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Editorial Note

The entire process of bringing out the present issue of the journal passed through a challenging time. The ruthless second wave of Covid-19 made movements outside the home highly restricted. We lost our four highly dynamic and proactive life members during this period. Despite all such odds, I am happy to share with you we could publish a good number of articles, the largest in recent years.

Once again, our contributors make a combination of young and mature scholarship. On one hand, in the list of our contributors are included names such as Professor H. Ramachandran, National Fellow, ICSSR, New Delhi and Dr. Prithvish Nag, Former Surveyor General of India, on the other young research fellow such as Mr. Soleman Khan, Aliah University, Kolkata and Mr. Ashis Kumar Majhi, Pt. Ravi Shankar Shukla University, Raipur (Chhattisgarh).

The main thrust of research contributions published in this issue is on Indian urbanization, may it be the city growth, urban hierarchy and urban living in Assam, or urban, urbanization and urbanism in India, or population projections for metropolitan cities of India or sourcing of land for sheltering the urban poor, all provide refreshing explanations and in-depth analysis of each issue. Besides, the availability and accessibility of health care facilities in the tribal setting, the nature of the association between natural resource base and demographic characteristics in the Ganges basin, and fertility and female education in India are other themes examined in papers included in this issue.

The traditional, as well as modern techniques of data analysis and interpretation, have been put into service by the authors. The findings of these studies are worthy of special attention. These are to be noted for their applied value.

The Map Series, a regular feature of Population Geography journal, this time highlights the spread of Malayalam speaking people outside Kerala in India. Geo-Reflections, the newly inducted series reflects on sustainable goals and uneasy questions interconnected with this concept.

Finally, I express my sincere gratitude to the Members of the Executive Committee of the Association of Population Geographers of India (APGI) and the Editorial Board of Population Geography for their unqualified help and support in discharging my duties as the Editor. My special thanks are due to Professor K.R. Dikshit, Editor-in-Chief, for his encouragement, Mr. Mohan Singh, Cartographic Advisor, for his tremendous help and support, Professor R.Vaidyanathan, a reputed senior geographer, for sharing comments on the papers published in different issues of this journal and the paper contributors for their well-researched and articulated research contributions.

Surya Kant
Editor

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City Population, Hierarchy of Urban Centres and Urban Living Conditions in Assam[1]

Hariharan Ramachandran[2], Poonam Sharma and Priyanka Tiwari, New Delhi

ABSTRACT: The proportion of urban population in Assam for the census years 1991, 2001 and 2011 does not show much variation across districts. There are, however, notable changes between 2001 and 2011 with spatial distribution significantly skewed in 2011 as compared to 2001. The urban population remained low throughout the past century in Assam.

Using decadal urban population growth rates, this paper identifies three types of towns: in-migrating, stagnant and out-migrating. Large towns do not emerge as in-migrating towns. In the background of low urbanization level, a high degree of primacy, the eccentric location of the largest town, and a large number of small towns, the question addressed in this paper is: Are traditional concepts like urban settlement hierarchy and rank-size rule valid in the state? Since, the entire analysis rests on a popular concept in human geography–settlement hierarchy-that has accumulated a huge body of literature no attempt is made to burden this paper with a comprehensive list of references. The paper is based on data from the Census of India publications and reports; the result of the analysis using the concept of centrality and rank size rule. In addition, an index of living conditions has been computed for each urban centre, showing no or little link between urban living conditions and the hierarchy of settlements.

Key Words: Settlement hierarchy, Centrality, Rank-size rule, Living conditions, Urban population growth, Migration.

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Introduction

Assam is the largest state in the North-East region of India, accounting for about 2.4 per cent of the total geographical area and 2.6 per cent of country's population. The density of population at 398/km^2, is slightly higher than the national average (382/km^2) in 2011. The rate of urbanization in Assam is quite low (14.0 per cent) in comparison to national average of 31.0 per cent.

The social and economic development process of Assam has been affected by the two wars on the eastern front of the country and the large-scale in-migration of people from Bangladesh, which also led to no census enumeration in the year 1981. While inadequate growth of state income itself may be part of the cause of social tension and unrest during the seventies and eighties, the growth process itself got adversely affected due to the movements in the subsequent period. These factors are also responsible for the low urbanization in the state. The economic, social and political environments are obviously inter-dependent.

Urbanization is a very complex phenomenon and is based on the social structure, the economic base and the spatial characteristics of the region in addition to the diffusion process, and

[1]The paper is a part of a larger study entitled 'Urbanisation and Human Capital Development in Assam', sponsored by the Indian Council for Social Science Research, (ICSSR), New Delhi.

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migration. The demographic interpretation of urbanization process visualizes it in terms of increasing concentration of population in 'urban' places. This increase of urban population may be due to the increasing size of existing urban settlements in isolation or in association with other neighbouring urban settlements. This can also occur through the appearance of a new urban area, a new township being created or a largely rural settlement reclassified as urban.

In India, all statutory towns, i.e. all places with a municipal corporation, cantonment board or notified area committee, etc., are treated as urban. In addition, places having: (i) a minimum population of 5,000. (ii) 75.0 per cent of the male working population engaged in non-agricultural activities and (iii) a density of population of at least 400 persons/ km^2 are also treated as Census Towns. Thus, there are two types of towns in India (a) statutory or municipal towns and (b) census towns. These two types are not mutually exclusive – a census town can be a statutory town and vice versa. The definition of an urban place in India has remained almost the same since 1961.

Research Objective

In the light of above stated background of urbanization in Assam, we will attempt to look into the size class classification of towns, their growth over the time, the pattern of urban growth and the reason underlying that growth.

Trends in urban population distribution and growth

A comparison of shares of urban population in Assam for 1991, 2001 and 2011 do not show much variation in the districts. There are, however, notable changes between 2001 and 2011. In 2011, the spatial distribution is significantly skewed in comparison to 2001. This has been brought out by the GINI coefficient based on district level data for 1991, 2001 and 2011 (Table 1). The values in Table 1 show that from near equal district-wise distribution of proportion of the urban population in 1991, there has been an increasing tendency towards a more regionally skewed distribution of urban population in the state. With the growth in urban population over time, there is also a tendency towards concentration.

Table 1: Assam: District level proportion of urban population in Assam (GINI Coefficients), 1991-2011

Census Year	GINI Value	Census Year	GINI Value
1991	0.001	2011	0.322
2001	0.022	*Source*: *Primary Census Abstract*, Assam, 1991, 2001 and 2011	

The proportion of urban population has been low throughout the last century in Assam. Assam's urban growth was significantly higher than that of the country but subsequently, after 1981, the growth rate has reduced. The reduced gap in growth rate after 1981 may be because of the increasing urban base in Assam.

Number of urban centres by size class of towns

The number of towns increased from 87 to 214, mostly in class V and VI (Table 2). This is essentially a result of New Census Towns– reclassified from Villages. In the case of larger

towns, the change is low, because the movement of towns from one size class to another within the set of urban centres. For example, the number of towns increased to six from four in class I and to eight from four in class II.

In 1991, the state had a total of 87 towns. Of this, four towns each belonged to class I and class II. The number of larger towns (class I and class II) increased between 1991 and 2001, but there is no change in 2011 there is no change in the number of Class I towns and only one town is added to Class II category (Goalpara town) in 2011. The number of towns with less than 20,000 population size category of towns is more than the other size classes. The distribution of towns in different size classes shows a pyramidal structure, illustrating a wider base till the size class V.

Table 2: Assam: Distributions of urban centres by population size category, 1991, 2001 and 2011

Town size/class category	Census year		
	1991	2001	2011
1,00,000 and Above (I)	4	6	6
50,000-99,999 (II)	4	7	8
20,000-49,999 (III)	20	23	26
10,000-19,999 (IV)	32	34	52
5,000-9,999 (V)	15	43	94
Below 5,000 (VI)	12	11	28
Total	**87**	**125**	**214**

Source: *Primary Census Abstract, Assam*, 1991, 2001 and 2011

Since the natural growth rate of Assam is below 15.0 per cent between 2001 and 2011, all the towns recording a growth rate of less than 15.0 per cent may be treated to be out-migrating towns. Similarly, one can consider the towns recording a growth rate of 15.0- 25.0 per cent as stagnant towns and those above 25.0 per cent as in-migrating towns.

The growth rate (2001-11) by size class of towns in 2001 is recorded in Table 3. In-migrating towns were only 14 in number – all of them small; and many large towns were out-migrating towns. We may infer from the table that (a) No association exists between size class of towns and town growth rate and (b) Urbanization pattern in Assam is dominated by a large number of small towns. One important reason for this could be poor transport connectivity.

Urban settlement hierarchy

Some significant attributes of urbanization and urban centres in Assam can be summarised as: The state reveals (i) low level of urbanization, (ii) strong primacy of the state capital, Guwahati, in terms of population, wherein the second ranking city records only one fifth of the population of the first ranking city (See Appendix-I), (iii) The largest city – Guwahati is eccentrically located – towards the east of the state, (iv) poor transport connectivity with the mighty Brahmaputra river bisecting the state into the north and the south.

Table 3: Assam: Population growth rate (%) by size category of towns, 2001-2011 (by size class in 2001)

Nature of Town's growth	Growth rate (%)	Size Class					
		I	II	III	IV	V	VI
Out-migrating	< 15	4	6	18	29	25	9
Stagnant	15-25	1	1	5	3	8	0
In-migrating	> 25	0	0	2	8	4	0

Source: *Primary Census Abstract, Assam*, 2001 and 2011

Traditionally, the distribution pattern of urban population across a system of cities is treated as a result of centrifugal and centripetal forces – population attracting and population repelling factors. Within such a system one expects cities to be distributed in a hierarchical pattern. Two different approaches are available to establish urban hierarchy: (a) the Rank-Size-Rule and (b) the Central Place Model by computing Town wise Centrality Index. While these two approaches arrange the towns of a region according to what can be termed central functions (catering not only to the city population but also the population of the hinterland) and usually have a strong relationship to the population size of the city, there are other physical infrastructure facilities that are provided for essentially the use of city population, which determine the living conditions of people residing in them. Such facilities are adequate and supply of clean drinking water, assured supply of electricity, proper drainage system and intra-city connectivity. These are civic facilities of prime importance. As these services are public services in nature they need to be provided to all residents. Insufficient basic facilities result in a poor quality of life. Provision of most of these basic needs is the responsibility of state government and Urban Local Bodies.

Urban hierarchy in Assam based on rank-size rule

The concept of rank distribution of cities, towns, and other settlements for specific areas, is generally referred to as "Rank Size Rule", popularized by Zipf (1941)[3]. He scientifically put forward the concept as a theoretical model to express the relationship between observed and empirical regularity in the size of human settlements. The rule, also referred to as Zipf's Law, implies that a city's population is equal to the population of the region's largest city, divided by the rank of that city.

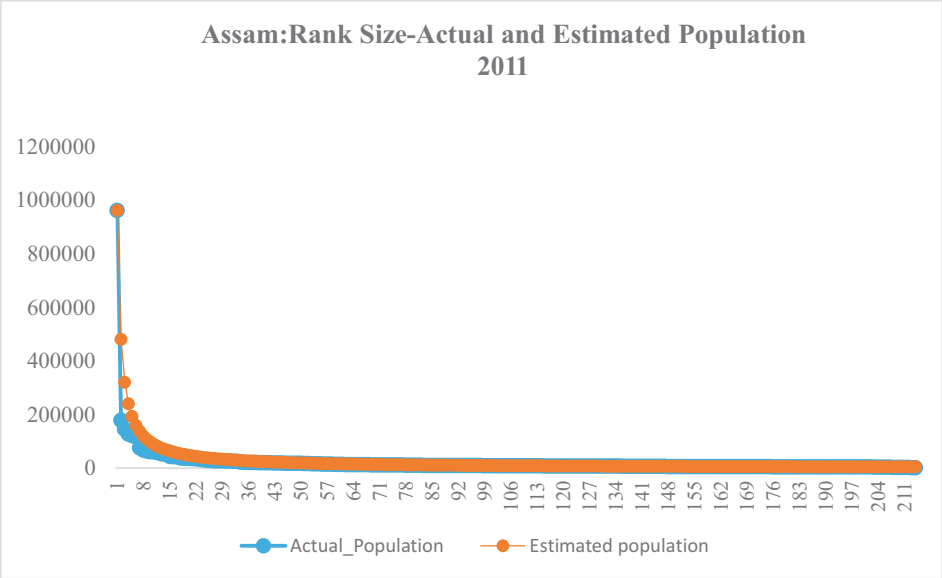
Rank-size distribution or the rank-size rule describes a remarkable regularity in many phenomena including distribution of city sizes around the world. If one ranks the population size of cities in a given region and calculates the natural logarithm of the rank and of the city population, the resulting graph provides a remarkable log-linear pattern. This is the rank-size distribution. Moreover, Zipf also observed that if the city populations were plotted against city rank on a double logarithmic scale, the scale would be approximately a straight line with a slope of -1. In other words, each city would be half the size of the city next highest in rank. This is known as 'normal' rank size distributions. The rank-size rule in its most restrictive form is given by: $P_x = P_1/x$ where: x is the rank of the city's population, i.e. a 1 for the highest population, 2 for the

[3] Zipf, G. K. (1941): *National unity and disunity; the nation as a bio-social organism*, Principia Press.

second highest etc. Px is the population size of the city ranked x, P_1 is the population size of the largest city. Generally, the relationship is curvilinear.

This section attempts to plot the rank size distribution for the towns of the state of Assam for the year 2011 based on Census of Assam data. Town wise population data is arranged in descending order and then the town with the largest population is allocated rank 1, the town with the second largest population ranked second, and so on. The population of the towns and the rank of the towns have been plotted on a graph (Fig.1). Guwahati was the largest (9,62,334 persons) and Ananadnagar, the smallest town, with a population of only 2,050 persons in 2011.

Fig. 1: Rank and Population (Actual and Rank Size Estimates), 2011



Source: Actual population data from *Primary Census Abstract, Assam*, 2011 and estimated population calculated from rank-size rule.

It is possible to estimate the population of towns other than first ranking town based on the rank-size principle. Significant deviations among middle order towns can be noted although in general, as the size of the towns decrease the deviations are also smaller. The graph also brings out natural breaks in the urban population distribution that emphasize prominent breaks with reference to larger urban centres.

Centrality index of urban settlements

The concept of settlement hierarchy is rooted in the concept enunciated in the central place model (Christaller, 1939). Centrality of a human settlement (urban or rural) is a crucial indicator of its significance, growth and expansion in a region. Central places mean human settlements which provide goods and services to the hinterland area on a regular basis. Central goods and services are the ones which attract people from the complementary area. However, not all central goods and services are available in each central place as benefits to customer and the producer

need to be ensured from the efficiency point of view. From the customer viewpoint, range (maximum distance travelled) and from the producer viewpoint, the threshold (minimum population/demand required to support the good/service) is an important criterion in accessing/ providing goods and services, respectively. Central places higher up in the hierarchy offer a larger number of goods and services of both high end (costly and less frequently purchased) and low end (ordinary goods and services). Central places are therefore, different from each other on the basis of intensity and variety of goods and services.

Often central places (in the present analysis-urban centres) are arranged in hierarchical order by computing centrality scores of each urban settlement. Present study uses a set of 16 variables, data obtained from the Census of India (2011) for Assam, including:(1) Railway Station, (2) Allopathic Hospital, (3) Dispensary/health Centre, (4) Family Welfare Centre, (5) Maternity and Child Welfare Centre, (6) TB hospital/clinic, (7) Nursing Home, (8) Veterinary Hospital, (9) Colleges– arts, science, commerce, law, (9) Medical Colleges, (9) Engineering colleges (10) Management Institutes, (11) Polytechnics, (12) Nationalised Banks, (13) Private Commercial Banks, (14) Cooperative Banks, (15) Agricultural Credit Societies, and (16) Non-agricultural Credit Societies.

The second step involves assigning weights to variables-either judgmentally or using some specified criteria and computing composite scores. The scores derived by several methods but the central functions, attracting people from the hinterland, is basic to all. Here, we have assigned weights which are inversely proportional to the number of settlements having the selected indicators and computing composite scores – the method of deriving weights is built into the method of computing centrality index (CI). A matrix has been created having 214 rows (each row is an urban settlement in Assam– 2011) and 16 columns, each recording the number of facilities (variables listed above) in the towns. Each value in a column is divided by the column mean. Thus, variables having larger mean- i.e. variables which are more ubiquitously distributed will get lower weights and vice-versa. Addition of values across a row weighted by 100 gives CI the towns. The values of the CI are classified into four categories (See Table 4).

The CI is, in a way, a reflection of population size of the towns, correlation coefficient between the two variables being 0.96. Guwahati tops with CI value of 1255.49. Also, it indicates that there is a pyramidal structure, as the number of towns declines centrality values increase. The first order city is supported by 15 second order, 62 third order and 136 fourth order towns. One can see similarity in the spatial patterns of composite centrality scores of towns (see Fig.1). Overlapping of hinterlands of lower order centres and higher order centres, as well as hinterlands of lower order centres falling within the hinterland of higher order centres, is very common. These two features are common only in case of districts having both the level of urbanization and the frequency of the small towns relatively high. Such overlapping is almost absent in districts with relatively lower levels of urbanization, characterised by a fewer number of small towns.

Table 4: Classification of Towns based on Weighted Centrality Scores	
Centrality index value	Name of the town
Below 20	Bilasipara (TC), Mankachar (CT), Dergaon (MB), Dhing (TC), Tangla (TC), Makum (TC), Abhayapuri (TC), Niz-Hajo (CT), Ambikapur Pt. X (CT), Sualkuchi (CT), Basugaon (TC), Digboi Oil Town (CT), Sapatgram (TC), Gobindapur (CT), Nahira (CT), Lido Town (CT), Salpara Molandubi Pt.-I (CT), Gerimari Chapori (CT), Gutlong Gaon (CT), Umrangso (TC), Kampur Town (TC), Morongial (CT), Chapakhowa Town (C T), Lakhipur (MB), Dimaruguri (CT), Khaira Bari (CT), Kamalabaria N.C. (CT), Sarupathar (TC), Kahi Kuchi (CT), Bhuragaon (Rev.) Town (CT), Golaghatia Basti (CT), Bhalukdubi (CT), Kanakpur Pt. II (CT), Donkamokam (TC), Durga Nagar Pt. V (CT), Chekonidhara (CT), Badarpur Rly. Town (CT), Amin Gaon (CT), Jhagra Pt.III (CT), Teok (TC), Tarapur Pt VI (CT), Sarupathar Bengali (CT), Hamren (TC), Belsor (CT), Moran Town (CT), Dahali (CT), Borpukhuri (CT), Simaluguri (TC), Bohari (CT), Golokganj (CT), Chatibor Gaon (CT), Majgaon (CT), Sarbhog (TC), Dharapur (CT), Kumar Kaibarta Gaon (CT), Rupahi Town (CT), Amguri (MB), Ambicapur Pt VI (CT), Nidanpur Pt-II (CT), Barika Chuburi (CT), Irongmara (CT), Barpathar (TC), Bamun Sualkuchi (CT), Kochpara (CT), Jamunamukh (CT), Kanisail Pt I (CT), Asudubi (CT), Mairabari Town (CT), Upar Hali (CT), Tarapur VII (CT), Uttar Krishnapur Pt. I (CT), Padmabil (CT), Bahbari Gaon (CT), Takhlibilar Pathar (CT), Sarpara (CT), Jalah (CT), Bali Koria (CT), Chota Haibor (CT), Silchar Pt. X (CT), Pub-Dhaniram Pather (CT), Maibong (TC), Kanakpur I (CT), Katirail T.E. (CT), Forest Vill. Lakhipathar (CT), Uttar Athiabari (CT), B.R.P.L. Township (CT), Narayanpur (TC), Bangaon (CT), Sonapur Gaon (CT), Chalantapara Pt IV (CT), Niz Katigorah Pt III (CT), Mohmaiki (CT), No.2 Goreswar (CT), Thekashu Pt.-II (CT), Tegheria (CT), Kakaya (CT), Kharijapikon (CT), Dokmoka (TC), Changsari (CT), Lakhi Nepali (CT), Digheli (CT), Borgolai Grant No.II (CT), Uttar Krishnapur Pt III (CT), Niz-Bahjani (CT), Kalaigaon Town (Part) (CT), Chandrapur Baghicha (CT), Charingia Gaon (CT), Lido Tikok (CT), Mosli Pt I (CT), Dudhpatil Pt VI (CT), Naubaisa Goan (CT), Rupiabathan (CT), Palasbari (MB), Damara Patpara (CT), Salakati (CT), Majir Gaon (CT), Majarkuri (CT), Dhekorgorha (CT), Udiana (CT), Tupkhana Pt I (CT), Pipalibari (CT), Sanpara (CT), Garal (CT), Thekashu Pt-I (CT), Nowsolia Gaon (CT), Sepon (CT), Dudhpatil Pt V (CT), Marowa (CT), Nakhula Grant (CT), Kachujan Gaon (CT), Digaru Gaon (Digarubar Gaon) (CT), H.P.C. Townshi p (CT), Laharijan Natun Bosti (CT), Numaligarh Refinery Township (CT), Mahur (TC), Anand Nagar (CT) **Total=136**
20-80	Bongaigaon (MB), Dhubri (MB), Karimganj (MB), Haflong (TC), Barpeta (MB), Golaghat (MB), Lanka (MB), Hojai (MB), Barpeta Road (MB), Kokrajhar (MB), Hailakandi (MB), Lumding (MB), Marigaon (MB), Duliajan Oil Town (CT), Rangia (MB), Nalbari (MB), Margherita (TC), Mangaldoi (MB), Silapathar (TC), Gauripur (TC), Lumding Rly. Col. (CT), Digboi (TC), Dhekiajuli (MB), Doom Dooma (TC), Mariani (TC), Chapar (TC), Bokajan (TC), Sonari (MB), Biswanath Chariali (TC), Kharupatia (TC), Rangapara (TC), Howli (TC), Titabor Town (TC), Jagiroad (CT), Namrup (CT), Lakhipur (TC), Udalguri (TC), Dhakuakh ana (TC), Nazira (MB), Badarpur (TC), Bijni (TC), Doboka (TC), Dhemaji (TC), Gohpur (TC), Bihpuria (TC), Lala (TC), Ambicapur Pt VIII (CT), Pathsala (TC), Chapra (CT), Raha (TC), North Guwahati (TC), Bokakhat (TC), Gossaigaon (TC), Chabua (TC), Sarthebari (TC), Niz-Mankata (CT), Moranhat (TC), Barua Bari Gaon (CT), Howraghat (TC), Tihu (TC), Jonai Bazar (CT), Barbari (Amc Area) (CT) **Total=62**
80-400	Silchar (MB+OG), Dibrugarh (MB+OG), Jorhat (MB+OG), Nagaon (MB+OG), Tinsukia (MB+OG), Tezpur (MB+OG), Diphu (TC), North Lakhimpur (MB), Goalpara (MB), Sivasagar (MB), Naharkatiya (TC), New Bongaigaon Rly. Col.(CT), Azara (CT), Parlli Part (CT), Batarashi (CT) **Total=15**
Above 400	Guwahati (MB+OG) **Total=1**
Source: Calculated from *Primary Census Abstract, Assam, 2011* M Corp= Municipal Corporation, MB=Municipal Board, OG= Out Growth, TC=Town area Committee, CT=Census Town,	

Urban living conditions

A city performs the two kinds of function: (i) only for those living within the city limits, and (ii) for the population living within and outside the city limits. In the preceding section, an index of centrality has been calculated, showing the city position in the hierarchy of cities. Similarly, a living conditions index, based on variables and reflecting mainly the living conditions of residents (falling below (ii) above), can be calculated. These two indices may or may not relate to each other.

Table 5: Assam: Mean values of urban living conditions indicators by size class of Towns (2011)

S.No	Indicators	VI	V	IV	III	II	I
1	Pucca Road/Km^2	4.98	4.21	4.25	4.51	4.01	3.44
2	Drainage System (Closed 1; Others 0)	0.04	0.00	0.06	0.08	0.13	0.17
3	Flush/Pour Flush Latrines per 1000 households	541.33	540.57	521.86	678.69	680.42	828.33
4	Source of Water Supply (Treated Tap Water 1; Others 0)	0.21	0.41	0.37	0.42	0.50	0.83
5	Water Capacity per 1000 Population (in KL)	33.65	50.05	93.76	113.48	126.15	95.01
6	Electricity Domestic Connection per 1000 households	715.99	730.44	790.29	837.36	870.90	869.22
7	Electricity Commercial Connection per 1000 population	10.91	14.40	22.66	35.32	32.86	47.41
8	Electricity Road Lighting Connection per sq km.	50.18	35.84	42.22	85.73	73.70	101.80
	No. of Towns	**28**	**94**	**52**	**26**	**8**	**6**

Source: As Table 3

The mean values of some possible indicators of living conditions by size class of towns are in Table 5. *Pucca* road density is the only indicator whose score declines with town size. For example, the highest ratio of roads/km^2 of urban area is in the case of class IV towns and the lowest for Class I towns, probably because the road length is a function of area size of a city than its population size. All other indicators record, in general, increased values with increase in population size of towns, as evident from the values for the drainage system, domestic and commercial electric connections as well as road lighting (Table 5).

To measure the overall living conditions in towns of Assam (2011), the indicators listed in Table 5 have pressed into service. The steps involved to calculate the overall living conditions are as follows:

1) Constructing a data matrix of 214 x 8 dimension each row being a town in Assam and eight columns that define living conditions. Since all the variables are positive in nature, a higher score would indicate better living conditions.
2) Computing the mean of each indicator for different classes of towns (Size category of towns giving in Census of India)
3) Dividing the value of each indicator for a town by the average value for all the towns in that class category.
4) Summing up by rows to get composite living condition scores of each town.

Table 6: Classification of Towns on the basis of composite scores of living condition	
Score value	Name of the town
Below 06	Goalpara (MB), Haflong (TC), Lanka (MB), Lumding (MB), Gauripur (TC), Biswanath Chariali (TC), Howli (TC), Lakhipur (TC), Ambikapur Pt. X (CT), Sualkuchi (CT), Gobindapur (CT), Nahira (CT), Lido Town (CT), Salpara Molandubi Pt.-I (CT), Ambicapur Pt VI (CT), Gutlong Gaon (CT), Morongial (CT), Chapakhowa Town (CT), Dimaruguri (CT), Khaira Bari (CT), Bhalukdubi (CT), Donkamokam (TC), Chekonidhara (CT), Jhagra Pt.III (CT), Tarapur Pt VI (CT), Hamren (TC), Dahali (CT), Borpukhuri (CT), Golokganj (CT), Chatibor Gaon (CT), Majgaon (CT), Dharapur (CT), Kumar Kaibarta Gaon (CT), Rupahi Town (CT), Nidanpur Pt-II (CT), Ambicapur Pt VIII (CT), Barika Chuburi (CT), Irongmara (CT), Bamun Sualkuchi (CT), Kochpara (CT), Jamunamukh (CT), Asudubi (CT), Upar Hali (CT), Batarashi (CT), Uttar Krishnapur Pt. I (CT), Padmabil (CT), Bahbari Gaon (CT), Takhlibilar Pathar (CT), Sarpara (CT), Jalah (CT), Bali Koria (CT), Silchar Pt. X (CT), Katirail T.E. (CT), Niz- Mankata (CT), Parlli Part (CT), Sonapur Gaon (CT), Niz Katigorah Pt III (CT), Mohmaiki (CT), No.2 Goreswar (CT), Tegheria (CT), Kakaya (CT), Barua Bari Gaon (CT), Changsari (CT), Lakhi Nepali (CT), Digheli (CT), Uttar Krishnapur Pt III (CT), Niz-Bahjani (CT), Kalaigaon Town (Part) (CT), Chandrapur Baghicha (CT), Lido Tikok (CT), Dudhpatil Pt VI (CT), Naubaisa Goan (CT), Rupiabathan (CT), Damara Patpara (CT), Majir Gaon (CT), Dhekorgorha (CT), Udiana (CT), Tupkhana Pt I (CT), Pipalibari (CT), Sanpara (CT), Garal (CT), Nowsolia Gaon (CT), Sepon (CT), Marowa (CT), Nakhula Grant (CT), Kachujan Gaon (CT), Digaru Gaon (Digarubar Gaon) (CT), Dudhpatil Pt V (CT), Anand Nagar (CT) **Total=89**
06-10	Guwahati (MB+OG), Dibrugarh (MB+OG), Jorhat (MB+OG), Tezpur (MB+OG), Bongaigaon (MB), Bilasipara (TC), Dergaon (MB), Dhing (TC), Makum (TC), Abhayapuri (TC), Niz-Hajo (CT), Digboi Oil Town (CT), Gerimari Chapori (CT), Umrangso (TC), Kampur Town (TC), Bhuragaon (Rev.) Town (CT), Golaghatia Basti (CT), Kanakpur Pt. II (CT), Durga Nagar Pt. V (CT), Teok (TC), Sarupathar Bengali (CT), Moran Town (CT), Sim aluguri (TC), Bohari (CT), Amguri (MB), Kanisail Pt I (CT), Mairabari Town (CT), Tarapur VII (CT), Chota Haibor (CT), Maibong (TC), Kanakpur I (CT), Forest Vill. Lakhipathar (CT), Uttar Athiabari (CT), B.R.P.L. Township (CT), Narayanpur (TC), Thekashu Pt.-II (CT), Kharijapikon (CT), Dokmoka (TC), Borgolai Grant No.II (CT), Charingia Gaon (CT), Mosli Pt I (CT), Thekashu Pt-I (CT), Laharijan Natun Bosti (CT), Numaligarh Refinery Township (CT), Barpeta (MB), Golaghat (MB), Kokrajhar (MB), Marigaon (MB), Nalbari (MB), Margherita (TC), Silapathar (TC), Doom Dooma (TC), Mariani (TC), Chapar (TC), Bokajan (TC), Rangapara (TC), Jagiroad (CT), Namrup (CT), Udalguri (TC), Nazira (MB), Doboka (TC), Lala (TC), Pathsala (TC), Chapra (CT), North Guwahati (TC), Bokakhat (TC), Gossaigaon (TC), Chabua (TC), Sarthebari (TC), North Lakhimpur (MB), Naharkatiya (TC), Moranhat (TC), Jonai Bazar (CT), Badarpur (TC) **Total=74**
10-20	Nagaon (MB+OG), Tinsukia (MB+OG), Dhubri (MB), Sivasagar (MB), Karimganj (MB), Hojai (MB), Barpeta Road (MB), Duliajan Oil Town (CT), Mangaldoi (MB), Lumding Rly. Col. (CT), Digboi (TC), Dhekiajuli (MB), Sonari (MB), Kharupatia (TC), Titabor Town (TC), Tangla (TC), New Bongaigaon Rly. Col.(CT), Bijni (TC), Dhemaji (TC), Sapatgram (TC), Bihpuria (TC), Raha (TC), Kamalabaria N.C. (CT), Sarupathar (TC), Amin Gaon (CT), Azara (CT), Belsor (CT), Sarbhog (TC), Barpathar (TC), Pub-Dhaniram Pather (CT), Chalantapara Pt IV (CT), Howraghat (TC), Palasbari (MB), Barbari (Amc Area) (CT), Mahur (TC) **Total= 35**
Above 20	Silchar (MB+OG), Diphu (TC), Hailakandi (MB), Rangia (MB), Mankachar (CT), Basugaon (TC), Dhakuakhana (TC), Gohpur (TC), Lakhipur (MB), Kahi Kuchi (CT), Badarpur Rly. Town (CT), Bangaon (CT), Salakati (CT), Majarkuri (CT), Tihu (TC), H.P.C. Township (CT) **Total=16**
Source: Calculated from *Primary Census Abstract, Assam, 2011* M Corp= Municipal Corporation, MB=Municipal Board, OG= Out Growth, TC=Town area Committee, CT=Census Town,	

Table 6 records the distribution of towns by the four categories based on the composite scores of living conditions. Obviously, there are fewer towns with relatively better living conditions. As the frequencies of towns increase the scores of living conditions decline.

The value presented in Table 5 reveals that there is no relationship between town size and living conditions. The mean values of indicators increase with size classes of towns except in the case of *pucca* roads. As a result, the r value is insignificant between the two variables when the town-wise values are calculated (r=.07). The map also brings out the fact that level of urban living conditions is not spatially contiguous; one can often notice neighbouring towns with disparate levels of living conditions. Thus while population size is strongly related with estimated population based on rank-size rule (0.95) and the centrality scores (r=0.96), population size is very weakly related with living conditions (r= 0.10), centrality score and living conditions are almost independent of each other (r= 0.07). Thus, large cities do not necessarily have better living conditions; nor do the small towns have poorer living conditions.

Concluding Observations

Despite attributes of urbanization, low levels and a high degree of primacy in Assam, urban settlements appear to be distributed in a hierarchical manner with marked differences in centrality scores and do assume a pyramidal structure. Rank-size rule appears to over-estimate the expected population as in the case of Assam about 188 of the 214 urban settlements record actual populations lower than the estimated population. This may be possibly because of high degree of primacy.

While the concept of population threshold, contained in the Central Place Model, can be measured though available secondary data, the measurement of range of a good has to be generated from primary sources. As a result, demarcation of the hinterland of central places can only be done based on primary data or through the application of Gravity models or its variant - Reilly's law of retail trade[4];The living conditions in a city are not dependent on its place in the hierarchy of cities in a region; and

Since the required data is available in a digital form and the calculations involved are simple, it is possible to replicate this for many other states with different urban backgrounds for comparison.

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[4] The gravity model was expanded by William J. Reilly into the law of retail gravitation to demarcate the breaking point between two places where customers will be drawn to one or another of two competing commercial centres. See, Reilly WJ (1931): *The Law of Retail Gravitation*, New York , Knickerbocker Press

Appendix-I

Town Name	Population 2011	Estimated Population based on rank-size rule	Total score	
			Centrality	living condition
Guwahati (M Corp. + OG)	962334	962334	1255.49	7.65
Silchar (MB + OG)	178865	481167	362.65	44.54
Dibrugarh (MB + OG)	145488	320778	259.31	7.84
Jorhat (MB + OG)	126736	240584	301.85	6.47
Nagaon (MB + OG)	121628	192467	223.92	12.32
Tinsukia (MB + OG)	116322	160389	209.77	12.23
Tezpur (MB + OG)	75540	137476	205.19	8.12
Bongaigaon (MB)	67322	120292	60.71	7.24
Dhubri (MB)	63388	106926	77.33	10.43
Diphu (TC)	61797	96233	93.26	34.15
North Lakhimpur (MB)	59814	87485	92.55	6.61
Karimganj (MB)	56854	80195	46.82	16.05
Goalpara (MB)	53430	74026	153.93	4.45
Sivasagar (MB)	50781	68738	138.13	11.35
Haflong (TC)	43756	64156	38.06	5.5
Barpeta (MB)	42649	60146	52.48	7.58
Golaghat (MB)	41989	56608	52.78	9.8
Bilasipara (TC)	37410	53463	18.9	8.6
Lanka (MB)	36805	50649	24.24	5.45
Hojai (MB)	36638	48117	60.05	13.77
Barpeta Road (MB)	35571	45825	45.51	11.82
Kokrajhar (MB)	34136	43742	74.55	9.93
Hailakandi (MB)	33637	41841	28.93	30.25
Lumding (MB)	31347	40097	38.3	5.34
Marigaon (MB)	29164	38493	50.65	8.66
Duliajan Oil Town (CT)	28626	37013	24.72	11.93
Rangia (MB)	27889	35642	45.71	33.37
Nalbari (MB)	27839	34369	57.98	9.17
Margherita (TC)	26914	33184	28.68	9.14
Mankachar (CT)	26162	32078	16.56	31.31
Mangaldoi (MB)	25989	31043	67.65	15.34
Silapathar (TC)	25662	30073	32.03	6.44
Gauripur (TC)	25124	29162	26.54	5.41
Lumding Rly. Col. (CT)	22658	28304	37.52	13.27
Digboi (TC)	21736	27495	36.62	11.79

Dhekiajuli (MB)	21579	26732	33.98	10.14
Doom Dooma (TC)	21572	26009	30.42	9.7
Mariani (TC)	20801	25325	36.75	8.31
Chapar (TC)	20322	24675	20.87	6.82
Dergaon (MB)	20059	24058	11.56	8.45
Bokajan (TC)	19877	23472	37.56	6.92
Sonari (MB)	19810	22913	20.49	11.05
Dhing (TC)	19235	22380	15.78	8.45
Biswanath Chariali (TC)	19145	21871	79.35	5.48
Naharkatiya (TC)	18937	21385	93.08	7.21
Kharupatia (TC)	18501	20920	31.53	11.32
Rangapara (TC)	18393	20475	45.61	9.45
Howli (TC)	18301	20049	36.08	5.5
Titabor Town (TC)	17920	19639	51.62	17.77
Jagiroad (CT)	17739	19247	24.36	3.89
Tangla (TC)	17183	18869	19.1	11.54
Makum (TC)	16923	18506	17.98	7.27
Abhayapuri (TC)	15847	18157	18.58	9.44
Namrup (CT)	15719	17821	20.94	8.21
Lakhipur (TC)	15633	17497	22.96	5.9
Udalguri (TC)	15279	17185	26.25	9.31
Niz-Hajo (CT)	15188	16883	12.55	2.96
New Bongaigaon Rly. Col.(CT)	14896	16592	88.32	14.77
Ambikapur Pt. X (CT)	14283	16311	7.69	3.82
Sualkuchi (CT)	13898	16039	12.48	4.94
Basugaon (TC)	13849	15776	15.22	68.45
Dhakuakhana (TC)	13502	15522	25.43	31.04
Nazira (MB)	13304	15275	37.39	6.2
Badarpur (TC)	13298	15036	40.37	9.43
Bijni (TC)	13257	14805	21.92	10.19
Doboka (TC)	13118	14581	23.05	8.74
Dhemaji (TC)	12816	14363	50.24	10.1
Digboi Oil Town (CT)	12726	14152	14.3	7.01
Gohpur (TC)	12223	13947	21.59	31.8
Sapatgram (TC)	12163	13748	9.47	13.13
Bihpuria (TC)	12016	13554	24.03	12.62
Gobindapur (CT)	11863	13366	1.92	2.17
Nahira (CT)	11790	13183	9.93	2.28

Lala (TC)	11771	13005	21.61	9.29
Lido Town (CT)	11717	12831	11.77	4.82
Salpara Molandubi Pt.-I (CT)	11709	12662	1.76	2.87
Ambicapur Pt VIII (CT)	11691	12498	24.98	4.58
Pathsala (TC)	11242	12338	31.07	7.98
Chapra (CT)	11220	12181	20.3	8.08
Raha (TC)	11030	12029	28.12	13.59
Gerimari Chapori (CT)	11004	11881	17.64	7.03
Gutlong Gaon (CT)	10900	11736	3.1	3.41
Umrangso (TC)	10376	11594	18.04	6.78
Kampur Town (TC)	10371	11456	12.93	6.76
North Guwahati (TC)	10328	11322	27.27	8.42
Morongial (CT)	10318	11190	1.48	4.3
Chapakhowa Town (CT)	10305	11061	5.84	3.17
Lakhipur (MB)	10277	10936	16.56	39.48
Dimaruguri (CT)	10235	10813	2.81	4.42
Khaira Bari (CT)	10210	10693	3.62	5.44
Bokakhat (TC)	10143	10575	56.96	8.17
Kamalabaria N.C. (CT)	10071	10460	17.65	10.16
Sarupathar (TC)	9931	10348	17.72	17.25
Kahi Kuchi (CT)	9917	10238	5.52	29.56
Bhuragaon (Rev.) Town (CT)	9845	10130	10.42	7.29
Golaghatia Basti (CT)	9809	10024	5.94	8.69
Bhalukdubi (CT)	9636	9921	1.64	2.79
Kanakpur Pt. II (CT)	9519	9820	7.36	6.28
Donkamokam (TC)	9116	9721	7.76	4.51
Gossaigaon (TC)	9068	9623	28.92	6.34
Durga Nagar Pt. V (CT)	9051	9528	9.77	6.25
Chekonidhara (CT)	9026	9435	11.55	5.13
Chabua (TC)	8966	9343	41.27	8.68
Badarpur Rly. Town (CT)	8882	9253	15.88	37.46
Amin Gaon (CT)	8855	9165	7.48	17.85
Jhagra Pt.III (CT)	8838	9079	2.51	2.18
Teok (TC)	8795	8994	14.43	8.12
Azara (CT)	8780	8911	145.31	12.93
Tarapur Pt VI (CT)	8753	8829	6.23	5.15
Sarupathar Bengali (CT)	8752	8748	11.84	6.21
Hamren (TC)	8747	8670	17.24	3.73

Belsor (CT)	8523	8592	12.19	18.89
Moran Town (CT)	8434	8516	9.16	9.67
Dahali (CT)	8397	8442	2.61	3.27
Borpukhuri (CT)	8318	8368	4.43	4.88
Simaluguri (TC)	8286	8296	15.69	8.35
BOHARI (CT)	8264	8225	10.55	8.97
Golokganj (CT)	8244	8155	16.08	2.66
Chatibor Gaon (CT)	8231	8087	2.84	3.04
Majgaon (CT)	8154	8019	3.55	5.11
Sarbhog (TC)	8112	7953	13.65	10.69
Dharapur (CT)	8095	7888	18.45	4.95
Kumar Kaibarta Gaon (CT)	8056	7824	11.55	5.88
Rupahi Town (CT)	8052	7761	1.48	5.93
Amguri (MB)	8002	7699	15.55	6.84
Ambicapur Pt VI (CT)	7971	7638	17.48	4.83
Nidanpur Pt-II (CT)	7954	7577	0.3	1.6
Barika Chuburi (CT)	7911	7518	13.65	4.79
Irongmara (CT)	7685	7460	5.62	2.96
Barpathar (TC)	7657	7403	19.16	11.34
Bamun Sualkuchi (CT)	7628	7346	2.89	3.49
Kochpara (CT)	7540	7290	8.96	4.67
Jamunamukh (CT)	7377	7236	11.4	3.43
Kanisail Pt I (CT)	7358	7182	3.21	7.14
Asudubi (CT)	7356	7128	3.42	3.08
Mairabari Town (CT)	7177	7076	8.51	9.56
Upar Hali (CT)	7095	7024	7.49	4.23
Batarashi (CT)	7001	6973	217.05	3.24
Tarapur VII (CT)	6977	6923	7.75	8.27
Uttar Krishnapur Pt. I (CT)	6960	6874	0.58	3.6
Sarthebari (TC)	6913	6825	25.44	6.97
Padmabil (CT)	6874	6777	10.71	3.03
Bahbari Gaon (CT)	6821	6730	4.49	5.29
Takhlibilar Pathar (CT)	6611	6683	3.53	4.44
Sarpara (CT)	6529	6637	3.61	4.17
Jalah (CT)	6468	6591	7.42	2.48
Bali Koria (CT)	6359	6546	4.51	3.24
Chota Haibor (CT)	6315	6502	0.9	6.29
Silchar Pt. X (CT)	6313	6459	2.89	4.08

Pub - Dhaniram Pather (CT)	6280	6416	2.19	10.42
Maibong (TC)	6236	6373	13.27	7.88
Kanakpur I (CT)	6219	6331	5.23	9.66
Katirail T.E. (CT)	6182	6290	2.95	2.95
Forest Vill. Lakhipathar (CT)	6129	6249	3.21	8.72
Uttar Athiabari (CT)	6091	6209	2.19	7.44
B.R.P.L. Township (CT)	6001	6169	4.46	7.49
Narayanpur (TC)	6001	6130	12.46	8.59
Niz- Mankata (CT)	5924	6091	33.24	3.81
Bangaon (CT)	5873	6052	3.77	24.37
Parlli Part (CT)	5788	6015	84.43	2.27
Sonapur Gaon (CT)	5771	5977	8.55	4.52
Chalantapara Pt IV (CT)	5744	5940	6.9	18.42
Niz Katigorah Pt III (CT)	5687	5904	4.07	4.42
Moranhat (TC)	5679	5868	21.25	8.77
Mohmaiki (CT)	5639	5832	5.51	3.9
No.2 Goreswar (CT)	5631	5797	5.84	4.54
Thekashu Pt.-II (CT)	5625	5762	9.18	6.32
Tegheria (CT)	5567	5728	1.22	4.27
Kakaya (CT)	5550	5694	3.79	3.5
Kharijapikon (CT)	5550	5661	1.32	6.5
Dokmoka (TC)	5478	5628	8.1	8.03
Barua Bari Gaon (CT)	5444	5595	23.71	4.92
Howraghat (TC)	5443	5563	29.48	11.27
Changsari (CT)	5354	5531	11.65	3.72
Lakhi Nepali (CT)	5348	5499	10.16	3.95
Digheli (CT)	5285	5468	0.39	3.17
Borgolai Grant No.II (CT)	5241	5437	7.33	6.58
Uttar Krishnapur Pt III (CT)	5187	5406	2.25	4.86
Niz-Bahjani (CT)	5183	5376	4.01	1.89
Kalaigaon Town (Part) (CT)	5112	5346	5.59	5.45
Chandrapur Baghicha (CT)	5106	5317	7.02	3.01
Charingia Gaon (CT)	5094	5288	11.04	6.77
Lido Tikok (CT)	5091	5259	8.51	3.82
Mosli Pt I (CT)	5087	5230	5.23	9.32
Dudhpatil Pt VI (CT)	5083	5202	4.05	4.51
Naubaisa Goan (CT)	5015	5174	7.98	4.24
Rupiabathan (CT)	4981	5146	2.76	5.61

Palasbari (MB)	4925	5119	6.2	13.32
Damara Patpara (CT)	4922	5092	1.48	3.65
Salakati (CT)	4863	5065	12.47	25.63
Majir Gaon (CT)	4774	5038	3.97	7.06
Majarkuri (CT)	4727	5012	10.65	30.5
Dhekorgorha (CT)	4708	4986	9.53	5.03
Udiana (CT)	4644	4960	4.51	2.21
Tupkhana Pt I (CT)	4640	4935	0.58	3.28
Tihu (TC)	4599	4910	25.61	26.54
Pipalibari (CT)	4534	4885	1.56	2.8
Sanpara (CT)	4534	4860	2.64	2.94
Jonai Bazar (CT)	4459	4836	22.23	7.88
Garal (CT)	4400	4812	5.17	4.53
Thekashu Pt-I (CT)	4384	4788	0.3	6.15
Nowsolia Gaon (CT)	4312	4764	10.05	4.55
Sepon (CT)	4234	4741	6.47	2.01
Dudhpatil Pt V (CT)	4121	4717	2.06	4.14
Marowa (CT)	4004	4694	6.91	4.87
Nakhula Grant (CT)	3806	4672	3.97	2.68
Kachujan Gaon (CT)	3246	4649	0.39	3.72
Digaru Gaon (Digarubar Gaon) (CT)	3207	4627	5.4	2.42
Barbari (Amc Area) (CT)	2884	4604	50.91	11.08
H.P.C. Township (CT)	2732	4583	3.21	21.87
Laharijan Natun Bosti (CT)	2508	4561	0.96	8.91
Numaligarh Refinery Township (CT)	2318	4539	2.18	6.19
Mahur (TC)	2121	4518	18.21	10.61
Anand Nagar (CT)	2050	4497	1.94	5.97

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Urban, Urbanization and Urbanism in Indian Context

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Abstract: The paper examines critically the criteria used to make a distinction between urban and rural areas in different countries of the world and noted that different criteria and the threshold used differ very widely. In addition to this, the paper presents a review the different urban area concepts such as standard urban area, urban agglomeration, and out-growth used by the Indian Census at different times for various objectives along with the trends in and the changing character of Indian urbanization during 1901-2011.

