will be more than 50 per cent and that of rural population will be less than 50 per cent. Generally, this is a picture of developed country where the percentage of urban population is more than that of rural population. This may be happened when our country will be developed.

Table-5: Census Wise Change in Total, Urban and Rural Population from 1901-2011 against the Towns/Cities

Census year	Number of Towns	Population	Change in Total Population*	Urban Population	Change in Urban Population*	Rural Population	Change in Rural Population*
1901	1827	238396327	0	25851873	0	212544454	-
1901- 1911	1815	252093390	13697063	25941633	89760	226151757	13607303
1911- 1921	1949	251321213	-772177	28086167	2144534	223235046	-2916711
1921- 1931	2072	278977238	27656025	33455989	5369822	245521249	22286203
1931- 1941	2250	318660580	39683342	44153297	10697308	274507283	28986034
1941- 1951	2843	361088090	42427510	62443709	18290412	298644381	24137098
1951- 1961	2365	439234771	78146681	78936603	16492894	360298168	61653787
1961- 1971	2590	548159652	108924881	109113977	30177374	439045675	78747507
1971- 1981	3378	683329097	135169445	159462547	50348570	523866550	84820875
1981- 1991	3768	844324222	160995125	217177625	57715078	627146597	103280047
1991- 2001	5161	1027015247	182691025	285354954	68177329	741660293	114513696
2001- 2011	7935	1210193422	183178175	377105760	91750806	833087662	91427369

Source: Source: Census of India for different years. N.B.: * = self calculated.



The Figure-6 is drawn on the Basis of Table-5.

Explanation of Table-5 and Fig.-6: The curves for census wise change in Total Population, Urban Population and Rural Population are upward rising with slightly up and down from 1901 census to 2011 census, while the curves for change in Total Population and change in Rural Population have become negative in 1911-1921 census, as a result both the curves move down ward below the X-axis. All the three curves are up and down with upward trend. So the overall velocity of urbanization in India is prominent in positive direction from 1901 census to 2011 census.

IV. FINDINGS

Through different way of presentations, mathematically and diagrammatically, it is found that the urbanization in India is expanding from the very beginning, 1901 census to 2011 census but at different velocity at different census year.

V. CONCLUSION

Urbanization velocity, which includes both direction and speed, can be used to estimate the rate of growth and the geographic expansion of urban areas, giving researchers a consistent and spatially explicit measure of the areas' expansion. Furthermore, our understanding of the spatiotemporal dynamics of urban processes and the ensuing change in land cover can be further enhanced by combining the geographic pattern of velocity of urbanization with the pattern of land use change, which reveals radically outward expansions of high density urban activities across developing areas and the accompanying emergence of human-built surfaces. Therefore, we can forecast future urban growth and the underlying conversions of coupled human and natural landscape to fully human-dominated urban scope with the help of the velocity of urbanization (Ting Ma & et.al).

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