Following a detailed examination of the three-fold criteria used to define urban areas in India, the paper argues that it fails to capture the ground realities, which are changing fast especially during the last few years. A large number of sett lements in different parts of India, classified as rural from the administrative point of view, have acquired urban character and deserve to be classified as urban but are treated as rural settlements for unrealistic definition of urban centres devised by the Indian Census. Analyzing the current trends of urbanization in India, the paper predicts that the urban system with cities, towns and overgrown villages will shape the population geography of India in the coming decades.

Keywords: Urbanization, Urbanism, Peri-urban, Metropolitan area, pseudo-urbanization

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Introduction

Urbanization, a long term process, transforms a traditional rural economy into a modern industrial one. Urbanization, a product of demographic explosion and poverty induced rural-urban migration, is occurring not due to urban pull but due to rural push. It is a progressive concentration of population from spread out pattern of human settlements in urban units (Davis, 1965; 1962). It is a finite process - a cycle through which a nation passes as it evolves from agrarian to industrial society (Davis and Golden, 1954).

The onset of modern and universal urbanization process is a relatively recent phenomenon, linked closely with the Industrial Revolution and associated economic development. Historical evidence suggests that urbanization process is inevitable and universal. Currently developed countries are characterized by high urbanization level and some of them are in final stage of urbanization process, experiencing the slowing down of urbanization due to a variety of factors

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(Brockerhoff, 1999; Brockerhoff and Brennam 1998). Against this, the majority of the developing countries are now experiencing rapid urban growth.

World Urbanization

The urban population was estimated to be 3.77 billion in 2010 (United Nations, 1993); nearly 50 million people are added to the world's urban population each year. The share of world's population living in urban centers has increased from 39.0 per cent in 1980 to 48.0 per cent in 2000. The developed countries had higher urbanization level (76.0 per cent) in comparison to developing countries (40.0 per cent). The urbanization level has almost stabilized in developed countries of Anglo-America and Europe. Africa and Asian countries are in the process of urbanization. The document entitled, *World Urbanization Prospects: The 2018 Revision,* a United Nations (2019) publication has estimated that more than two-thirds or about 68.0 per cent of the world's population will reside in urban areas by 2050. In 2018, this share was only 55.0 per cent. According to this projection, population will shift from rural to urban areas on a large-scale, adding another 2.5 billion persons to urban areas by 2050. Nearly, nine-tenths of this increase will take place in Afro-Asian Countries. This same document states that that future increase in the size of the world's urban population is expected to be highly concentrated in just a few countries. The three countries namely India (416 million), China (255 million) and Nigeria (189 million) will share more than one-third (35 per cent) of the projected growth of the world's urban population by 2050.

The global urban population has increased rapidly from only 751 million in 1950 to 4.2 billion in 2018. Asia, despite its relatively lower level of urbanization, is a host to 54.0 per cent of the world's urban population, followed by Europe and Africa with 13.0 per cent each. In the same year, the most urbanized regions in world included Northern America (82.0 per cent), Latin America and the Caribbean (81.0 per cent), Europe (74.0 per cent) and Oceania (68.0 per cent). Against this, the share of urban population was 43.0 per cent in African and about 50 per cent in Asia. It is, however, true that rural population is declining all over the globe.

It is, however, also true some of the cities in the world have experienced decline in population in the recent years. The majority of such countries are located in the low-fertility countries of Asia and Europe where overall population sizes are also stagnant or declining. The economic slowdown and natural disasters have also contributed to population losses in some cities. A few cities in Japan and the Republic of Korea have experienced population decline between 2000 and 2018. Several cities in Eastern Europe countries, including Poland, Romania, the Russian Federation and Ukraine, have been registering a decline in population since 200l. In addition to low fertility, emigration has contributed to this phenomenon in case of some of these cities. Moreover, globally, a few more cities are projected to register a decline in their populations until 2030, while comparing with to what occurred during the last two decades.

Cities and Mega Cities in the world

Tokyo is the world's largest city with an agglomeration of 3 7 million inhabitants, followed by New Delhi (29 million), Shanghai (26 million), and Mexico City and São Paulo (both around 22 million). Today, Cairo, Mumbai, Beijing and Dhaka all have close to 20 million inhabitants. By 2020, Tokyo's population is projected to begin to decline, while Delhi is expected to continue growing and to become the most populous city in the world around 2028 (United Nations, 2019).

By 2030, the world is projected to have 43 megacities with more than 10 million inhabitants, mostly in developing regions. However, some of the fastest-growing urban agglomerations are cities with fewer than one million inhabitants, many of them located in Asia and Africa. On one side of the scale, one in every eight urban dwellers lives in the top ranking 33 megacities of the world, on the other about one of each two or nearly half of the world's total urban population resides in the urban settlements of less than 500,000 inhabitants each.

Definitions of Urban Areas

There is no universal definition of urban areas. Different countries define urban localities in terms of different demographic and economic attributes. Moreover, all those countries defining urban areas in terms of the same factors/attributes do not use the same threshold values to distinguish urban localities from rural areas. For example, among the countries defining urban areas in terms of minimum size of population, some consider minimum threshold population size 5,000 persons and the some other 2,000 persons to declare it an urban; making a comparative study of urbanization level between countries a challenging task.

So far as the India Census is considered, a population of 5000 persons is taken as the minimum threshold size with exceptions in specific case. In fact, Indian Census has adopted a three-fold criterion including population size, population density and the composition of male working force. In cases such as mining and industrial townships, where the latter two criteria are met, threshold population size criteria is liberalized. In addition, all those places having urban local bodies to govern are also considered as the urban areas irrespective of the fact whether they meet or do not the criteria set by the Census of India to define an urban center. That is why, Badrinath, a famous pilgrimage place of Hindus in Uttarakhand state, having zero population at the time of census enumeration is defined as urban area, since municipal body, Nagar Panchayat, has been constituted by the state government for administrative control of the area. In fact, during the summer season when there is a time for pilgrims to arrive for worshipping there gathers a huge crowd to manage and provide various civic amenities. The urban areas those having a population of hundred thousand and above are called as Class I towns or cities.

Urbanization and Urbanism

Urbanization does not imply *urbanism*. While, the former refers to the growth of urban population in relation to that of rural areas, the latter indicates to the presence of a distinct culture in urban areas. The term urbanism, coined by Wirth (1938), refers to the way of life in cities.

Practically the urban areas of India are *rurban*, *i.e.,* reflecting the characteristics of both urban and rural areas. Thus urban population of India lives in urban areas but shows the characteristics of rural areas. It is easy to argue that rurbanisation is a solution to India's development problems. About rural-urban or rurban fringe, Singh (1967) observes:

"The study of rural-urban (rurban) fringe has assumed great topical importance these days and has drawn attention of research workers from various disciplines – urban geography, sociology, land economics, urban government and administration and planning. The rapid sprawl of the modern city outside its political boundary and beyond its real physical-cultural domain possess several attendant problems, which are reflected through diverse facets, such as changing suburban, peri-urban and adjacent or interstitial rural land uses and the socio-economic, demographic and cultural patterns of the people and settlements thus affected."

Attempts are being made to measure urbanization in terms of level (or sometimes called degree) of urbanization and speed of urbanization. Level of urbanization is defined as the percentage of total population of an area that is living in urban localities. All countries classify localities into urban and rural and collect data on their population.

Definition of Urban Areas in different countries

As per the United Nations, each country or territory has its own way to define *urban areas.* Base population and density are considered the important factors to identify urban centres. Some of the definitions have been discussed here.

Definitions vary somewhat between nations. European countries define urbanized areas on the basis of urban-type land use, not allowing any gaps of typically more than 200 meters, and use satellite imagery instead of census blocks to determine the boundaries of the urban area. In less developed countries, in addition to land use and density requirements, a requirement is that a large majority of the male work force, typically 75.0 per cent, must be engaged in non-farm economic activities.

In Australia, urban areas are referred to as *urban centres* and are defined as population clusters of 1,000 or more people, with a density of at least 200/km^2. Mostly, urban areas are defined on the basis of density and infrastructure. Though, UN publishes data on cities, urban and rural areas, but relies almost entirely on national definitions of these areas. The UN principles and recommendations state that due to different characteristics of urban and rural areas across the globe, "a global definition is not possible."

A metropolitan area includes not only the urban area, but also satellite cities plus intervening rural land that is socio-economically connected to the urban core city, typically by employment ties through commuting with the core city.

There is no consistent and universally accepted standard definition to identify urban and rural areas due to a wide variety of situations across countries. Mostly the respective statistical offices

or census bureau apply classification based on the size or characteristics of the habitations. Some define urban areas based on infrastructure, services and administrative arrangements. Estimates of the global urban population would alter substantially if the populous nations change their definitions. Identification of city and metropolitan area are based on national definitions. United Nations recognizes the definitions by different national agencies as well.

Village or Town is recognized as the basic area of habitation. In all censuses throughout the world this dichotomy of rural and urban areas are recognized and the data are generally presented for the rural and urban areas separately. In the rural areas the smallest area of habitation, *viz.*, the village generally follows the limits of a revenue village that is recognized by the normal district administration. The revenue village need not necessarily be a single agglomeration of the habitations. But the revenue village has a definite surveyed boundary and each village is a separate administrative unit with separate village accounts. It may have one or more hamlets. The entire revenue village is one unit. There may be un-surveyed villages within forests etc., where the locally recognized boundaries of each habitation area are followed within the larger unit of say the forest range official jurisdiction.

Lahiri (1988) provides an account of the definitions of urban area in the Indian census from 1872 to 1971. In defining the urban areas, generally the problem arises. The definition also determines the pattern of urbanization in every country, including India. However, the 1971 Census adopted the definition of urban areas that follows the pattern of 1961:

(a) all places with a municipality, corporation or cantonment or notified town area; and
(b) all other places which satisfied the following criteria:

(i) a minimum population of 5,000 persons;
(ii) at least 75 per cent of the male working population in non-agricultural activities; and
(iii) a density of population of at least 400 square km (*i.e.* 1,000 per square mile)

The Directorates of Census Operations in each state or union territory in consultation with the respective state government are, however, given some discretion in marginal cases to include some places having other distinct urban characteristics and to exclude undeserving cases.

An important point is that India's urbanization relates to changes taking place in the demographic characteristics and economic activities of the people contained in the geographical areas called 'urban area' or 'towns', which are there and had existed, as a human settlement, in the past under the dissimilar definitions and criteria. Any serious analysis of data relating to various aspects of urbanization, therefore, has to be understood with such a limitation.

This definition lacks not only the scientific and realistic criteria, but also uniformity of its application in different parts of the country. In addition, there is an element of aphorism and discretion as well. Interestingly, the Census Superintendent enjoyed the privilege of deciding any area as *town* or *village*, making

comparability much more difficult across the country for different cultural setup.

For the first time a more realistic and meaningful definition of *urban area* was adopted, which had taken into consideration economic characteristics along with other administrative and demographic criteria. There was also considerable uniformity in application of the test for deciding a place as *urban*. The net result was that a fairly large number of settlements hitherto treated as *towns* up to 1951 Census lost their urban status in 1961; likewise a number of settlements treated as *village* in 1951 got *urban* status in 1961. Thus, the new definition of *urban area*, while providing a more realistic picture of Indian urbanization further created the problem of comparability of data.

Standard Urban areas (SUA)

A new concept, *Standard Urban Area* or SUA, was developed in 1971 Census for the tabulation of certain urban data. The essentials of a *Standard Urban Area* are:

(i) It should have a core town of a minimum population size of 50,000,
(ii) The contiguous areas made up of other urban as well as rural administrative units should have close socio-economic links with the core town, and
(iii) The probabilities are that this entire area will get fully urbanized within a period of two to three decades.

The idea behind such a concept is that it should be possible to provide comparable data for a definite area of urbanization continuously for three decades, giving a meaningful picture. This replaced the concepts of *Town Group* that was in vogue at the 1961 Census. The town groups were made up of independent urban unit not necessarily contiguous to one another, but inter-dependent to some extent. The data for such town groups became incomparable one after the other census, as the town boundaries changed and the intermediate areas were left out of account This concept came in for criticism in a symposium of the International Geographic Union (IGU) held in November-December, 1968, giving a way to adopting the *Standard Urban Area* concept at the 1971 Census. If data for the 'standard area' were to be made available in the next two or three successive censuses, it is likely to yield much more meaningful picture, required to study urbanization around large urban nuclei.

Urban Agglomeration (UA)

According to the Indian census, an Urban Agglomeration (UA) is a continuous urban spread constituting a town and its adjoining outgrowths (OGs), or two or more physically contiguous towns together with or without outgrowths of such towns. An UA must consist of at least a statutory town and its total population (*i.e.* all the constituents put together) should not be less than 20,000 as per the 2001 Census e.g. Greater Mumbai UA, Delhi UA, etc.

Out Growths (OGs)

An Out Growth (OG) is a clearly identifiable and viable unit such as a village or a hamlet or an enumeration block which have come up near a statutory town outside its statutory limits but within the revenue limits of a village or villages contiguous to the town. While determining the outgrowth of a town, it has been ensured that it possesses the urban features in terms of infrastructure and amenities such as *pucca* roads, electricity, tap water, drainage system for disposal of waste water, educational institutions, post offices, medical facilities, banks etc., and physically contiguous with the core town of the UA. There can be several OGs associated with a town. Each such town together with its outgrowth (s) is treated as an integrated urban area, designated as an *urban agglomeration.*

Other Urban Centres

According to 2011 Census, there are other classes of towns. The UAs/Towns having a population of at least 1,00,000 persons are categorized as *Class I towns/UAs*. During this census, 468 such urban centres were identified. The UAs or towns having population over a million persons are known as *Million plus UAs/Cities*. Further, there are UAs/Cities in large number, as many as fifty-three in 2011, having a population more than ten million persons, known as *Mega Cities*. Examples are Greater Mumbai UA (18.4 million), Delhi UA (16.3 million) and Kolkata UA (14.1 million). Nevertheless, the growth of population in the *Mega Cities* has slowed down significantly during the period 2001-11.

Indian Urbanization

In line with other developing countries, the rural habitations predominate in settlement system India. With a few exceptions, it is the over grown villages that mark the sites of towns and cities. Over the years, such a scenario is undergoing a change. The towns and cities have not only multiplied in numbers but also expanded several times. For the first time since Independence, the absolute increase in population is more in urban that in rural areas.

In India, the number of urban agglomeration and towns has gone up to 7,935 from 1,827 during 1901-2011 (Table 1). During this period, urban population has multiplied almost three times, from 10.8 per cent to 31.16 per cent. In smaller states, the urban population has crossed fifty per cent mark. Such a trend is likely to continue in the forthcoming Census of India 2021 (March) as well. Several other states will cross this mark as well. The decennial growth rate, annual growth rate and annual gain of urban population have also increased.

There has been a continuous increase in percentage share of urban population to the total population of India (Fig. 1). Recently, there has been horizontal and vertical expansion both of big urban centres. During last ten years several information technology (IT) based towns, located in the surroundings of the existing metropolitan centres and other cities were merged with the latter ones. In some cases, the resultant horizontal expansion of cities crossed over not only to the district boundaries but also to that of the states. In fact, greater urban regions or metropolitan

regions are forming in a big way. These processes are in a way up gradation of urban corridors which starting forming three decades earlier or so. Examples of such centres are National Capital region of Delhi, Chandigarh, Mumbai-Pune, Hyderabad, Bangalore, and Kolkata-Salt Lake-New Town. In-migration to these places is also significant. They have all contributed towards the growth of urban population.

Table 1: Urbanisation Trends in India during 1871-2011

Year	Towns and Cities (numbers)	No. of million + cities/UAs	Population (million)		Urban Share (%)	Annual population growth rate %		% Share of major 10 cities population in		Sex ratio	
			Urban	Total		Urban	Total	Urban	Total	Urban	Total
	1	2	3	4	5	6	7	8	9	10	11
1871		1	18	212	8.7						944
1881		1	20	214	9.3	0.75	0.08				962
1891		1	22	234	9.4	1.03	0.92				962
1901	1,916	1	26	238	10.8	1.63	0.19	17.3	1.9	910	972
1911	1,908	2	26	252	10.3	0.04	0.56	19.4	2.0	872	964
1921	2,048	2	28	251	11.2	0.80	-0.03	19.8	2.2	846	955
1931	2,220	2	33	279	12.0	1.77	1.05	19.0	2.3	838	950
1941	2,427	2	44	319	13.9	2.81	1.34	22.0	3.0	831	945
1951	3,060	5	62	361	17.3	3.52	1.26	24.4	4.2	860	946
1961	2,700	7	79	439	18.0	2.37	1.98	26.0	4.7	845	941
1971	3,126	9	109	548	19.9	3.29	2.24	26.5	5.3	858	930
1981	4,029	12	159	683	23.3	3.87	2.23	25.7	6.0	880	934
1991	4,689	23	218	846	25.7	3.16	2.16	25.4	6.5	894	926
2001	5,161	35	286	1,029	27.8	2.78	1.97	26.0	7.2	900	933
2011	7,935	53	377	1,211	31.2	2.80	1.64	24.6	7.7	929	943

Notes: Census in 1871 was asynchronous. Major ten cities refer to top ten cities in 2001 by population. Sex ratio is females per 1,000 males. Source: Data before 1901 from Dyson (2004) and after 1901 from various Census volumes, especially Census 2001, Table A-2 and A-4; and Census of India 2011.

During 2001-11 decade, there is a slowing down of the overall growth rate of population. Which is mainly due to a sharp decline in rural population growth rate, urban growth has remained almost the same. During this period, the total number of towns has increased from 5,161 in 2001 to 7,935 in 2011 (Fig 2). Number of urban agglomerations and towns has also increased excepting in 1961, contributing towards teeming urban population. Rural population share has decreased from 72.2 in 2001 to 68.8 per cent in 2011. In contrast, urban population share increased from 27.8 per cent in 2001 to 31.2 per cent in 2011.

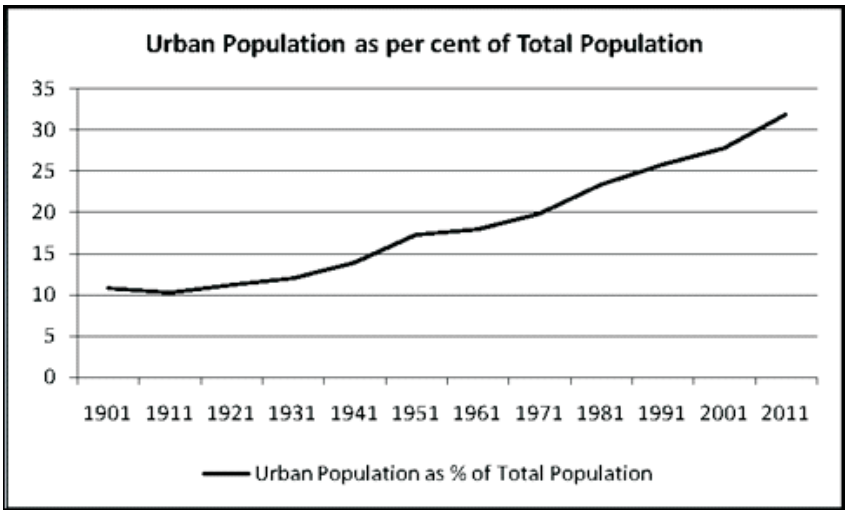

Fig. 1: Trends in growth of urban population, 1901-2011

In India's total population of 1,210 million, nearly 68.8 per cent is rural and 31.2 per cent urban. The absolute addition to the population during 2001-11 is slightly lower than the total population of Brazil, the fifth most populous country. Further, during 2001-11, the population of the country added 181.4 million, registering higher increase in urban population (91 million) than its rural counterpart (90.4 million) (Fig. 2 and Table 2).

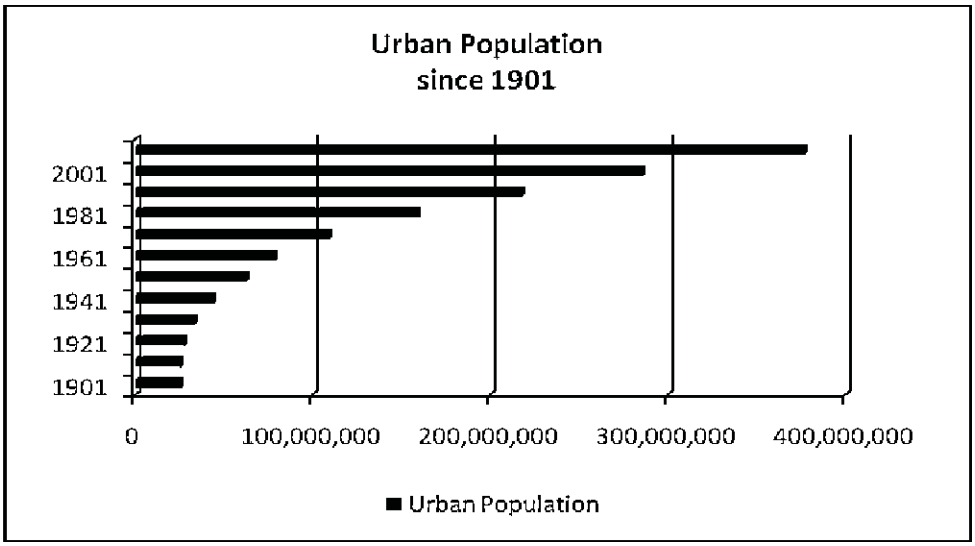

Fig. 2: Trends in urban population increase, 1901-2011

Table 2: Number and Population (in Million) of Urban Agglomerations (UAs) and Towns

Census year	Number of UAs/Towns	Total population	Total Urban population	Urban population (in %)
1901	1,830	238,396,327	25,851,873	10.8
1911	1,815	252,093,390	25,941,633	10.3
1921	1,944	251,321,213	28,086,167	11.2
1931	2,066	278,977,238	33,455,989	12.0
1941	2,253	318,660,580	44,153,297	13.9
1951	2,822	361,088,090	62,443,934	17.3
1961	2,334	439,234,771	78,936,603	18.0
1971	2,567	548,159,652	109,113,977	19.9
1981	3,347	683,329,097	159,462,547	23.3
1991	3,769	846,387,888	217,551,812	25.7
2001	4,378	1,028,610,328	286,119,689	27.8
2011	7,935	1,21,01,93,422	377,105,760	31.8

Source: Census of India, 2011.

There has been a spectacular increase in the number of urban place in India (Fig 3). In some of the union territories in India, the majority of population is urban. Further, in a number of states located in the western (Maharashtra, Goa and Gujarat), the southern (Tamil Nadu and Kerala) and the northeastern India (Mizoram) more tow-fifths of total population was urban. These were closely followed by Karnataka and Andhra Pradesh (including Telangana) in the south, and Punjab, Haryana and West Bengal in the north India. On the other side, the economically less developed states in northern India, where less than one-third of their population was living in urban areas, have low urbanization level.

In India, the urban population has increased from 25.9 million in 1901 to 377.1 million in 2011. Over the years, there has been a continuous concentration of population in class I towns, against the fluctuated or declined in concentration of population in the medium and small towns. The movement of a number of urban centres from lower population size categories to class I cities has resulted into a top-heavy structure of urban population. The big urban centres have large population sizes is leading to a virtual collapse in the services like housing, water, health, mobility, and quality of life, in general. Nevertheless, in comparison to other countries, relatively low percentage share of population resides in urban India. The ripples of development, planning, investments, and globalization have not reached the small sized urban centres. Their functions and infrastructure appears to be marginally better than villages. They hardly attract any in-

migration. Hence, India's urbanization is often termed as over-urbanization or even pseudo-urbanization. In this context, the following of Nag (2007), made in the context of urbanization in 2001, are quite apt:

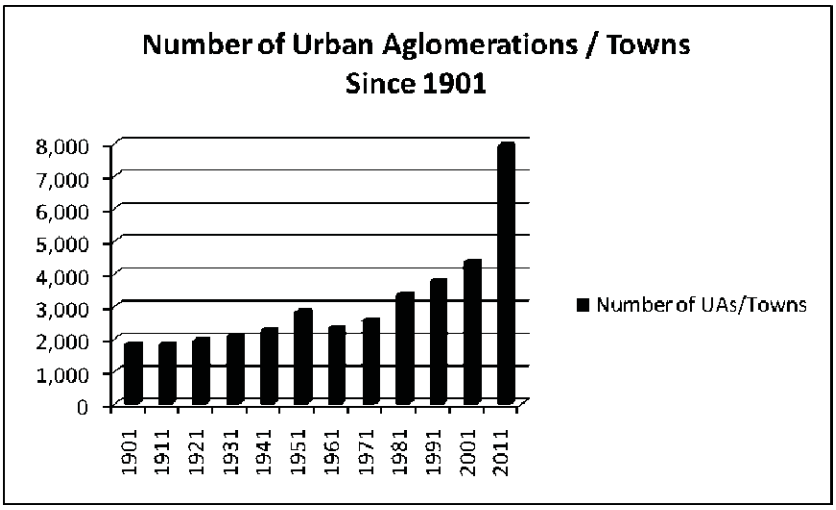

Fig.3: Changing number of town and urban agglomrations, 1901-2011

> "Indian urbanization has poly-metropolitan apex in which million cities dominate the entire urban scheme accounting for one-third of India's total urban population. ….The over population of the bigger cities of India in comparison to the small towns is another feature of Indian urbanization. The stagnancy of urban population in small towns is revealed by various data and analysis as well".

India's Urban Future

As it has already been discussed that every country has its own data collection protocols and procedures, hence population data is not always comparable. In India, the population base to identify a town is taken as 5,000 persons, against 2,500 persons in United States, 1,500 persons in United Kingdom and 1,000 persons in Canada.

In north India, a typical village has several hamlets and can be meet this criterion. In 2011, there were as many as 6,40,867 villages in 2011, of which about 3.1 per cent were having population between 5,000-9,999 persons; and about 1.0 per cent had population even more than ten thousand persons. These virtual towns have most of the urban amenities with banks, ATMs, be auty parlors, convent schools, mobile and computer repair shops and the like. They have 14.9 and 8.7 per cent of the rural population, respectively. This number is increasing with time. In smaller states and union territories, such a trend is more prominent. In the union territory of Chandigarh the share of villages having population between 5,000 and 9,999 persons was 60.0 per cent about 9.0 per cent

in NCT of Delhi, more than 26.0 per cent in Daman & Diu, about 17.0 per cent in Lakshadweep and about 29.0 per cent in Puducherry. In the state Haryana share of such villages was about 9.0 per cent.

Bihar presents a unique case where the number of villages falling in this range increased from 5.9 in 2001 to 8.2 per cent in 2011 indicating the existence of a massive pre-urbanization process. Further, Kerala has 14.4 per cent villages in this range, while 78.4 per cent villages are having more than 10,000 persons. These villages for all practical purposes are urban in character and well connected with urban areas. They have good connectivity of all types (physical, electronic, knowledge etc.) and meet the concept of PURA, providing urban amenities in rural areas, proposed by late Dr A.P.J. Abdul Kalam (Abdul Kalam and Rajan, 1998). Furthermore, several small states and union territories like Chandigarh (97.3 per cent), NCT of Delhi (97.5 per cent), Lakshadweep (78.1 per cent), Goa (62.2 per cent) and Puducherry (68.2 per cent) more than six of each ten citizens were residing in urban population in 2011 (Fig. 4). Further, in states like Maharashtra (45.2 per cent), Kerala (47.7 per cent) and Tamil Nadu (48.4 per cent) will soon cross the 50 per cent mark, means the majority of population in these states will be residing in the urban areas.

During the last census decade (2001-11), the number of towns and cities has increased from 5,161 to 7,936. It is expected that this number will further increase after the forthcoming 2021 census enumeration. As a result, in several other states the share of urban population will increase further. Hence, the urban system with cities, towns and overgrown villages will shape the population geography of India in the coming decades.

The economic criterion used by the Census of India to define urban areas is that the place must have at least 75.0 per cent of its male working population engaged in non-agricultural activities. It means that the economic contribution of the female workers is not taken into consideration. Nonetheless, the national average of the share non-agricultural workers in total urban female workers is as high as 82.1 per cent. According to 2011 Census figures, more than four-fifths of total urban female workers in India were classified under 'other workers' category, standing for non-agricultural workers. In some of the states and union territories this share was more than 95.0 per cent. These included in Chandigarh (98.0 per cent), NCT of Delhi (96.0 per cent), Sikkim (96.5 per cent), Daman & Diu (98.1 per cent), Goa (95.2 per cent), Lakshadweep (98.5 per cent), and Andaman & Nicobar Islands (98.3 per cent). Of course, this is a relatively recent phenomenon but cannot be overlooked for a long time. If the Census of India remove the male biasness from the economic criterion used to define urban centres in India by including the *total workers engaged in non-agricultural activities*, the urban scenario in India will get be transformed.

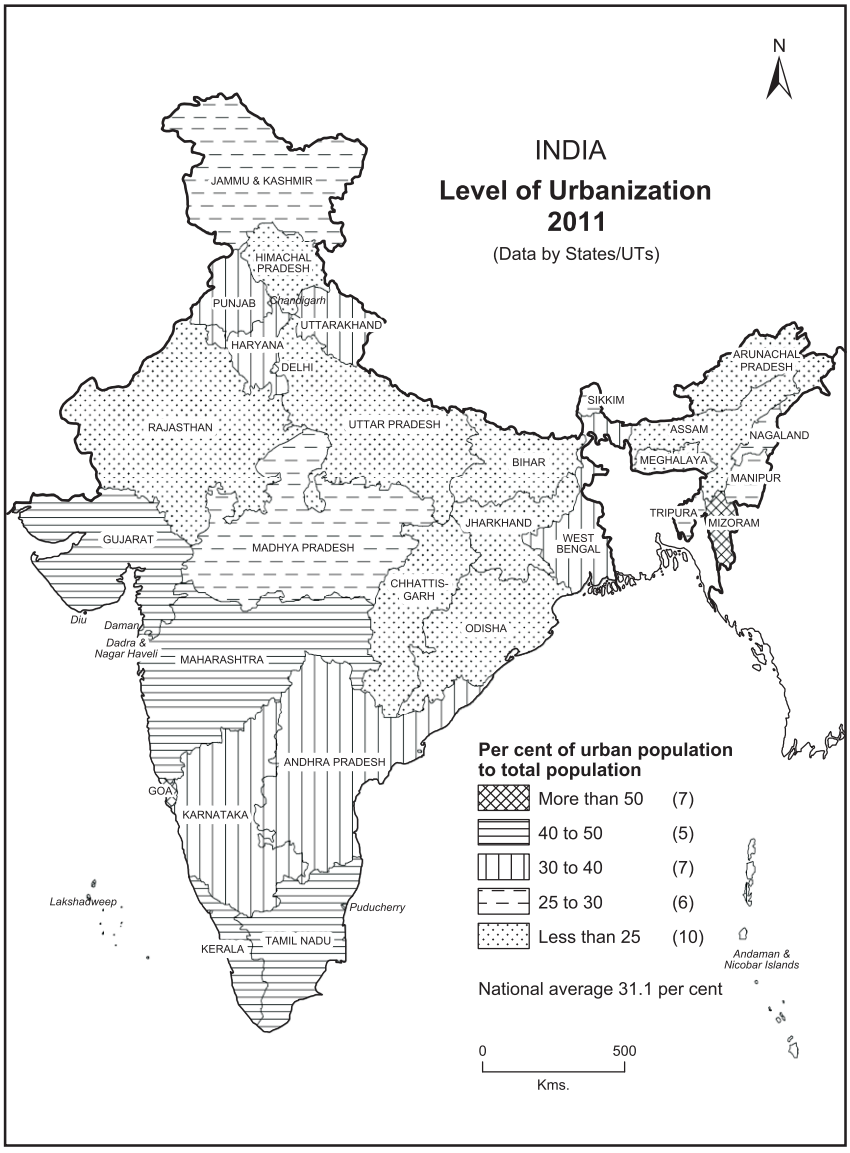

Fig. 4

The very first impact of urbanization and urbanism is felt in the peri-urban areas surrounding the main city and along the roads emerging out of these centres. Ripples of urbanization can be traced over time around these places. Housing colonies, institutions, factories, showrooms, hotels, schools and go downs have sprung up in different phases. Due to this several villages have been swallowed by the impact of urban expansion. Villages have lost their identity. In some places they can be traced by the name of the housing colonies or the locality. Jana and Archita (2019) have rightly questioned our policies for urban areas. According to them, at least 24, 000 villages of India failed to acquire urban status mainly because of such a policy. The adjoining

areas or villages are included in the *out growth* and ultimately become a part of the respective municipal or development authority. Some time they are also identified as *census towns*.

Briefly, for understanding the key trends in urbanization, which are likely to unfold in the coming years, it is crucial to implement The *2030 Agenda for Sustainable Development*, including efforts to forge a new framework of urban development. The United Nations (2015) report observes:

> "As the world continues to urbanize, sustainable development depends increasingly on the successful management of urban growth, especially in low-income and lower-middle-income countries where the pace of urbanization is projected to be the fastest. Many countries will face challenges in meeting the needs of their growing urban populations, including for housing, transportation, energy systems and other infrastructure, as well as for employment and basic services such as education and health care."

Integrated policies to improve the lives of both urban and rural populations are needed for balanced the development between urban and rural areas, building on their existing economic, social and environmental ties. In order to ensure that the benefits of urbanization also reaches up to interior villages, policies for urban growth need to ensure access to infrastructure and social services for all, focusing on the needs of the urban poor and other vulnerable populations.

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Population Projections for Million Plus Cities of India, 2011-2050

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Abstract: The future demographic scenario is central to any planning exercise where demographic projections become imperative. This paper attempts to project the population of the 52 million-plus cities in India on a decadal basis until 2050. The lack of availability of all requisite data required to project the population limited the scope of the methods to ratio, growth differential, compound annual growth rate and extrapolation.

It is projected that the population of the three cities, namely Delhi, Mumbai and Bengaluru will cross over the 20 million mark in 2050, another ten cities will attain a population between 10 and 18 million persons, and another eight cities will reach the population of fewer than two million persons. This calls for prior planning by the respective civic administrations as well as state governments to accomplish an optimal resource-population ratio in terms of physical, health, and education infrastructure along with employment generation, in particular, to cope up with emerging demand for such things.

Keywords: Population projections, Million plus cities, Techniques, Ratio, Growth differential, Compound annual growth rate, Extrapolation.

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Introduction

Today, we live in a world of urban predominance. In 2018, an estimated 55.0 per cent of the world's population resided in urban settings. One in every eight urban inhabitants was living in 33 megacities (with more than ten million persons), and the one in every two was residing in towns with fewer than 500,000 inhabitants. Approximately, 43.0 per cent of the world's urban dwellers lived in cities with more than a million inhabitants. Among the different geographical areas, this proportion ranged from 60.0 per cent in Oceania to 25.0 per cent in Europe. The share was about 45.0 per cent for Asia and Latin America and the Caribbean, 36.0 per cent for Africa, and 56.0 per cent for African and Northern America; and the number of cities with one million-plus population was 548 (United Nations, 2019).

By 2030, according to the same estimate, the world will have 706 cities with more than a million inhabitants, most of them in developing regions. The number of megacities will increase to 43, again especially in developing regions of the world. Cities with a population of one million, mainly in Asia and Africa, are expected to experience the fastest growth. Tokyo (Japan) with 37 million inhabitants was the world's largest city, followed by New Delhi (India) with 29 million, Shanghai (China) with 26 million, and Mexico City (Mexico) and Sau Paulo (Brazil), each with around 22 million inhabitants. By 2020, the population of Tokyo is projected to begin to decline, while that of Delhi is likely to continue to grow to make it the most populous city in the world around 2028 (United Nations, 2019).

By 2030, the population of Delhi is projected to reach 38.9 million, overshadowing Tokyo-the top-ranking city in the world. Mumbai with a population of 24.6 million is projected to be the 6th

largest city in the world. Of the nine such Indian cities, eight are projected to improve their ranking during 2018-2030. While the ranking of Kolkata will remain the same at 16th place, Surat is likely to experience an increase of its ranking by 10 steps, from 56th in 2018 to 46th in 2030.

According to the Census of India, 2011, there are 52 cities in India with a population of one million persons or more, sharing, in the combine, about 13.0 per cent of India's total population (Table 1). There has been a steady increase in the number of million-plus cities from five in 1951 to 35 in 2001 and then to 52 in 2011. In 1951, million-plus cities accounted for 18.8 per cent of the total urban population and 3.2 per cent of the total population of the country. The respective shares have gone to 42.6 per cent and 13.3 per cent in 2011.

Table 1: Decadal change in million-plus cities in India, 1951-2011

Year	No. of cities	Population (in million)	%age of population of million-plus cities in total urban population	%age of population of million-plus cities in total population
1951	5	11.75	18.83	3.25
1971	9	27.84	25.52	5.08
1991	23	70.68	32.75	8.35
2001	35	108.72	38.00	10.57
2011	52	160.71	42.62	13.28

Source: Different Volumes, *Census of India*, Registrar General of India, New Delhi.

Several agencies, both worldwide and nationally are involved in the task of projecting the population. At the Global level, the World Bank, the United National Population Division and the Population Reference Bureau regularly project the future population of different geographic regions. At the national level, the Office of the Registrar General and Census Commissioner, India has been doing the same at the behest of the Planning Commission of India (now Niti Aayog) through the Expert Review Committees at some internals regularly (Sharma, 2013). Projections are generally made at the state and union territories levels since the projection of population at the sub-regional level is a relatively risky issue. While estimating trends in birth rate and death rate here may not pose much of a problem, the real challenge lies in working out the role of migration in shaping the future population growth scenario. This factor may be insignificant at the national level but presupposes criticality at the state level or below the state level. A careful examination of the various exercises undertaken to project the population clearly shows that such an attempt has never been made at a disaggregated level for the million-plus cities. Finding a research gap, this paper endeavours to project the population of 52 cities million-plus in India at a disaggregated level. This has been carried out until 2050.

Assumptions

A set of assumptions derived from an understanding of the short-term and long-term historical trends, government policies, and other relevant information influencing population change in any area have been developed for this purpose. Firstly, it is visualized that the prevailing trends in fertility, mortality and migration will remain the same not only in the million-plus city but also in the region of its location. Second, non-demographic factors, such as natural catastrophes, would

not come into play. One may say that the present sets of projections would be more exploratory than prescriptive.

To neutralize the debilitating effect of assumptions on the projected population numbers, and make these robust, it is proposed that more than one technique be deployed and the results are compared. In this exercise, the four different techniques, with varying conceptualizations were used and the ones that provided population projections, close to each other were averaged to obtain more reliable data.

Techniques

A variety of techniques, both mechanical and analytical, are employed depending on data availability. The former techniques treat the aggregated population, and the latter differentiates between the relative contributions of the three vital processes: fertility, mortality and migration. The population figures for 52 million-plus cities, available from the Census of India 2011, have been projected through a combination of mechanical techniques. Guided by the dependability of techniques and data availability, four techniques, namely ratio, growth differential, compound annual growth rate and extrapolation have been deployed for projecting the population of these cities. Each technique is critically reviewed based on its assumptions, data requirements, properties and limitations. The lack of highly reliable data on migration, age structure, fertility and mortality across time series has hampered the use of more sophisticated techniques. All the steps performed and calculations done in the four projection methods have been presented to make them available for simulation by any other researcher. The population projection of the city of Bengaluru has been elaborated in terms of its simulation. The same rule was applied to the remaining 51 million-plus cities.

Ratio method

The method assumes that the share of any million-plus city's population in that of its parent state will remain virtually the same in the short run, and any change in the degree (quantum) and direction (positive/negative) of this share will be sustained over a long period. The current behaviour of a part is seen as linked to that of the whole. The availability of necessary data and ease in understanding and convenience of computation makes it a popular technique (Krishan, 1994: 13).

Two sets of data are required for the purpose. The first is the total population of Bengaluru and that of Karnataka state over several previous years. The second is the projected population of Karnataka for the years over which population projections for Bengaluru are to be made. The data to meet the first requirement were collected from the Census of India, 2011. For resolving the second requirement, the projected populations of Karnataka for the respective years were taken from the Report of the Population Foundation of India and Population Reference Bureau, August 2007. The following sequential steps were taken to operationalize the technique.

Steps involved

Projections for 2021

(i) Calculated the percentage share of the population of Bengaluru city in the population of Karnataka in 1991, 2011 and 2011 (Table 2);

(ii) For projecting the population of Bengaluru for the year 2021, calculated the difference between the population share of Bengaluru to the population of Karnataka in 2001 and 2011, as follows.

Share of Bengaluru city's population in the population of Karnataka in 2001 (S_{2001}) = 10.76428478

Share of Bengaluru city's population in the population of Karnataka in 2011 (S_{2011}) = 13.90531255

Difference (D) = S_{2001} - S_{2011}
= 10.76428478 –13.90531255= -3.141027771

This tendency, in degree and direction, was forward to project the population in 2021. The steps followed were as follows:

S_{2021} = [S_{2011} - D]
= [13.90531255 – (-3.141027771)]
= [13.90531255 + 3.141027771]=17.04634032

In other words, the city of Bengaluru would have 17.04634032 per cent of the population of Karnataka in 2021.

Table 2: The percentage share of Bengaluru's population in Karnataka's population: 1991-2051

Year	Population of		%age share of Bengaluru's population in Karnataka
	Karnataka	Bengaluru	
1991*	44977201	4129424	9.181149
2001*	52850562	5688985	10.76428
2011*	61095297	8495492	13.90531
2021#	67003104	11421577	17.04634
2031#	71549769	14444015	20.18737
2041#	74553669	17392175	23.32840
2051#	76017867	20121491	26.46942

Source: * Census of India (2011).*General Population Tables: A-Series*, Office of the Registrar General and Census Commissioner, India, New Delhi.
The Future Population of India, A Long Range Demographic View, Population Foundation of India and Population Reference Bureau, Delhi, August 2007.

(iii) The combined population of Karnataka in 2021 was noted as 67003104.

Hence projected population of Bengaluru city in 2021 can be worked out as (67003104 X 17.04634032) / 100 =11,421,577

Technically, this could be expressed as follows:

$Bengaluru_{2021}$ = (T_{2021} X S_{2021}) / 100
= (67003104 X 17.04634032) / 100
= 11,421,577

(iv) Following the same procedure, the population of Bengaluru was projected at 14,444,015 in 2031.

$Bengaluru_{2031}$ = (T_{2031} X S_{2031}) / 100
= (71549769 X 20.18737) / 100
= 14,444,015

(iv) Following the same procedure, the population of Bengaluru was projected at 17,392,175 in 2041.

$Bengaluru_{2041}$ = $(T_{2041} \text{ X } S_{2041}) / 100$
= (74553669 X 23.3284) / 100
= 17,392,175

(iv) Following the same procedure, the population of Bengaluru was projected at 20,121,491 in 2051.

$Bengaluru_{2051}$ = $(T_{2051} \text{ X } S_{2051}) / 100$
= (76017867 X 26.46942) / 100
= 20,121,491

v) To obtain the population figures for the intervening years, an interpolation technique was used, decade by decade; done by calculating the annual compound growth rate of population for each intercensal period separately. An illustration during the period 2041 and 2051 are as follows:

Population of Bengaluru in 2041 = 17392175

Population of Bengaluru in 2051 = 20121491

Compound annual growth rate (in percentage)
during 2001-2011 = $[(20121491/17392175)^{1/10} -1] \text{ x } 100 = 1.47$

This growth rate was applied to obtain projected population estimates for successive years, 2011-2021, 2021-2031, 2031-2041 and 2041-2051. By following this process, population of Bengaluru is projected at 19830312 for 2050. A similar exercise was done to obtain the population of all the remaining million-plus cities for the year 2050. The results obtained are presented in Table 3.

The population of Bengaluru city is projected at 11.42 million in 2021, an addition of 2.93 million to 8.49 million persons recorded in 2001. Within about four decades, the population of Bengaluru city is expected to multiply by 2.33 times.

Mumbai with a population of 18.39 million in 2011 was ranked at the top, followed by Delhi with 16.34 million persons. According to projections made by the ratio technique, Delhi is projected to surpass Mumbai in 2021. By 2050, Delhi, the largest city in the country is projected to house 29.3 million followed by Mumbai with 21.6 million and Bengaluru with 19.83 million persons. On the other hand, Durg-Bhilainagar and Tiruchirappalli cities are projected to continue to remain the smallest cities among the million-plus cities.

Urban-rural growth differentials

The Urban-Rural Growth Differential (URGD) technique, developed by the United Nations Population Division to project and estimate urban populations, is used here as a variant of the URGD technique, enjoying a high degree of respectability for projecting the population of a sub-system.

Table 3: Projected population of million plus cities by ratio technique: 2011-2050

Million plus cities	2011*	2021#	2031#	2041#	2050#
Delhi	16349831	20329542	23927045	27039842	29343686
Mumbai	18394912	19896277	20953072	21537032	21635474
Bangalore (Bengaluru)	8495492	11421577	14444015	17392175	19830312
Hyderabad	7677018	9727878	11735835	13610792	15092272
Surat	4591246	6527535	8596188	10694333	12512181
Kolkata	14057991	14274444	14006345	13294408	12356915
Ahmadabad	6357693	7690860	8971289	10148714	11080280
Pune	5057709	6447007	7898361	9351241	10595038
Ghaziabad	2375820	3939034	5856060	8048040	10161949
Chennai	8653521	6984217	7883918	8674489	9215483
Malappuram	1699060	3267271	4888877	6463307	7700689
Jaipur	3046163	3934032	4907431	5922922	6832415
Thrissur	1861269	3096711	4357610	5568214	6506334
Lucknow	2902920	3721373	4614458	5530244	6336499
Kozhikode	2028399	3086716	4153052	5165404	5938369
Indore	2170295	2920471	3752514	4624406	5409883
Kochi	2119724	2935581	3739952	4488743	5045094
Vasai Virar	1222390	2068815	3026611	4053560	4986027
Thiruvananthapuram	1679754	2400978	3118215	3791194	4296839
Kollam	1110668	1895751	2699301	3472702	4073922
Agra	1760285	2238071	2755047	3280476	3739134
Bhopal	1886100	2342207	2818541	3288726	3690285
Nagpur	2497870	2834729	3136318	3391614	3571372
Kannur	1640986	2137724	2616336	3052308	3365988
Nashik	1561809	2005679	2471517	2939827	3342345
Vijayawada	1476931	1953351	2430500	2885429	3252586
Patna	2049156	2382773	2705268	2980218	3176113
Visakhapatnam	1728128	2129481	2514559	2867218	3140135
Faridabad	1414050	1828178	2263178	2699299	3068602
Rajkot	1390640	1778065	2170730	2551088	2867743
Raipur	1123558	1515111	1939681	2376945	2764102
Kota	1001694	1381972	1819696	2297683	2743477
Kanpur	2920496	3086445	3112048	2971814	2700408
Vadodara	1822221	2093365	2329966	2525205	2661128
Jodhpur	1138300	1480413	1857917	2254241	2611285
Meerut	1420902	1716381	2013942	2292445	2515097
Aurangabad	1193167	1516455	1853540	2190384	2478271
Coimbatore	2136916	1766760	2033482	2273484	2444598
Varanasi	1432280	1679856	1913059	2112623	2254572
Ranchi	1126720	1407028	1695761	1977449	2218283
Ludhiana	1618879	1808833	1960777	2074957	2132770
Gwalior	1102884	1351773	1607856	1856634	2065823
Jamshedpur	1339438	1560076	1759439	1925546	2044959
Srinagar	1264202	1451709	1609607	1735302	1817236
Allahabad	1212395	1403845	1577191	1716865	1807233
Asansol	1243414	1393134	1517037	1609051	1665270
Amritsar	1183549	1345580	1482928	1594224	1661000
Jabalpur	1268848	1412364	1527020	1603532	1638073
Madurai	1465625	1108300	1181676	1236163	1261099
Dhanbad	1196214	1279885	1313050	1291459	1228765
Durg-Bhilainagar	1064222	1124008	1149808	1140020	1102515
Tiruchirappalli	1022518	742801	761774	767404	757499

Source: * - *Towns and Urban Agglomerations Classified by Population Class in 2011 with Variations since 1901, A-4*, Census of India, 2011, RGI.

\# - Author's calculations.

The method assumes that the growth behaviour of the sub-system, that is, Bengaluru city, and that of the whole of which it forms a part, that is, Karnataka state, is complementary to each other. If the former records a faster growth rate through net in-migration, this is construed as happening at the cost of the rest of the system, seen as losing in the process of migration. An opposite picture will prevail if the sub-national area/state is making a population growth rate lower than its rate of natural increase. In essence, the method takes into account the difference in growth rates of the sub-national area/state and the rest of the system and projects population for the former. The technique invokes a wider role for migration (Krishan, 1994: 14).

The growth differential calls for population figures for Bengaluru city for two census periods and the projected population of Karnataka for the years for which projections are to be made. The projections for Karnataka as a whole at five-year intervals were obtained from the Report of the Population Foundation of India and Population Reference Bureau, August 2007. Additionally, the decennial Census data was interpolated to get the figures at five-year intervals, a requirement of this method. The technique followed is detailed below.

Steps

i)

Bengaluru's 2010 population (Ban_{2010})	=	8161560
Bengaluru's 2005 population (Ban_{2005})	=	6678767
Karnataka's 2010 population (Kar_{2010})	=	60216008
Karnataka's 2005 population (Kar_{2005})	=	56005784

ii) Bengaluru's compound annual growth rate (CAGR) during 2005-2010 in unit fraction was worked out as follows:

$$\text{CAGR (Ban)} = (Ban_{2010}/Ban_{2005})^{1/5} - 1$$
$$= (8161560/6678767)^{1/5} - 1$$
$$= (1.2220160)^{1/5} - 1$$
$$= 1.040915 - 1$$
$$= 0.040915$$

iii) The CAGR of non-Ban has been worked out.

$$\text{CAGR (Non-Ban)} = [(Kar_{2010}-Ban_{2010}) / (Kar_{2005}-Ban_{2005})]^{1/5} - 1$$
$$= [(60216008-8161560) / (56005784-6678767)]^{1/5} - 1$$
$$= (52054448 / 49327017)^{1/5} - 1$$
$$= (1.05529284)^{1/5} - 1$$
$$= 1.0102218 - 1$$
$$= 0.0108218$$

iv) The difference between the two growth rates (D) that is of Bengaluru and Non-Bengaluru was found as follows:

$$D = 0.04091526 - (0.0108218)$$
$$= 0.0300935$$

Table 4:Projected population of million-plus cities using urban-rural growth differential technique:2011-2050

Million plus cities	2011*	2021#	2031#	2041#	2050#
Vasai Virar	1222390	3874147	9785101	24690665	41602804
Ghaziabad	2375820	5897001	12025228	24614689	37770132
Malappuram	1699060	14995502	31821682	36163244	36314103
Kollam	1110668	4285406	11239805	22287837	28078264
Thrissur	1861269	6042335	13387859	23140637	27991753
Bangalore (Bengaluru)	8495492	13255305	18032634	23647942	27349881
Delhi	16349831	20563473	23065190	24874579	25701328
Mumbai	18394912	20209890	21151568	21636331	21744755
Surat	4591246	8013084	11948335	17263634	21193511
Hyderabad	7677018	10784916	13633144	16824816	18901426
Kozhikode	2028399	4599752	8265085	13644547	17401768
Kolkata	14057991	14270337	14001337	13395439	12933893
Pune	5057709	7094101	9008273	11222432	12710958
Ahmadabad	6357693	8151923	9581286	10993733	11836951
Chennai	8653521	7406384	8376685	9355049	9903861
Thiruvananthapuram	1679754	3164845	5025994	7691968	9694444
Kochi	2119724	3662782	5425413	7758552	9420811
Jaipur	3046163	4257538	5358060	6575874	7367332
Indore	2170295	3307485	4478759	5944969	6996641
Lucknow	2902920	4014868	5012338	6094933	6788605
Kannur	1640986	2470847	3304844	4313925	5000830
Vijayawada	1476931	2273703	3109441	4184959	4971662
Nashik	1561809	2223040	2859996	3616512	4136996
Agra	1760285	2403589	2969956	3573046	3953678
Bhopal	1886100	2503086	3032218	3587143	3934449
Raipur	1123558	1744702	2399045	3236578	3845719
Visakhapatnam	1728128	2315578	2830970	3392919	3754559
Nagpur	2497870	2922368	3214198	3458403	3584028
Rajkot	1390640	1961106	2489799	3095860	3502654
Kota	1001694	1569829	2169842	2939076	3500878
Faridabad	1414050	1992690	2515835	3093869	3467644
Patna	2049156	2475200	2786437	3050227	3187887
Kanpur	2920496	3153066	3232791	3213307	3165807
Aurangabad	1193167	1666867	2112520	2630282	2980490
Jodhpur	1138300	1609437	2045080	2536006	2859876
Coimbatore	2136916	1907835	2231832	2583948	2798297
Vadodara	1822221	2164629	2396833	2590012	2690079
Meerut	1420902	1800630	2095299	2369007	2523382
Ranchi	1126720	1501451	1815972	2140007	2341169
Varanasi	1432280	1745165	1968186	2154965	2250894
Gwalior	1102884	1434509	1710077	1989951	2160767
Ludhiana	1618879	1853763	1997867	2101274	2143771
Jamshedpur	1339438	1615806	1805153	1960840	2041202
Srinagar	1264202	1501326	1658023	1784895	1848626
Allahabad	1212395	1453347	1618002	1748279	1811492
Amritsar	1183549	1388712	1525592	1635982	1688739
Asansol	1243414	1430688	1549168	1637977	1680043
Jabalpur	1268848	1446598	1553148	1623819	1651970
Dhanbad	1196214	1301625	1340513	1340580	1327433
Madurai	1465625	1139744	1201559	1252072	1272386
Durg-Bhilainagar	1064222	1136808	1162058	1159064	1147202
Tiruchirappalli	1022518	753677	763390	764111	757947

Source: * - *Towns and Urban Agglomerations Classified by Population Class in 2011 with Variations since 1901, A -4*, Census of India, 2011, RGI.

\# - Author's calculations.

v) Bengaluru's population was projected by solving two equations A and B.

A = $(Ban_{2010} / Non\text{-}Ban_{2010}) \times e^{(5xD)}$
= $(8161560 / 52054448) \times e^{(5 \times .0.0300935)}$
= (0.15678891) x 1.16237733
= 0.18224787 ……. equation 1

B = [A / (1+A)] ……... equation 2
= [0.18224787 /1.18224787]
= 0.154153689

Ban_{2015} = B x$Non\text{-}Ban_{2015}$
= 0.154153689 X 63393195
= 9772295

vi) Same procedure has been adopted for projecting the population for the successive years of 2020, 2025, 2030, 2035, 2040, 2045 and 2050.

vii) Figures for individual years were obtained through interpolation. Using the interpolation technique, the population of Bengaluru is projected at 13255305 for 2021, 18032634 for 2031, 23647942 for 2041 and 27349881 for 2050. A similar exercise was done to obtain the population of the remaining 51 million-plus cities for the year 2050 (Table 4 depicts the results this obtained).

Compound annual growth rate

The method assumes that in a given set-up, the population growth behaviour is likely to extend both in the direction (increase/decrease) and extent (quantum) in future also, at least in the short run. The underlying belief is that the basic determinants of population growth, namely fertility, mortality and migration, do not change abruptly in their level and direction, found true in the case of large systems of population. The technique does not permit much confidence when applied to smaller systems of the population (Krishan, 1994:18).

The data requirements of this technique include population figures of the sub-national area, that is Bengaluru in this case, for the latest and as many preceding census years. In this technique, the projections of population for the sub-national area are independent of what is happening to the larger system.

The steps followed for projecting the population of the Bengaluru city are listed below:

i) The compound annual growth rate (CAGR) was referred to the following formula:

CAGR = $[(p_1 / p_0)^{1/t} - 1] \times 100$

(ii) Likely, some exceptional event, such as a short term construction project may distort the population growth behaviour during a particular decade. To take care and moderate the effect of such a situation, compound annual growth rates were calculated for the preceding three decades (1981-2011), two decades (1991-2011) and one decade (2001-2011), applied to the base population and an average of the three results obtained thereby.

CAGR of 1981 – 2011 = $[(p_{2011} / p_{1981})^{1/t} - 1] \times 100$
= $[(8495492 / 2919530)^{1/30} - 1] \times 100$
= 3.62 per cent ..... (a)

CAGR of 1991 – 2011 = $[(p_{2011} / p_{1991})^{1/t} - 1] \times 100$
= $[(8495492 / 4129424)^{1/20} - 1] \times 100$
= 3.67 per cent ..... (b)

CAGR of 2001 – 2011 = $[(p_{2011} / p_{2001})^{1/t} - 1] \times 100$
= $[(8495492 / 5688985)^{1/10} - 1] \times 100$
= 4.09 per cent ..... (c)

Hence :

a. With CAGR of 1981-2011 at 3.62 per cent

P_{2021} = $P_{2011} \times [(100 + CAGR) / 100]^{10}$
= $8495492 \times [100+3.62)/100]^{10}$
= $8495492 \times [103.62/100]^{10}$
= 8495492 x1.427039122
= 12128685 ……. (a)

b. With CAGR of 1991 – 2011 at3.67 per cent

P_{2021} = $8495492 \times [100+3.67)/100]^{10}$
= $8495492 \times [103.67/100]^{10}$
= 8495492 x1.433940019
= 12185352 ……. (b)

c. With CAGR of 2001 – 2011 at 4.09 per cent

P_{2021} = $8495492 \times [100+4.09)/100]^{10}$
= $8495492 \times [104.09/100]^{10}$
= 8495492 x1.493104091
= 12686513 ……. (c)

The average of a, b and c (12128685, 12185352 and 12686513) works out to be 12333517. This is the population projected for Bengaluru city for the year 2021.

A similar procedure was adopted for projecting the population of Bengaluru city for the years 2031, 2041 and 2051. To project the populations for intervening years every year, the interpolation technique was employed. Using this technique, the population of Bengaluru is projected at 36700652 for the year 2050. A similar exercise was done to obtain the population of all the remaining 51 million cities for the year 2050 using this technique (see Table 5).

This technique also projects that Delhi will surpass Mumbai by 2021. However, this technique seems to have an inflating tendency probably because of the increasing base of population year by year. This is evident from that the fact that the population of Malappuram is projected to increase from 1.69 million in 2011 to 238.2 million in 2050; an increase of almost 141 times. Similarly, this technique projected the population of Vasai Virar to increase by 30.2 times during the same period. This seems unrealistic.

Table 5: Projected population of million plus cities by CAGR technique: 2011 to 2050

Million plus cities	2011*	2021#	2031#	2041#	2050#
Malappuram	1699060	5786728	20428836	75111670	238197563
Delhi	16349831	22197182	29953193	40209965	52539903
Vasai Virar	1222390	2941224	7035832	16830413	36919198
Bangalore (Bengaluru)	8495492	12333517	17942366	26163145	36700652
Mumbai	18394912	21936402	25965190	30608089	35570093
Surat	4591246	7761626	13126244	22102919	35380918
Ghaziabad	2375820	4733057	9432407	18751953	34832350
Hyderabad	7677018	10481934	14171467	19182956	25206324
Thrissur	1861269	3541206	6873360	13595096	24902919
Chennai	8653521	11028399	14065496	17964593	22377126
Kolkata	14057991	15633425	17294812	19071943	20861112
Kollam	1110668	2238878	4595970	9665861	18679397
Pune	5057709	7077717	9874858	13729794	18498690
Ahmadabad	6357693	8354281	10966944	14377813	18356164
Kozhikode	2028399	3244709	5217942	8508141	13140330
Jaipur	3046163	4234544	5854991	8060465	10769726
Lucknow	2902920	3903888	5193120	6907158	8938775
Indore	2170295	3043956	4281052	6027817	8196255
Kochi	2119724	2912066	4017702	5589814	7499220
Thiruvananthapuram	1679754	2415708	3474410	5056613	7058935
Coimbatore	2136916	2886308	3917929	5300953	6963083
Nashik	1561809	2261868	3249725	4649333	6432349
Faridabad	1414050	2109273	3101225	4531181	6397408
Bhopal	1886100	2537874	3384969	4510418	5847135
Raipur	1123558	1708389	2609259	3975552	5809828
Rajkot	1390640	1996055	2858502	4081533	5631025
Nagpur	2497870	3054209	3710557	4498484	5357096
Patna	2049156	2621657	3357354	4270280	5314531
Agra	1760285	2326116	3074210	4048630	5193434
Kanpur	2920496	3394858	3923918	4506637	5119032
Visakhapatnam	1728128	2298642	3017248	3965405	5075569
Vijayawada	1476931	2009774	2737097	3744439	4956266
Aurangabad	1193167	1715067	2428906	3432168	4695668
Kannur	1640986	2154404	2786367	3637033	4614641
Vadodara	1822221	2321649	2936082	3706724	4577995
Ludhiana	1618879	2045376	2539415	3143787	3820296
Meerut	1420902	1839291	2354705	3005656	3752079
Kota	1001694	1401938	1957207	2740465	3707267
Ranchi	1126720	1489984	1976331	2614469	3365330
Jodhpur	1138300	1494746	1963084	2580026	3298563
Srinagar	1264202	1610595	2052775	2617124	3256084
Jamshedpur	1339438	1668477	2078416	2581311	3140456
Madurai	1465625	1731256	2044853	2419676	2813641
Varanasi	1432280	1701367	2012638	2382377	2773411
Amritsar	1183549	1471094	1828580	2259662	2739485
Gwalior	1102884	1386083	1740698	2190027	2691277
Allahabad	1212395	1451776	1730320	2059434	2411139
Jabalpur	1268848	1496420	1763960	2075035	2403498
Asansol	1243414	1480193	1742798	2055839	2386437
Durg-Bhilainagar	1064222	1299195	1572052	1895662	2248205
Dhanbad	1196214	1406037	1648409	1924736	2216542
Tiruchirappalli	1022518	1201491	1409537	1650953	1904762

Source: * - Census of India (2011).*Towns and Urban Agglomerations Classified by Population Class in 2011 with Variations since 1901, A-4*, Registrar General and Census Commissioner, India, New Delhi.

\# - Author's calculations.

Extrapolation

This technique, based on the reasoning employed in compound annual growth rate, has a distinct departure in its functioning. Herein, the increase or decrease in population is computed in absolute numbers, not in terms of rates. A rationale underlying this technique is that any numerical rise in the contribution made by a natural increase, associated with a successively bigger base over the year, will be counter-balanced by a decrease in the net in-migration.

The functioning of the technique may be demonstrated in the case of the city of Bengaluru as follows:

P_{2021} = $(2 \text{ X } P_{2011}) - P_{2001}$
= $(2 \text{ x } 8495492) - 5688985$
= 16990984-5688985
= 11,301,999
P_{2031} = $(2 \text{ X } P_{2021}) - P_{2011}$
= $(2 \text{ x } 11301999) - 8495492$
= 22,603,998 – 8495492
= 14,108,506

The same process was followed for projecting the population for 2041 and 2051. Interpolation was carried out to compute the population on an annual basis. Thus, the projected population for the city of Bengaluru for the year 2050 is 19421089; the same procedure was followed for projecting the population of the remaining 51 million-plus cities. Table 6 represents the results obtained in detail.

The projected figures seem to be depressed due to an assumed constraint on net in-migration.

Contrary to the ratio, the URGD and the ratio technique that Delhi will exceed Mumbai by 2021, the extrapolation projects that this will happen in 2025. According to this technique, the ranking of the first nine cities will remain more or less the same while the ranking of Malappuram city will abruptly go up to 10^{th} place in 2025 from 25^{th} in 2011. It is expected that the cities of Durg-Bhilainagar and Tiruchirappalli will remain at the bottom of the ladder by 2050 also. Projections based on the extrapolation technique do not differ for these cities.

Population projections: a comparative view

A stage has been reached where we can have a comparative view of the results obtained with the help of various techniques. Table 7 presents the output from 2011 to 2050 for all the million-plus cities. The population figures for the city of Bengaluru as projected by the ratio, the growth differential, and the extrapolation techniques are quite close to each other. Averaging was considered to provide reliable projections numbers for the most acceptable population projections for the city of Bengaluru in 2050. The situation is summarized in Table 7.

Among the first ten ranking million-plus cities, the rank of Bengaluru city will go up to 3^{rd} place from 5^{th} and that of Mumbai to 2^{nd} place from 1^{st} and of Delhi to 1^{st} position from 2^{nd}. The most drastic change in the ranking of the first ten million-plus cities in 2011 will be experienced by Chennai whose ranking is projected to come down to 12^{th} place from 4^{th}. Seven out of 10 top cities in 2011 will experience a slip in their rankings. Delhi, Bengaluru and Surat may experience

an increase in their rankings. On the other hand, the million-plus cities of Durg-Bhilainagar and Tiruchirappalli, ranking among the three lowest-ranked cities in 2011, are likely to remain at those very positions even in 2050. However, Kota ranked at last place in 2011 is projected to move to the 35th position among 52 cities.

Table 6:Projected population of million-plus cities by extrapolation technique: 2011 to 2050

Million plus cities	2011*	2021#	2031#	2041#	2050#
Delhi	16349831	19804115	23258399	26712683	29802331
Mumbai	18394912	20355438	22315964	24276490	26034041
Bangalore (Bengaluru)	8495492	11301999	14108506	16915013	19421089
Kolkata	14057991	14864643	15671295	16477947	17202188
Chennai	8653521	10620902	12588283	14555664	16314895
Hyderabad	7677018	9597307	11517596	13437885	15154399
Ahmadabad	6357693	7802474	9247255	10692036	11983960
Surat	4591246	6362119	8132992	9903865	11484257
Pune	5057709	6346806	7635903	8925000	10077221
Malappuram	1699060	3086562	4474064	5861566	7096682
Ghaziabad	2375820	3534097	4692374	5850651	6883461
Thrissur	1861269	2948940	4036611	5124282	6093526
Jaipur	3046163	3769751	4493339	5216927	5863854
Kozhikode	2028399	2955641	3882883	4810125	5637116
Lucknow	2902920	3560331	4217742	4875153	5463018
Kochi	2119724	2828782	3537840	4246898	4880023
Indore	2170295	2823672	3477049	4130426	4714064
Coimbatore	2136916	2672638	3208360	3744082	4222951
Thiruvananthapuram	1679754	2308575	2937396	3566217	4127462
Vasai Virar	1222390	1926179	2629968	3333757	3960948
Nagpur	2497870	2866240	3234610	3602980	3932879
Kollam	1110668	1802593	2494518	3186443	3802898
Kanpur	2920496	3125437	3330378	3535319	3719242
Bhopal	1886100	2313784	2741468	3169152	3551590
Patna	2049156	2400336	2751516	3102696	3417039
Kannur	1640986	2069074	2497162	2925250	3307851
Agra	1760285	2146077	2531869	2917661	3262682
Visakhapatnam	1728128	2110318	2492508	2874698	3216487
Vijayawada	1476931	1914344	2351757	2789170	3179919
Nashik	1561809	1971292	2380775	2790258	3156224
Vadodara	1822221	2153397	2484573	2815749	3112126
Rajkot	1390640	1778265	2165890	2553515	2899866
Faridabad	1414050	1772162	2130274	2488386	2808482
Raipur	1123558	1503622	1883686	2263750	2603099
Ludhiana	1618879	1839291	2059703	2280115	2477559
Madurai	1465625	1710352	1955079	2199806	2418882
Meerut	1420902	1669698	1918494	2167290	2389972
Aurangabad	1193167	1493851	1794535	2095219	2363988
Srinagar	1264202	1540194	1816186	2092178	2339007
Varanasi	1432280	1648168	1864056	2079944	2273271
Jamshedpur	1339438	1574163	1808888	2043613	2253701
Jodhpur	1138300	1415782	1693264	1970746	2218806
Kota	1001694	1300238	1598782	1897326	2164014
Ranchi	1126720	1389945	1653170	1916395	2151747
Gwalior	1102884	1340220	1577556	1814892	2027160
Jabalpur	1268848	1439696	1610544	1781392	1934443
Asansol	1243414	1419459	1595504	1771549	1929230
Amritsar	1183549	1363181	1542813	1722445	1883301
Allahabad	1212395	1382561	1552727	1722893	1875312
Dhanbad	1196214	1327101	1457988	1588875	1706202
Durg-Bhilainagar	1064222	1200580	1336938	1473296	1595469
Tiruchirappalli	1022518	1157171	1291824	1426477	1547112

Source: * - Census of India (2011). *Towns and Urban Agglomerations Classified by Population Class in 2011 with Variations since 1901, A-4*, Registrar General and Census Commissioner, India, New Delhi.
- Author's calculations.

Table 7: Projected population of million-plus cities by an average of the ratio, the growth differential and the extrapolation techniques, 2011-2050

Million plus cities	2011*	2021#	2031#	2041#	2050#	Rank in 2011	Rank in 2050	Rank Change, 2011-2050
Delhi	16349831	20232377	23416878	26209034	28282448	2	1	1
Mumbai	18394912	20153868	21473535	22483284	23138090	1	2	-1
Bangalore (Bengaluru)	8495492	11992961	15528385	19318377	22200427	5	3	2
Ghaziabad	2375820	4456711	7524554	12837793	18271847	14	4	10
Malappuram	1699060	7116445	13728208	16162706	17037158	25	5	20
Vasai Virar	1222390	2623047	5147227	10692661	16849927	40	6	34
Hyderabad	7677018	10036700	12295525	14624498	16382699	6	7	-1
Surat	4591246	6967579	9559172	12620611	15063316	9	8	1
Kolkata	14057991	14469808	14559659	14389265	14164332	3	9	-6
Thrissur	1861269	4029329	7260693	11277711	13530537	21	10	11
Kollam	1110668	2661250	5477875	9648994	11985028	48	11	37
Chennai	8653521	8337168	9616295	10861734	11811413	4	12	-8
Ahmadabad	6357693	7881752	9266610	10611494	11633730	7	13	-6
Pune	5057709	6629305	8180846	9832891	11127739	8	14	-6
Kozhikode	2028399	3547370	5433673	7873359	9659085	19	15	4
Jaipur	3046163	3987107	4919610	5905241	6687867	10	16	-6
Kochi	2119724	3142381	4234402	5498064	6448643	17	17	0
Lucknow	2902920	3765524	4614846	5500110	6196041	12	18	-6
Thiruvananthapuram	1679754	2624799	3693869	5016460	6039582	26	19	7
Indore	2170295	3017209	3902774	4899934	5706862	15	20	-5
Kannur	1640986	2225882	2806114	3430494	3891556	27	21	6
Vijayawada	1476931	2047133	2630566	3286519	3801389	30	22	8
Bhopal	1886100	2386359	2864075	3348340	3725441	20	23	-3
Nagpur	2497870	2874446	3195042	3484332	3696093	13	24	-11
Agra	1760285	2262579	2752291	3257061	3651832	23	25	-2
Nashik	1561809	2066671	2570763	3115532	3545188	29	26	3
Visakhapatnam	1728128	2185126	2612679	3044945	3370394	24	27	-3
Patna	2049156	2419436	2747741	3044380	3260347	18	28	-10
Kanpur	2920496	3121649	3225072	3240147	3195152	11	29	-18
Coimbatore	2136916	2115744	2491224	2867171	3155282	16	30	-14
Faridabad	1414050	1864344	2303095	2760518	3114909	34	31	3
Rajkot	1390640	1839145	2275473	2733488	3090088	35	32	3
Raipur	1123558	1587812	2074137	2625757	3070973	47	33	14
Vadodara	1822221	2137130	2403791	2643655	2821111	22	34	-12
Kota	1001694	1417346	1862774	2378028	2802790	52	35	17
Aurangabad	1193167	1559058	1920198	2305295	2607583	43	36	7
Jodhpur	1138300	1501877	1865420	2253664	2563323	45	37	8
Meerut	1420902	1728903	2009245	2276247	2476151	33	38	-5
Varanasi	1432280	1691063	1915100	2115844	2259579	32	39	-7
Ludhiana	1618879	1833962	2006116	2152115	2251367	28	40	-12
Ranchi	1126720	1432808	1721634	2011283	2237066	46	41	5
Jamshedpur	1339438	1583348	1791160	1976666	2113287	36	42	-6
Gwalior	1102884	1375501	1631830	1887159	2084584	49	43	6
Srinagar	1264202	1497743	1694605	1870791	2001623	38	44	-6
Allahabad	1212395	1413251	1582640	1729346	1831346	41	45	-4
Asansol	1243414	1414427	1553903	1672859	1758181	39	46	-7
Amritsar	1183549	1365824	1517111	1650884	1744347	44	47	-3
Jabalpur	1268848	1432886	1563571	1669581	1741495	37	48	-11
Madurai	1465625	1319465	1446105	1562680	1650789	31	49	-18
Dhanbad	1196214	1302870	1370517	1406972	1420800	42	50	-8
Durg-Bhilainagar	1064222	1153799	1216268	1257460	1281729	50	51	-1
Tiruchirappalli	1022518	884550	938996	985997	1020853	51	52	-1

Source: * - Census of India (2011). *Towns and Urban Agglomerations Classified by Population Class in 2011 with Variations since 1901, A -4*, Registrar General and Census Commissioner, India, New Delhi.

\# - Author's calculations.

Concluding Remarks

Delhi is expected to have a population of 28.2 million people followed by Mumbai at 23.1 million and Bengaluru at 22.2 million by 2050. Delhi is likely to surpass Mumbai in 2021, which was placed first in 2011. Moreover, the cities of Durg-Bhilainagar and Tiruchirappalli, placed at the bottom among the million cities, are expected to remain so even in 2050. The findings also revealed that the population projections made by the United Nations for Delhi for the year 2030 at 38.9 million are on a higher side as compared to the 23.4 million projected here.

Eleven cities, namely Ghaziabad, Malappuram, Vasai Virar, Hyderabad, Surat, Kolkata, Thrissur, Kollam, Chennai, Ahmedabad and Pune are projected to house a population ranging from 11.1 million to 18.2 million persons in 2050. Tiruchirappalli will be the only city that will experience negative population growth of -0.01 in 2011-2050. The population of the city of Bengaluru will grow at a compound annual growth rate of 3.51 per cent during 2011-2021 and 2.49 per cent during 2011-2050. The corresponding numbers for Delhi will be 2.15 per cent and 1.41 per cent and for Mumbai, these will be 0.92 per cent and 0.59 per cent.

Population growth in these cities will impact their physical infrastructure, in particular housing, health, education and employment scenarios. Consequently, the respective civic administrations must generate additional resources not only to meet the needs of the growing population but also to improve the quality of life. Successive plans of these cities may take into account the projected population size for successive years up to 2050.

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Sheltering the Urban Poor in India

(A Study of Land Sourcing)

Jit Kumar Gupta, Chandigarh

ABSTRACT: The paper is an attempt to examine of urban housing stock required to sheltering the urban poor in India. The land being the most vital component of any housing project has been analyzed in in-depth in terms of urban land market, land acquisition for urban housing projects, role of development agencies including the private players, legal and planning aspects. An examination of the prevailing urban housing scenario in India reveals that there is huge gap between the need and availability of dwelling units for the poor and the needy in urban India; gaps between the two widening over the time. The defective policies and their poor implementation are largely to be blamed for the present state of affairs. The market demand supersedes the needs of the urban poor, having little or limited affordability; forcing the urban poor to illegally occupy the government land.

Following a detailed analysis of the problem, the paper finally makes a number of recommendations to resolve issue, including redefining of the master plans, promotion of flatted development, cross-subsidization, creation of land bank, involvement of land developers as co-partners, promoting-private partnership, taxing vacant urban land and effective legal frame.

Keywords: Urban housing, Land Market, Land acquisition, Cross-subsidization, Land bank

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Introduction

The role and importance of the housing, as a determinant of growth and development of individuals, communities and nations, has been globally appreciated. Good homes provide the families a base to build the foundations of empowered society; giving physical and financial security, employment and a healthy living to people. Being one of the three basic human necessities, the 'Right to Adequate Housing' has been accepted as the basic human right by the United Nations. The Government of India has also accepted the goal of 'Providing Housing for All' as the prime objective of the National Housing Policy and the *Pradhan Mantri Awas Yojna*.

The right to adequate, affordable housing is promised in the Constitutions and the legal frameworks of more than 100 nations, but these rights are often inadequately implemented. There is a worldwide shortage of affordable housing. UN Habitat Report on, Right to Adequate Housing observes, 'Well over a billion people are not adequately housed. Millions around the world live in life or health threatening conditions, in overcrowded slums and informal settlements and conditions, which do not uphold human rights and their dignity'. India Habitat III National Report, 2016, identified 65.49 million urbanites living in slums besides 1.77 million counted to be homeless-without any kind of shelter, roof and walls (Census of India, 2011).

Massive growth of population has wide ranging implications for promoting social, economic, physical infrastructure and environment besides providing appropriate shelter, amenities and facilities to ever growing numbers. Situation becomes all the more critical in urban areas, growing at a much faster pace under the dynamic forces unleashed by economic liberalization, privatization and globalization. Considering large contribution made by the urban centers to the national economy (estimated to be 75.0 per cent by 2050), improving the productivity and operational efficiency of urban centers assume importance. Efficiency and productivity of urban centers closely hinges upon how safe, livable, sustainable, resilient and healthier these settlements are and what kind of quality of life and opportunities of gainful employment they offer to their inhabitants. Accordingly, for promoting rational and sustainable development of urban settlements, making adequate provision of appropriate shelter for all the urban residents besides basic infrastructures, amenities and services, assumes importance. Even World Assembly of Nations (Habitat – II) and 17 Sustainable Development Goals defined by UNO have endorsed the twin goals of "Ensuring adequate shelter to all and making human settlements Safer, Healthier, more Livable, Equitable, Sustainable and more Productive", to make this world a better place to live.

India occupies a unique position globally, marked by both dualities and contradictions- distinctly portrayed by low landmass area holding large population base. In 2020, India with merely 2.4 per cent (32 million km^2) of global land, housed more than 17.6 per cent of global population (1381 million). Considering land-man ratio, India ranks low among nations, with land resource remaining under enormous stress. With population standing at 1211 million in 2011, projected to be 1400 million by 2021 and 1600 million by 2050, India is bound to face a sharp decline in land-man ratio.

The limitations imposed by land, materials, construction technologies, skilled manpower, limited housing options, non-involvement of stakeholders/private sector and inadequate financial resources, have emerged as the major roadblocks in ensuring adequate supply of housing for poor. Considering high cost of urban land, non-availability of developed land in adequate quantity; magnitude, complexity and resource intensive nature and ever-growing mismatch between demand and supply in the lower income categories; the creation of appropriate quantity and quality of housing for urban poor remains the most formidable challenge.

Land remains the most critical component of any housing programme, since all housing related activities are essentially consumers of land. Despite the fact that land holds the key to success of any housing program, most of the parastatal agencies have failed to increase the supply of serviced land in the urban areas, to meet the ever-increasing demand for shelter. In India, the capacity of the state to arrange land remains limited, due to high cost and ever-increasing population pressure. Accordingly, over the years, the land has emerged as the greatest hindrance in providing appropriate shelter due to its perpetual shortage, large speculation and high land value in the urban market. In the process, land market has become highly distorted and operationally inefficient, making land expensive and unaffordable for the urban poor.

The above statements raise a variety of research questions relating to urban housing problems including availability and acquisition of land, land market, role of development agencies, legal and planning framework and so on.

Research objectives

The present paper focuses on urban land and interrelated issues in India with reference to housing the urban poor, in light of the following research objectives:

- Critical evaluation of urban land market and land acquisition;
- An examination of land development agencies including the private developers;
- Review of legal and planning frame;
- Identification of challenging in land acquisition process for housing the urban poor;
- Appraisal of sourcing of land for urban poor; and
- Offering suggestions/strategies to resolve the problem

Data sources and Methodology

The study is based on secondary sources of data available in the form of government reports, published research material, conference proceedings and technical group reports published from time to time.

The author gleaned from the various government documents information about different urban housing programs initiated by the government in India from time to time, and also to trace the policy issues relating land acquisition, legal and planning provisions relating to urban land and its development from temporal perspective. In addition, he used his own experience, while working with Government of Punjab as Senior Town Planner, and also as the Advisor to the Punjab Urban Planning and Development, Authority.

Indian housing scenario

Perpetually in deficit, with demand invariably chasing supply, the managing the housing sector is a challenging and demanding task. Demand for housing has never been static. Considering the demographic dynamics, the assessment of precise housing requirement has always eluded the human imagination. Considering its fixed nature with zero mobility, the provision of adequate housing for all, has remained the most difficult task. Government and parastatal agencies, on their parts, have been making efforts to assess and project the demand for housing for various income categories, much away from the ground realities.

A 'Technical Group' constituted by the then Ministry of Housing and Poverty Alleviation (MHPUA) estimated that by the end of 10^{th} Five Year Plan (2002-2007), there will be the urban housing shortages to the tune of 24.71 million units. Backlog for the 11^{th} Five Year Plan (2007-12) was placed at 26.53 million dwelling units. Housing shortage in different income groups was observed to the tune of 99.9 per cent for EWS, 10.5 per cent for LIG and merely 0.2 per cent for MIG/HIG category.

It can be observed that supply of shelter specifically for the urban poor has outpaced the demand. The situation shows the worsening trend in the low-income category, due to ever increasing

migration of rural poor to urban areas. These migrants, due to limited availability of resources and poor affordability, are known to put enormous pressure on urban land. This invariably leads to promoting congestion, pavement dwelling and the growth of slum and squatter settlements. Growth of slums is a sign of inability of people to afford land and shelter through the normal market mechanism. In addition, this reveals the failure of the public agencies to ensure equitable access of land to the urban poor. Nearly one-fourth population in metros is living in declared slums: Mumbai (41.3 per cent) and Kolkata (29.6 per cent), recording high proportions. Slums and size of cities find positive co-relation: larger the city-size, bigger the number of slums. It is not only the problem of quantity but also of the quality. More than two-fifths households are living in single room and another thirty per cent in two room tenements, in metropolitan centers like Kolkata and Mumbai. In large cities, with increase in density of population in EWS/LIG housing, the availability of housing space per capita has declined rapidly, impacting adversely the quality of living and privacy.

Parallel existence and development of formal and informal housing stock and settlements is another phenomenon seen all over the developing world i.e. City within a City- a multiple city syndrome. Distinct settlements of the poor and the rich are a classic testimony to the process of urbanization, which has thrown up "Islands of affluence in a sea of poverty". Both options have their role and importance in providing shelter to the urban households. In order to clinch the objective of housing for all in urban India, potential of both formal and informal sectors needs to be understood and synergized.

Looking objectively at the entire context of housing scenario, it can be safely assumed that Indian housing scenario remains beset with problems like ever growing shortage of housing for the urban poor, lack of basic infrastructure, overcrowdings of buildings on land and people in the building, multiplicity of squatter colonies, multiplicity of agencies, haphazard and unplanned growth, mushrooming of slums, lack of financial resources, encroachment on public spaces, high land cost, scarcity of serviced land and high degree of land speculation.

LAND RELATED ISSUES

Land remains the most critical component of any housing programme, since all housing related activities are essentially consumers of land. Despite the fact that land holds the key to success of any housing program, most of the parastatal agencies have failed to increase the supply of serviced land in the urban areas, required to meet the ever-increasing demand for shelter. In India, the capacity of the State to arrange land is limited due to high cost and rapid increase in population pressure. Resultantly, the land has emerged as the greatest hindrance in providing appropriate shelter. In the process, land market has become highly distorted and operationally inefficient, making land out of reach, especially for the urban poor.

Land Market

Land market in past has been largely controlled by the public sector with government holding virtual monopoly. The inefficient legal framework coupled with lack of adequate resources at the disposal of parastatal agencies (like State Housing Boards, Improvement Trusts, and

Development Authorities), has made the supply of the serviced land in market highly skewed. Excessive governmental controls have further restricted the role of private sector in bringing land into the urban market. Accordingly, most of the land available in urban areas is either unauthorized or un-serviced or both. In fact, major problems in the land market have genesis in the lack of understanding about the operational intricacies of the land market on the part of urban managers. The situation gets further compounded due to lack of clarity of land title and disputed ownership. This has led to the creation of a parallel land market in the urban sector, beyond the control and ambit of any regulated system. The share of informal land market has been increasing rapidly. Accordingly, the major chunk of land available in urban market remains un-serviced; and city growth illegal.

Holistically, irrational growth and development of urban centers has its genesis in the prevailing lack of capacity on the part of urban local bodies to meet effectively the shelter related requirements of the majority inhabitants. This malaise can be squarely attributed to the operational inefficiency of urban land market, which has not been able to ensure supply of right quantum of serviced land at the right place, time, and price to right people. Recent thinking on land as a tradable commodity, making large upfront profit, has added a new dimension to the land market and its operation. Large tracts of developed urban land remain vacant and unused for number of years with owners waiting for speculative prices to make large profits.

Land Acquisition

With fast changes in urban dynamics and prices of urban land going up steadily, the capacity of the government to intervene effectively in the land market has been considerably eroded. Limited availability of land with public agencies, coupled with its inefficient use and abuse has further reduced the supply of land in the urban market. Complex system of land transactions, including heavy cost involved in the process and transaction has further restricted the supply side of land. Land acquisition through a legal process, under the new land acquisition Act (Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013), involving not only payment of fair compensation for the land acquired but also rehabilitation and resettlement of the landowner, has made acquisition process more complicated, cumbersome and cost intensive. This has rendered most of the Development Authorities, operating at state and local levels, incapable of supplying adequate quantity of serviced land in the urban market at the affordable prices.

Role of Development Authorities

The urban development authorities, such as Punjab Urban Planning and Development Authority (PUDA), have made land as a profit making mechanism. In the process, the developed land is available in the market only on a limited scale, periodically. Since there is huge demand for the land, the prices of released land shoot up considerably. The pricing mechanism adopted to dispose-off the land by way of public auction, add fuel to the fie, making the land unaffordable. This leaves the poor totally dependent on sourcing land through legal process. Even when certain land meant for urban poor is released in the market, due to wrong targeting, the land falls in the hands of the upper income groups. The restricted supply of serviced land coupled with high

pricing has thrown the urban poor out of the urban land market; forcing them to occupy the public land illegally for sheltering.

Private sector and Land Market

One of the major hurdles in the efficient functioning of land market is the non-involvement of private and co-operative sectors. In contrast, the majority of the housing stock is being supplied by the private sector. Hence, the need is to fully understand, appreciate and support the role and importance of the private sector for bringing adequate land in the urban market. In fact, the public sector agencies must change their role from the "sole suppliers of land", to the 'facilitators' in the urban land market for the sake of its efficient functioning. The State must make all possible efforts to remove roadblocks in the way of improving supply of developed land in the urban areas.

Legal and Planning Framework

Legal framework would need a thorough review and modification to make the sourcing of land quicker and affordable. Planning tools like Master Plans and Development Plans, prepared under various state urban development laws including- The Punjab Regional and Town Planning and Development, 1995- used for promoting planned development in urban areas, have emerged as the greatest hindrance in the smooth operation of land market due to their rigidity and exclusion of the poor from the formal planning and development process. These plans would require critical review and modification, in their intent, contents and approach to promote orderly growth and efficient functioning of land market. Development controls and building by-laws, known to provide low floor area ratio, irrational population densities; restricted height; low ground coverage; limited floor area norms etc have hampered the optimum utilization of land. They would need to be reviewed, revised and redefined to make the shelter for the poor, cost- effective and affordable.

Derelict urban lands

In urban areas, large pockets of land remain locked under closed industrial units, institutions and derelict buildings. These pockets remain unused for years in the absence of requisite permission to redevelop. Granting permissions to develop on time bound basis, would help in bringing large amount of land in the urban market, for creating large stock of affordable housing. In addition, plotted development is also known to promote inefficiency in land utilization due to limited construction made on these plots by the owners.

Major Challenges in Urban Land Development

There are a number of issues which come in the way of making the land available for affordable housing for the urban poor. The Ministry of Housing and Poverty Alleviation (MHPUA)[1] organized a National Seminar on Future Cities, at the Vigyan Bhawan, Delhi. During this seminar, following land related issues, hampering the provision of affordable shelter to the urban poor, were identified:

[1] In 2017, The Government of India merged the Urban Development and Housing and Urban Poverty Alleviation ministries as the Ministry of Housing and Urban Affairs (MoHUA).

- There is inadequate supply of serviced land in urban areas despite increased demand leading to rapid increase in its prices; making land unaffordable for majority of the urban dwellers;
- Haphazard and premature exploitation of peripheral lands has genesis in the critical shortage and high pricing of urban land;
- Out-pricing of the urban poor coupled with inadequate supply of legal and affordable sites for shelter, has led to proliferation of squatter settlements and problems of haphazard growth and congestion in un-serviced areas;
- Land use controls used for planned development have hampered the affordability of large majority of the urban poor;
- Existing inefficient legal and regulatory framework has adversely impacted upon the functioning of land market; creating conditions for unwarranted increase in land and housing prices in larger cities;
- Focus of parastatal agencies on housing for higher income groups, by carving out large sizes plots and constructing high end housing, has inordinately restricted the supply of services land to poor and economically weaker sections of the society;
- Reduced supply and distorted functioning of urban land market can be largely attributed to inefficient use of publically held land and large-scale land speculation practiced by parastatal agencies and private developers;
- Scarcity of land and high pricing can be attributed to poor land related information system and prevailing high transaction costs;
- Long drawn legal proceedings and consequential increased compensation has adversely impacted the capacity of public agencies to acquire large parcels of land under Land Acquisition Act,1894;
- Inefficient functioning, reduced supply of services land in the market has its roots in the non-involvement of private and co-operative sector on large scale in sourcing and pooling land for development;
- Existing planning tools and planning practices have emerged as the creators of major road-blocks in promoting planned development of urban centers; and
- Restricted capacity of poor to secure legal serviced land at affordable cost for their shelter/ working can be attributed to exclusion of the urban poor from city planning and development process.

This is evidently clear from the above listed points that the defective policies and their implementation ignoring the ground realities, where the focus is placed on market demand rather the need of the poor and needy, has largely being responsible for the prevailing crisis. Now, in the following paragraphs we attempt an examination of sourcing land for the urban poor and make suggestions in this context.

Sourcing Land for the Urban Poor

Cost of land constitutes a major component of housing, placed in the range of 20-50 per cent of total cost of house. It is known to play a critical role in determining pricing and affordability of residential units. But land as a resource, having numerous connotations, remains most complex in terms of its nature, ownership, utilisation, cost, planning, development and management. Accordingly, evolving multi- pronged strategies and bringing all stake holders on the same platform will be critical to ensure adequate supply of land at affordable cost. Focus of housing the poor should revolves around the sourcing adequate land quantity at an appropriate place and at the most affordable cost, making optimum use of available land resource to create cost-effective and affordable housing. In search for the appropriate solutions, to source adequate land for creating large stock of affordable housing, following strategies have been recommended.

i) Redefining Master plans

Existing practices of preparing Master and Development Plans do not provide any space for living and working of the informal sector as an integral part of the city planning and development process. In the absence of any dedicated area, informal sector has to compete with formal sector for finding space for the shelter and associated activities. Unable to compete, due to high land cost and poor affordability, informa1 sector fails to compete in the urban land market. With no space made available, the poor have little option but to look for whatever cities can offer them outside the planning process. This leads to haphazard and unplanned growth leading to mushrooming of slums and squatter settlements.

For making the city planning rational and realistic, informal sector has to be spaced and made integral part of the city planning and development process. Thus, if sufficient area is identified for housing and working of the urban poor and rural migrants in the Master Plans/Development Plans, this can help in making available land for creating affordable shelter in the cities. Land thus earmarked can be acquired, developed and provided with basic infrastructures and used for creating affordable housing either by the parastatal agencies or as a joint venture on PPP (public private partnership) model. For the success of the scheme sufficient funds have to be generated as a part of urban development process, with contributions made by the beneficiaries- as a surcharge or levy in the development charges.

ii) Promoting Flatted development

Typologies of housing used for creating shelter also impact the use of land resources. Comparative merits and demerits of plotted and flatted development has already been debated. Considering the context of different typologies, flatted development remains the best option for creating affordable housing in large quantity. Flatted development is known for minimizing the land consumption, besides being cost-effective. Also, it is known to minimize land speculation, promote community living and optimize cost of basic services and amenities to be provided. Accordingly, adopting flatted development will help in creating large housing stock at minimal cost. If combined with livelihood options, as part of the development, it can be major game changer for rationalizing the city growth and development.

iii) Cross - subsidization

As evident from numerous examples all over the globe, the cross-subsidization, as an option, has been considered both effective and efficient for making affordable housing accessible to the urban poor. Option of cross- subsidization can be used for both land and housing in the domain of public and private sectors. This mechanism has been used successfully in Hong Kong where problem of low affordability of the poor to land and housing has been resolved by leveraging the public and private sector resources. Cross-subsidization to the extent of 45.0 per cent of the market value of land and housing for urban poor has been made possible through the mechanism of comprehensive urban development and re-development programmes launched by the government, which capitalizes on sharing the increase in land values due to continued re-development of the city of Hong Kong.

iv) Creation of Land Bank

Establishing the land bank offers another option for making available land for promoting cost-effective and affordable housing in urban centers. In this process, land is sourced from different schemes and pooled to create a land bank to be used for creating affordable housing. Even land available with parastatal agencies can be made a part of the land pool for creating affordable housing. Provision already exists in different planning laws including- The Punjab Apartment and Property Regulations Act, 1995- to earmark certain percentage of plots/ area of the scheme for creating housing for EWS/LIG categories. However, developers invariably avoid providing such housing. Alternatively, they try to carve out plots and sell them off in the market in the name of EWS/LIG. This invariably reduces the supply of the land and housing for the urban poor. Provision needs to be made to ensure that the land earmarked in the sanctioned scheme should either be used for constructing affordable housing by developer or transferred and placed at the disposal of any public authority like Housing Board or Slum Development Authority, utilizing the same for construction of housing for the poor. In Punjab, under –'The Punjab Apartment and Property Regulations Act, 1995', 10.0 per cent of the area under residential use in residential colonies has to be used for construction of the housing for poor, provided area of colony is 40 Hectares. In addition, 10.0 per cent of flats are to be reserved for these categories if the number of flats exceeds 100. In case of Haryana under the Haryana Development and Regulations of Urban Area Act, 1975, all developers are required to provide 20.0 per cent of total plots for the EWS category. Similar provisions need to be made in all state laws in the schemes undertaken by both public and private sectors to create a land bank, from where developed land, with all approvals, can be made available off the shelf, for creating affordable housing in different parts of the city.

v) **Involving landowners as co-partners**

For sourcing land for housing the poor, it will be vital to make land owners as the co-partners in the development process. Globally, nations have used this process by pooling raw land of different stakeholders; undertaking planning and development of the land so pooled on defined norms & standards; making provision of the basic infrastructure and services; return majority (about 70.0 per cent) of land to the landowners for sale. Landowners are required to pay a part of

the unearned profit, accruing from difference between planned or developed and raw land, to the planning and development authority.

Money thus raised, is used for making payment for the land retained by the Authority (about 30.0 per cent), in the shape of roads, open spaces, education, healthcare and commercial use besides meeting the cost of development and making provision of the infrastructure and services defined under the scheme. Scheme does not involve any compulsory acquisition of land and or any financial liability on the part of the Authority. Schemes generate enough land for public purposes and resources for infrastructure development, helping the landowners to have land planned and plots shaped, fetching higher returns. These schemes help in bringing large amount of potential land falling on the urban fringe into the land market and the land owners are free to dispose-off the pockets of land as may be decided by them, helping to keep the land price stable and imparts efficiency to the land market.

Under the provisions of Gujarat Town Planning Act, all the Town Planning schemes are required to reserve an area to the extent of 5.0 per cent of the scheme for housing the poor. Under the plot re-constitution mechanism, large amount of land has been brought into the urban market, facilitating the creation of affordable housing on large scale. While P.R. scheme is popular in India, it has been extensively used in Asian countries like Japan, Korea and Taiwan for sourcing land to meet the needs of both urban development and creating large housing stock

vi) Involving Private Sector

Private sector is known for its potential, resources and capacity to promote qualitative and state of art urban development and making provision of cost-effective housing by using latest technologies and materials. Private sector also holds potential to source land directly from landowners without resorting to land acquisition process. Considering the limitations of the public sector, it has been recognized as prudent to encourage and involve private sector in large-scale assembly, planning, development and disposal of land to supplement the efforts of public agencies.

State of Haryana has taken a lead in this regard by evolving a comprehensive and effective framework for sanctioning of colonies, which has brought in lot of reputed builders in urban centers of Gurgram, Faridabad, Panchkula, Sonepat, Karnal and other major cities of the state. Haryana model needs to be replicated by carrying out certain modifications in order to attract developers in small and medium towns also. These developers have not only contributed substantially to the orderly growth and development of urban centers but have also made available large quantity of land/ plots for the urban poor at an affordable price. Recently launched affordable housing scheme by Government of India has also brought in a large number of promoters and developers to create large stock of affordable housing in urban areas. Large amount of land has been put under affordable housing under this scheme. Prime Minister Awas Yojna, with four verticals, also calls for involvement of private sector on large scale, in creating affordable housing

vii) Public-private partnership

Combined strength of both public and private sectors needs to be effectively used in providing shelter to the urban poor. West Bengal has taken a lead by floating number of joint venture companies (JVs) between West Bengal Housing Board and reputed private sector companies like Peerless Group, Ambuja Cement etc. Under these JV's, land is made available by the West Bengal Housing Board, whereas construction is done by the private developers. The share holding pattern defined is : 51:49 per cent between the private developer and the Housing Board, respectively.

Under the JV, a large number of houses, on subsidized rates, have been provided to LIG/EWS categories, through a system of prior registration. The subsidy is made good through HIG housing and commercial sites, provided as part of the scheme to make scheme operationally viable. Option can be used effectively by Development Authorities and Housing Boards of the states to create large stock of affordable housing. PPP has also been suggested as a strategy under the PMAY, for creating affordable housing to meet the targe t of housing for all by 2022.

viii) Promoting Brown Field Development

Urban land as a resource remains the most dynamic, ever evolving and ever devolving. Looking at the prevailing status of urban land resource, it can be observed that substantial amount of public and private land in the city remains unused or locked under inefficient uses in the shape of abandoned industrial units, old jails, public offices, institutions, derelict buildings etc. In order to make optimum use of the land, it is essential that this land is brought into urban market and used for creating housing and other amenities, for both general public and urban poor. Considering the opportunity of promoting planned development; making optimum utilization of vacant/unused/misused urban land and generating resources, state of Punjab launched the scheme, 'Optimum Utilization of Vacant Government Lands (OUVGL) '.

Under this scheme unused and underused potential public lands are identified, planned, developed and disposed off for housing and commercial purposes. This has not only generated resources for the state for infrastructure development but has also brought in considerable amount of derelict land into the urban market. Scheme offers enormous potential for regenerating obsolete and unused urban land for meeting the housing needs of the poor.

xi) Taxing Vacant Urban Land

Speculation in land, as a phenomenon, has gained enormous currency due to substantial gain accruing to the plot holders on account of ever-rising land prices in the urban areas. This process has led to putting under lock, large quantity of potential serviced urban land from the land market. Shortage of land thus caused, has led to large scale development in peri-urban areas due to non-availability of land at affordable price in urban areas. In certain cities land to the tune of 25-35 per cent remains vacant for obvious reasons. Vacant land is known to make land market both expensive and inefficient. In addition, it makes city development irrational and lopsided. In order to bring this land into the market and to minimize land speculation, it would be desirable to levy tax on such land. The tax liability should be made heavy, so as to act as deterrent for

keeping the land vacant for unreasonable time. Taxing vacant urban land would serve dual purposes, of not only bringing vacant land into the urban market but would also generate resources, which can be utilized for funding the housing for the poor. Punjab Urban Development Authority has imposed extension fee on the vacant plots after three years of allotment @ 2.0 per cent of the current allotment price. This has resulted in rapid construction on plots lying vacant for number of years besides generating lot of resources. Accordingly, it would be important to map the city in terms of the land resource and evolve strategies to promote its optimum utilization.

In case of plotted development, generally a large number of plots are not built to full capacity, leading to under utilization of the developed land. In such cases, owners should be enabled and supported to make construction to the permitted capacity, or should be allowed to sell floor rights to persons who do not have land. This can help in creating large housing stock without acquiring land. In New York, all high-rise buildings were permitted to create service apartments on the large terraces of buildings, to overcome the shortage of affordable housing. Singapore, in order to meet the shortage of land to create additional housing stock, evolved a policy to convert all plotted development into multi-storied flatted development.

x) Efficient legal framework

In order to improve the supply of serviced land in urban areas, existing legal framework needs close scrutiny and drastic amendments. Newly enacted; "Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013", which replaced the old Land Acquisition Act, 1894; has compounded the entire process of land acquisition by adding two more components of rehabilitation and resettlement, in addition to paying fair compensation.

Considering the larger implications of land acquisition under the new Act, majority of development authorities have closed the option of land acquisition under new law. This has considerably reduced the capacity of the public sector to intervene in the land market, which is largely being dictated by the private and informal sectors. It has also adversely impacted the operational efficiency of the land market. Law needs a critical review to make it more rational. Rent control laws also need close scrutiny in order to promote rental housing in urban areas on large scale. Central government is already in the process of putting a Model Rent Control Act, to facilitate the creation of rental housing stock. Modifying the Urban Land (Ceiling and Regulation) Act, to facilitate supply of land through open market, while protecting the interests of the poor, would be critical to promote housing for the poor on large scale.

xi) Building Bye-Laws and Development controls

The effective and optimum utilization of valuable urban land is often hindered by the existence of archaic and outdated building bye-laws and development controls, which impose undue restrictions on the use, and development of the land. Despite ruling land prices remain very high, permissible floor area ratio remains very low. Restrictions on height, further limit the use of land

in an efficient manner. Minimum sizes defined for living rooms along with height invariably lead to low-rise typology of buildings.

Low density coupled with low heights and low floor area ratio cumulatively lead to inefficient use of land resource. In order to improve the utilization of available land, there is an urgent need to redefine the development controls, so that optimum utilization of land resource could be made. Thus, building by-laws and development controls would require careful review, revision and redefinition in order to meet the housing requirement of urban inhabitants, majority of which cannot afford a minimal space for living and working.

xii) Keep residents where they are

Slums not only house large share of urban population, but they are also known to occupy considerable proportion of urban land, sometimes very central and precious. Pattern of development followed by the slums remains generally low rise, dense, narrow streets, lack of open spaces. Cumulative impact of these developments is that land under slums is used in a very inefficient manner, considering the development permitted in the area. The land under occupation of the slums offers an opportunity to create affordable housing not only for the residents of that slum but also for housing the additional population.

It is wrong to see slums as a problem, rather than an opportunity. It is an even bigger mistake to locate people away from their current settlements to new distant projects. Slums typically crop up around centres of economic opportunity, however rudimentary. Making *in- situ development* for these settlements, allows slum dwellers to remain connected to their own networks and sites of economic opportunity besides permitting optimum utilisation of the land resource.

xiii) Defining an efficient land Information System

Indian urban land suffers from the malaise of outdated and poor land record system which has led to lot of disputes arising on the status of land including ownership, exact area, past history of ownership, existing status of land, encumbrances to which land is subjected to, lack of transparency; absence of land related information from public domain etc. This has cumulatively led to inefficient function of the land market with majority of properties subjected to litigation and dispute regarding ownership.

Lack of transparency coupled with lack of information has considerably reduced supply of land in the urban market. This has also led on number of projects put on hold or getting stalled during their construction. If availability of adequate land has to be made available in the urban area, it will be desirable to put in place, on priority, an effective, efficient and tran sparent system of land information in all the urban centers. Accordingly, development of an automated and cadastral land titling system throughout the country, would be critical and pre-requisite to ensure effective functioning of the land market.

CONCLUSION

The housing is one of the most critical and dynamic entities related to human living, always evolving and devolving, never static/definitive, and ever dynamic. Housing strategies for the

urban poor need a holistic and multi-pronged approach; ensuring adequate supply of serviced land at most affordable price in equitable and sustainable manner. Also making the land market operationally efficient and socially just; rationalizing the urban planning and development process; making informal sector an integral part of urban planning and development; rationalizing the existing legal framework governing land and its management; changing role of parastatal agencies from providers to enablers; actively involving private and co-operative sectors in sourcing land and creating shelter; creating an effective and efficient urban land information and management system; rationalizing the process and cost of land transactions; minimizing the charges and fees levied in the land transactions; minimizing the time frame for sourcing land; making optimum use of available land; and identifying right beneficiaries.

Looking at the quality of life and adversities human beings faced, without an assured and permanent shelter, during the ongoing crisis of pandemic, the Covid-19 has clearly demonstrated the vulnerability of cities and migrants in the face of lockdown, when majority of urban migrant workers, without having any shelter, had no option but to leave cities to go back to their native places, despite all odds and hardships. This clearly establishes the context, role and importance of shelter in not only rationalizing growth and development of cities but also creating ownership among its citizens. It has also clearly demonstrated the necessity of providing adequate housing to all the urban residents, if the cities are to be made safe, resilient, sustainable and livable.

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Progress of Higher Education in India, 1991-2011
(A State-Level Analysis)

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Abstract: The spatio-temporal analysis of the higher educational attainment in India during 1991-2011 has been made at the state level by picking up data/information from the Census of India and Government of India educational reports and documents. Simple percentages, gender differential and co-efficient of correlation technique has been used to study the spatial pattern and changes therein. The study unfolds that though there has been an increase in the share of persons having higher educated attainments from 5.7 per cent in 1991 to 8.9 per cent in 2011, still India is at the infancy stage of higher educational attainments where only about one of each ten literates has attained the higher educational level. Moreover, there are wide variations in educational attainment at the regional level, attributed mainly to the varying determinants like availability of educational institutes, gross enrolment ratio, literacy rate, urbanisation and poverty. Rapid expansion in higher education and narrowing down gender inequalities in higher education attainment are some of the distinctive achievements of the post-reforms period.

Keywords: Higher education, attainments, determinants of education, India

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Introduction

Higher education, which has long been considered a key factor in economic, institutional, social development and technological progress (Lutz and Goujon, 2001:323), provides not just educated workers, but also knowledge workers to the growth of the economy (Tilak, 2003:152). While computing the human development index of any country, the UNDP has also accorded equal weightage to the education factor, speaking of the vital importance of literacy and education to the development of a nation. The higher education system is thus considered as a key pillar for the development of the national economy and achieving the frontiers of knowledge and innovation for human resource development (see Tilak, 2007; Altbach, 2009; Chattopadhyay, 2009; Jacob, 2018). For centuries, India has been home to higher education institutions and *Nalanda* university is believed to be one of the World's oldest universities created well before in Europe, America and other developed nations (Stolarick, 2014).

Several studies conducted earlier reveal that the inequality in access to higher education has increased substantially based on household's economic status, gender and residence (see Tilak 2007; 2018). Altbach et al. (2005) while analyzing the patterns of higher education development throughout the world concluded that universities in much of the third world simply cannot cope with the increased enrollments, budgetary constraints, and in some cases, fiscal disasters. Tilak

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(2015) opined that higher education in South Asian countries is in crisis and the crisis is not confined to numbers, finances and quality, but an unusual policy crisis. Balakrishnan (2007) examined the impact of six per cent GDP on education and found that the dwindling resource base of the Indian university system is unable to cope with the student numbers. Upadhyay (2007) examined both the demand-side and supply-side of higher education to understand the constraint facing higher education in India.

In recent years, the quality of higher education attracted the attention of academicians. Several studies focus on the quality of higher education (see Filmer and Pritchett, 1999; Lutz and Goujon, 2001; Husain and Sarkar, 2011; Sharma and Sharma, 2017). In India, following the initiation of the new economic policy in mid-July 1991, higher education is undergoing rapid changes and solving the basic problems of accessibility for all categories of the population. However, the globalization and privatization of higher education have posed new challenges in the path of achieving the set goals (Arunachalam, 2010). The new economic policy enhanced the demand for quality human resource and induced competition in the quickly changing employment landscape and global ecosystem. All this brought perceptible changes in the Indian higher education system.

The changing dynamics of the market have implications for access to higher education. The minimization of inequality and maintaining excellence in India is the priority of the Ministry of Human Resource Development, Govt. of India (Chattopadhyay, 2009). The human resource development (HRD) ministry, now the Ministry of Education, has set a goal of doubling GER to 30 per cent by 2020, against 26.3 per cent in 2018-19 (Govt. of India, 2019). It plans to create and develop world-class universities in India (Altbach, 2009). It is against this backdrop and to achieve a lofty sustainable development goal-4 (SDG4) of "ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all" by 2030, India has launched National Education Policy (NEP)-2020 with a major thrust to restructure, revamp and reconfigure the entire education system. It is likely to bring an epochal shift in the higher educational attainment and knowledge landscape of the country.

How is it going to unfold spatially, is an important question? In another way, how the different states are responding to the new scenario? What are the challenges and options before the state governments? All these are pertinent questions needing debate and discussions. However, a quick scan through the existing literature reveals that the spatial dimension of various issues and challenges linked with higher education has hardly been given the importance it deserves.

Research problem and questions

Taking a cue from all this, the present paper makes a modest attempt to examine the changing pattern of progress in higher education in India during the recent decades (1991-2011) at the state level. The study will deliberate on the questions such as: Which states are lagging and why in higher educational attainment? Have some states and union territories emerged as role models in the field of higher educational attainment in India? Which factors have brought major changes in educational attainment all across the country? How the inter-state pattern of higher education

changed following the new economic policy of 1991? What are the gender differentials in higher educational attainments across the states and union territories? The study will also try to focus on some other interrelated issues and challenges in this context.

Materials and methods

The study is mainly based on secondary sources of data, collected and tabled after downloading from the website of Census of India for 1991 and 2011. In addition, different reports/documents available from the NITI Aayog, the National Institute of Educational Planning and Administration (NIEPA) and the Ministry of Human Resource Development (MHRD), Government of India have also been pressed into service.

The study takes 1991 as the base year and 2011 as the terminal year to examine the spatio-temporal changes taking place in the higher education scenario during 1991-2011. The base year of the study coincides with the initiation of the new economic policy in 1991.

The present study is based on an analysis of 25 states and 7 union territories as per the 1991 Census year. In 1991, Census was not conducted in Jammu and Kashmir due to disturbed conditions. In 2011, there were 28 states and 7 UTs. For comparison, the data for newly formed states of Uttarakhand, Jharkhand and Chhattisgarh were clubbed in the parent states of Uttar-Pradesh, Bihar and Madhya Pradesh, respectively. To examine the level of higher educational attainment, three variables i.e. (X_1) educated males; (X_2) educated females; and (X_3) all educated persons up to higher-level have been considered and analyzed. Besides, 13 determinants which include number of higher education institutes/1,00,000 persons (Y_1); gross enrolment ratio (per cent) at higher level (Y_2); pupil-teacher ratio at higher level (per) (Y_3); literacy rate (per cent) (Y_4); level of urbanisation (per cent) (Y_5); density of population (persons/km^2) (Y_6); level of poverty (per cent) (Y_7); work participation rate (per cent) (Y_8); female work participation rate (per cent) (Y_9); road density (km/100 km^2) (Y_{10}); railway density (km/100 km^2) (Y_{11}); GSDP (per cent) (Y_{12}) and budgeted expenditure on education (per cent) (Y_{13}). The data for pupil-teacher ratio at a higher level of education is not available for the 1991 reference year. To examine the relationship between the three variables of higher educational attainment and associated key drivers, a co-efficient correlation method has been applied.

In this study, anyone who has completed the post-secondary education i.e. graduates, post-graduates, M.Phil. and a PhD degree is included in the higher educational bracket as per the Census of India definition. Census of India includes graduate degree other than a technical degree, post-graduate degree other than a technical degree, technical degree or diploma equal to degree or postgraduate degree, i.e. engineering and technology, medicine, agriculture and dairying, veterinary etc. in the category of graduates and above. However, a non-technical diploma or certificate not equal to a degree, technical diploma or certificate not equal to the degree is not included in higher education as per the Census of India.

Discussions and results

Notwithstanding, the females are still lagging behind the males in higher education in India there has been a relatively higher increase in their share during 1991-2011. The proportion of highly educated males witnessed an increase by 3.3 per cent points against 3.5 per cent points among females. The share of total persons in higher education, which was just 5.7 per cent in 1991, increased to 8.9 per cent by 2011, indicating a sluggish growth in higher educational attainment. Even one-tenth of India's literate population has not attained higher education by the end of 1st decade of the 21st century. Another peculiar feature of educational attainment at a higher stage in India is the gender gap.

In the following, an attempt has been made to examine the inter-state pattern and changes therein during 1991-2011 in total, male and female population higher educational attainments.

Highly Educated Persons: Pattern and Change, 1991-2011

As stated before, the share of the total highly educated in India increased from 5.7 per cent in 1991 to 8.9 per cent in 2011. In proportional terms, the increase is quite low, but in numerical terms, there has been an increase of about two and half times during 1991-2011. The growth rate of highly educated people was about 3 times higher than that of those educated up to elementary level and 1.32 times that of those educated up to secondary level. It shows both the propensity and inclination of Indian youths towards higher education after the 1990s.

The correlation matrix shows a positive association between educated persons at a higher level and higher educational institutes per size of population (0.43 in 1991 and 0.29 in 2011), gross enrolment ratio (0.84 in 1991 and 0.78 in 2011), level of urbanisation (0.70 in 1991 and 0.66 in 2011), the density of population (0.88 in 1991 and 0.81 in 2011) and rail-road density at national level (Table 6). There is a negative relationship between total educated persons and level of poverty (-0.37 in 1991) at the national level. The increasing number of educational institutes, higher enrolments, rising urban forms and improving the network of roads and railways enhancing the mobility of people individually and collectively made remarkable inroads in higher educational attainments at the national level. Poverty continued to undermine the progress of higher education at the national level during the post-reforms period. There are, of course, wide inter-state differentials in proportional shares of highly educated persons, ranging from a high of 24.1 per cent in Chandigarh to a low of only 4.4 per cent in Lakshadweep, both union territories. Among major states, it ranged from 11.3 per cent in Haryana to only 5.3 per cent in Assam (Table 1). In the following, states and union territories have been classified into the three categories of high, moderate and low based on their shares of the total highly educated persons in India.

i) Areas of High Level in Highly Educated Persons (10.0 per cent and above)

Among all the states and union territories, the NCT of Delhi and Chandigarh are the only two having a share of more than 10.0 per cent of graduates, post-graduates, M.Phil and PhD degree holders in 1991 (Table 1).

Table 1: The percentage share of highly educated among total, male, and female literates by states/union territories, 1991 and 2011

State/Union Territory	PERSONS		MALE		FEMALE	
	1991	2011	1991	2011	1991	2011
A. Major States						
Andhra Pradesh	6.0	11.0	7.2	12.9	3.9	8.7
Assam	3.8	5.3	4.6	6.0	2.4	4.3
Bihar	6.3	6.2	7.3	7.6	3.6	4.1
Gujarat	4.8	7.7	5.4	8.1	3.6	7.3
Haryana	5.1	11.3	5.2	11.3	4.8	11.4
Jammu & Kashmir	#	9.3	#	9.4	#	9.0
Himachal Pradesh	3.7	8.9	4.4	9.1	2.6	8.5
Karnataka	5.3	9.9	6.4	11.1	3.7	8.6
Kerala	3.5	9.0	3.8	8.3	3.2	9.7
Madhya Pradesh	5.9	7.3	6.2	8.0	5.2	6.3
Maharashtra	5.8	10.6	6.5	11.4	4.7	9.6
Odisha	4.3	6.7	5.2	7.8	2.6	5.2
Punjab	5.9	9.4	6.1	8.4	5.7	10.7
Rajasthan	6.2	8.0	6.3	8.8	5.7	6.7
Tamil Nadu	4.8	10.5	5.6	11.1	3.7	9.8
Uttar Pradesh	6.5	8.9	6.8	9.6	5.8	8.0
West Bengal	6.3	7.8	7.3	9.1	4.5	6.3
B. Small States						
Arunachal Pradesh	5.3	7.0	6.1	8.3	3.6	5.3
Goa	6.0	12.0	6.5	12.6	5.3	13.6
Manipur	7.9	11.8	8.7	13.0	6.7	10.4
Meghalaya	4.3	5.1	4.9	5.1	3.6	5.1
Mizoram	2.4	5.9	3.4	6.7	1.3	4.9
Nagaland	3.3	6.7	4.3	7.3	1.9	5.9
Sikkim	3.4	7.3	4.0	7.7	2.5	6.9
Tripura	4.5	4.9	5.3	5.9	3.3	3.8
C. Union territories						
A & N Islands	4.2	8.2	4.3	8.3	4.0	8.1
Chandigarh	21.9	24.1	22.3	22.5	21.4	26.4
Dadra & Nagar Haveli	4.0	8.6	4.3	8.6	3.5	8.5
Daman & Diu	3.2	6.8	3.9	6.8	2.1	6.9
Lakshadweep	3.5	4.4	3.8	5.2	3.2	3.4
NCT, Delhi	17.5	21.7	17.6	21.3	17.3	22.0
Puducherry	6.0	14.8	7.5	16.0	4.0	13.6
INDIA	**5.7**	**8.9**	**6.4**	**9.7**	**4.5**	**8.0**

Source: Calculated from Census of India.C2 Table: Age, Sex and Educational Level, for 1991 and 2011, Registrar General and Census Commissioner, India, New Delhi.

Census could not be held in Jammu and Kashmir in 1991 for disturbed conditions

Both the union territories are highly urbanized and administrative and educational hubs, attracting highly educated persons for seeking employment and higher education. In 2011, Chandigarh union territory shared only 0.11 per cent of total literates in India against 0.28 per cent of total highly educated persons. Similarly, NCT of Delhi had 1.67 per cent of total literates in India against 4.0 per cent of all highly educated persons, having graduate plus educational level. This could be possible for two reasons: (i) highly educated persons from the neighbouring states or even different states of India migrate to these two union territories, and (ii) those temporarily migrating to other states for higher education return back to these union territories after completing their education.

By 2011, the seven new states/union territories from the moderate and low category joined this category to raise the number of states and UTs to Nine. Haryana, Manipur, Maharashtra, Goa, Andhra Pradesh and Puducherry moved from the moderate category and Tamil Nadu from the low category (Table 2). In this way, Tamil Nadu recorded the biggest jump by moving from the low having only 4.8 per cent highly educated persons in 1991 to have 10.5 per cent in 2011. In all the states and union territories included in this category not only the degree of urbanization was quite high, but there was also better higher educational infrastructure. Tamil Nadu had less than 7.0 per cent of total literates in India against 8.0 per cent of total highly educated persons. Similarly, Maharashtra had less than 11.0 per cent of total literates in India against about 13.0 per cent of total highly educated persons. Haryana has benefitted from the spillover effect of the National Capital of Delhi and Andhra Pradesh due to the presence of Hyderabad, the IT hub of India.

Table 2: Association between 1991 and 2011 levels of highly educated persons in India

Level (1991-2011)	Name of state/union territory
High-High	Chandigarh, NCT of Delhi
Moderate-Moderate	Karnataka, Punjab, Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar, West Bengal, Arunachal Pradesh
Low-Low	Tripura, Lakshadweep
Moderate-High	Andhra Pradesh, Puducherry, Goa, Maharashtra, Haryana
Low-Moderate	Kerala, Assam, Meghalaya, Mizoram, Nagaland, Sikkim, Himachal Pradesh, Gujarat, Odisha, Dadra and Nagar Haveli, Daman and Diu, Andaman and Nicobar Islands
Low-High	Tamil Nadu

ii) Areas of Moderate Level in Highly Educated Persons (5.0-10.0 per cent)

In 1991, thirteen states and one union territory distributed in all parts of India had a 5.0 -10.0 per cent share of highly educated persons. Andhra Pradesh, Karnakata, and union territory of Puducherry from the south, Goa and Maharashtra from the west, Haryana and Rajasthan from the northwest, Uttar Pradesh from the north, Bihar and West Bengal from the east and Arunachal Pradesh and Manipur from the northeast were included in this category. Several factors including urbanisation, high population density, and low poverty ratio are responsible for the moderate proportion of tertiary educated persons in this category of states. By 2011, the number of states and UTs in this category increased to 21, covering large parts of India. Several states such as

Assam, Gujarat, Himachal Pradesh, Odisha, and Sikkim, which were in the low category in 1991 moved to the moderate category of states. In addition, union territories of Dadra and Nagar Haveli, Daman and Diu, and I& N Islands also moved to this category. This could be possible due to the faster growth of higher education in these states and union territories in the post-economic reforms period (Table 2).

iii) Areas of Low Level in Highly Educated Persons (Below 5.0 per cent)

In 1991, several major states of India had a low share of highly educated persons. Even states like Tamil Nadu, Kerala and Gujarat had this share of 5.0 per cent. Besides, the hill states from northwest and northeast India were included in this category. In the case of hill states, peripheral location, poor accessibility, and low level of urbanisation are the factor working behind this. The most intriguing feature of the literate population was that the low proportion of graduate persons in the high literate states of Kerala (89.8 per cent), Himachal Pradesh (63.9 per cent), Assam (52.9 per cent) and Nagaland (61.7 per cent) was counterbalanced by their higher proportion in the category of elementary educated persons. By 2011, except Tripura and the union territory of Lakshadweep all the states and union territories falling under this category moved to the moderate category (Table 2). Privatization of higher education combined with a higher budgetary allocation by the central and state government in the post-reforms period played a significant role in this context. For example, more than a dozen of privately managed universities were established in the hill state of Himachal Pradesh after 2001.

Highly Educated Males: Pattern and Change, 1991-2011

In 2011, when the national average of highly educated males made 9.7 per cent, it ranged from 22.5 per cent in Chandigarh UT to only 5.1 per cent in Meghalaya, differing by more than 17.0 per cent points. Earlier in 1991 when the national average was 6.4 per cent, it ranged from 22.3 per cent in Chandigarh UT to only 3.4 per cent in Mizoram, differing by about 19.0 per cent points, indicating some reduction in inter-state gap during 1991-2011. Among the major states, the share ranged from 12.9 per cent in Andhra Pradesh to 6.0 per cent in Assam, differing by about 7.0 per cent points or the share of Andhra Pradesh was more than twice of Assam in 2011.

In the following, the states and union territories have been classified into three categories based on their shares in the highly educated male population. Those having share 10.0 per cent or more are termed as high male educated states, those having share between 5.0 and less than 10.0 per cent as moderate male educated states, and those having share less than 5.0 per cent as the low male educated states.

i) Areas of High Level in Highly Educated Males (10.0 per cent and above)

In 1991, only the two highly urbanized union territories, NCT of Delhi and Chandigarh, registered a share of more than 10.0 per cent for highly educated males (Table 1). These two union territories (UTs) besides being highly urbanized are the hubs of administrative and educational activities. Highly educated males migrate here not only from the neighbouring states but also from other parts of the country.

Coming to 2011, the seven states namely Andhra Pradesh, Goa, Haryana, Manipur, Maharashtra, Tamil Nadu, and Karnataka along with three union territories of Chandigarh, NCT of Delhi and Puducherry entered this club. The higher concentration of highly educated persons in 2011 is attributable to the combination of factors like higher number of higher educational institutes, high urbanisation, high population density, low poverty ratio and high budgeted expenditure on education. Privatization of higher education also played an important role in this context. Increased demand for technical and professional education brought private players into higher education. Several technical and professional universities were opened in the private sector especially after 2001. States like Andhra Pradesh, Maharashtra and Karnataka benefited because big IT centres are located in the states. In 2011, Andhra Pradesh had less than seven per cent of all male literates in India against about 9.0 per cent of total graduate plus educated males. Similarly, Maharashtra had 10.4 per cent of all male literates against 12.3 per cent of all graduate plus educated males and Karnataka 5.2 per cent of all male literates against nearly 6.0 per cent of all graduate plus educated males. The role of in-migration of highly educated males can not be denied in this context.

Table 3: Association between 1991 and 2011 levels of highly educated males in India

Level (1991-2011)	Name of state/union territory
High-High	Chandigarh, NCT of Delhi
Moderate-Moderate	Gujarat, Punjab, Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar, West Bengal, Odisha, Tripura, Arunachal Pradesh
Low-Low	-
Moderate-High	Andhra Pradesh, Karnataka, Tamil Nadu, Puducherry, Goa, Maharashtra, Haryana, Manipur
Low-Moderate	Kerala, Assam, Meghalaya, Mizoram, Nagaland, Sikkim, Himachal Pradesh, Dadra and Nagar Haveli, Daman and Diu, Andaman & Nicobar Islands, Lakshadweep

ii) Areas of Moderate Level in Highly Educated Males (5.0-10.0 per cent)

In 1991, all the major states of India except Himachal Pradesh, Kerala and Assam had a moderate share of highly educated males. The exclusion of Kerala from this category is surprising, needing further investigation. A combination of factors such as better availability of higher educational institutes, degree of urbanisation, low poverty ratio and historical background has been responsible for such kind of pattern. By 2011, entire India had this share higher than 5.0 per cent. Among the major states, it ranged from 12.9 in Andhra Pradesh to only 6.0 per cent in Assam. Factors such as high population density, low poverty ratio, and high work participation rate find a high positive correlation coefficient with the moderate proportion of highly educated males. In 2011, several states and union territories that were either in the low or moderate category moved to the moderate or high category (Table 3). This could be possible due to the faster expansion of higher education in the post-reforms period especially after 2001. Andhra Pradesh, Goa, Maharashtra, Haryana, Tamil Nadu and Karnataka, which were in the moderate category in 1991 moved to the high category in 2011. These states registered rapid expansion in higher education in the post-economic reforms period due to increased private investment.

iii) Areas of Low Level in Highly Educated Males (Below 5.0 per cent)

In 1991, when the national average for the highly educated male population made 6.4 per cent, all the hill states (Himachal Pradesh, Sikkim, Assam, Meghalaya, Nagaland and Mizoram), the coastal state of Kerala and the UTs of Lakshadweep, Daman and Diu, Dadra and Nagar Haveli and Andaman & Nicobar Islands had this share below 5.0 per cent. The delayed beginning of higher education in Himalayan states also resulted in a low share of educated males. Besides, the low proportion of graduate males in the highly literate states i.e. Kerala and Himachal Pradesh was counter-balanced by their higher proportion in elementary education. It indicated the occurrence of drop-outs after elementary and secondary stages in these high literate states. However, in three north-eastern states of Sikkim (35.5 per cent), Meghalaya (38.3 per cent) and Mizoram (34.4 per cent), the share of males was more in the category of 'others', which included technical and non-technical diploma or certificate not equal to degree holders, unclassified literates and literates without educational level. It indicates that during the early 1990s, the youth in a majority of northeast India was more attracted towards technical and vocational education in comparison to general education. Probably, the former is considered more job-oriented than the latter. It is understandable that more males graduated and post-graduated during the post-liberalisation period due to the growing need for a knowledge-based Indian economy and her globalizing market.

The results of correlation brought out that the availability of educational institutes, gross enrolment ratio, high urbanisation and better road-railway connectivity were the factors that acted as a catalyst in strengthening the educational attainment among males. However, poverty and lack of finance reflected in terms of less budgeted expenditure on education posed threats in male educational attainment at the tertiary level in India.

Highly Educated Females: Pattern and Change, 1991-2011

The national average for highly educated females made 8.0 per cent in 2011, against 8.9 per cent for total highly educated persons and 9.7 per cent for males. Earlier in 1991, females share made only 4.5 per cent, against 5.7 per cent for total and 6.4 per cent males. Notwithstanding the wide gap between the male and female shares, the share of females in higher education registered a relatively fast increase in comparison to that of males during 1991-2011.

There were, however, wide inter-state differentials in the share of highly educated females. In 2011, the share ranged from a high of 26.4 per cent in Chandigarh to only 3.4 per cent in Lakshadweep, both union territories. Among the major states, it ranged from 11.4 per cent in Haryana to 4.1 per cent in Bihar. Earlier in 1991, it ranged from 21.4 per cent in Chandigarh union territory to only 1.3 per cent in Mizoram. Among the major states, it ranged from 5.8 per cent in Uttar Pradesh to only 2.4 per cent in Assam. All this indicates narrowing down of the gap among states but remains quite high. In the following, states and union territories have been grouped into the three categories of high, moderate and low based on their shares in highly educated females.

i) Areas of High level in Highly Educated Females (8.0 per cent and above)

In line with the male share, the union territories of NCT, Delhi and Chandigarh recorded a high share of highly educated females in total literate females in 1991, attributed to high urbanization level, the concentration of administrative and educational activities and in-migration of highly educated females from the neighbouring states as well as other parts of India. By 2011, the number of states and union territories in this category rose to 17: 12 states and 5 union territories (Table 1). Uttarakhand which was a part of Uttar Pradesh in 1991 was placed in this category in 2011. It means Uttarakhand after its emergence as an independent state out of Uttar Pradesh in 2000 registered faster growth in the higher education field. Several higher educational institutions especially in the private sector came to the states around its capital city of Dehradun to cater for the demand from the plains. It is to be noted here that the proportional shares of highly educated females were higher than that of the males in Chandigarh, NCT of Delhi, Daman and Diu, Goa, Haryana, Punjab and Kerala, happening for the first time in modern Indian history. In 2011, NCT of Delhi had less than 2.0 of total female literates in India against about 5.0 per cent of total highly educated females, that is, graduate plus. Similarly, these two shares were 4.4 per cent and 5.4 per cent in Kerala, and 2.5 per cent and 3.4 per cent in Punjab. All the south Indian states registered the biggest jump as they moved from low to high category states and union territories between 1991 and 2011 (Table 4).

Table 4: Association between 1991 and 2011 levels of highly educated females in India

Level (1991-2011)	Name of state/union territory
High-High	Chandigarh, NCT of Delhi
Moderate-Moderate	Rajasthan, Madhya Pradesh, Uttar Pradesh, West Bengal
Low-Low	Bihar, Tripura, Lakshadweep
Moderate-High	Maharashtra, Goa, Punjab, Haryana, Manipur, Puducherry, I & N Islands
Low-Moderate	Assam, Odisha, Meghalaya, Mizoram, Nagaland, Sikkim, Arunachal Pradesh, Daman and Diu, Gujarat
Low-High	Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Himachal Pradesh, Dadra and Nagar Haveli

ii) Areas of Moderate Level in Highly Educated Females (4.0 -8.0 per cent)

In 1991, states and union territories located in north-western, central, and western regions had a moderate level for highly educated women in India. The majority of states located in northeast and south India did not fall in this category. By 2011, additional eight states and one union territory moved from low to this category. Most of the states located in the northeast region registered higher growth in female education in the post-reforms period. On one hand, the Central government opened either the new universities or provided the central status to the already existing universities in the region. On the other, several universities/colleges were opened in the private sector, under the mission-higher education at your doorstep. In the case of Daman and Diu, the share of highly educated females was higher than that of the males in 2011.

iii) Areas of Low Level in Highly Educated Females (Below 4.0 per cent)

In 1991, fifteen states and three union territories of India had a low proportion (i.e. < 4.0 per cent) of tertiary-educated females (Table 1). The high poverty ratio states like Bihar and Orissa (now Odisha) along with the thinly populated hill states of Arunachal Pradesh, Mizoram, Sikkim, Nagaland and Himachal Pradesh fell in this category. Another group of states included in this category were the states where the literacy rate was quite high but the share of highly educated females in total literates quite low. Such states included Himachal Pradesh, Kerala, Assam, Nagaland, and Tamil Nadu. The glaring incidence of girls drop-outs after elementary and secondary stages must have caused this.

Interestingly, the low female literacy level states like Rajasthan, Uttar Pradesh and Madhya Pradesh registered a better share of highly educated females i.e. between 4.0 -8.0 per cent in their total female literates. A clear cut north-south and east-west divide in the female educational landscape has been witnessed. The results of correlation reveal that the availability of educational institutes impacted positively (0.40 in 1991 and 0.25 in 2011) and poverty adversely (-0.43 in 1991 and -0.22 2011) the educational landscape of females at a higher level in the country.

By 2011, several states and union territories included in this category moved either to the moderate or high category of states. Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Himachal Pradesh and Dadra and Nagar Haveli moved to the high category, registering a sharp increase in female education at the tertiary level. While Gujarat, Assam, Odisha, Meghalaya, Mizoram, Nagaland, Sikkim, Arunachal Pradesh, and Daman and Diu moved to the moderate category, registering a moderate growth of female territory education. It means that several states performed very well in the spread of female tertiary education during 1991-2011. This is attributed to the developments taking place in the post-reforms period. Keeping in view the future needs of a fast developing Indian economy, the aim of the government in India to give a big push to higher education in general and technical and professional education in particular. In this regard, the progress made in states like Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, and Himachal Pradesh is remarkable.

Gender Gap in Higher Education Attainment

In the following, the gender differentials in higher education attainment in India and changes therein during 1991-2011 have been discussed briefly. In 1991, the female-male differential index value for India as a whole was 0.70. In other words, 70 females against 100 males had attained higher education in India. The index value ranged from a high of 0.98 in the NCT of Delhi to only 0.38 in Mizoram (Table 5).

On the whole, the index value was below the national average in 14 states and two union territories, and in the three states of Bihar, Nagaland and Mizoram the index value was less than 0.50. In other words, less than half female literates of each 100 male literates had attained higher education in these states in 1991.

Table 5: Gender differentials in tertiary education in India and changes therein during 1991 -2011						
State/Union Territory	1991			2011		
	Male	Female	Female/ male ratio	Male	Female	Female/ male ratio
A. Major States						
Andhra Pradesh	7.2	3.9	0.54	12.9	8.7	0.67
Assam	4.6	2.4	0.52	6.0	4.3	0.72
Bihar	7.3	3.6	0.49	7.6	4.1	0.54
Gujarat	5.4	3.6	0.67	8.1	7.3	0.90
Haryana	5.2	4.8	0.92	11.3	11.4	1.01
Jammu & Kashmir	#	#	-	9.4	9.0	0.96
Himachal Pradesh	4.4	2.6	0.59	9.1	8.5	0.93
Karnataka	6.4	3.7	0.58	11.1	8.6	0.77
Kerala	3.8	3.2	0.84	8.3	9.7	1.17
Madhya Pradesh	6.2	5.2	0.84	8.0	6.3	0.79
Maharashtra	6.5	4.7	0.72	11.4	9.6	0.84
Odisha	5.2	2.6	0.50	7.8	5.2	0.67
Punjab	6.1	5.7	0.93	8.4	10.7	1.27
Rajasthan	6.3	5.7	0.90	8.8	6.7	0.76
Tamil Nadu	5.6	3.7	0.66	11.1	9.8	0.88
Uttar Pradesh	6.8	5.8	0.85	9.6	8.0	0.83
West Bengal	7.3	4.5	0.61	9.1	6.3	0.69
B. Small States						
Arunachal Pradesh	6.1	3.6	0.59	8.3	5.3	0.64
Goa	6.5	5.3	0.81	12.6	13.6	1.08
Manipur	8.7	6.7	0.77	13.0	10.4	0.80
Meghalaya	4.9	3.6	0.73	5.1	5.1	1.00
Mizoram	3.4	1.3	0.38	6.7	4.9	0.73
Nagaland	4.3	1.9	0.44	7.3	5.9	0.81
Sikkim	4.0	2.5	0.63	7.7	6.9	0.90
Tripura	5.3	3.3	0.62	5.9	3.8	0.64
C. Union territories						
A & N Islands	4.3	4.0	0.93	8.3	8.1	0.98
Chandigarh	22.3	21.4	0.96	22.5	26.4	1.17
Dadra & Nagar Haveli	4.3	3.5	0.81	8.6	8.5	0.99
Daman & Diu	3.9	2.1	0.54	6.8	6.9	1.01
Lakshadweep	3.8	3.2	0.84	5.2	3.4	0.65
NCT, Delhi	17.6	17.3	0.98	21.3	22.0	1.03
Puducherry	7.5	4.0	0.53	16.0	13.6	0.85
INDIA	**6.4**	**4.5**	**0.70**	**9.7**	**8.0**	**0.82**

Due to the disturbed conditions, Census was not conducted in Jammu and Kashmir in 1991

The group of states and union territories, that had the differential index value below the national average, included Gujarat and Daman and Diu from western, Tamil Nadu, Karnataka, Andhra

Pradesh and Puducherry from southern, Bihar, West Bengal, and Odisha from eastern, Himachal Pradesh from northwestern, and Sikkim, Tripura, Arunachal Pradesh, Assam, Nagaland, and Mizoram from northeastern India. Kerala from the south and Manipur from northeast India are the notable exceptions from this group of states and union territories. In other words, with a few exceptions, entire south and northeast India was covered under below national average on this count.

In contrast, the differential index value was above 0.90 in the NCT of Delhi, Chandigarh, Andaman and Nicobar Islands union territories and Punjab and Haryana states. In other words, their record of gender parity in higher education was among the top few states and union territories in India. Another eight states and two union territories having index value ranging between 0.72 and 0.90 included Rajasthan, Uttar Pradesh, Madhya Pradesh, Manipur, Meghalaya, Dadra and Nagar Haveli, and Lakshadweep.

On the whole, union territories along with states in the northwest and west India performed relatively well on account of gender parity in higher education attainments. Against this, the states located in southern and northeast India lagged on this count in 1991. Notably, the presence of states like Uttar Pradesh, Rajasthan, and Madhya Pradesh in a relatively better performing category of states in terms of gender balance in higher education need further investigation.

In 2011, when differential index value registered an increase to 0.82 from 0.70 in 1991 indicated the narrowing down of gender disparity in higher education attainment in India. With exception of a few states gender disparities narrowed down during 1991-2011, the period is known as the post-reforms era in India. The narrowing in gender differentials in higher education attainment was to the extent that in some states and union territories it went in favour of the female population. These included Punjab, Kerala, Haryana, Goa, NCT of Delhi, Chandigarh and Daman and Diu. Further, it was unity in Meghalaya and near-unity in Dadra and Nagar Haveli. In a way, except for Lakshadweep, all the union territories achieved a distinction of maintaining gender balance or favouring their female population in gender parity in higher education attainment. Their peculiar character is responsible for this.

Punjab with an index value of 1.27 topped the list followed by Chandigarh union territory and Kerala with 1.17. On the whole, 13 states and five union territories recorded differential index value higher than the national average. Further, the index value was above 0.50 for all the states and union territories in India, indicating a healthy movement in better gender balancing of higher education attainment across the country during 1991-2011. States and union territories doing exceedingly well on this count included Daman and Diu, Nagaland, Mizoram, Himachal Pradesh, Punjab, Kerala, Puducherry, Goa, Meghalaya, Sikkim, Gujarat, Tamil Nadu, Chandigarh and Assam. Against this, slow-performing states and union territories included Haryana, West Bengal, NCT of Delhi, Arunachal Pradesh, Bihar, Andaman and Nicobar Islands, Manipur, and Tripura. The worst performing states and union territories included Uttar Pradesh, Madhya Pradesh, Rajasthan and Lakshadweep, where gender inequality in higher education attainment increased during 1991-2011.

Concluding remarks

The country has experienced a noticeable improvement in higher educational attainment during the post-reforms phase. The growing demand of graduates and post-graduates in all 'A' grade jobs for administration and highly qualified human resource in the fast-changing job market of India brought positive transformation in the higher education landscape. Resultantly, the share of highly educated persons grew about three and one and a half times more than the elementary and secondary educated, respectively. It shows the growing propensity and inclination among Indians towards higher education after the 1990s.

Nonetheless, the share of a highly educated person in total educated and literate persons in India was only 8.9 per cent in 2011, increased by only 3.2 per cent points during 1991-2011. More than nine-tenths of total literates in India have the educational level up to the elementary or secondary level. We are far behind the developed country in this race. Another peculiar feature of educational attainment at a higher level is the wide gender gap. Among states, except for Goa in the west, Kerala in the south and Haryana and Punjab in the northwest, male-female in higher education is quite wide. However, the majority of union territories including Chandigarh, Delhi, Dadra & Nagar Haveli and Daman & Diu registered a relatively higher share of female graduates than males in 2011, signifying a stiff gender competition in seeking higher education and opportunities for job in the quickly changing employment landscape.

The increase in the proportion of highly educated persons has been quite low in densely populated states of the country like Bihar, West Bengal and hilly tribal tracts of northeast India. In these states, there has been more pursuance of technical and vocational education. The study brings out the 'high literacy-low higher education' paradox at the tertiary level in Indian education. The study belies a deeply entrenched perception that more literate states are more highly educated. The highly literate states of Kerala, Mizoram and Himachal Pradesh witnessed a low share of tertiary educated persons (below 5.0 per cent) in 1991. The high literate states viz. Mizoram (91.6 per cent) and Tripura (87.7 per cent) registered a very low proportion of highly educated persons even in 2011. Against this, low literacy level states performed relatively better in the highly educated population segment. Narrowing down gender inequalities in higher education attainment during 1991-2011 is among the remarkable achievements of the post-reforms era in India.

The increasing number of educational institutes, growing urbanisation and improving network of roads and railways acted as a catalyst for a higher level of educational attainment at the national level. Though both central and state governments are trying hard to improve the higher education system in the country, yet we are miles to go. The population pressure accompanied by a high incidence of poverty is the biggest hindrance in achieving quality higher education in the country. With fast-changing employment ecology and globalizing economy, the demand for highly educated human resource is on the rise. The hope lies in the proper implementation of the National Education Policy-2020 to achieve the sustainable development goal-4 aimed at "ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all" by 2030.

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Table 6
India: Correlation Matrix at Higher Level of Education

		Determinants of Education (Y)																									
		Y_1		Y_2		Y_3		Y_4		Y_5		Y_6		Y_7		Y_8		Y_9		Y_{10}		Y_{11}		Y_{12}		Y_{13}	
		1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011
Educational Variables (X)	X_1	**0.45**	**0.33**	**0.84**	**0.79**	DNA	0.02	**0.29**	0.15	**0.70**	**0.62**	**0.87**	**0.78**	**-0.34**	-0.11	0.07	-0.18	-0.21	-0.25	**0.89**	**0.76**	**0.84**	**0.62**	-0.02	0.10	**-0.32**	-0.15
	X_2	**0.40**	**0.25**	**0.82**	**0.73**	DNA	-0.05	**0.28**	**0.28**	**0.72**	**0.69**	**0.88**	**0.81**	**-0.43**	-0.22	0.00	**-0.26**	**-0.27**	**-0.37**	**0.92**	**0.82**	**0.82**	**0.61**	-0.04	0.00	**-0.38**	-0.21
	X_3	**0.43**	**0.29**	**0.83**	**0.77**	DNA	-0.00	**0.28**	0.21	**0.70**	**0.66**	**0.88**	**0.81**	**-0.37**	-0.16	0.04	-0.22	-0.24	**-0.31**	**0.91**	**0.80**	**0.84**	**0.63**	-0.02	0.06	**-0.35**	-0.19

Source: Correlation among variables is calculated using Census of India data and MHRD educational statistics

Table 7
India: Determinants of Educational Attainment by States and Union-territories

States/UTs	Urban Population (per cent)		Persons/km^2 Area		BPL Population (%)		Work Participation Rate (%)		Female Work Participation Rate (%)		Road Length (km)/100 km^2 Area		Railway Length (km)/100 km^2 Area		GSDP (per cent)		Budgeted Expenditure on Education (%)	
	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011	1991	2011
Andhra Pradesh	26.9	33.36	242	308	22.19	9.2	45.1	46.61	34.3	36.16	15.79	76.22	1.82	1.91	6.87	4.91	3.34	3.24
Arunachal Pradesh	12.8	22.93	10	17	39.35	34.7	46.2	42.47	37.5	35.44	6.59	13.04	0.001	DNA	0.14	0.14	5.46	4.45
Assam	11.1	14.09	286	397	40.86	32	36.1	38.36	21.6	22.46	38.93	51.43	3.14	4.98	1.99	1.85	3.91	5.36
Bihar	13.1	14.36	959	1516	54.96	35.3	32.2	36.5	14.9	24.08	10.83	28.72	3.05	6.33	5.71	5.15	4.65	4.15
Goa	41	62.17	316	394	14.92	5.1	35.3	39.58	20.5	21.92	191.62	276.19	2.13	1.86	0.34	0.55	4.59	3.74
Gujarat	34.5	42.59	211	308	24.21	16.6	40.2	40.98	26	23.38	20.44	39.53	2.69	2.69	5.9	7.97	3.42	2.13
Haryana	24.6	34.87	372	573	25.05	11.2	31	35.17	10.8	17.8	52.06	61.33	3.39	3.48	3.27	3.85	2.27	2.69
Himachal Pradesh	8.7	10.03	93	123	28.44	8.1	42.8	51.85	34.8	44.82	42.77	60.57	0.48	0.53	0.65	0.94	6.45	5.35
Jammu & Kashmir	23.8	27.37	77	124	25.17	10.3	DNA	34.47	DNA	19.11	5.49	9.81	0.03	0.12	DNA	1.01	4.11	6.44
Karnataka	34.9	38.67	235	319	33.16	20.9	42	45.62	29.4	31.87	68.26	39.21	1.59	1.69	5.82	7.82	3.14	3.04
Kerala	26.4	47.7	749	859	25.43	7.1	31.4	34.78	15.8	18.23	52.19	72.57	2.53	2.7	3.16	4.71	4.18	3.51
Madhya Pradesh	23.2	26.49	288	425	42.52	35.7	42.8	45.57	32.7	36.17	29.45	36.31	1.9	3.26	6.11	6.13	3.27	4.06
Maharashtra	38.7	45.22	257	365	36.86	17.4	43	43.99	33.1	31.06	57.34	78.55	1.76	1.82	15.17	16.48	2.4	2.78
Manipur	27.5	29.2	82	122	33.78	36.9	42.2	45.09	39	38.56	23.93	61.93	0.004	DNA	0.19	0.17	7.88	7.16
Meghalaya	18.6	20.06	79	132	37.92	11.9	42.7	39.96	34.9	32.67	25.35	38.2	DNA	DNA	0.19	0.26	6.23	4.76
Mizoram	46.1	52.11	33	52	25.66	20.4	48.9	44.36	43.5	36.16	15.97	2.75	0.005	0.01	DNA	0.09	9.63	9.37
Nagaland	17.2	28.85	73	119	37.92	18.9	42.7	49.24	38	44.74	10.58	72.58	0.07	0.08	0.14	0.15	6.35	5.61
Odisha	13.4	16.68	203	269	48.56	32.6	37.5	41.79	20.8	27.16	DNA	11.66	1.28	1.55	2.76	2.95	4.08	3.41
Punjab	29.6	37.48	403	550	11.77	8.3	30.9	35.67	4.4	13.91	76.44	207.07	4.28	8.15	4.45	3.45	2.39	2.14
Rajasthan	22.8	24.87	129	201	27.41	14.7	38.9	43.6	27.4	35.12	17.04	55.34	1.7	1.69	4.5	5.65	3.63	2.85
Sikkim	9.1	25.15	57	86	41.43	8.2	41.5	50.47	30.4	39.57	31.89	27.26	DNA	DNA	0.08	0.14	9.94	5.79
Tripura	15.3	26.16	263	350	39.01	14	31.1	40	13.8	23.57	54.81	161.46	0.42	1.46	0.26	0.25	10.3	5.66
Tamil Nadu	34.2	48.39	429	555	35.03	11.3	43.3	45.58	29.9	31.8	131.32	209.33	3.08	2.98	7.27	9.73	3.03	2.67
Uttar Pradesh	19.8	22.65	680	1017	40.85	20.3	32.2	35.66	12.3	21.71	24.37	125.09	3.03	4.28	13.01	10.87	2.8	4.1
West Bengal	27.5	31.87	767	1029	35.66	19.9	32.2	38.08	11.2	18.08	20.02	23.17	4.3	4.44	8.63	DNA	4.22	3.07
A & N Islands	26.7	37.7	34	46	34.47	1	35.24	40.08	13.1	17.81	10.47	16.23	DNA	DNA	0.04	0.05	DNA	6.81
Chandigarh	89.7	97.25	5632	9252	11.35	DNA	34.9	38.29	10.4	16	1245.61	2530.41	9.64	14.04	DNA	0.24	DNA	2.36
Dadra & Nagar Haveli	8.5	46.72	282	698	50.84	39.3	53.2	45.73	48.8	25.25	72.7	164.96	DNA	DNA	DNA	DNA	DNA	DNA
Daman & Diu	46.8	75.17	907	2169	15.8	9.9	37.6	49.86	23.2	14.9	DNA	242.34	DNA	DNA	DNA	DNA	DNA	DNA
Delhi	89.9	97.5	6352	11297	14.69	9.9	31.6	33.28	7.4	10.58	1461.9	2202.49	11.32	80.65	3.2	4.45	DNA	1.68
Lakshadweep	56.3	78.06	1616	2013	25.04	2.8	26.4	29.09	7.6	10.96	DNA	673.33	DNA	DNA	DNA	DNA	DNA	DNA
Pondicherry	64	68.33	1683	2598	37.4	9.7	33.1	35.66	15.2	17.63	97.34	139.82	5.51	4.49	0.14	DNA	DNA	5.63
INDIA	**26.1**	**31.16**	**267**	**382**	**35.97**	**21.9**	**37.5**	**39.8**	**22.3**	**25.5**	**70.79**	**142.68**	**1.89**	**1.96**	**3.45**	**3.57**	**3.8**	**4.17**

Source: Census of India and Planning Commission of India, Note: A & N Islands stands for Andaman & Nicobar Islands

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Demographic Characteristics of Population and its Physiographic Correlates in the Ganges Basin: A District-Level Analysis

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Abstract: The paper is an attempt to study the nature of the association between the distribution of population and its various demographic characteristic vis-à-vis physical resource base such as relief, land use/cover, crop productivity of a region by picking up the Ganges basin. The study conducted at the district level, collected data/information from various secondary sources such as Census of India, NATMO, and ISRO. Spread over one-fourth of the total geographical area of the country and administratively divided into 219 districts of ten states and one union territory, the Ganges basin presents a variety in physiography and natural resource base. The Ganges basin is asymmetric in terms of the distribution of area, its northern part having a lesser land area for cultivation and human settlements in comparison southern counterpart. The distribution of population and its different demographic characteristics have not maintained a balance with this asymmetrical nature of the basin. The population is mainly concentrated within 100 km of the mainstream of the River Ganges. The density of population gradually increases from the river sources to downstream.

Key Words: River Basin, Population Density, Sex Ratio, Physical Factor, Crop Productivity.

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Introduction

For its close association with the development process in an area, population distribution is considered as one of the major focal themes in Population Geography. In developing countries like India, where the dominant majority of the population is still dependent on land resources for its livelihood, the study of population distribution in terms of its association with land resources has become an issue of national importance as well as concern. As we are aware that some of the natural resources are finite and the high density of population has created pressure over such resources, lowering down the rate of resource consumption and the quality of human lifestyle (Pimentel et. al., 1997:105). The rapid growth of the human population is considered among the major reasons behind the loss of natural resources (Sharma, 2016: 54). Because of this, most of the nations in the world have framed specific population policies, which are either pro- or anti-natalist. The river basins, which had been the cradle of human civilizations all over the world, are under great pressure due to the long history of land resources use and increased population density to the extent of overcrowding in several cases.

Several studies, conducted earlier, found a close relationship between various factors of socio-economic and distribution of the population (see Beeson et. al., 2001; Dobson et. al., 2000; Mera, 1977; Shoshany and Goldshleger, 2002; Ahmed and Taha, 2016). A study conducted by Liu et al. (2018) found a link between physical factors and population distribution. Several other studies

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examined the role various geographical and natural factors play in the distribution of the population (see Hu, 1982, 1990; Chen and Wang, 2007; Onoye, 1970; Sun, 1982; Zhu, 1983).

Research Problem

India is recognized as a riverine country. The Ganga basin is very important because it is the largest river basin of India where resides one-fourth of the total population of India and considered the lifeline of northern India. The Ganges river basin of India is one of the major river basins in the world in terms of area, population size and population density. It spreads over an area of more than eight hundred thousand square kilometres in 219 districts of 10 states and one union territory having densely populated rural and urban settlements. On one hand, several big urban-industrial centres and metropolitan cities are located in the Ganges basin, on the other hand, its eastern half is highly rural and agricultural with high to very high rural densities, sometimes termed as rural slums. What happens to the Gangetic Plains is always felt in the Himalayan mountain system, located to its north, especially in the foothill region, which is known as Tarai in the west and the Duar in the east.

Taking a cue from the above statements, the present study makes an analytical examination of demographic characteristics of the Ganges basin and link these with physical resource base like relief, land use and crop productivity.

Data Sources and Methodology

This study is mainly based on secondary and tertiary data sources. Data on demographic aspects have been collected from the Census of India, 2011, available online from the website of the Census of India (www.censusindia.gov.in). The satellite image and Digital Elevation Model (DEM) are collected from Earth Explorer. The software ArcGIS is used for processing the satellite image and DEM. Besides Earth explorer, the images of the Ganga river basin have been taken from National Atlas & Thematic Mapping Organization (NATMO) and Google Earth.

Land use/land cover map has been prepared with the help of the *Bhuvan* platform, Indian Space Research Organisation, headquartered in Bangalore. Data on crop productivity has been collected from the Ministry of Agriculture and Farmers Welfare , Government of India, New Delhi. For comparison, population data relates to 2011, land use/cover data for 2011 and crop production data for 2010-11. The regression analysis has been run to find out the statistical relationship between population distribution and crop productivity in the study area.

The Study Area

The Ganges river basin spread over an area of 812,620 km^2, making one-fourth of the total geographical area of the country. It extended between 73º24'02"E to 89º05'02"E longitude and 21º30'50"N to 79º04'51"N latitude. In 2011, it was administratively divided into 219 districts of 10 states and one union territory. These included West Bengal, Jharkhand, Bihar, Uttar Pradesh, Uttarakhand, Madhya Pradesh, Chhattisgarh, Rajasthan, Haryana, Himachal Pradesh and NCT of Delhi (Table 1). More than two-thirds of the total districts falling under the Ganges basin belonged to Uttar Pradesh, Uttarakhand, Bihar, Jharkhand, and West Bengal, making pre-2000

Bihar, Uttar Pradesh and West Bengal. Districts falling in the Middle and the Lower Ganges Plain are densely populated and rural. The size of agricultural landholding is generally small to marginal. According to Tendulkar methodology, the headcount poverty ratio in Bihar, Uttar Pradesh, and West Bengal was 33.7 per cent, 29.4 and 20.0 per cent, respectively in 2011 -12.

Table 1: The Study Area (Ganges Basin): Administrative units, 2011

Sr. No.	State Name	No. of districts	Sr. No.	State Name	No. of districts
1	Himachal Pradesh	02	7	Madhya Pradesh	30
2	Haryana	08	8	Chhattisgarh	01
3	Rajasthan	17	9	Bihar	38
4	NCT of Delhi	09	10	Jharkhand	17
5	Uttar Pradesh	71	11	West Bengal	13
6	Uttarakhand	13		**TOTAL**	**219**

Result and Discussion

Physiographically, the northern portion of the basin falls under the Himalayan region with a very high altitude (> 2000 meters), largely covered by snow glaciers and forests. The south-eastern part of the basin is characterised by moderate altitude (i.e. 1000-250 metre) and fall under the arid and semi-arid region. In the case of the arid and semi-arid region, the vegetative cover is comparatively low. The rest of the basin has a gentle altitude with < 250 -metre height from mean sea level. The distribution of population is controlled by various physical characteristics of the basin. The regional pattern of population density shows that the region where the local physical characteristics are not much suitable for habitation (i.e. northern, south-western and part of southern) is characterized by low population density (i.e.<500 population/sq. km).

Against this, the area with high population density is found in the middle (Haryana and Uttar Pradesh), south-eastern (Bihar and Uttar Pradesh) and southern (West Bengal) parts of the basin (Fig. 1). It is further observed that the density of population is relatively high, where the altitude is relatively low (< 250 metres) and the people able to avoid the adverse effect of the aridity conditions. The contour pattern and its relation to the density of population in the basin show that the highest density recorded in the region below the 100 meters contour line (i.e. in the downstream section of the basin). This region is mainly covered with thin forest and vegetation type, largely man-made.

The density of population is found moderate in the region bounded by 100 and 200 meters contour lines. As one moves above 200 meters contour line, the density of population is relatively low. The density of population is quite high in the basin where the frequency of contour line is low and this zone is mainly formed within 100 km buffer area of the mainstream of Ganges. In the northern part of the mainstream of Ganga, the average population density is found to be high (880 persons/sq. km), and then declining with movement to the south (537persons/km^2). The low conducive physical characteristics (high altitude, forest cover, arid and semi-arid climate, and low level of soil fertility etc.) on the southern periphery of the Ganges force the people to settle in the north.

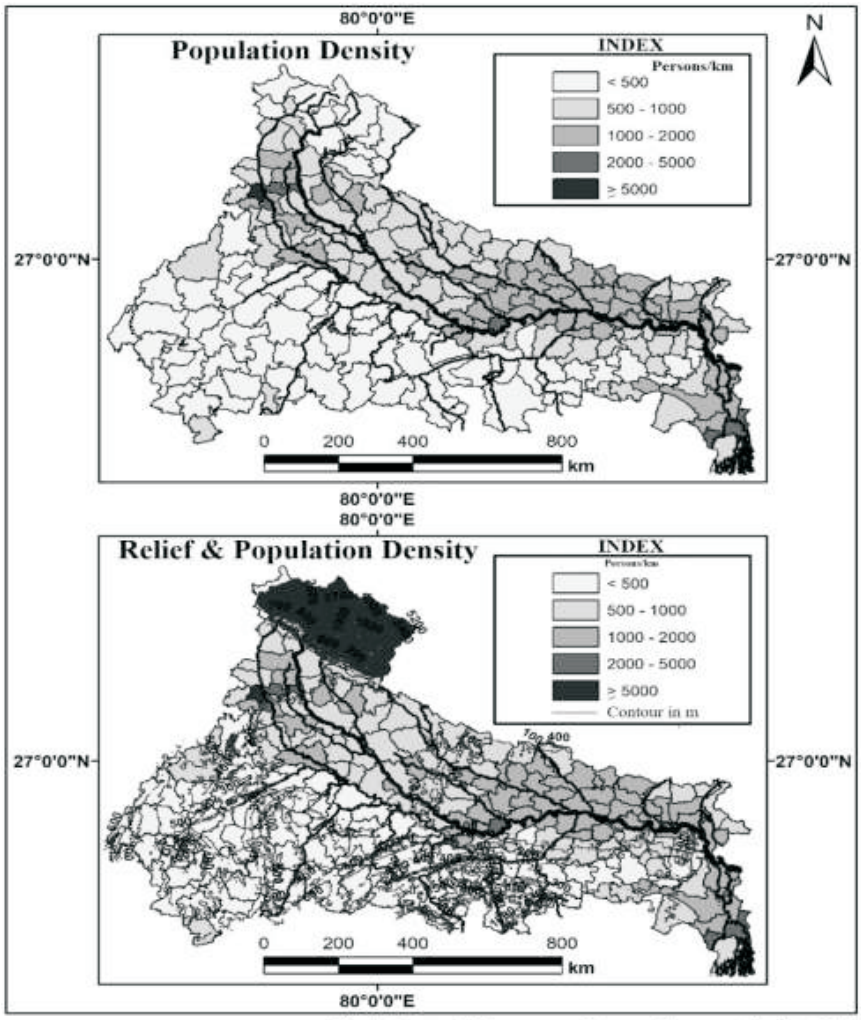


Fig. 1: Ganges Basin Source: Census of India, 2011

The size of the household and the population density found a positive association between different parts of the Ganges Basin. In areas where the density of population is quite high (i.e. Haryana, Uttar Pradesh, Bihar and Jharkhand) the family size is also large (Fig. 2). However, the southern part of West Bengal is an exception to this. Soil fertility and developed agriculture also find a close association with a high density of population and large family size. The average size of the family was larger (5.66) in the north in comparison to the south (5.19).

Interestingly, the sex ratio is high in the parts of the basin where the density of population is relatively low, dominated by tribal population and suffering from regional backwardness. In contrast, in the areas having relatively high population density, better urbanization level and relatively developed economy sex-ratio is relatively low. However, the role of the modern practice of sex determination of the foetus and hostility towards girl child can not be ruled out in keeping imbalanced sex-ratio in such parts of the basin. In the northern part of the Ganges basin,

which is quite close to the Himalayan region, the sex ratio is relatively high i.e. 930 females/1000 males in comparison to the southern part, having a sex ratio of 912 female/1000 males. The buffer zonation analysis represents that the sex ratio is quite low within the 100 km buffer zone, moderate in the 100-200 km buffer zone, and high in the zone beyond the 200 km.

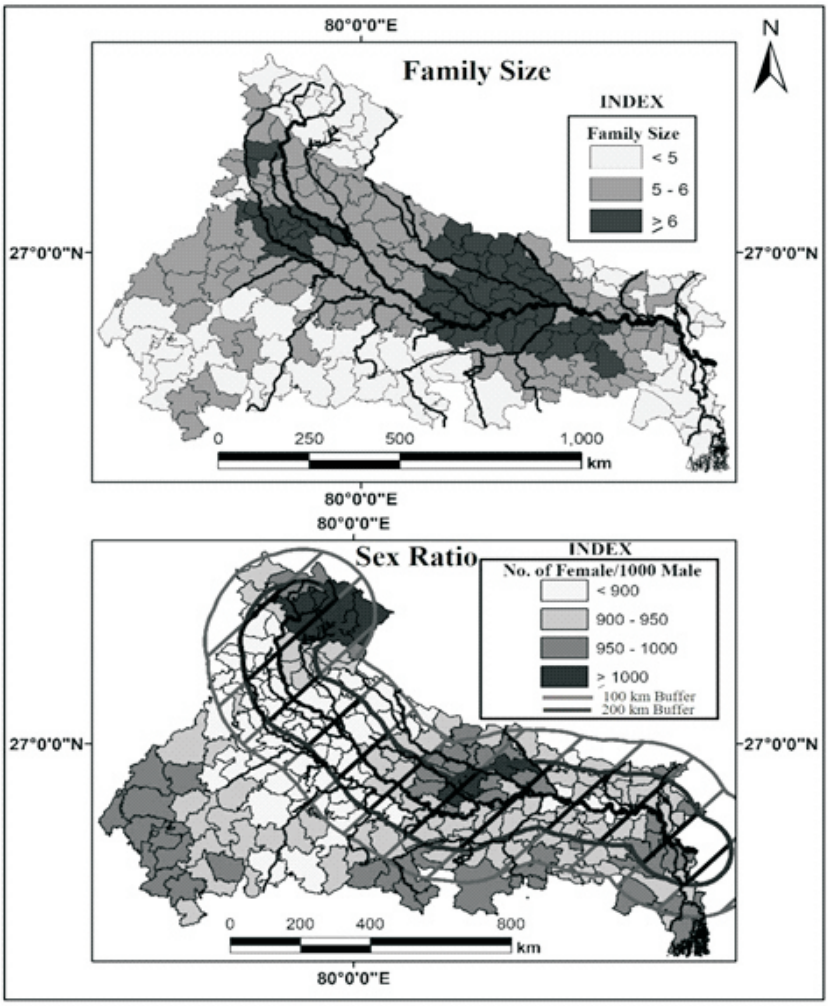
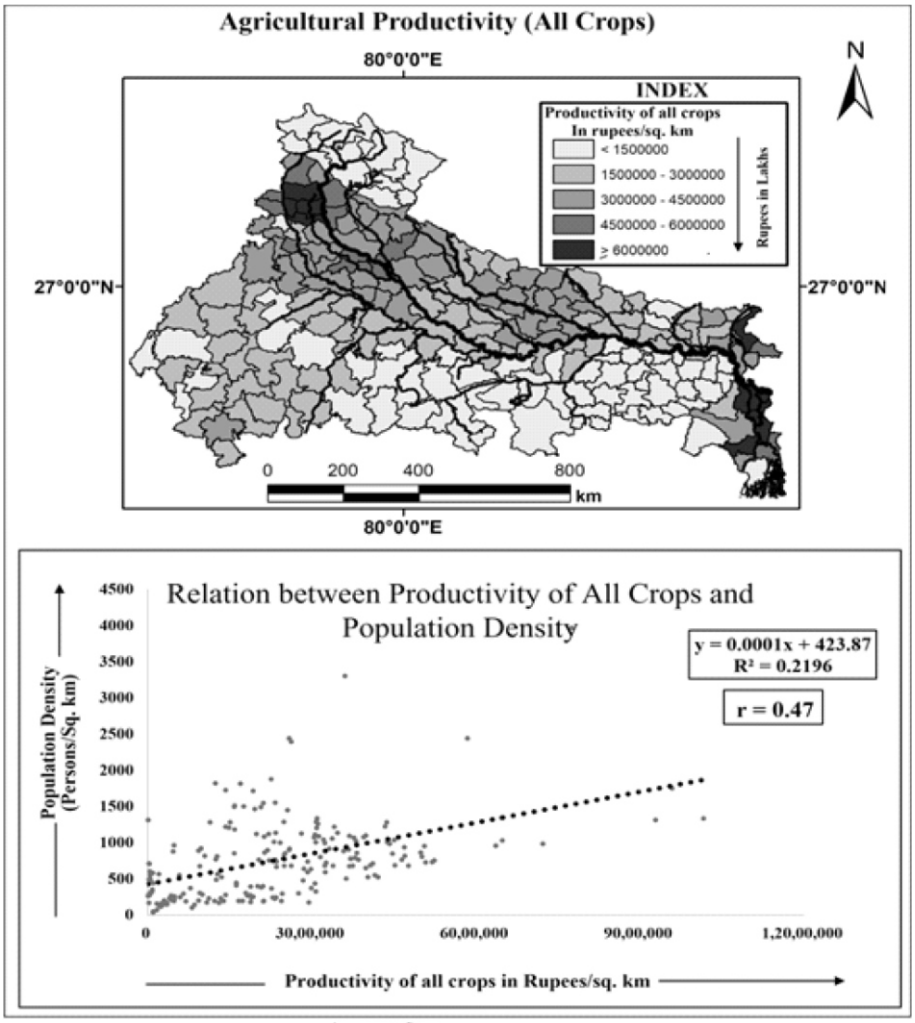


Fig.2: Ganges Basin Source: Census of India, 2011

Besides density of population, family size and sex ratio it is quite important to focus on the variation of the rate of human fertility rate in this region. Because the rate of fertility is the medium through which the number and distribution of population gradually and continuously change. It has been often viewed that the interaction between population dynamics and environment is mechanistically sealed (Sherbinin et.al, 2007:345). To understand fertility rate three methods of measurement of fertility rate are adopted i.e. CBR, GFR and TFR. The fertility rate analysis indicates that the size and density of the population gradually change in the outer margins and middlemost portion of the basin. On the other hand, the ring-shaped areas around

the central part of the basin ranked the highest for fertility rate moreover this is the area where the change of population employing fertility rate is the highest.

An examination of the relationship between the distribution of population and land use/land cover in the study areas is quite revealing. Agricultural fields are the most dominant feature on the map of land use/cover of the study area. Such are also the areas of a high density of population too. Against this, areas falling on the north-west, south-west and southern margins of the basin and having the dominancy of forest land and wasteland display low to a very low density of population.



Source: Ministry of Agriculture and Farmers Welfare (MAFW), 2010-11

Fig 3: Ganges Basin

The agricultural productivity and population distribution (Fig. 3) also find a close relationship in the Ganges basin. Crop productivity differs widely in different parts of the Ganges basin. Crop

productivity has been calculated in monetary terms, the crop value calculated by the minimum support price and the average price rate of various crops in the selected states. It is found that the productivity of different crops is comparatively high in the buffer zone of 100 km of the mainstream of the Ganges basin. In this zone, soil fertility is high and irrigation facility from both canals and tube wells is available. A high concentration of population is found in areas having high crop productivity. The regression analysis between the productivity of various type of crops and population density represents a positive relationship. The value of correlation (r) is found to be the highest i.e. 0.49 between the productivity of cereal and the density of population. The correlation analysis further supports that the productivity of crops has played a significant role in controlling the distribution of population in the study area. The high crop productivity and high density of population go hand in hand and vice versa.

Conclusion

The Ganges basin is asymmetric in terms of the distribution of area. The northern part of the main river has a lesser land area for cultivation and human settlements in comparison to the southern part. However, the distribution of population and its different demographic characteristics are not able to maintain balance with this asymmetrical nature of the basin. For various comfortable physical characteristics available in the northern portion, it is a more preferable area for human habitation. These included altitude, soil fertility, climatic condition, water availability and forest cover. Resultantly, there is a higher population density in the northern part. In addition, the population size, household size and sex ratio are also high in the north.

The population is mainly concentrated within 100 km of the mainstream of the River Ganges and found concentrated mainly in the downstream section of the basin. The density of population gradually increases from the river sources to their downstream. This is applicable for all kind of river or any stage of river order type i.e. Strahler classification of river order. The density of population gradually increases with the increase of river order. The meeting point of two rivers from where a next higher order river starts its journey revealed a comparatively high density of population than its previous order. In other words, in a river network, the distribution of population is found associated with the activity of river or sediment flow characteristics within the river basin area. In the upstream where the main work of the river is erosional, the density of population is the lowest. This upstream zone is considered as the negative area where the land erosion is highly active. In the case of the River Ganges, it is found that the upstream section of the river represents the lowest density of population. In the middle part of the stream where the balance between erosion and deposition maintained, the population density is moderate. In the downstream section, where the deposition of sediments found as the main activity of the river, the density of population is the highest. The downstream area is considered as a positive area or surplus area where the deposition is greater than erosion. In the case of the Ganges river basin, it has been found that the downstream section of the river (Rajmahal to confluence) represents the area of the highest density of population compared with the upper and middle section of the

basin. Finally, it has been found that the unequal rate of soil fertility further played an important role in the distribution of the population in the basin.

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Accessibility and Service Area Analysis of Primary Health Centres in North Bastar Kanker District, Chhattisgarh

Ashis Kumar Majhi[1] and Anusuiya Baghel

Abstract: In the present paper an attempt has been made to identify the service areas and accessibility of primary health centres (PHCs) making North Bastar Kanker district, located in the tribal belt of south Chhattisgarh, the study area. The study pressed into service both primary and secondary sources of data. A GPS survey was conducted to know the existing location of PHCs, a 30-meter SRTM digital elevation model (Satellite data) used for slope analysis, Survey of India Topographical sheets and Google Earth images were taken for the road network analysis. Population data, village information, health data were obtained from Uttar Bastar Kanker District Census Handbook, 2011. The service area of each primary health centre data has been obtained from 31 primary health centres of Kanker district.

Keeping a focus on the service efficiency of PHCs, an attempt has been made to analyse the service area of the existing PHCs, their availability in terms of area and population, buffer zones along the major roads, and the level of accessibility. The study reveals that more than two-fifths of villages were located at a distance of more than 10 kilometres from the nearest PHC. Poor transport and communication system, hilly terrain, forest cover, and deficiency of health care services have further complicated the situation. Finally, the study makes recommendations to improve the situation.

Keywords: Accessibility, PHCs, Service efficiency, GPS, Buffer Zones.

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Introduction

As a part of public health care services, primary health centres (PHCs) are considered the backbone of the rural health care system in India. PHCs are supposed to help in controlling the spread of diseases and reducing the mortality rate, an essential pillar in improving and maintaining the health of the population (Munoz and Kallestal, 2012). Access to health care services is a multidimensional concept describing the people's ability to use health services, when and where they are needed. It describes the relationship between attributes and the characteristics of service delivery systems (Murad, 2018). But sometimes people can't access primary health care services due to a lack of physical/social/economic accessibility. Access to healthcare can be segregated into two parts: potential and realized delivery of service (Aday and Anderson, 1981). Therefore, access to primary health care is an important indicator of the development of the health care system in an area. From a geographer's view, geographic accessibility plays a crucial role to access primary health care services. Accessibility can be

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measured in terms of physical accessibility, affordability, and acceptability (Gulliford, 2002). It is considered that distance of health care centre from habitation, availability of transport network, road condition, health care services, relief features, and different geographical barriers act as barriers to access health services. Travelling distance or the time taken to cover the distance and the health care providers are the important spatial impedances to the delivery of health care services (McLafferty, 2003). Spatial justice is one of the major goals of the national health care system. The availability and affordability of GIS, as a robust tool for accessibility analysis for its capability to handle a large amount of transportation and socio-economic data, has made things quite easier to deal with the situation (Liu and Xuan, 2004).

Research Problem and Questions

For their physical isolation from the main settlement system in our country and their faith in the natural cure system, the Tribal population in India has a limited scope to access basic medical facilities. North Bastar Kanker district, where the tribal population is highly concentrated, is one such area of Chhattisgarh state. The tribal population live in the hilly forested area having widely dispersed rural hamlets, where access to health and medical care services is a challenge because of inadequate availability of transport facilities, hilly terrain, and inadequate health infrastructure In all, there are 31 PHCs in North Bastar Kanker district. How are these distributed in terms of area and population? What are service gap areas or area overlapping? How much distance is covered to access a PHC by the people in different parts of the district? What kind of transport network and road density is available in the area? How are distributed PHCs in terms of area and population in different parts of the district? What is the level of accessibility to primary health centres (PHCs) in the district?

In the light of the above-stated statements and questions posed in the context of the tribal population concentrated Kanker district of Chhattisgarh state, the present paper has the following objective to meet.

Research Objectives

The present research work has the following objectives to meet with help of data analysis. These included to:

i) Identify the served/overserved/unserved areas by the PHCs in the study area;
ii) Know the availability of PHCs in terms of population and area along with their service efficiency;
iii) Study the level of accessibility to PHCs; and
iv) Suggest ways and means improve the service efficiency level of PHCs

Data Source and Methodology

The present study is based both on primary and secondary sources of data. The primary data were collected by undertaking a GPS survey of the existing location of PHCs. A 30-meter SRTM digital elevation model (Satellite data) has been used for slope analysis. The secondary data including population data, village information, number of primary health centres, and base map of the study area was obtained from the District Census Handbook, 2011 of the Uttar Bastar

Kanker District. The Service area data for each of the 31 PHC has been collected through field visits to the PHCs. Topographical maps, collected from the Survey of India, have been to analyse the road density and buffer zones along the major roads.

Spatial and non-spatial data were integrated into ArcGIS 10 software. Two buffers (5 km interval basis) have been drawn along the primary health centres for proximity analysis. It shows the catchment area of the existing primary health centres (PHCs) and also identifies the unserved areas of the PHCs. Thiessen polygon technique was pressed into service to show the served population and served area of the existing PHCs using 2011 Census data. The area and total population of each village have been calculated for calculating the service efficiency index. It has been calculated by multiplying the service area of each PHC with its population size. Accessibility to PHCs was analysed based on six indicators: (i) Number of PHCs per 20,000 persons, (ii) Density of PHCs per 100 km^2, (iii) average travel distance to PHCs from the habitation, (iv) Sloping pattern, (v) road density, and (vi) the existing number of villages within three km from major roads.

The road network was digitized from topographical sheets to generate a road density map. The length of the roads is also measured using ArcGIS software from digitized topographical maps. Buffer zone (3 km interval basis) has been drawn from major roads, includes NH-30, SH-5, SH-6, SH-25, SH-26, and district roads. The level of accessibility to the PHCs map was prepared based on the ranking method and values divided into high, moderate, low and very low accessibility level based on composite rank value. The population projection method was used for the required number of PHCs in different blocks in the district.

The Study Area

North Bastar Kanker district is located in the northern part of Bastar Plateau, covering 5.3 per cent of the total geographical area of Chhattisgarh State. It consists of the Kanker basin and Kotri basin. Kotri is a tributary of the Indrwati River. The Kanker basin is drained by the Mahanadi River and its tributaries. Administratively, Kanker district is divided into seven community development blocks namely Koyalibeda, Antagarh, Bhaupratappur, Kanker, Charama, Durgkondal, and Narharpur. There are 1070 rural settlements: 1063 inhabited and 7 uninhabited. In 2011, districts had a population of 748,941 persons, the majority of whom of scheduled tribe (55.3 per cent).

It is one of the least urbanized districts having only 10.3 per cent in urban areas. Non-availability of the railway network, hilly terrain, forested area, low level of income, and lack of medical facilities are among the factors contributing to its backwardness.

Results and Discussions

The discussions are arranged in sequential order, beginning with proximity analysis of PHCs, the area served/unserved/over-served by the existing PHCs, service area of PHCs, service efficiency index, and levels of accessibility to PHCs.

Proximity Analysis of PHCs

Proximity analysis, a class of spatial analysis tools and algorithms employing geographic distance as a central principle is a crucial tool for the selection of the most accessible site/location. In the case of health care services, it is used either to locate a new health care facility centre or to know the accessibility of the existing ones to the population living in their catchment areas by studying the adequacy of available health centre resources and their fair distributions (Woldemichael, 2019). The availability of health centres, clinics, or hospitals within a negotiable distance increases the probability of fast remedy of health hazards (Roy, 2008). In an examination of the distribution of primary health centres (PHCs) at the block-level in Kanker district, it has been observed that primary health centres have a highly skewed distribution (Fig. 1). Uneven topography, inadequate road network and forest cover are the main reasons for the unequal distribution of PHCs in the entire study area.

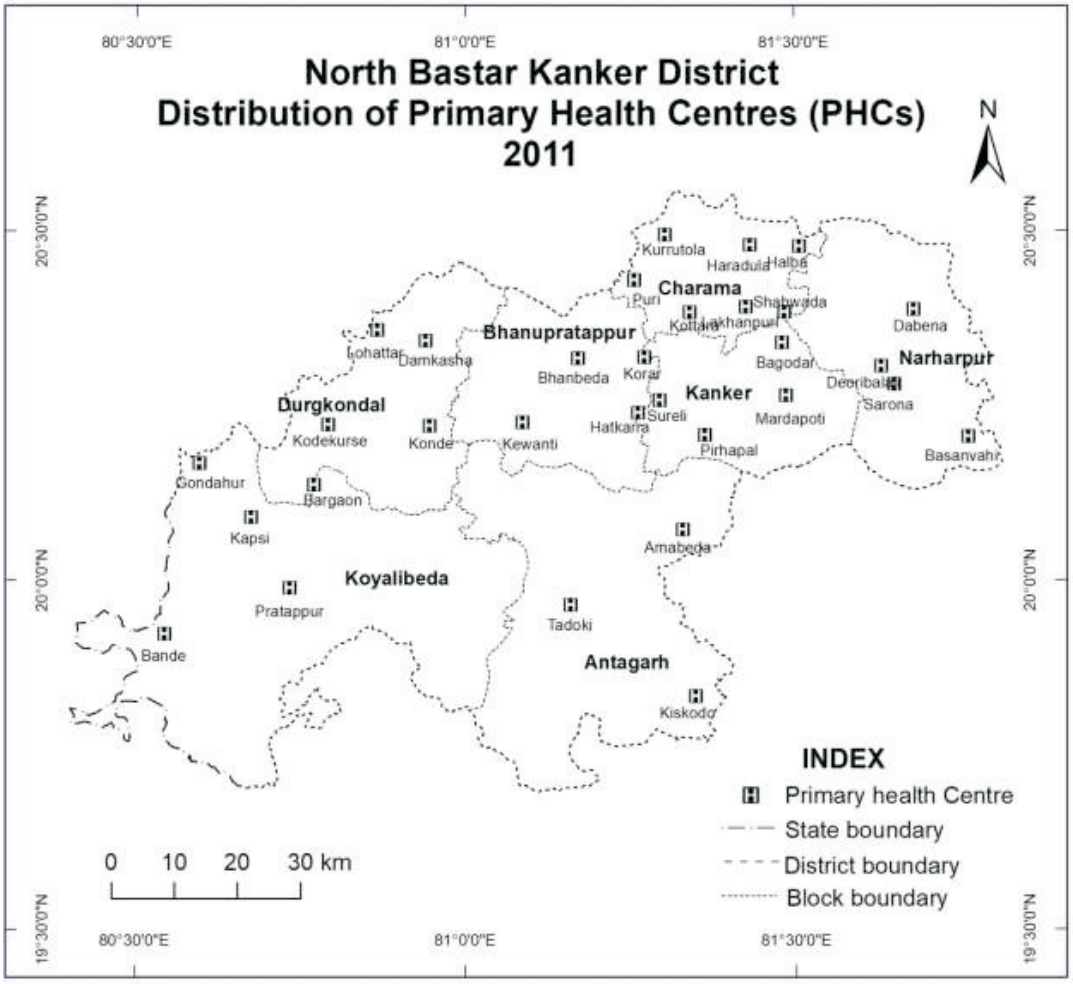

Fig. 1

Buffer, a polygon used for the proximity analysis of geographical features within or outside of a particular zone and also used for straight line distance from a line or point to show the geographical features within or outside the buffer, has been used to create buffers around the primary health centres to identify the overlapped/gap areas in health centre services in the study area. The two buffer zones have been drawn (each at a five km. interval) using ArcGIS software. The results are highly revealing. It has been found that more than two-fifths or 45.7 per cent of villages are unserved by PHCs (Fig. 2). The villages falling within the proximity limit can be considered as having the access to PHCs facilities and those located outside of this limit as not access to health care facilities. The overlapping buffers represent good services while without buffers considered to have a shortage of services. The northern part of the study area has two buffer layers, overlapping with each other. It means that the northern part of the area gets better access to health care facilities as compared to other parts of the study area. Antagarh and Koyalibeda blocks have more gap areas because of the non-available transport network, hilly terrain, and forest cover.

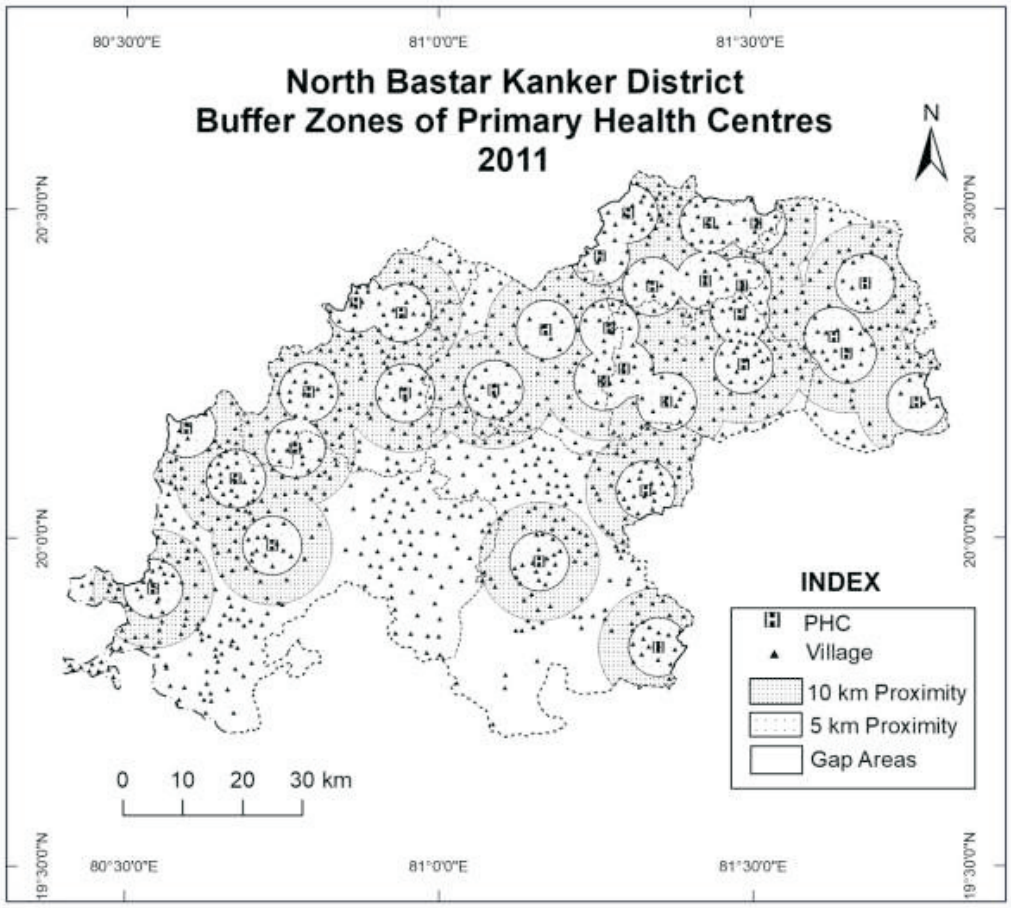

Fig. 2

Spatial access mainly depends on the distance to the nearest PHCs. Equal access is achieved by allocating new health care facilities in unserved or inadequately served areas (Rekha, 2017). An examination of the distance of the nearest PHC from habitation revealed that 17.3 per cent of villages were located within 5 km. from the nearest PHC and 45.7 per cent above 10 km distance from the nearest PHC in the district (Table 1). It has also been observed that the majority of the villages of Koyalibeda (65.1 per cent) and Antagarh (54.6 per cent) blocks are located at a distance of more than 10 km from the nearest PHC, explained by the high elevation, forest cover and non-available transport network. On the other hand, most of the villages of Charama, Bhanupratappur, and Kanker blocks have been located under proximity level, getting better access to health care and medical services.

Table-1: North Bastar Kanker District: Distance of the nearest PHC from habitation, 2011

Sl. No.	Block Name	<5 km	%	5-10 km	%	>10 km	%	Total
1	Charama	31*	32.0	44*	45.4	22*	22.7	97
2	Bhanupratappur	22	20.0	59	53.6	29	26.4	110
3	Durgkondal	28	18.7	53	35.3	69	46.0	150
4	Kanker	25	25.0	46	46.0	29	29.0	100
5	Narharpur	22	18.6	58	49.2	38	32.2	118
6	Antagarh	25	12.9	63	32.5	106	54.6	194
7	Koyalibeda	32	10.6	73	24.3	196	65.1	301
TOTAL		185	17.3	396	37.0	489	45.7	1070

Source: Computed from Census of India (2011). *District Census Handbook: Uttar Bastar (Kanker)*, 2011
* Refers to the number of villages

Service Areas of PHCs

Thiessen polygon, a technique used to determine the proximity and neighbourhood of any geographical feature analysis and also the influence area or service area analysis of any health centre, has been used here for the analysis of the service area and efficiency of each PHCs in the district. Based on the existing location of PHCs, Thiessen polygons have been generated for the service area and influence area analysis. After the creation of polygons, a field survey was conducted to check the ground reality. It has been observed that the service area and population served of each PHCs and areas of Thiessen polygons are the same. The map showing the nearest distance of PHC from villages and its served areas reveals that Tadoki, Pratappur and Kapsi's primary health centres cover more than 500 sq. km area each, against the norms prescribed by the NRHM, 2005 it 116.46 sq. km service area and 20,000 population in the tribal areas. On the other hand, primary health centres located at Tadoki, Bande and Kapsi serve more than 40,000 population (Table-2). Lohattar and Puri's primary health centres cover less than 90 sq. area and served below 10,000 population. It emerged that only 29.0 per cent of primary health centres serve the area as per the prescribed norms (116.46 sq. km service area/PHC), and 51.6 per cent of them cater to the population below 20,000 persons, as outlined in the norm. The PHCs of Antagarh and Koyalibeda blocks serve area and population both much higher than the prescribed norms. It shows that spatial justice is highly lacking in the case of health and medical care services in the study area.

On the other hand, PHCs in Charama block serves below 20,000 persons, as prescribed in the norms. During the fieldwork, it was observed that population pressure on PHCs services in Charama block is relatively low, hence serving better the visitors from their service areas.

Table-2: North Bastar Kanker District: Service areas and population served by PHCs

Sl. No.	Name of the PHC	Area in sq. km	Population Served	Service Efficiency Index (Area x Population in lakhs)
1	Pratappur	583.43	29,770	174
2	Tadoki	1044.93	40,611	424
3	Amabeda	270.38	20,077	54
4	Dabena	269.03	30,209	81
5	Lakhanpuri	86.84	16,170	14
6	Damkasha	261.00	27,902	73
7	Kodekurse	175.89	15,598	27
8	Kapsi	201.98	45,128	91
9	Gondahur	121.64	12,112	15
10	Bargaon	267.89	15,396	41
11	Bande	551.20	47,839	264
12	Kiskodo	318.26	8,600	27
13	Sarona	190.08	22,642	43
14	Deoribalaji	119.46	18,702	22
15	Basanvahi	178.09	17,459	31
16	Shahwada	90.81	16,328	15
17	Puri	85.56	9,809	8
18	Kurrutola	105.25	17,512	18
19	Kottara	124.02	23,479	29
20	Haradula	105.10	29,528	31
21	Halba	144.09	23,607	34
22	Korar	94.83	17,215	16
23	Hatkarra	179.87	11,498	21
24	Sureli	70.38	10,540	7
25	Pirhapal	193.21	13,269	26
26	Mardapoti	216.13	25,994	56
27	Bagodar	92.39	19,932	18
28	Kewanti	375.52	38,762	146
29	Bhanbeda	222.96	22,506	50
30	Konde	389.40	26,581	104
31	Lohattar	84.24	4,365	4

Source: Computed by author from *District Census Handbook: Uttar Bastar Kanker*, 2011

Health Centre Efficiency

The efficiency of the health centre depends on the optimal utilization of resources for improved health of the people, satisfaction level of people, and area and population served. In the present

study, primary health centre efficiency has been calculated based on the total service area of PHC and its total population size. The total population size was multiplying with the total service area of each PHC in the North Bastar Kanker district (Table-2). The service efficiency index has been categorized into five groups (Fig. 3). The low-efficiency index value indicates a better situation or high health centre efficiency and vice versa. It has been found that Tadoki's Primary health centre of the southern part of Antagarh and Bande's Primary health centre of the western part of Koyalibeda blocks have higher index values (Above 200), representing deficiency of health care facilities. On the other hand, Lohattar's primary health centre of Durgkondal block, Sureli and Puri's Primary health centres of Charama block have a low-efficiency index (below 10), representing the good quality of health care facilities. On the whole, more than two-fifths (67.7 per cent) PHCs have a low service efficiency index (below 50). Table-2 shows that all primary health centres of Charama block have a low-efficiency index (below 50), which represents high health centre efficiency. Low population pressure for each PHC is a good indication for better health care services.

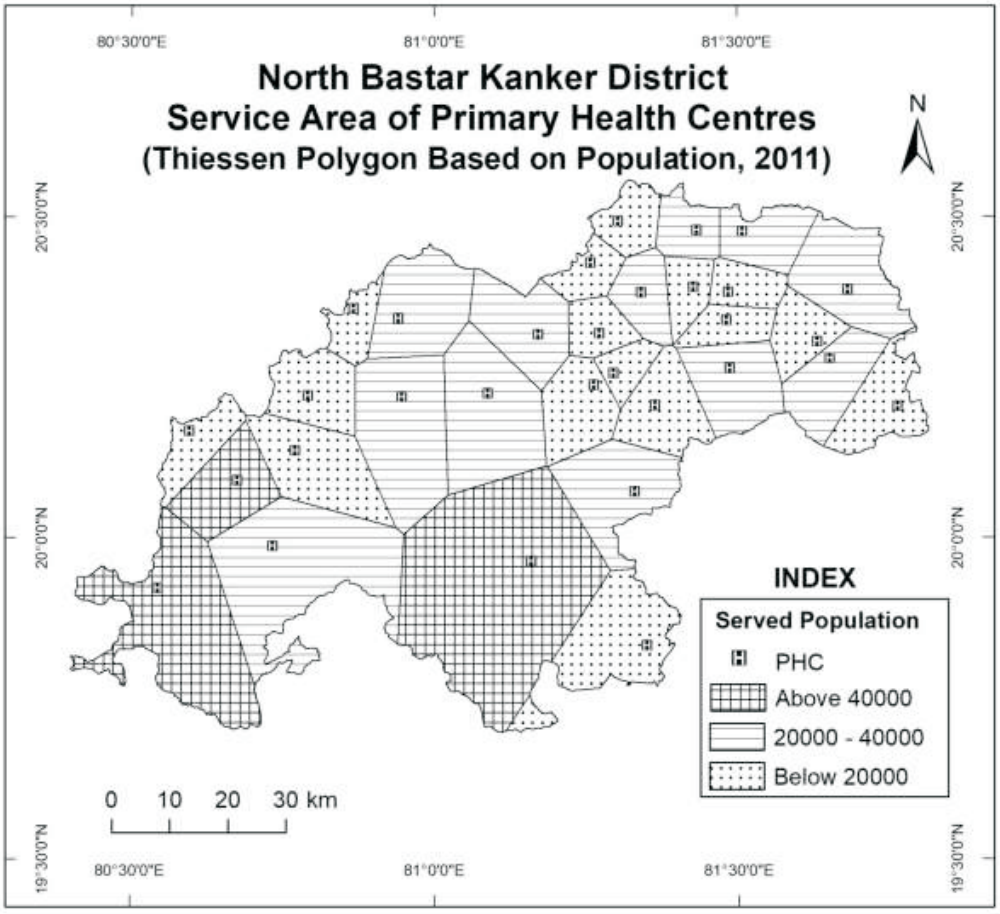

Fig. 3

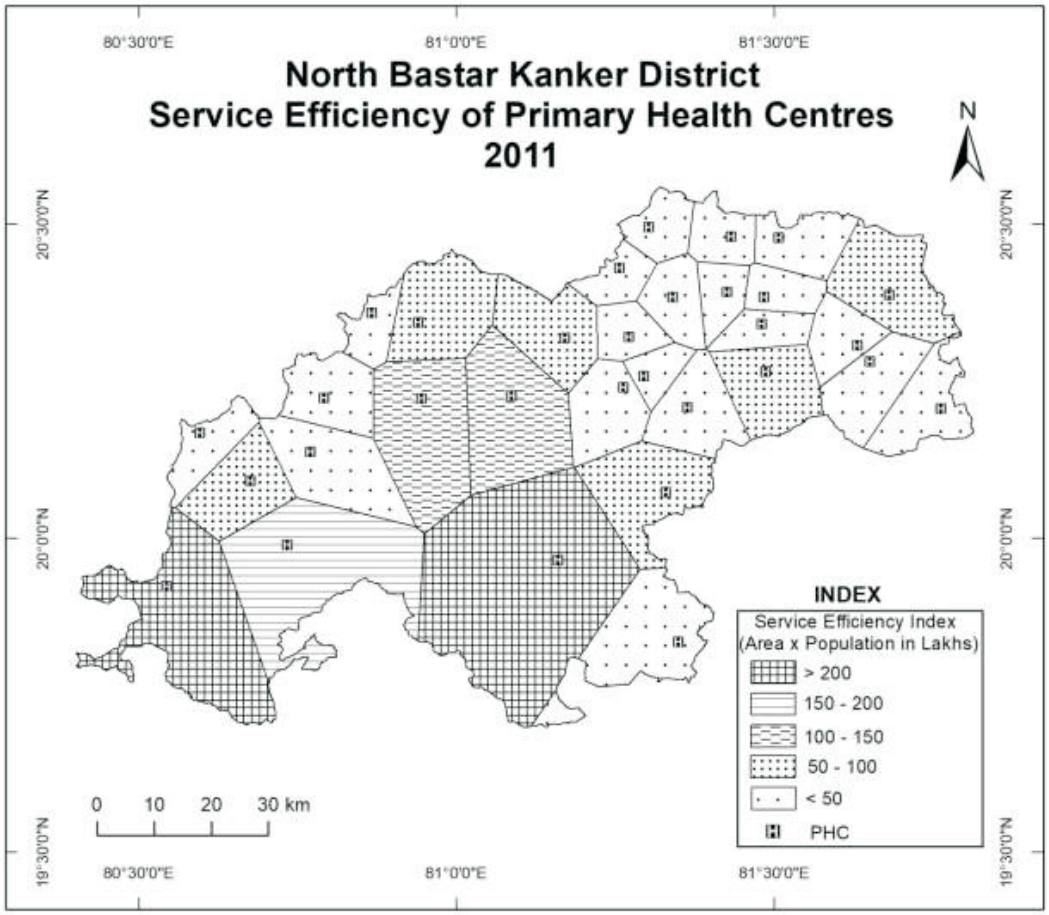

Fig. 4

Accessibility to Primary Health Centres (PHCs)

Accessibility to primary health centres (PHCs) means the ability to provide timely health services for achieving better health outcomes. Here, the term 'Access' represents the ability to obtain a good quality of health services for every individual. Spatial accessibility to health services is primarily dependent on the geographical locations of health care providers and the population in need, as well as the travel distance/time between them (Wan et al. 2013). Tribal people are cautiously facing the problem to access health facilities, due to the poor condition of roads, forest cover, long-distance to PHCs from their habitation and hilly terrain. So these factors are the main barrier to the tribal area development. In this present study, the level of accessibility to PHCs has been analyzed.

Availability of PHCs

The availability of PHC services refers to the number of health facilities available for the population in demand to choose from (Ye and Hyun, 2014). The blockwise distribution of the availability of PHCs reveals that the highest number of PHC (7) is in Charama block and the lowest (3) in Antagarh block (Table 3). The served population per PHC was calculated based on the norms of the National Rural Health Mission (NRHM), 2005, each PHC serving 20000 persons in the tribal region.

Table-3: North Bastar Kanker District: Distribution of PHCs

Sl. No.	Block	Total Population	Area in km^2	PHCs	PHC/20000 population	Density (PHC/100km^2)
1	Charama	96755	478.97	7	1.45	1.46
2	Durgkondal	64293	630.24	4	1.24	0.63
3	Bhanupratappur	86812	608.79	4	0.92	0.66
4	Kanker	86208	439.08	4	0.93	0.91
5	Narharpur	105915	623.59	4	0.76	0.64
6	Antagarh	71398	690.91	3	0.84	0.43
7	Koyalibeda	160799	1226.77	5	0.62	0.41
TOTAL		**672180**	**4698.35**	**31**	**0.92**	**0.66**

Source: Computed by Author from District Census Handbook: Uttar BastarKanker, 2011

It is only Charama and Durgukondal blocks that fill the norm set by the NRHM, 2005. The PHC and population ratio of Charama and Durgkondal are 1:1.45 and 1:1.24. The density of primary health centres, calculated based on the number of PHCs per 100 km^2 geographical area, reveals that the Charama block has the highest number of PHCs (1.46 PHCs/100 km^2 area) followed by Kanker (0.91), Bhanupratappur (0.66), Narharpur (0.64), Durgkondal (0.63), Antagarh (0.43) and Koyalibeda (0.41), in order. Based on the criteria (Total number of PHCs, PHC and population ratio, Density of PHCs) Charama block tops all the blocks in the district.

Slope and Exiting location of PHCs

The slope is an important indicator to determine the existing location of PHCs. The blockwise average slope has been measured and classified into five divisions. Most of the areas come under a gentle slope (below 5^o). On the whole, the slope of the study area ranges from 0^o to $73^0$6'36?. The maximum slope has been found in Antagarh block ($73^0$6'36?) followed by Durgkondal ($54^0$44'24?), and koyalibeda ($51^0$42' 36?). Most of the area is covered by a gentle slope but the southern part of the area has the high average slope ($6^0$27'36?). The spatial distribution of PHCs concerning the sloping pattern of the study area reveals that the Charama block has the lowest average slope ($2^0$36' 36?) which indicates a flat surface (Table 3). On the other hand, Antagarh and Kanker blocks have the highest average slope i.e. $6^0$27'36? and $5^0$54'36?, respectively.

The average slope of the study area and the existing location of PHCs are inversely related to each other (r = -0.8959). As a result, Charama block has the lowest average slope but the highest number of PHCs. The reverse is true of Antagarh block.

Road network and distribution of PHCs:

The transport network is the key indicator of the existing location of PHCs. Most of the people were not having the access to health services due to the bad condition of the road network and long travel distance. A study of road density, average distance of PHCs from habitation, buffer zone analysis along the major roads, and proximity habitation nearest to major roads is highly revealing. It was observed that the average distance of the nearest PHC from the habitation in the district is 8.5 km, but according to norms of NRHM, 2005, it must 6.1 km.

Table-4: North Bastar Kanker District: Block wise average slope

Sl. No.	Block Name	Average Slope in Degree	PHCs
1	Charama	$2^0$36' 36?	7
2	Durgkondal	$4^0$31' 48?	4
3	Bhanupratappur	$5^0$02' 24?	4
4	Kanker	$5^0$54' 36?	4
5	Narharpur	$4^0$21' 36?	4
6	Antagarh	$6^0$27' 36?	3
7	Koyalibeda	$4^0$26' 24?	5
TOTAL		$4^0$45' 36?	31

Source: Computed by author, from SRTM digital elevation model (Satellite data), 2017

Table-5: North Bastar Kanker District: Distribution of road network

Sl. No.	Block	Average distance of PHC from villages (km)	Road Density (Length of road/100 km2)	Number of villages within 3 km from major roads (%)	PHCs
1	Charama	7.03	193.83	34.02	7
2	Durgkondal	8.87	107.89	33.33	4
3	Bhanupratappur	7.82	114.98	61.81	4
4	Kanker	7.70	145.28	71.00	4
5	Narharpur	8.18	145.61	49.15	4
6	Antagarh	9.59	72.04	50.51	3
7	Koyalibeda	10.22	98.86	45.51	5
TOTAL		**8.49**	**112.63**	**31**	**31**

Source: Computed by author, from SOI Topographical sheets and Google earth images, 2018

All the blocks have a higher average distance to access PHC than the prescribed norms. The villages of Koyalibeda block recorded the highest average distance (10.22 km) to access PHC and of Charama block the lowest (7.03 km) (Table-5). It represents that all the blocks have poor conditions in respect of average distance to access PHC.

Buffer zone at an interval of three km has been created to measure proximity to major roads from habitation. The majority of the villages of Kanker (71.0 per cent) and Bhanupratappur (61.8 per cent) blocks were located within three km. distance from the major roads. On the other hand, only about one-third of the villages of Durgkondal (33.3 per cent) and Charama (34.0 per cent) blocks were located with this radius of major roads.

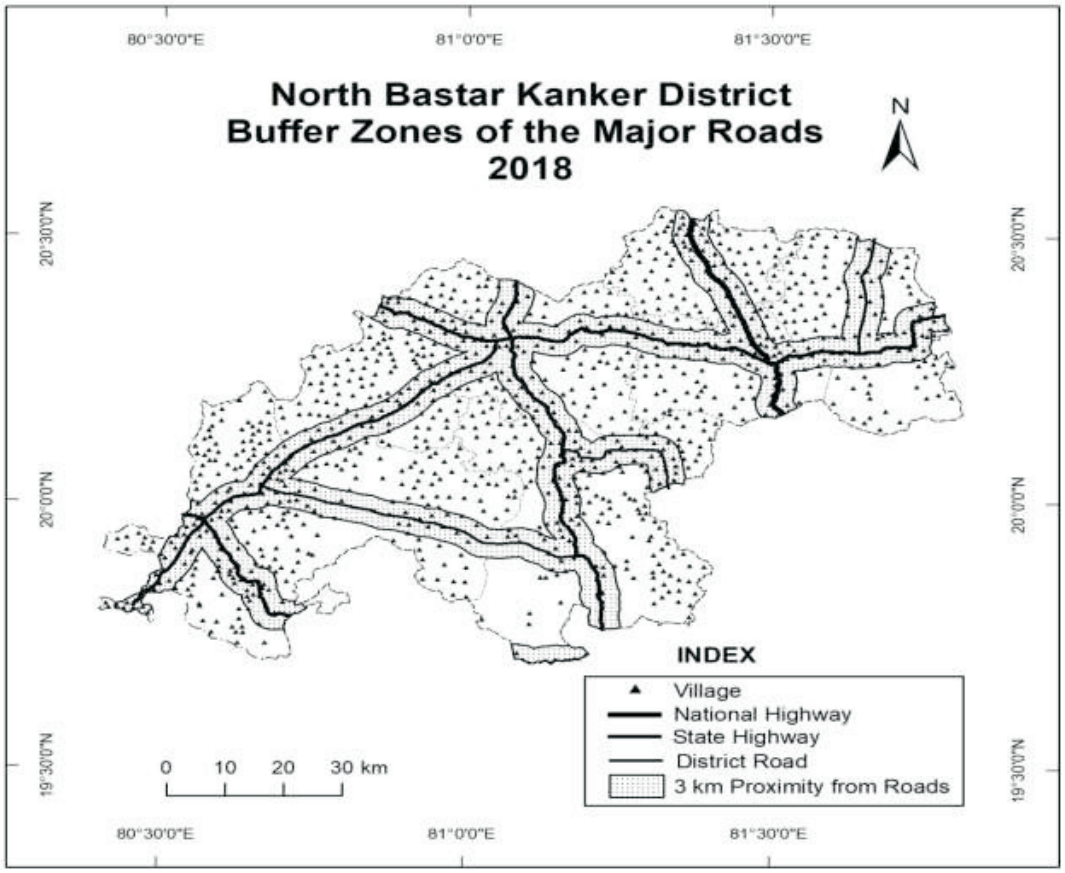

Fig. 5

The density of the road network is another important factor to establish any health centre. It means the exiting location of PHCs and road density are positively related. The density of road has calculated based on the following formula:

$$Road\ Density = \frac{\text{Total Length of the Roads}}{\text{Total Land area}} * 100$$

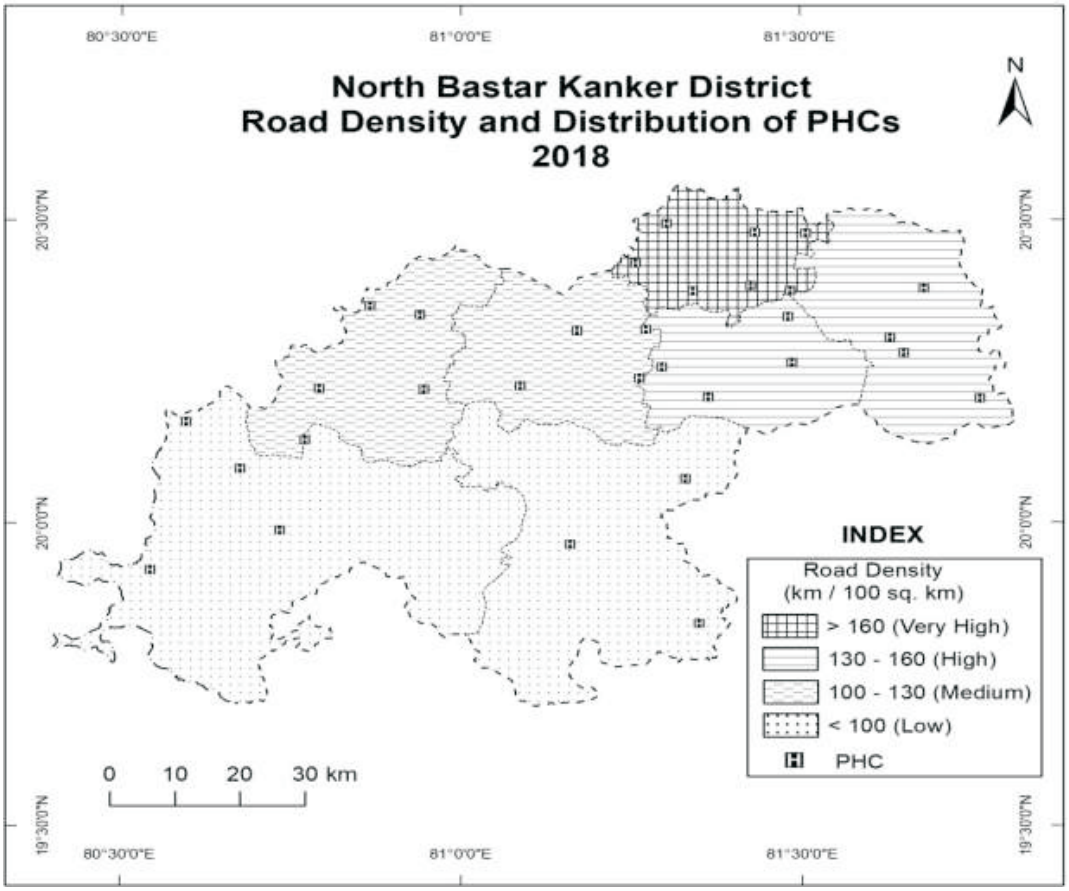

Fig. 6

All types of roads have been measured, including NH-30, SH-5, SH-6, SH-25, SH-26, district roads, village road, cart track, pack track, footpaths, and new construction roads. The average road density in the district is 112.63 km roads/100 km^2 area (Fig.6), lower than the national average (142.7 km. roads/100km^2). Charama block has the highest road density (193.83 km roads/100km^2) and also the national average road density. The lowest road density was found in Antagarh (72.04 km roads/100km^2). The remaining blocks had: Koyalibeda (98.86 km. roads/100km^2), Durgkondal (107.89 km roads /100km^2) and Bhanuprattappur (114.98 km roads/ 100km^2). The number of PHCs and road density are positively related (r = +0.765) and the slope is negatively related (r = -0.723) with road density.

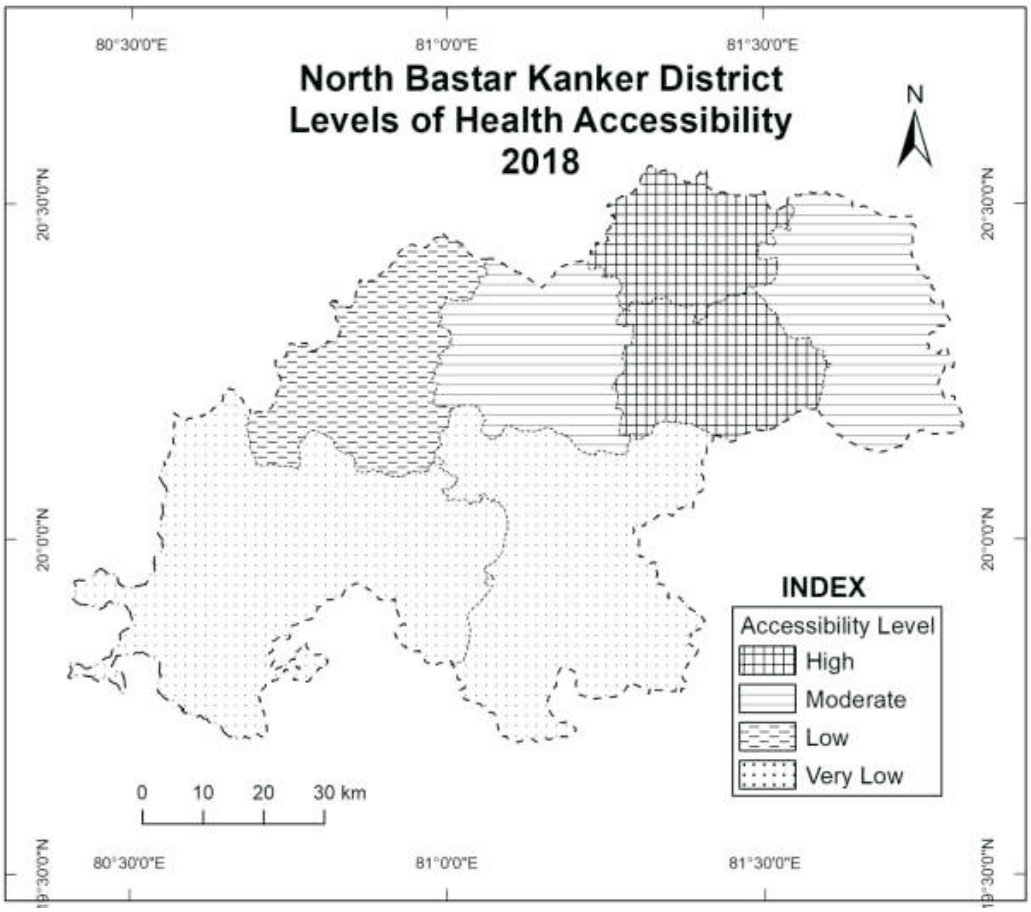

Fig. 7

Levels of Accessibility

The accessibility index, calculated based on six indicators of PHC/20,000 population, Density of PHCs/100km^2 area, average distance of PHC from habitation, Road density, sloping pattern, and the number of villages within 3 km from major roads and grouped into the four categories of High, Moderate, Low, and Very low accessibility (Fig. 7) is highly revealing. Only Charama and Kanker blocks came under a high level of accessibility. Bhanupratappur and Narharpur blocks have moderate accessibility, Durgkondal block low accessibility and the remaining two blocks, Antagarh and Koyalibeda, very low accessibility to access primary health care services.

Conclusion

Several aspects linked with accessibility and availability of the medical and health care facilities studied here in the context of tribal population North Bastar Kanker district of Chhattisgarh state are quite revealing. In several development blocks of the district, the distribution of PHCs was

far below the area and population served norms outlined by the National Rural Health Mission (NRHM), 2005. High pressure of population noted in the case of several PHCs located in different blocks has been responsible for the poor health care services received by the people in such blocks.

More than two-fifths of the total villages in the district were more than 10 km away from the nearest PHC. The availability and accessibility of health and medical services were made more challenging by the inadequate availability of transport and communication system, thick forest cover, and uneven terrain especially in southern and western parts of the district. The two blocks namely Charama and Kanker had relatively high accessibility to access primary health centres against Koyalibeda and Antagarh blocks have relatively poor accessibility. The Health centre service efficiency index and availability of PHCs were also very low in the southwest and southern part of the district. As per the norms specified by the National Rural Health Mission (NRHM), 2005, there is a need to create 14 more PHCs (based on population projection method) at the different locations (Koyalibeda-5, Kanker-3, Antagarh- 2, Narharpur-2, and Bhanupratappur-2) in the district. The southwest and southern parts of the study area being more deprived areas must be accorded the top priority in establishing the new PHCs.

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Women's Education and Fertility in India: A State-Level Analysis

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Abstract: The paper explores the causal relationship between female education and fertility in India with the help of data available from the latest publication of the National Family Health Survey (NFHS-4) for the year 2015-16. Analysis carried out at the state level selected two independent variables, literate women and women having attained 10 or more years of schooling, to examine their individual as well as the collective impact on female fertility.

The paper poses several pertinent questions to answer with the help of data analysis. The study confirms a strong inverse association between women literacy rate and fertility rate. Similarly, the women's schooling of ten or more years also finds a strong negative relationship with the fertility rate in India.

Keywords: Fertility, Women education, Schooling, Negative relationship

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Introduction

The relationship between socioeconomic variables and demographic change has been a subject of great interest during the last couple of decades for scholars and policymakers all over the world. The degree of interest and perception of the significance of women's educational attainment for demographic changes has become an area of research focus in developing countries. Among the various determinants of fertility, the role of education has been recognized worldwide. The degree of influence, however, might be different across regions and countries. Martin and Juarez (1995:52) studied women in Latin America to find that women who are illiterate or have no education have families of 6-7 children, while women who have better education tended to have smaller families of 2-3 children. Extensive demographic literature is devoted to examining how women's education affects fertility decline in different parts of the world. Several research findings and evidence of the role of education on fertility compels scholars and policymakers to focus on the increased investment in education for the overall development and reducing fertility. The abundant indications of the influence of education on fertility can be partly traced to the impact of attitudes on fertility. Several studies reveal that the impact of female schooling on childbearing cannot be simply reduced to socio-economic aspects, such as family income, husband's education or husband's occupation. India, a developing country with a majority of the population in the child-bearing age group witnessed declining fertility rates during the last couple of years. On the other hand, it has also achieved a certain level of educational development, particularly women's educational attainment. It is therefore interesting to enquire about how development factors like women's education influence the childbearing attitude in India. Take a cue from the above statements, the present study explores the nature of education existing

between women's education and female fertility in India in the light of the following two research questions:-

(i) Does women's education play any significant role in the decline of the fertility rate?

(ii) Do women's years of schooling play an important role in the decrease in fertility rate across the states of India?

Theoretical context

Ainsworth et.al (1996: 85-122) in their study examining the impact of women's schooling on fertility and contraceptive use in the fourteen Sub-Saharan countries claims that women's education is the single most influential investment that can be made in the developing world. Many governments now support women's education not only for sustainable development but also to promote family planning and improve child health. Various population organizations and associations have examined the linkages between education and fertility. Most internationally recognized research institutes and organizations recognize the links between education and fertility rates with childbearing women with more schooling tending to have smaller, healthier families. Throughout the world, more education is associated with smaller family sizes. World Fertility Surveys (United Nations, 1987: 35-46) conducted in 38 developing countries shows that from 2.0 to 98.0 per cent of married women of fertile age have had no schooling while the proportion with 10 or more years of education ranges from 0 to 24.0 per cent. On average, women aged 25-29 have received about two years more schooling than those aged 45-49.

Studies from many less developed countries show that women with no education have about twice the number of children as women with ten or more years of school. Women having higher education qualification by and large make a later, healthier transition into adulthood: marry later, want smaller families, and are more likely to use family planning methods than their less-educated counterparts. Jungho (2016: 1-10) found out that educated women are more physically capable of giving birth than uneducated women; but want fewer children and control birth better.

Higher levels of education increase the time women spend at educational institutions resulting in the delay of marriage and their opportunities to have children. This effect is directly related to the postponement of fertility and negatively affects the number of children (see Lappegard and Ronsen, 2005:31–49; Bhrolchain and Beaujouan, 2012: 311–327). Higher education usually allows attaining a higher job and greater earnings; therefore, increasing the chance of leaving the labour market to have children (Rondinelli et.al., 2010:549–577; Willis, 1973: S14–S64; Gustafsson, 2001: 225–47; Liefbroer and Corijn, 1999: 45–75). Women's access to educ ation has emerged as one of the most important issues in the studies of demography and for overall development. Caldwell (1980: 225- 256) and Handwerker (1986:400-417) have shown clearly how women's education contributes to fertility decline in Third world countries. Several studies have shown the inverse relationship between women's education and fertility (Ainsworth, Beegle and Nyamette, 1996; Basu, 2002; Behrman, 2015; Bongaarts, 2010; Castro-Martin 1995; Coale and Watkins, 1986; Skirbekk, 2008; Hotz, Klerman and Willis, 1997; Graff, 1979, Caldwell, 1980, Jain1981, Dreze and Murthi 2001, Bhat 2002, Kravdal, 2002).

In India also there are many such studies, undertaken using different methods and at a different level of segregation (see Arokiasamy 1998: 45-62; Dreze and Murthi 2001; Jain 1981; Maholtra et.al 1995; Murthi et.al 1995; Parasuraman et.al 1999). Parasuraman et.al analyzed the 1992-93 NFHS data for the major Indian states to conclude that among all the socio-economic status variables they investigate, women education has the greatest net effect on their fertility. Studies conducted at IIPS Mumbai analyzed the relationship between fertility and education in India based on NFHS-I, II&III and found that there exists a persistent relationship between education and fertility in India (see Mondal et. al, 2010). Like many other countries, fertility continues to decline in India. Between 1990-92 and 1996-98, the total fertility rate fell from 3.39 to 2.85 children per woman per reproductive lifetime and in the latest NFHS-4, the total fertility rate in India is 2.2, just higher than the replacement level of 2.1 children per woman (NFHS-I, II, III and IV).

The present study rightly focuses on the influence of women's education on fertility. It is hypothesized that education, especially women's literacy rate and year of schooling has a negative association with fertility in India.

Materials and Methods

The present study is based on National Family Health Survey (NFHS) data, published in 2015-16. For the National Family Health Survey-4 (NFHS-4), a total of 628,900 sampled households across the country were selected, of which 616,346 were occupied. Of the occupied households, 601,509 were successfully interviewed, for a response rate of 98.0 per cent. In the interviewed households, 723,875 eligible women age 15-49 were identified for individual women's interviews. Interviews were completed with 699,686 women, for a response rate of 97.0 per cent. In all, there were 122,051 eligible men, age 15-54 in households selected for the state module. Interviews were completed with 112,122 men, for a response rate of 92.0 per cent.

NFHS-4 collected data on the number of children ever born to women age 15-49 and those still living. On average, women age 45-49 have given birth to 3.3 children over their lives. Of these, 3.0 children survived to the time of the survey. Currently, married women age 45-49 had an average of 3.4 children, and 3.1 of these were alive at the time of the survey. The NFHS-4 covers all the states of India and Union Territories.

Thus, the fertility rate of all the 29 states of India and women's education, as well as schooling, were analyzed to find out the relationship between fertility and education. The Pearson correlation coefficient method was pressed into service to examine the relations. Women literacy and women having 10 or more years of schooling are independent variables while fertility is the dependent variable. The following formula was applied:

$$r= \frac{\sum((x-\bar{x})(y-\bar{y}))}{\sqrt{\sum(x-\bar{x})2\ \sum(y-\bar{y})2}}$$

Where:

R= Pearson Relation Coefficient

x= Women education/literacy rate if women of all India states as well as women's years of schooling

y= Fertility rate of all Indian states; Σx= Total of literacy rate; Σy= Total fertility rate

=median of x; ! =median of y

Women's literacy rate and women who attained 10 or more years of schooling will be separately considered as determinant factors we used the same formula but analyzed separately.

Discussion and Results

According to the NFHS-4, the total fertility rate in India is 2.2 children per woman, which declined from 2.7 children in 2005-6, just above the replacement level of fertility of 2.1 children per woman. The median birth interval is 32 months since the preceding birth while the median age at first birth among women age 25-49 is 21 years. Eight per cent of women aged 15-49 began childbearing, half the level in 2005-06. The Total Fertility Rate (TFR) has declined noticeably in India over time. Between 1992-93 and 2015-16, the TFR has declined by 1.2 children (from a TFR of 3.4 children in 1992-93 to 2.2 children in 2015-16). The TFR among women in rural areas has declined from 3.7 children in 1992-93 to 2.4 children in 2015-16. The corresponding decline among women in urban areas was from 2.7 children in 1992-93 to 1.8 children in 2015-16. In all the NFHS surveys, irrespective of place of residence, the fertility rate peaks at age 20-24, declining thereafter steadily.

Women education and fertility in India

According to NFHS-4, the women literacy rate across the states of India ranges from as low as 49.6 per cent in Bihar to as high as 97.9 per cent in Kerala. Kerala has the highest women literacy rate, followed by Mizoram (93.5 per cent), Goa (89.0 per cent), Himachal Pradesh (88.2 per cent), Sikkim (86.6 per cent), Manipur (85.0 per cent), Meghalaya (82.8 per cent), Punjab (81.4 per cent), Nagaland (81per cent) and Tripura (80.4 per cent). Among the 29 states, Bihar becomes the least in terms of women literacy rate (49.6 per cent), followed by Rajasthan (56.9 per cent), Jharkhand (59.0 per cent), Madhya Pradesh (59.4 per cent), Uttar Pradesh (61 per cent) and Andhra Pradesh (62.9 per cent). Looking from a spatial perspective, there exist variations wherein among the top ten women literacy rate in India, six of them belongs to the northeast states, two from south India and two from north India (See Table 1). On the other hand, the least educated states are diversely distributed as three of them belong to the eastern part of India such as Bihar, Jharkhand and Chhattisgarh, three from the central part of India such as Madhya Pradesh, Andhra Pradesh and Tel angana while Uttar Pradesh located in the northern part of India

and Rajasthan in the western part and Arunachal Pradesh in the northeastern part of India *(Table-1 as annexure-I).*

Table 1: India: Fertility and women's education by states, 2015-16

Sl.no	District	Total fertility rate (TFR)	Literate women (%) (age 15-49)	Women having schooling up to 10th class or higher
1	Bihar	3.4	49.6	22.8
2	Meghalaya	3.0	82.8	33.6
3	Nagaland	2.7	81.0	33.3
4	Uttar Pradesh	2.7	61.0	32.9
5	Jharkhand	2.6	59.0	28.7
6	Manipur	2.6	85.0	45.9
7	Assam	2.4	71.8	26.2
8	Rajasthan	2.4	56.5	25.1
9	Madhya Pradesh	2.3	59.4	23.2
10	Mizoram	2.3	93.5	40.2
11	Chhattisgarh	2.2	66.3	26.5
	India	**2.2**	**68.4**	**35.7**
12	Arunachal	2.1	65.6	31.0
13	Haryana	2.1	75.4	45.8
14	Odisha	2.1	67.4	26.7
15	Uttarankhand	2.1	76.5	44.6
16	Gujarat	2.0	72.9	33.0
17	Jammu & Kashmir	2.0	69.0	37.2
18	Himachal	1.9	88.2	59.4
19	Maharashtra	1.9	80.3	42.0
20	Andhra Pradesh	1.8	62.9	34.3
21	Karnataka	1.8	71.7	45.5
22	Telangana	1.8	65.2	43.3
23	West Bengal	1.8	71	26.5
24	Goa	1.7	89	58.2
25	Tamil Nadu	1.7	79.4	50.9
26	Tripura	1.7	80.4	23.4
27	Kerala	1.6	97.9	72.2
28	Punjab	1.6	81.4	55.1
29	Sikkim	1.2	86.6	40.7

Source: National Family Health Survey-4, India fact sheet & State fact sheets

Women having 10 or more years of schooling

The share of women who are having 10 or more years of schooling also ranges from as low as 22.8 per cent in Bihar to as high as 72.2 per cent in Kerala. The top ten states include Kerala,

Himachal Pradesh, Goa, Punjab, Tamil Nadu, Manipur, Haryana, Karnataka, Uttaranchal and Telangana. Out of these, four states belong to the south, another four to the north and one each from the northeast and central part of India.

Women who are attaining 10 or more years of schooling are lowest in the state of Bihar, followed by Madhya Pradesh, Tripura, Rajasthan, Assam, West Bengal, Chhattisgarh, Odisha, Jharkhand and Arunachal Pradesh. All of them belong to the eastern parts of India.

It appears from Table-1 that there exist somewhat similar trends of women literacy and women attaining 10 or more years of schooling. Even though the relationship is not so clear from the table one can find that there is a relationship between the two independent variables.

Total fertility rate (TFR) among the Indian states

As stated earlier, TFR in India declined during the last couple of decades. The top ten high fertility states in India are Bihar (3.4), Meghalaya (3.0), Nagaland (2.7), Uttar Pradesh (2.7), Manipur (2.6), Jharkhand (2.6), Assam (2.4), Rajasthan (2.4), Mizoram (2.3) and Madhya Pradesh (2.3). Of these, five belong to northeastern states while Bihar and Uttar Pradesh belong to the northern plains and Jharkhand and Madhya Pradesh belong to the eastern part of India while Rajasthan is located in the western part of the country.

The lowest fertility rate is found in Sikkim (1.2), Punjab (1.6), Kerala (1.7), Tamil Nadu (1.7), Tripura (1.7) Goa (1.8), Andhra Pradesh (1.8), Telangana (1.8), and West Bengal (1.8). Of these, five belong to the south, two to the northeast while West Bengal belongs to the east and Punjab to north India.

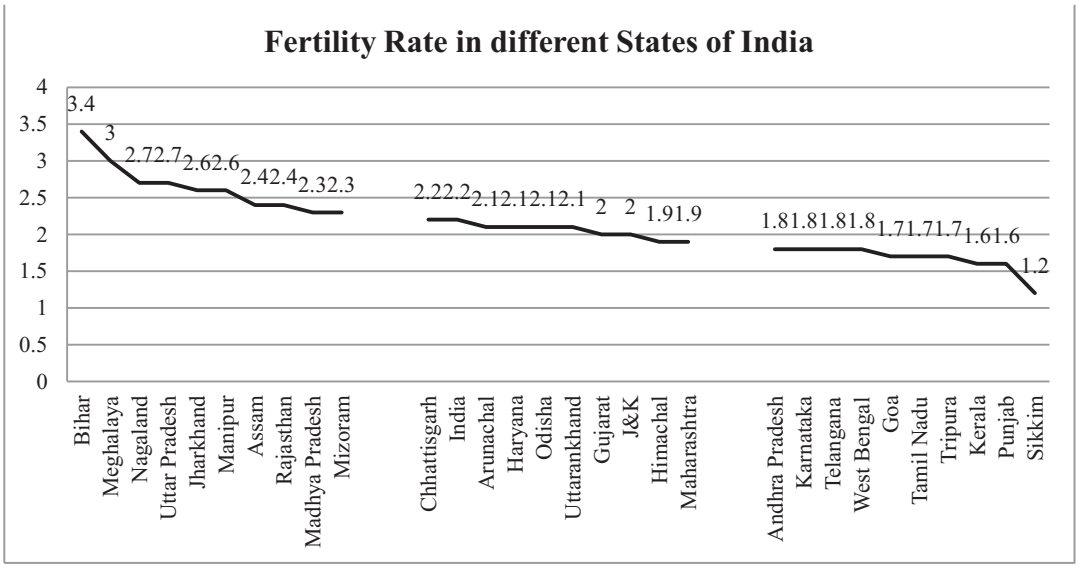

Fig.1. Fertility Rate in India by states

Interestingly, 15 of 29 states in India recorded TFR below replacement level (2.1), four just replacement level fertility, and the remaining 11 states well above replacement level. Eleven of the 29 states in India registered above and 18 below the national average of total fertility (Fig.1).

From the above, it is difficult to find out any clear relationship between women's education and the fertility rate among Indian states. For example, the second-highest fertility rate of Meghalaya is found among the top ten educated states. Similarly, Nagaland and Manipur are also having high fertility rate with high women's literacy rate, somewhat indicative of a positive relationship. On the other hand, Bihar records the least in women's education and has the highest total fertility rate. Similarly, Uttar Pradesh and Jharkhand are among the lowest women's literate states having a high TFR, showing a somewhat negative relationship. Therefore, the general observation does not make any substantial evidence and as a result of which a more in-depth statistical analysis is required. To do this, we select Pearson correlation coefficient methods to analyze the relationship between female education and fertility rate across the states of India with the following formula:

Association between women's education and total fertility rate in India

Analysis based on Pearson Formula:

$$r = \frac{\sum ((x-\bar{x})(y-\bar{y}))}{\sqrt{\sum (x-\bar{x})2 \ \sum (y-\bar{y})2}}$$

The correlation coefficient method shows that there is a negative correlation between women literacy rate and total fertility rate with a 0.5 significant level (-.442*). There is also a strong positive association between women's literacy rate and women who attend 10 or more years of schooling with a very high significant level of 0.01 (0.718**) (Table-2).

Table-2. Correlations between Women's Education and Total Fertility in India

		Literate women	Women having 10 or more year of schooling	Total fertility rate
Literate Women	Pearson Correlation	1	.718**	-.442*
	Sig. (2-tailed)		.000	.016
	N	29	29	29
Women having schooling up to 10th or higher	Pearson Correlation	.718**	1	-.489**
	Sig. (2-tailed)	.000		.007
	N	29	29	29
Total fertility rate	Pearson Correlation	-.442*	-.489**	1
	Sig. (2-tailed)	.016	.007	
	N	29	29	29
**. Correlation is significant at the 0.01 level (2-tailed).				
*. Correlation is significant at the 0.05 level (2-tailed).				

It is also interesting to note that there exists a strong negative correlation (-.489**) with a 0.01 significant level (Table 2). The statistical analysis validates that women's education has played an extremely important role in the total fertility rate in India.

Conclusion

It emerges that women's education, whether it is their simple literacy or attaining 10 or more years of schooling has a negative relationship with the fertility rate in India. The findings of our study confirm with the previous statistical analysis done in conducting similar kind of exercises based on the previous National Family Health Survey data. In other words, we can say that educating women can greatly reduce the fertility rate in India. It might be suggested that more emphasis on educating women is one of the best policies to reduce the birth rate and for the success of family planning in India. Women's education has a plethora of positive effects. It can be related that education not only improves a woman's economic status but also increases her likelihood of having fewer children and using contraceptive methods.

In India, the number of children per woman declines with women's level of schooling. Women with no schooling have an average of 3.1 children, compared with 1.7 children for women with 12 or more years of schooling.

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Annexure-I: Correlation between women's education and Fertility								
Sl.no	District	X	y	(x-x^-)	(y-y^-)	(x-x^-)x(y-y^-)	(x-x^-)2	(y-y^-)2
1	Bihar	49.6	3.4	-24.4	1.3	-31.72	595.4	1.69
2	Meghalaya	82.8	3	8.8	0.9	7.92	77.4	0.81
3	Nagaland	81	2.7	7	0.6	4.2	49.0	0.36
4	Uttar Pradesh	61	2.7	-13	0.6	-7.8	169.0	0.36
5	Jharkhand	59	2.6	-15	0.5	-7.5	225.0	0.25
6	Manipur	85	2.6	11	0.5	5.5	121.0	0.25
7	Assam	71.8	2.4	-2.2	0.3	-0.66	4.8	0.09
8	Rajasthan	56.5	2.4	-17.5	0.3	-5.25	306.3	0.09
9	Madhya Pradesh	59.4	2.3	-14.6	0.2	-2.92	213.2	0.04
10	Mizoram	93.5	2.3	19.5	0.2	3.9	380.3	0.04
11	Chhattisgarh	66.3	2.2	-7.7	0.1	-0.77	59.3	0.01
12	Arunachal	65.6	2.1	-8.4	0	0	70.6	0
13	Haryana	75.4	2.1	1.4	0	0	2.0	0
14	Odisha	67.4	2.1	-6.6	0	0	43.6	0
15	Uttarankhand	76.5	2.1	2.5	0	0	6.3	0
16	Gujarat	72.9	2	-1.1	-0.1	0.11	1.2	0.01
17	J&K	69	2	-5	-0.1	0.5	25.0	0.01
18	Himachal	88.2	1.9	14.2	-0.2	-2.84	201.6	0.04
19	Maharashtra	80.3	1.9	6.3	-0.2	-1.26	39.7	0.04
20	Andhra Pradesh	62.9	1.8	-11.1	-0.3	3.33	123.2	0.09
21	Karnataka	71.7	1.8	-2.3	-0.3	0.69	5.3	0.09
22	Telangana	65.2	1.8	-8.8	-0.3	2.64	77.4	0.09
23	West Bengal	71	1.8	-3	-0.3	0.9	9.0	0.09
24	Goa	89	1.7	15	-0.4	-6	225.0	0.16
25	Tamil Nadu	79.4	1.7	5.4	-0.4	-2.16	29.2	0.16
26	Tripura	80.4	1.7	6.4	-0.4	-2.56	41.0	0.16
27	Kerala	97.9	1.6	23.9	-0.5	-11.95	571.2	0.25
28	Punjab	81.4	1.6	7.4	-0.5	-3.7	54.8	0.25
29	Sikkim	86.6	1.2	12.6	-0.9	-11.34	158.8	0.81
		Mean =74.0	*Mean=2.1*			$\sum$ 68.74	$\sum$ 3885.3	$\sum$ 6.24
		$\sum$ 2146.7	*$\sum$61.5*					

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Public Health System in India and the Contemporary Challenges

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Abstract: A diagnostic study of the structural deficits in the public healthcare system of India, playing a detrimental role in the utilization of healthcare services particularly during public health emergencies such as the Covid 19 pandemic has been conducted. In addition, the paper throws light on the preparedness of the system to deal with such emergencies. Using secondary data available from different Rural Health Statistics reports, the study adopted a mixed-method approach. Convenience and purposive sampling techniques were deployed for the qualitative study of governance mechanism in the selected states of the country. In addition, structural ratios and percentages were calculated to analyse the health system deficits across states.

The study identified the six broad structural deficits relating to access, physical infrastructure, human resources, quality, finances and governance; and pinpointed the chronic shortfall of human resources and healthcare infrastructure as the major impediments to the treatment of the community during the current pandemic wave. People with general morbidities had to crowd at tertiary medical and health facilities due to weak or inadequate preventive healthcare system at the middle and lower orders of the hierarchical tiers in the health care system of the country. Better treatment of general patients at primary health centres and treating of COVID-19 patients at the lower level hierarchical tiers can ease out the burden at the higher order of the referral system, eventually helping to deal more effectively with general morbidities along with those arising out of the pandemic.

Keywords: Access to healthcare, Preventive healthcare services, Human resources for health, Health infrastructure, Governance and quality of healthcare

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Introduction

The government sources inform us that nearly 30.0 million COVID-19 (Corona Virus Disease) cases have been reported in India by 14th June 2021. With an escalation in the COVID-19 cases, India is experiencing a surge in demand for curative healthcare services. Moreover, India's burden of non-communicable and other morbidities (communicable diseases, maternal and child wellbeing, injuries, etc.) is also very high (Arokiasamy, 2018). Hence, India urgently needs primary or preventive healthcare services in addition to tertiary medical facilities (Badrfam and Zandifar, 2020). Several studies suggest that universal access to basic healthcare services is controlled by different factors (i.e. availability, accessibility, accommodation, affordability,

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acceptability and awareness) across the globe, especially in developing countries (Saurman, 2016; Solar and Irwin, 2010). Out-of-pocket expenditure (OOPE) remains a primary source of healthcare funding in India and other developing nations. High OOPE pushes a large section of the population below the poverty line, further accentuating the health crisis (Kastor and Mohanty, 2018). Rural communities are more vulnerable due to geographical inaccessibility and lack of medical resources (Dutta and Dutta, 2013). Notwithstanding the recent initiatives like Ayushman Bharat- Pradhan Mantri Jan Arogya Yojana (AB-PMJAY) and health and wellness centres (HWCs) to deliver tertiary and primary health care free of cost, the deficits have blocked the way forward (Bajpai and Wadhwa, 2019; Shah and Nerges, 2020).

Research Problem

The above statements make it clear that the Indian public healthcare system suffers from the different type of malaises making it incapable to deal with the pandemic situation like Covid-19, throwing a challenge before the academicians and professionals to diagnose deficiencies in the existing health care system and suggest the remedial measures to deal comprehensively and systematically with health and medical care related exigencies created by the pandemic situations like Covid-19. Accepting the challenge, the present study aims to identify the existing deficits in the public healthcare system of India playing a detrimental role in the utilization of healthcare services particularly during public health emergencies such as the Covid 19 pandemic. In addition, an attempt will be made to throw light on the preparedness of the system to deal with such emergencies and the remedial measures.

Material and Methods

Both primary and secondary data sources have been used for the study. Secondary data have been collected from the *Census of India*, 2011; different reports of *Rural Health Statistics*; and the *National Health Profile* Reports. Further, the information regarding the quality of healthcare services has been collected from "Unstarred Question No 4974, Sixteenth Lok Sabha, Government of India"(Kulaste, 2017). To understand the trajectories of good governance, qualitative findings out of the information gathered during a recent field visit in Bihar have been pressed into service. Convenience and purposive sampling strategy were involved in the qualitative field visit in the apex hospitals, conducted for doctoral research work of the corresponding author (Karmakar, 2019).

Ratios have been calculated and presented in tabular form between existing health and medical care facilities centres such as Sub-Health Centres (SHCs), Primary Health Centres (PHCs) and Community Health Centres (CHCs) vis-à-vis the norms set by the Indian Public Health Standard (IPHS) to know the gap between the existing facilities and the prescribed norms. This has been calculated for 2005, 2015 and 2019 to understand the changing scenario. The positive and negative changes have been earmarked to understand changing gap scenario in infrastructural facilities.

There are, of course, some limitations of the present study. Information collected from different government reports is not available for consecutive years. To show the trend of healthcare

services (including the newly created states like Telangana) information on different years has been incorporated. In this way, the paucity of data posed a serious challenge to our effort to evaluate the quality standard across hospitals.

DISCUSSIONS AND RESULTS

Indian Public Health Standard (IPHS) Norms

Before proceeding further, we make a brief assessment of Indian Public Health Standard norms. It will help us to understand what medical and health care infrastructure is currently existing in India and what it ought to be? The different norms are set to be the government agencies for different areas in the country keeping in view physiography and the social groups living in the parts. These norms are known as Indian Public Health Standards (IPHS). A three-tier system of health care facilities has been evolved in India. The detailed components and quality parameters are described in the following.

i. Sub-centre as the first contact point

At the lowest level, the 'sub-centre is the most peripheral and first contact point between the primary health care system and community (Govt. of India, 2012c). Sub-centres are maintained by ANMs. As per IPHS norms, there must be to be at least one each ANM, a female and male health worker. Under NRHM, an additional ANM is also provided to SCs on a contract basis. One LHV officer supervises a minimum of six sub-centres. SCs have a significant position in maternal and child health care for providing first service contact point to mothers for their health-related issues. A sub-centre is supposed to serve a maximum of 5,000 persons in the plains and 3,000 persons in hilly/desert areas. In 2015, there were more than 153 hundred thousand health sub-centres in the country. On average, each of 684 districts at that time had about 225 sub-centres.

ii. PHC as the first meeting point between people and the medical officer

At the second level, Primary Health Centre (PHCs) provides both preventive and curative services to rural masses, the first meeting point between people and the medical officer. There must be a Medical Officer with 14 paramedical and other staffs; however, special provisions were made under the NRHM programme. A PHC provides all services to a maximum of thirty thousand local population in the plains and of twenty thousand in hilly/desert areas, having a capacity of 4-6 beds to support 6 sub-centres in any area. In 2015, there were 25 thousand plus PHCs in India, giving an average of about 37 PHCs per district.

iii. CHC and above for specialist services

At the third level, a Community Health Centre (CHC) provides specialised services by surgeons, physicians, gynaecologists and paediatricians. It is also supposed to provide obstetric care facilities and consultations with a capacity of 30 beds. In 2015, there were 5396 CHC in India, a CHC supporting four PHCs in an area.

At the next higher level, first referral units were established by strengthening district hospitals, community health centres with 24-hour services, equipped with emergency obstetric care

services and newborn care units. Special facilities like blood storage and caesarean sections are the main characteristics of first referral units. At the top level, Medical College Hospitals and training centres were established for providing research and advanced medical facilities.

In addition, a recent development HWCs under AB-PMJAY are supposed to reduce the service gaps in primary care through technology and innovation (Govt of India, 2019). Encircling these two therapeutic shields, CHCs and other referral units protect the community with the specialists and tertiary health services at the highest level (Directorate General of Health Services, 2012a).

Regional pattern of deficits in the public healthcare system in India

Since its inception, the Indian public health system has a three-tier hierarchy of healthcare centres (SHCs, PHCs and CHCs). There are, of course, several bottlenecks in this comprehensively looking unified structure. There is a need to understand the system and its logjams before suggesting remedial measures to make it resilient and adequately prepared for pandemic situations.

In this section, we shall briefly discuss the wide-ranging deficits, inherent in the Indian health care system which are related to access, infrastructural, human resource, quality, financial and governance in the public healthcare structure.

Physical accessibility deficit

The foremost issue in the provision of PHCs is the accessibility problem. In the majority of cases, the geographical distance between the rural settlements and healthcare facilities is higher than 3.0 km, the range as per norms (Table 1). For instance, in Himachal Pradesh, four-fifths of villagers have to travel beyond 5.0 km to avail of SHC facilities. The situation of EAG and north-eastern states is though slightly different but equally deplorable concerning accessibility of the PHCs and CHCs. The norms suugests that a PHC must be centrally located within the village. However, in Bihar, one of the eight Empowered Action Group (EAG) states, the population living in more than 80.0 per cent of the rural settlements has to travel beyond 5.0 km to avail PHC services. Geographical accessibility can also be seen in terms of road conditions, mode of transport, topography and relief feature, travel time and cost of travel.

Table1: India: Distribution of public healthcare facilities by distance zones, 2011

Distance range	SCs (in %)	No. of Villages	% of PHCs	No. of Villages	% of CHCs	No. of Villages	Other Allopathic Hospitals (%)	No.of Villages
0-5 km	53.2	299064	25.1	143932	11	62883	10.7	58649
5-10 km	31.7	178329	40.3	230720	27.9	159028	26.1	142995
< 10 km	15	84373	34.6	198193	61.1	348999	63.2	346298
Total	100	561766	100	572845	100	570910	100	547942

Source: Census of India (2011). *Village and Town Directory* , different states, Registrar General and Census Commissioner of India, New Delhi

In the case of tertiary health services, it is quite usual that people have to travel beyond 10 km to access such facilities in government hospitals. A distance of more than 10.0 km is inconvenient for access to tertiary healthcare service (Govt. of India, 1999). In urban India also, the distribution of tertiary healthcare facilities (e.g. public allopathic hospitals, private nursing homes, and dispensaries) is highly concentrated in class I cities (Tables 1a and 1b).

Table 1a: Distribution of allopathic hospital, nursing homes and dispensary/health centres by size category of towns, 2011

Size class category of towns	Hospital (Allopathic)		Nursing Homes		Dispensary/Health Centre	
	Percent	Number	Percent	Number	Percent	Number
Class I (1,00,000 & above)	33.7	1897	65.2	2474	41.4	5424
Class II (50,000-99,999)	12.6	711	11.7	443	8.4	1095
Class III (20,000-49,999)	24.1	1359	12.0	456	19.8	2592
Class IV (10,000-19,999)	15.7	886	5.5	209	15.2	1994
Class V (5,000-9,999)	11.4	639	5.3	201	12.5	1632
Class VI (less than 5,000)	2.4	137	0.3	12	2.8	362
Total	100.0	5629	100.0	3795	100.0	13099

Source: Census of India (2011). *Town Directory,* different states, Registrar General and Census Commissioner of India, New Delhi

Table 1b: Distribution of hospital beds in hospitals, nursing homes and dispensaries/health centres by size category of towns, 2011

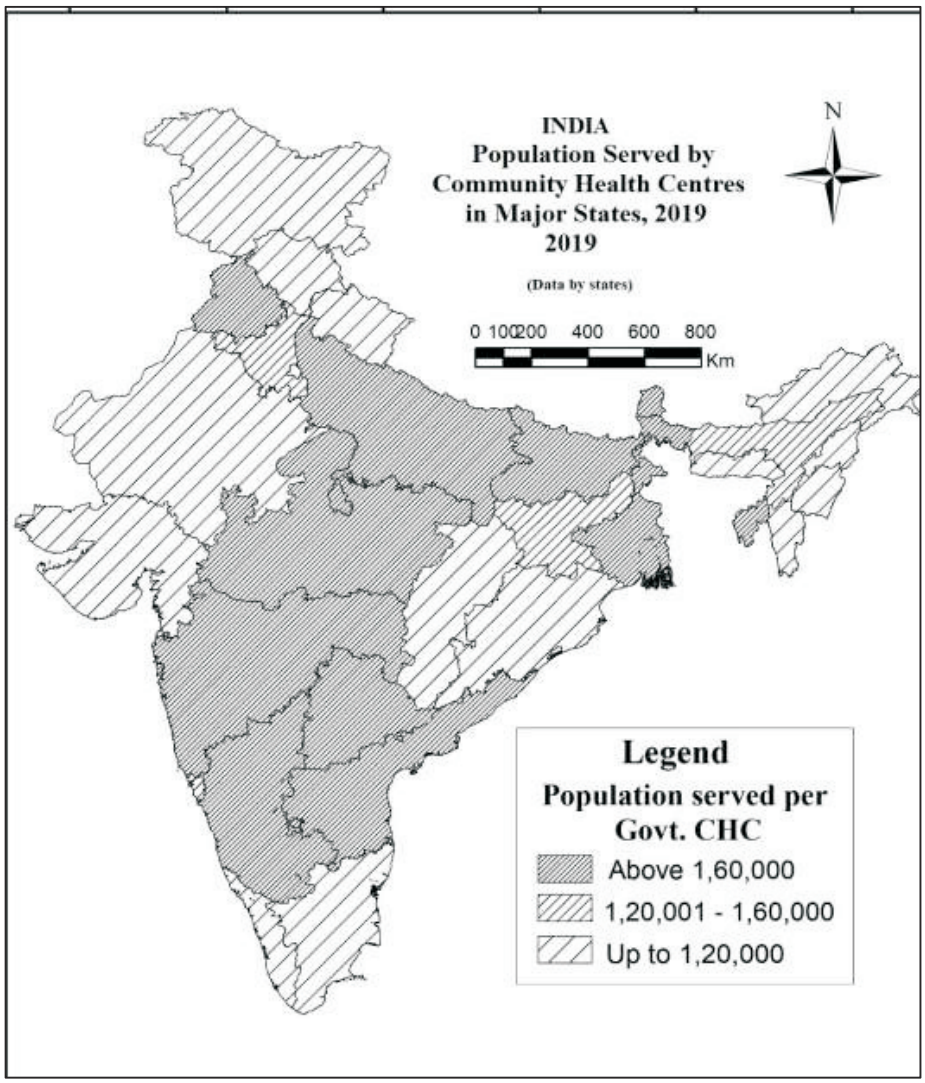
Size class category of towns	Dispensary/Health Centre Beds		Nursing Home Beds		Hospital Allopathic Beds	
	Percent	Number	Percent	Number	Percent	Number
Class I (1,00,000 & above)	23.4	9908	78.0	41693	61.5	321098
Class II (50,000-99,999)	9.8	4146	8.2	4396	11.0	57322
Class III (20,000-49,999)	27.0	11428	7.9	4211	13.7	71457
Class IV (10,000-19,999)	23.5	9930	2.9	1553	6.4	33235
Class V (5,000-9,999)	14.5	6148	2.8	1502	6.6	34207
Class VI (less than 5,000)	1.7	702	0.2	92	0.9	4645
Total	100	42262	100	53447	100	521964

Source: Census of India (2011). *Town Directory,* different states, Registrar General and Census Commissioner of India, New Delhi

Infrastructural deficits

Positive or negative values of the infrastructural ratio (IR) indicate the infrastructure status. The negative value for change indicates to increased infrastructural deficits and vice versa (Table 2). Large infrastructural deficits in the public healthcare system across states are the main hurdle to provide comprehensive health services to the poor. The preventive care (SHCs-PHCs) in the majority of southern and north-eastern states experienced a positive change during 2005-15. However, the reverse was the case of some large states like Jharkhand, West Bengal and Uttar Pradesh during the same period; although performing better in terms of the structural changes in secondary and tertiary/curative care services. However, the imbalance between the preventive

and curative services has variedly impacted states where the referral services are in a paralytic situation, creating a huge footfall at tertiary care hospitals due to abysmal preventive services. Uttar Pradesh, Jharkhand, Bihar, and West Bengal suffer the most. Low infrastructure level plus high population pressure at the SHCs and PHCs ultimately leads to overcrowding at CHCs and referral units. For example, the population served by a CHC is about five times higher in Bihar and about two times in Uttar Pradesh of the reccommended norm of 1.20 lakh population/CHC. The situation was more or less the same in large-sized states regarding tertiary services (Map. 1).



Map 1

Table 2. India: Infrastructural Ratio (IR) among the Sub Centre, Primary Health Centre and Community Health Centre and Infrastructural Change by Major States, 2005 to 2019

	2005		2019		Change in IR, 2005-19	
State/UT	No. of SC per PHC	No. of PHC per CHC	No. of SC per PHC	No. of PHC per CHC	No. of SC per PHC	No. of PHC per CHC
Andhra Pradesh	8	9.6	6.5	8.2	-1.5	-1.4
Assam	8.4	6.1	4.9	5.3	-3.5	-0.8
Bihar	6.3	16.3	5.2	12.7	-1.0	-3.7
Chhattisgarh	7.4	4.5	6.6	4.7	-0.8	0.2
Goa	9.1	3.8	9.1	4.8	0.1	1.0
Gujarat	6.8	3.9	6.2	4.1	-0.6	0.1
Haryana	6	5.7	6.9	3.3	0.9	-2.4
Himachal Pradesh	4.7	6.7	3.6	6.7	-1.1	0.1
Jammu & Kashmir	5.6	4.8	4.9	7.4	-0.8	2.6
Jharkhand	8	11.9	12.9	1.7	5.0	-10.2
Karnataka	4.8	6.6	4.6	10.7	-0.3	4.1
Kerala	5.6	8.6	6.3	3.7	0.8	-4.9
Madhya Pradesh	7.4	5.2	8.5	3.9	1.1	-1.3
Maharashtra	5.9	4.7	5.8	5.0	0.0	0.4
Odisha	4.6	5.5	5.2	3.4	0.6	-2.1
Punjab	5.9	4.2	7.1	4.7	1.2	0.5
Rajasthan	6.1	5.3	6.5	3.6	0.4	-1.6
Sikkim	6.1	6	6.1	14.5	-0.1	8.5
Tamil Nadu	6.3	39.4	6.1	3.7	-0.2	-35.7
Uttarakhand	7	5.1	7.2	3.8	0.2	-1.3
Uttar Pradesh	5.6	9.5	7.1	4.3	1.5	-5.2
West Bengal	8.8	12.3	11.4	2.6	2.6	-9.7
All India	6.3	6.9	6.3	4.7	0.0	-2.3

Source: Govt. of India: *Rural Health Statistics*, for 2005 and 2019

Human resource deficits

Unfortunately, 31.0 per cent of posts of allopathic doctors in the public healthcare sector of India are vacant. On average, more than eleven thousand persons are served by one doctor in India. This average was as high as 28,391 persons/doctor in Bihar, 19962 persons/doctor in Uttar Pradesh, and 18518 persons/doctor in Jharkhand.

The crisis of specialist doctors (i.e. Surgeons, Obstetricians & Gynaecologists, and Paediatricians) in CHCs all over India is very wide. At the national level, the shortfall of specialists doctors in CHCs' has widened over time. The shortage was as high as about 82.0 per cent in 2019 against 46.0 per cent in 2005. In north-eastern states, this share is as high as more than 95.0 per cent.

The doctor-nurses ratio is also quite wide. Though the ratio between doctors and nurses improved between 2005-2019, there is almost a 10.0 per cent shortage of nursing staffs at the national level. There are wide inter-state differentials on this count (Fig.1).

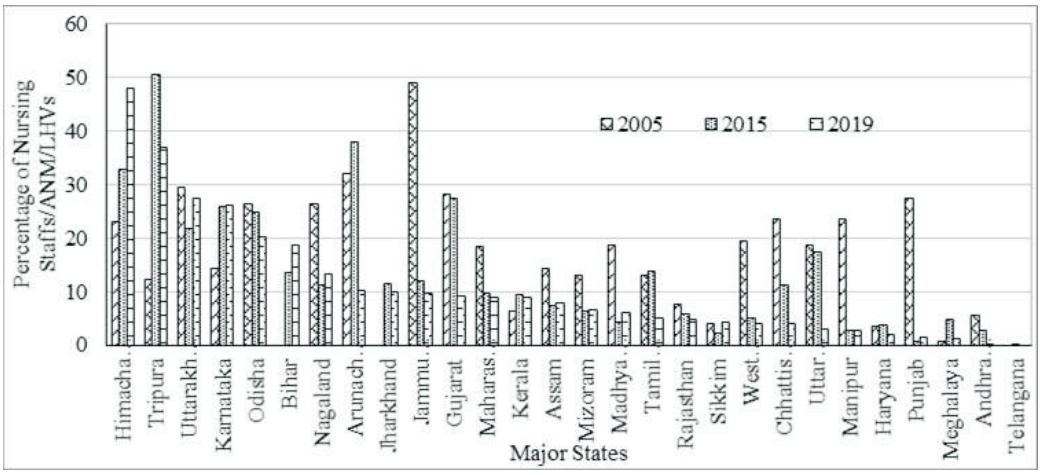


Fig. 1: India: Trends of shortfall of nursing staffs/ANM/LHV's across major states, 2005-2019
Source: Compiled from National Health Profile, 2005-2019)

The shortfall of other health workers (including Lab Technicians, Pharmacists, Radiographers and Health Assistant Male/LHV) has gone to 40.2 per cent in 2019 from 20.6 per cent in 2005, registering an increase in shortfall by more than twice. Except for a few states (Punjab, Rajasthan and Karnataka), there is a shortage of such workers all over India (Fig. 2). The situation in hill states of Himachal Pradesh, Uttarakhand and north-eastern regions is more deplorable on this count.

Quality deficit

Quality of Care (QoC) in primary care is one of the most important concerns for safeguarding the community (Roemer and Montoya-Agulier, 1988). Several studies on the quality of health care services have been conducted in India (Deorari and Livesley, 2018; Sarin and Livesley, 2018; Sivanandan et al., 2018) and other developed countries (Committee on Quality of Health Care in America and Institute of Medicine, 2001). Specific targets of National Health Policy, 2017 also outlined the major dimensions of patient-centredness, equity in access to health care (Govt. of India, 2017). IPHS norms provide a blueprint for quality standards in this vast network of primary and tertiary care hospitals in India. However, our analysis reveals that in most of the states in India there is a wide gap between the number of SHCs functioning, in actuality, and what should be as per the IPHS norms.

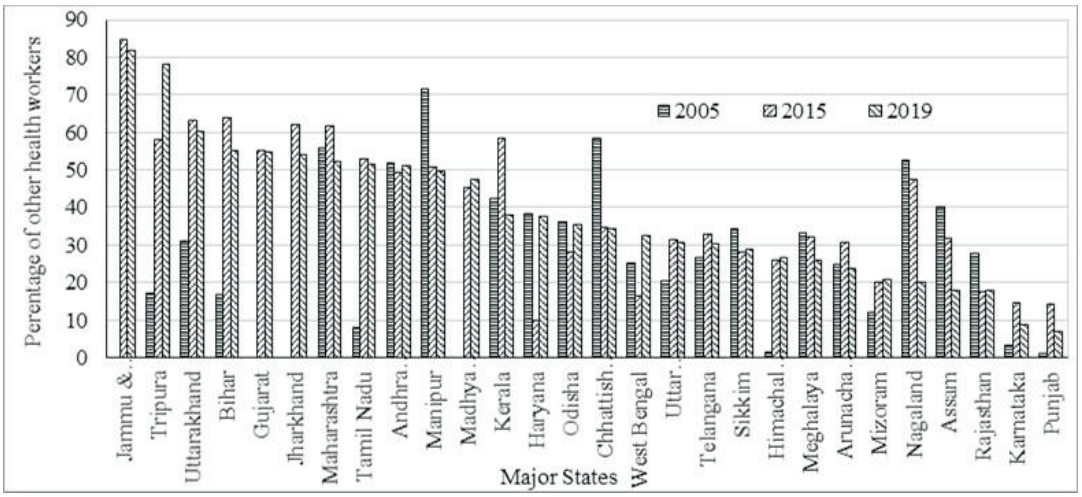


Fig.2: India: Trends in a shortfall of other health workers by major states in India, 2005-2019
Source: Compiled from National Health Profile, 2005-2019

The number of SHCs to the population served is quite in most of the large-sized states especially Empowered Action Group (EAG) states. The group included states such as Bihar, Chhatisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttarakhand, and Uttar Pradesh having in combine 44.0 per cent of the total population of the country, but contributing only 20.0 per cent to national GDP. The purchasing power of the general masses in these states is quite low, hence the dependency on government-owned healthcare services is quite high. The number of the population served per SHC being high in these states indicates the low quality of healthcare services. The situation of PHCs and CHCs is also not very different rather gloomy. Further, in West Bengal and Gujarat nearly half of the hospitals are not following IPHS norms. However, in southern India, Andhra Pradesh and Tamil Nadu performed well in this regard (Table 3).

Briefly, even though different quality control agencies (NABH, IPHS, NQAS) and monitoring programmes'(Mera-Aspataal-2106, LaQshya-2017 and National Patient Safety Implementation Framework-2018-2025) are there to monitor and control the quality of healthcare services in India, the quality of services in hospitals and other health institutions is highly poor.

Financial deficit

India's public healthcare spending is persistently low. It made less than one per cent of total GDP in 2005; only reached 1.3 per cent in 2019 (Central Bureau of Health Intelligence, 2019). Moreover, low capital investment has made the public health care system almost dysfunctional. Although the central government funding in healthcare has increased over time, the uneven distribution and slow funds utilization across states have painted a dismal situation. Wide inter-state inequalities in health expenditure make the situation far more complex and acute.

Table 3: India: Quality of SCs, PHCs and CHCs: Number of Health Centres Functioning as per IPHS norms by Major States, 2016

State/UT	Sub-Centres			Community Health Centres (CHCs)			Primary Health Centres (PHCs)		
	No. of Sub-Centres Functioning	No. of Sub-Centres Functioning as per IPHS norms	% of SC's functioning as per IPHS Norms	Number of CHCs functioning	Functioning as per IPHS norms	% of CHC's functioning as per IPHS Norms	Number of PHCs functioning	Functioning as per IPHS norms	% of PHC's functioning as per IPHS Norms
Chhattisgarh	5186	0	0	155	0	0	790	0	0
Gujarat	8801	0	0	322	175	54	1314	709	54
Himachal Pradesh	2071	0	0	79	0	0	518	0	0
Jammu & Kashmir	2805	0	0	84	0	0	637	0	0
Jharkhand	3953	0	0	188	0	0	327	0	0
Karnataka	9332	0	0	206	0	0	2353	0	0
Kerala	4575	0	0	225	7	3	824	1	0
Madhya Pradesh	9192	0	0	334	6	2	1171	0	0
Odisha	6688	0	0	377	0	0	1305	0	0
Punjab	2951	0	0	150	NA		427	NA	
Telangana	4863	0	0	114	0	0	668	0	0
Uttar Pradesh	20521	0	0	773	134	17	3497	170	5
Haryana	2576	77	3	110	10	9	474	8	2
Uttarakhand	1847	290	16	59	27	46	257	69	27
Maharashtra	10580	1755	17	360	127	35	1811	693	38
Rajasthan	14408	3140	22	571	233	41	2080	760	37
Tamil Nadu	8712	2854	33	385	338	88	1368	1271	93
West Bengal	10369	4971	48	349	189	54	909	308	34
Andhra Pradesh	7659	7659	100	193	193	100	1075	1075	100
Assam	4621	NA		151	NA		1014	NA	
Bihar	9729	NA		148	NA		1802	NA	
All India/Total	155069	21551	14	5510	1479	27	25354	5280	21

Source: Ministry of Health and Family Welfare, Dept. of Health and Family Welfare (2017): Unstarred Question No. 4974 on Rural Healthcare, Budget Session, 2017, Lok Sabha, New Delhi, Govt. of India

According to the National Health Profile, 2019, health expenditure is low in per capita terms in all EAG states. Bihar has the lowest among all states (Rs. 471). On the other side, the union territories recorded the highest per capita health expenditure, followed by northeastern states and major states including Kerala, Maharashtra, Gujarat and Tamil Nadu. However, health expenditure as a percentage of gross state domestic product is higher in EAG states than the non-EAG states. Among non-EAG state, Haryana records the lowest health expenditure in proportional terms. Other states low having a low proportion of health expenditure included Maharashtra and Karnataka.

Apart from per capita spending, the distribution of expenditure among expenditure heads. There must a rational and scientific difference of expenditure among different expenditure heads. It means that there should be a balanced distribution of spending on salary, infrastructure, medicine, equipment and other heads for comprehensive growth and development. The prioritised spending of budged amount on primary secondary and tertiary care services is a must.

Governance deficit

In the governance of health care, the three key players are the government, health workers, and the community or patients (Kickbusch and Gleicher, 2012). The collaborative process among these players determines the nature of governance, which in turn impacts the quality of care and functionality of the referral system in India (Rao, 2017). Our analysis reveals that the quality of governance and the paralytic nature of the referral system in India have failed to cater to patients' need at different hierarchical levels (from primary to tertiary referral units) of the public healthcare system. During the fieldwork, it was noticed that the local managerial bodies (e.g. Rogi Kalyan Samity-RKS) at the block level are hardly interested in engaging the communities in the decision-making process relating to the medical requirements of the communities. In another instance, location optimization of the PHCs and procurement of specific drugs were also not done as per the requirements of the local population. Local communities in Bihar, where the survey was conducted, have little say in the matters concerning their health requirements. In addition, the lack of transparency in transfer policy suffering from political favouritism there is a huge deficiency of doctors experts in specialized services at primary and secondary levels of healthcare services.

Recent studies from Kerala reveal that the strong governance of the healthcare system is the most impactful factor for resisting pandemic in the state. The revamping in primary and tertiary healthcare facilities after 2016 (Spinney, 2020), large investment package during the pandemic (Tharoor, 2020), proper coordination among the different government and non-government agencies (Rajan, 2020) and the large chain of testing laboratories (Ariyari, 2019), successful social mobilization and community engagements (Roy and Babu, 2020), the long experience of handling infectious tropical diseases like H1N1 and Nipah (Vora, 2020) and systematic strategies during COVID-19 (trace, test, isolate and support) (Spinney, 2020) helped Kerala to control the pandemic from the spread and continue the regular primary and tertiary healthcare services.

It is evident from the preceding discussion that apart from the lack of accessibility, poor human resources, financial difficulties and management practices; most of the public healthcare centres in India lack basic quality issues. The major parts of rural India have very limited access to public healthcare services centres like SHCs, PHCs and CHCs. Of course, the situation is not the same in all regions of India. The states in southern India are relatively better placed in terms of healthcare infrastructure as compared to states in northern and northeastern parts of the country.

In the case of primary and preventive care, there is a wide gap between the facilities available at the existing centres and the IPHS norms. Low spending on healthcare and poor governance are the main reasons behind the dismal quality of the healthcare system. Poor planning, financial

instabilities and underutilisation of resources have resulted in poor healthcare infrastructure. Poor governance of the referral healthcare system not only results in sharp inter-regional inequality in the health status of people but also contributes as a channelizing path for patients towards apex tertiary healthcare institutions. Proper management and governance of the referral system can improve the health status of people, and can reduce the overcrowding situation at apex tertiary level hospitals. Apart from the detection and treatment that are being carried out in the secondary and tertiary care hospitals, the primary health care units also have to be strengthened to detect and refer cases to the upper tiers of the system (Badrfam and Zandifar, 2020).

With the poor quality of hospital management services and the shortage of safety equipment (like PPEs), several doctors, nurses and other healthcare workers got infected and had to quarantined while serving COVID-19 patients (published in *The Times of India*, dated 16 July 2020). In addition, several outsourced nursing staffs resigned from different COVID-19 hospitals in several cities (such as Kolkata, Pune, Mumbai and Delhi) due to the risk of getting infected (Chatterjee, 2020; Joshi, 2020; Mishra, 2020). At this juncture, the adverse effect of the ill-equipped public health care system is not only confronted by the COVID-19 patients, but non-COVID-19 patients are heavily paying the price. The hospitals had shut down the OPD and diagnostic laboratory services during the partial or full lockdown period in the dismay of the spread of infection and inadequate service staff. The non-COVID-19 patients had to face adverse health consequences due to the disruption of follow-up consultations with medical experts. Although few of the hospitals had provided online video consultation, the diverse patients were hardly capable of availing the services under the disruptive COVID-19 situation.

Moreover, only a few of the Ayushman Bharat-Health and Wellness Centers (24400 AB-HWCs) came into operation to achieve the target, which is supposed to provide comprehensive primary care to the village communities across India (Govt. of India 2019). Only the four major states (Andhra Pradesh, Rajasthan, Kerala, and Telangana) have started telemedicine services to the poor as a part of AB-HWCs. Only less than one-fifth of the AB-HWCs are operational in Uttar Pradesh and Bihar and the situation is nearly the same in all states in north India (Govt. of India, 2019).

Several pre-planned follow-up check-ups have been delayed (Søreide et al., 2020) due to the non-availability of doctors, health care facilities and disruption in transport facilities in the containment zones. People with co-morbidity especially the elderly are facing a dual challenge, i.e. the ceased consultation with the specialists and the related pains with the anxiety of getting infected due to weak immunity (Centers for Disease Control and Prevention, 2020). Continuum of care for maternal and child health care, non-communicable diseases (NCDs) and other diseases have also been disrupted due to the closure of OPDs (Ganguly and Mishra, 2020). Hospitals demanded COVID-19 negative report to admit patients needing immediate medical care (Shelar, 2020). A manifold increase in the number of COVID-19 cases has been experienced after the stranded migrant workers returned to their home towns, creating an additional burden upon the overburdened health care system. In high outmigrant states like Bihar, Uttar Pradesh,

Jharkhand, Odisha and Rajasthan the already weak healthcare system suffered the most (Bhagat et. al., 2020).

Concluding remarks

The multiple inadequacies of our health system regarding the access, infrastructure, human resources, finances, quality and governance coupled with the dearth of reliable information created a huge panic and myths among people during the recent Covid-19 pandemic in India. Since, the creation of awareness is an important measure to stop the spread of a pandemic, a widely spread network of SHCs and PHCs could have used to provide proper and timely information to people in addition to the use of the mass media like TV, radio and newspapers. The proper utilization of scarce resources with new innovative technology like Telemedicine is yet another effective measure to use.

The horizontal and vertical coordination and integration among the primary, secondary and tertiary units is a must for successful handling of the current pandemic situation. While treatment will be done in secondary and tertiary care hospitals, the role of primary healthcare units cannot be ignored. The SHCs and PHCs are the first point of contact with the healthcare system and should be used effectively to identify the affected patients, contact tracing and referring them to higher levels of care for further treatment. In Kerala, testing labs are functioning at the PHC level to identify early signs of different diseases. The 'Kerala model' of testing and containment strategy can help states to combat COVID-19. With adequate protection, the ASHA (Accredited Social Health Activities) workers and ANMs (Auxiliary Nurse Midwife) can spread awareness among the community. As India faces a shortfall of doctors, medical and paramedical staff from private sectors, retired doctors, private practitioners all potential resources in the country should be pooled in this hour of distress.

The persisting neglect of the health system has been posing a serious challenge to deal with the current situation. While short term measures have to be implemented immediately, in future the policies required to be framed to strengthen the preventive healthcare system and also minimise the deficits in all aspects of the health system.

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Abbreviations used:

AB-PMJAY: Ayushman Bharat -Pradhan Mantri Jan Arogya Yojana, AB-HWCs: Ayushman Bharat-Health and Wellness Centers, NABH: National Accreditation Board for Hospitals and Healthcare, IPHS: Indian Public Health Standards, NQAS: National Quality Assurance Standards, LaQshya: Labour Room Quality Improvement Initiative

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New Map Series-13

Malayalam Speaking People outside Kerala in India, 2011

Gopal Krishan, Chandigarh

With a distinct physical disposition of its hilly and mountainous rear to the mainland and the front opening into the sea, Kerala has had an active maritime tradition throughout history. This was reflected, among other things, in the regular international mobility of people and lucrative trade in commodities. The area evolved as a zone of cultural confluence.

Today, Kerala has not only the world's wealthiest Hindu temple, Padamanabhaswamy at Thiruvananthapuram, but also India's first church, St. Thomas, at Palayur raised in 52 A.D., the first mosque built at Cheraman Junea Methala in 629 A.D., and the first Jewish synagogue opened at Cochin in 1567. The play of the historical process of settlement, inflow and conversion has been such that as per the 2011 Census, 56.0 per cent of Kerala's population is Hindu, 26.0 per cent Muslim and the remaining 18.0 per cent Christian. Virtually all Jews migrated to their Holyland, Israel, after its birth in 1948 A.D.

The 2011 Census of India revealed that 97.0 per cent of Kerala's population was Malayalam speaking. This rendered the state linguistically the most homogeneous in the country. Meanwhile, about 7.0 per cent or 2.43 million of the total 34.84 million Malayalam speaking people in India were recorded as residing outside their home state (Table1). In 2011, the number of emigrants (2.28 million) from Kerala to other parts of world, such as Middle East, United States, Malaysia and others was nearly the same, as reported in an article by S. Irudaya Rajan, published in *The Indian Express* on 27 April 2020.

Table 1: **India: Percentage of various linguistic groups* living outside their home state, 2011**

Language Group	Percentage	Language Group	Percentage
Assamese	1.41	Odia	7.49
Kashmiri	1.72	Tamil	7.64
Dogri	3.20	Telugu	12.89
Maithali	3.87	Manipuri	13.57
Bodo	4.50	Bengali	19.07
Gujarati	6.37	Punjabi	24.78
Marathi	6.70	Santali	55.62
Malayalam	**6.97**	Konkani	57.27
Kannada	6.99	Nepali	60.52

Source: Census of India (2011): State-wise Distribution of Population by Scheduled Languages in India, Part I.

*Hindi, Sindhi, Sanskrit and Urdu have been excluded, since these were not specific to any single state in terms of their affiliation.

Among the Malayalam speaking people outside their home state in India, 61.8 per cent were residing in the neighbouring states of Karnataka and Tamil Nadu (Table 2); the actual number being 1.5 million (Table 3). Several of them were not necessarily migrants but were native to the places of their domicile; which were located outside Kerala at the time of reorganization of

Indian states in 1956. Most of them were inhabitants of border districts of Kodagu and Dakshin Kannada (Karnataka) and likewise of border districts of Nilgiris, Kanyakumari, Coimbatore, Tenkasi and Theni (Tamil Nadu). Added to this is the fact that almost the entire population of Lakshadweep union territory and Mahe district of Puducherry is *in situ* Malayalam speaking.

In 2011, the number of migrants from Kerala to other parts of India was 0.9 million. In comparison, the number of Malayalam speaking people outside their home state was 2.43 million. It confirms that several of them were native to the present place of their residence outside Kerala.

This is not to deny considerable outflow of Malayalam speaking people to other parts of India. Tea and coffee plantations in Tamil Nadu and Karnataka were nearby destination. Bengaluru, Chennai and other cities in these states also attracted the migration from Kerala, particularly of nurses, school teachers and office workers. These two states partake 53.0 per cent of nurses who sought a livelihood outside their home state.

Almost one-fourth of the Malayalam speaking people outside Kerala were recorded to Maharashtra, National Capital Territory of Delhi, Gujarat and Andhra Pradesh. They were concentrated in metropolitan cities like Mumbai, Pune, Ahmadabad, Delhi and Hyderabad. An overwhelming majority of them found a niche in office jobs as also in technical, teaching and health services. Delhi accounted for nearly one-third of migrant nurses from Kerala. Cities like Bhopal (Madhya Pradesh), Jaipur (Rajasthan) and Lucknow (Uttar Pradesh) were also a destination for job seekers from this state.

The rest of India carried a limited attraction for Kerala migrants. They were in very small number in the North- East Region, East Indian states, and North-West India (Map 1). The size of private sector services in these areas is not as large to attract migrants from a distant state like Kerala. They had much more lucrative economic avenues in the Middle East to make a fortune.

One peculiar feature of Kerala migration research is that outflow from the state to other countries of the world is significantly more in picture than the movement of the people across other parts of India. While there is voluminous research material on emigration from the state, only nominal work covers their migration within India. The reason lies in a massive amount of remittances that emigration contributes to and plays a vital role in the economic and social life of the people.

Emigration typically has been more of the relatively less educated Muslims from Malappuram-Thrissur or Malabar region in the north, whereas migration to other parts of India was traditionally more of the educated Ezhavas, Nairs and Christians from the former Travancore-Cochin region in the south. Emigration was largely for general labour and migration to other parts of India for a variety of secretarial, technical, health and education jobs. A regional bias is evident in the case of both.

Table 2: **Number of Malayalam speaking people outside Kerala in India, 2011**

State/UT	Persons	Males	Females	Percent (Total)
Karnataka	774,057	388,391	385,666	31.91
Tamil Nadu	726,096	351,256	374,840	29.93
Maharashtra	366,153	187,534	178,619	15.10
Nct Of Delhi	88,662	44,739	43,923	3.66
Gujarat	64,998	34,208	30,790	2.68
Andhra Pradesh*	61,147	29,666	31,481	2.52
Lakshadweep	54,264	27,697	26,567	2.24
Puducherry	47,973	21,997	25,976	1.98
Madhya Pradesh	37,761	18,897	18,864	1.56
Andaman & Nicobar Islands	27,475	13,995	13,480	1.13
Uttar Pradesh	24,450	12,767	11,683	1.01
Rajasthan	24,439	12,819	11,620	1.01
Chhattisgarh	23,370	11,733	11,637	0.96
Haryana	14,518	7,864	6,654	0.60
Goa	12,983	7,153	5,830	0.54
Jammu & Kashmir	11,248	9,869	1,379	0.46
West Bengal	10,952	5,979	4,973	0.45
Punjab	9,734	6,099	3,635	0.40
Odisha	9,004	4,739	4,265	0.37
Jharkhand	6,549	3,365	3,184	0.27
Assam	5,768	3,942	1,826	0.24
Arunachal Pradesh	4.012	2,673	1,339	0.17
Uttarakhand	3,168	1,921	1,247	0.13
Nagaland	2,916	1,995	921	0.12
Dadra & Nagar Haveli	2,172	1,167	1005	0.09
Chandigarh	1,979	1,149	830	0.08
Meghalaya	1,789	1,146	643	0.07
Manipur	1,519	1,320	199	0.06
Daman & Diu	1,229	658	571	0.05
Bihar	1220	680	540	0.05
Himachal Pradesh	1,211	792	419	0.05
Tripura	1,173	975	198	0.05
Sikkim	899	712	187	0.04
Mizoram	718	521	197	0.03
INDIA	**2,425,606**	**1,220,418**	**1,205,188**	**100.00**

Source: Census of India (2011): State-wise Distribution of Population by Scheduled Languages in India, Part I.
* Including Telangana

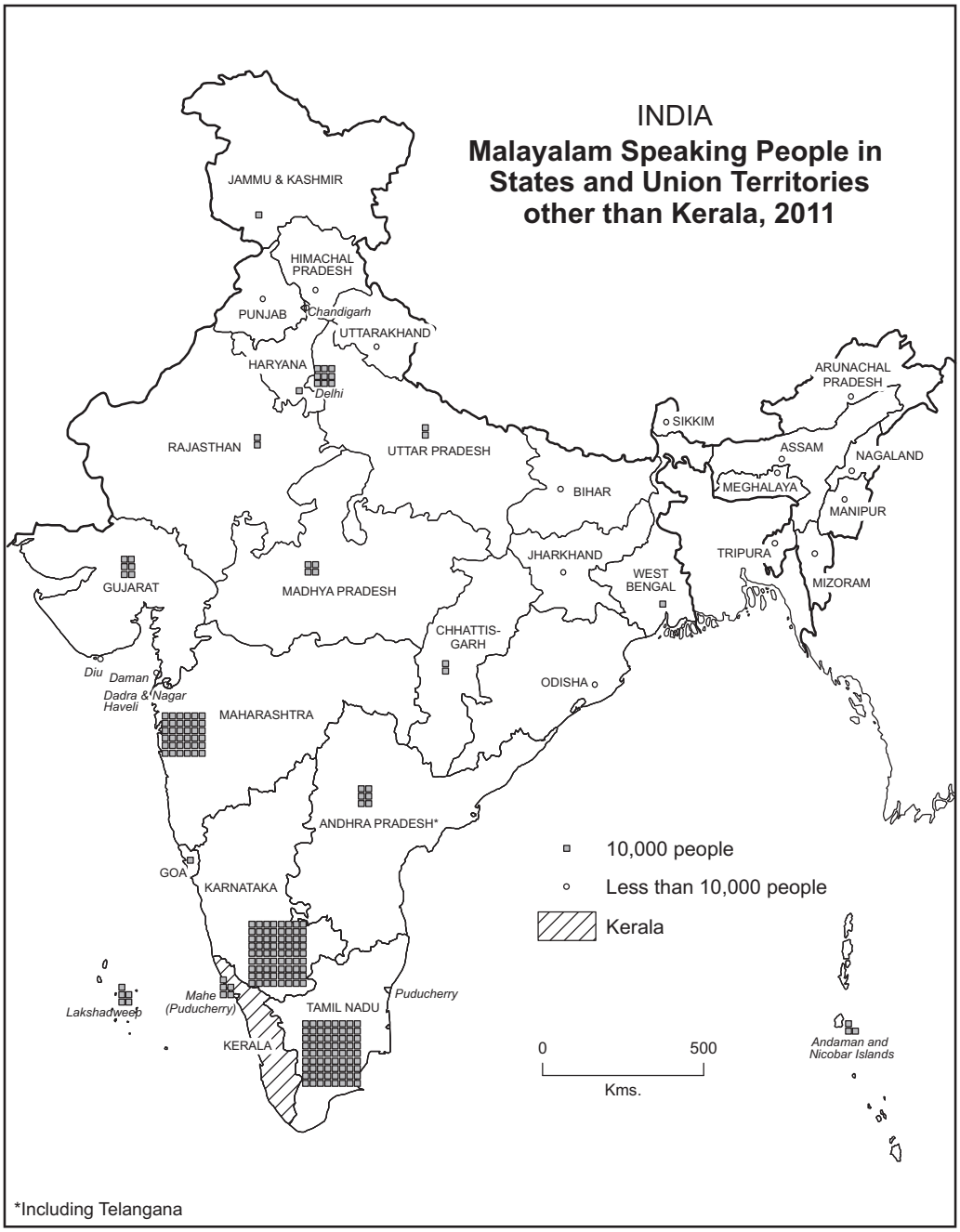
Table 3: **India: Distribution of Malayalam speaking population by states/union territories, 2011**

State/UT	Persons	Males	Females	Percent (Total)
Kerala	32413213	15491966	16921247	93.03
Karnataka	774057	388391	385666	2.22
Tamil Nadu	726096	351256	374840	2.08
Maharashtra	366153	187534	178619	1.05
Nct Of Delhi	88662	44739	43923	0.25
Gujarat	64998	34208	30790	0.19
Andhra Pradesh*	61147	29666	31481	0.18
Lakshadweep	54264	27697	26567	0.16
Puducherry	47973	21997	25976	0.14
Madhya Pradesh	37761	18897	18864	0.11
Andaman & Nicobar Islands	27475	13995	13480	0.08
Uttar Pradesh	24450	12767	11683	0.07
Rajasthan	24439	12819	11620	0.07
Chhattisgarh	23370	11733	11637	0.07
Haryana	14518	7864	6654	0.04
Goa	12983	7153	5830	0.04
Jammu & Kashmir	11248	9869	1379	0.03
West Bengal	10952	5979	4973	0.03
Punjab	9734	6099	3635	0.03
Odisha	9004	4739	4265	0.03
Jharkhand	6549	3365	3184	0.02
Assam	5768	3942	1826	0.02
Arunachal Pradesh	4012	2673	1339	0.01
Uttarakhand	3168	1921	1247	0.01
Nagaland	2916	1995	921	0.01
Dadra & Nagar Haveli	2172	1167	1005	0.01
Chandigarh	1979	1149	830	0.01
Meghalaya	1789	1146	643	0.01
Manipur	1519	1320	199	0.00
Daman & Diu	1229	658	571	0.00
Bihar	1220	680	540	0.00
Himachal Pradesh	1211	792	419	0.00
Tripura	1173	975	198	0.00
Sikkim	899	712	187	0.00
Mizoram	718	521	197	0.00
INDIA	**34838819**	**16712384**	**18126435**	**100.00**

Source: Census of India (2011): State-wise Distribution of Population by Scheduled Languages in India, Part I.

* Including Telangana

Map 1



As many as 84.52 per cent of Malayalam speaking people living outside their home state of Kerala were resident of western coastal states and union territories.

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Geo-Reflections Series-2

Sustainable Development Goals and Some Uneasy Questions

Gopa Samanta, Burdwan

Introduction

Have you ever wondered what the term 'Sustainable Development' really means? It is a term that has been part of the academic and political lexicon for decades, and at some point has become familiar even to a layman. And yet, do we really understand what it stands for?

In today's world, driven by capitalist economies and corporate measures of achievement, our social outlook too tends to follow a management perspective. In other words, we tend to quantify and measure everything, including social well-being. This is why setting measurable goals has become so important in the mission for every state, as well as that of the international organizations like the United Nations. But how far do these goals actually get us? Most of the time, we set goals and fail to achieve them in time, and then set another goal to make up for the first failure, and so on. This seems to be the pattern even with the goals set by the United Nations—be it Limits to Growth, Millennium Development Goals, or Sustainable Development Goals.

Background: Concern for the Environment and Making Promises

Let us go back and examine the historical trajectory of the idea of sustainable development. As civilization started to progress in terms of material well-being, it was increasingly felt that something was going wrong. In the process of understanding this problem, the idea of sustainable development came up. It is probable that the idea of sustainable development emerged with environmental concerns, which started coming in by the end of the 1960s. However, the term itself was not established and properly defined before the Brundtland Commission Report in 1987. The idea was initiated by the ecologist and philosopher Garret Hardin, who wrote 'The Tragedy of the Commons' in 1968. In his own words:

> 'We want the maximum good per person; but what is good? To one person it is wilderness, to another it is ski lodges for thousands. To one it is estuaries to nourish ducks for hunters to shoot; to another it is factory land. Comparing one good with another is, we usually say, impossible because goods are incommensurable. Incommensurables cannot be compared.'[1]

In 1972, a study called 'Limits to Growth' under the prestigious **Club of Rome** predicted the future of the earth with the help of a simulation model and showed a great concern for it,

[1] Garrett Hardin (1968) The Tragedy of the Commons, Science, New Series, Vol. 162, No. 3859, p. 1244 https://www.hendrix.edu/uploadedFiles/Admission/GarrettHardinArticle.pdf

claiming that the economic and social system of the earth will collapse by the end of the 21st century if we do not set a limit to growth. They analysed the growth rate of population, industries, pollution, food production, and the depletion of natural resources, and came to the conclusion that if the then current rate of all these factors continued, the earth could not sustain for long.

In the same year, i.e., in 1972, the United Nations organised the first UN Conference on the Human Environment. The conference declared:

> 'Local and national governments will bear the greatest burden for large-scale environmental policy and action within their jurisdictions. International cooperation is also needed in order to raise resources to support the developing countries in carrying out their responsibilities in this field. A growing class of environmental problems, because they are regional or global in extent or because they affect the common international realm, will require extensive cooperation among nations and action by international organizations in the common interest.'[2]

After a few days of serious discussions and negotiations among the member countries, the conference set out 26 principles. Later on, the idea of the Human Development Index (HDI) came up in 1980, which gave a thrust to enhancing the quality of life rather than on economic growth alone. It was also talked about ensuring minimum HDI in each and every country of the world, and to reduce the ecological footprint per capita.

Finally, in the Brundtland Commission Report (1987), alternatively called 'Our Common Future',[3] the idea of **sustainable development** was formalized and defined in concrete terms under the aegis of the World Commission on Environment and Development (WCED). The document defined sustainable development as, *"the human ability to ensure that the current development meets the needs of the present without compromising the ability of future generations to meet their own needs"*.

In 1988, the Intergovernmental Panel on Climate Change (IPCC) was created jointly by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) to regularly assess the climate change and its impacts on human civilization along with recommending the adaptation and mitigation policies. Since 1990, it has published five comprehensive reports and the sixth one is due in 2022. Later on, the UN also started the Millennium Ecosystem Assessment in 2001, and finally came up with the Sustainable Development Goals (SDGs), which were adopted by all Member States in 2015 as a universal call to end poverty, protect the planet, and to ensure that all people enjoy peace and prosperity by 2030. The 17 SDGs were set in an integrated manner so that action in one area would affect outcomes in others, and ensure that development would balance between social, economic and environmental sustainability.[4]

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[2] http://www.un-documents.net/unchedec.htm
[3] http://www.un-documents.net/our-common-future.pdf
[4] https://www.undp.org/content/undp/en/home/sustainable-development-goals.html

Problematic Definitions

The very definition of sustainable development clearly states to mean '*development that meets the needs of the present without compromising the ability of future generations to meet their own needs'*. This definition given by the World Commission on Environment and Development is problematic, as it does not have any specific clarification on whose needs and whose future it is talking about. We live in a world where 'need' is difficult to generalize. Some peoples' need is a high level of luxury for others. There is no level playing field in this world. There are immense differences between the needs of the people at all spatial scales. In most countries of the world, a high proportion of people cannot afford to pay even for the basic necessities such as food, water, and shelter. And after the Covid-19 phenomenon, the situation has been worsened. The present condition is not enough to meet their needs even for basic survival. Then the question arises: if we fail to serve the minimum needs of the people even now, what exactly are we thinking of when we talk about ensuring the supply of the future. Thus, the question of 'whose future' arises in our mind as soon as we read the UN definition of sustainable development.

Thus, the question of sustainable development can only be addressed when we ensure the minimum needs of the people at present, who are living in precarious conditions in different countries of the world. Otherwise, sustainable development as a concept does not excite much enthusiasm among people like us who are constantly bothered by the rising inequalities around the world in different forms, and in almost all countries. Although, it is talking about all people on this earth, but actually the concept itself takes the side of consumerist societies. This is evident in the way natural resources are being used to keep the supply chain intact for the production and consumption of the rich and upper middle class, but at the cost of the habitation and food of the poor living in marginal locations such as in forests and mineral-rich regions.

Sustainable development is also defined as an economic process. According to this definition, sustainable development is an economic process in which the quantity and quality of our stocks of natural resources (like forests) and the integrity of biogeochemical cycles (like climate) are sustained and passed on to the future generations unimpaired.[5] Like the first definition, this one also talks about ensuring future supply of natural resources and maintaining the integrity of the biogeochemical cycles. Here also the SDG takes a position that everything is okay at present, which is obviously not true. Moreover, it neither considers the unequal distribution of wealth nor the highly skewed quantity and quality of resources accessed by the people at present. None of these are addressed in the definition where we supposedly take a stand to save the future of the earth.

Problematic Conceptualization of Policies

It has been already proved that the earth in its present form and with technological innovation aggravating further destruction of nature cannot remain sustainable for thousands of years.

[5]https://www.downtoearth.org.in/classroom/what-is-sustainable-development-29774

Then, we need to think of using a time frame whenever we are discussing this issue or setting a target. However, if we look at the SDGs and the targets set in that document, we find that in 2015 the UN set a target of 17 goals to achieve by 2030. The 17 SDGs are: (i) No Poverty, (ii) Zero Hunger, (iii) Good Health and Well-being, (iv) Quality Education, (v) Gender Equality, (vi) Clean Water and Sanitation, (vii) Affordable and Clean Energy, (viii) Decent Work and Economic Growth, (ix) Industry, Innovation and Infrastructure, (x) Reducing Inequality, (xi) Sustainable Cities and Communities, (xii) Responsible Consumption and Production, (xiii) Climate Action, (xiv) Life Below Water, (xv) Life On Land, (xvi) Peace, Justice, and Strong Institutions, and (xvii) Partnerships for the Goals.[6] If we try to look into the document as stated under these goals, it is very clear that the goals are too ambitious and there is extreme lack of specificity and clarity in the goals on how to achieve those. The SDGs have an extremely broad scope, as though they seek to leave nothing out, but then they imply that all these can be tackled within a period of 15 years in a very uneven world.

If we start looking at the initiatives taken by the different Governments including India to work for the SDGs, we will find that in case of most of the goals genuine efforts are really microscopic in nature. On the contrary, we are moving in the reverse direction. *Poverty level* is increasing in most of the countries especially in the developing world, where to *counter hunger*; either the public food distribution system or basic income support is not guaranteed. *Good health and well-being* are not supported by the public health system; rather these services are shrinking to make way for private healthcare systems. *Quality education* cannot be attained with the help of a private education system which is affordable only to the rich. *Gender equality* is not prioritized through well-structured policies other than in declaring some token projects with very limited implementation. *Access to clean water and sanitation* services has become a luxury for the poor. Coal-based non-renewable energy is being explored more and more instead of affordable and clean energy. *The status of decent work and economic growth* is experiencing an all-time low in the recent past. *Industry, innovation and infrastructure* are being prioritised mostly under Global capita, where Governments are helping companies to destroy the natural habitat of flora and fauna including the people living in those areas.

Reducing inequality has still not become a priority. This should have been given support through people-centric projects. Rather, the new forms of inequalities are being witnessed. *Sustainable cities and communities* are taking shape as more exclusionary in nature, with real estate development going hand in hand with sky-rocketing land prices, thus facilitating the rich and upper middle class and pushing off the poor from the cities. *Responsible consumption and production* is not at all clear enough on who will be responsible in consumption and in production. Is it the individual or the member states? As a result of this lack of clarity, we cannot expect any action on this, making it a problematic goal like sustainable development itself.

[6] https://en.wikipedia.org/wiki/Sustainable_Development_Goals

Climate Action is not moving at a rapid rate even though we know that the climate itself is changing at a faster rate, and is likely to negatively affect our lives in numerous ways, some of which we probably cannot even conceptualize now. The same powerful and influential countries that are blaming others for not complying with the Paris Agreement are likely the ones who have contributed to the climate crisis in a very big way. *Life below water* aims to 'sustainably manage and protect marine and coastal ecosystems from pollution, as well as address the impacts of ocean acidification. Enhancing conservation and the sustainable use of ocean-based resources through international law will also help mitigate some of the challenges facing our oceans'.[7] However, even after the six years of conceptualization of this goal, we cannot see any large-scale change in the policies of the member countries to save the oceans. Instead, countries continue to use them as a resource pool and dumping ground. *Life on land* says 'urgent action must be taken to reduce the loss of natural habitats and biodiversity which are part of our common heritage and support global food and water security'.[8] The spread of Covid-19 virus might have a connection with the loss of natural habitats and biodiversity. However, the hard truth is that even after witnessing these catastrophic effects on human civilization, member countries continue to destroy natural habitats in the name of development. One such example is the new environment law passed by the Indian Government in 2020.

Peace, justice, and strong institutions are undermined by the authoritarian governments in power in many member countries of the world, and democracy itself is at stake. Lastly, *Goal* raised the implementation criteria, which is called 'Partnerships for the goals'. According to this goal the SDGs can only be realized through strong global partnerships and cooperation.

> 'The goals aim to enhance North-South and South-South cooperation by supporting national plans to achieve all the targets. Promoting international trade, and helping developing countries increase their exports is all part of achieving a universal rules-based and equitable trading system that is fair and open and benefits all.'[9]

The world is more interconnected than ever before, and this is also reflected in the level of unjust deals between countries. It is a new form of colonialism, differently called neo-liberal economy. Poor countries are not going to benefit much from this, other than keeping the global supply chain active in different forms—be it food items, industrial production exploiting cheap labour or the outsourced service sector through IT companies.

For better understanding of the problems, which underlie the very conceptualization of the SDGs, we may take the case of Goal number five, Gender Equality, and try to critically examine it with the help of in-depth analysis of women's empowerment principles.

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[7] https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-14-life-below-water.html
[8] https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-15-life-on-land.html
[9] https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-17-partnerships-for-the-goals.html

Gender Equality and Sustainable Development

Gender equality seeks to ensure elimination of all kinds of discrimination against all women and girls everywhere around the world. A careful reading of the document makes it very clear that this is a goal which is set well, and the necessity of the goal is also well grounded through analysing the need for gender equality. The document makes it clear that gender equality is not just a social issue but it also has a tremendous impact on the economic development of the future world. The idea behind bringing this dimension of economic development is probably to make it more of a priority for the member countries where social discrimination is not at all a concern. Therefore although the goal touches upon the human rights perspective, it seems to be more interested in the economic development aspect of gender equality. In this context this goal shifts its priority from just for the sake of individual women to the prospects of the global economy, the environment, and society at large.

Although it is nice to have a perspective of exploring the relationship between women's empowerment and the global economy, the problem is that the goal is inclined heavily towards the side of economy rather than human rights, an important priority. For the last few decades, the catchword 'women's empowerment' has always been prioritized where more attention is accorded to income generation of women. Although this is a good parameter for women's development, scholars around the world have shown that the relation between women's income and their empowerment does not work in a linear fashion. Unless the social structure changes, thereby ending the perspective of looking at women as subordinate human beings, their empowerment will remain as just a goal to meet. Therefore, giving more weightage to empowerment is problematic within the SDGs. Unless the socio-political system is completely restructured within these countries, mere access to a little income, which is again discriminatory on the basis of gender, will not bring equality. Moreover, the conceptualization of equality instead of equity is also another problem in case of eliminating gender-based discrimination.

The gender question itself varies from country to country. It is difficult to think about a universal solution to all kinds discriminatory practices that exist in different forms across countries. Moreover, the situation varies within both developed and developing countries and that is why feminists' current agenda is more of 'intersectionality' within feminist ideology. However, planners and policy makers prefer universalisation and treat the world as even and flat, by invisibilising the immense differences within countries and communities. These differences are more rooted in social context than in the economic one.

Reading the women's empowerment principles under the gender equality goal of the SDGs gives a feeling like a 'should do' list given by the Father of a church where nobody believes in the existence of God. Critical analysis of those principles gives clear insight into how superficially the policies are framed to bring gender equality. These are discussed below:

1. *High-Level Corporate Leadership*: This empowerment principle wants women in high-level corporate leadership but does not convey how it can be achieved. It is still in the model of 'add women and stir'. The corporate world itself is the epitome of an unjust practices, where expecting bias-free decisions is like chasing a mirage in a desert.
2. *Treat all women and men fairly at work without discrimination*: Under this principle several measures are proposed, such as equal wage, gender sensitive recruitment, and care services to facilitate women to enable them to retain their work. However, in reality we need to understand why women are forced to accept lower wages than that of men for the same work. Without analysing the structural inequality existing within the household by putting the responsibility of care and domestic work completely with the women, these kinds of measures will not have any impact on the lives of millions of women around the world. They cannot leave the house for better wages elsewhere because of their domestic responsibility. Moreover, women are mostly engaged in informal workspaces where discrimination is endemic.
3. *Employee health, well-being and safety*: It proposes a zero-tolerance policy against all forms of violence and sexual harassment at work, and to ensure health and safety as mandatory well-being. In reality we know that only a miniscule portion of women workers can raise their voice against such problems and the reasons are more social and structural in nature. 'Me too' movement has shown how unequal the workspaces are, as well as the level of exploitation within those areas. Women took years to even talk about it.
4. *Education and training for gender equality*: This seems to be a significantly important principle for empowering women. However, there is no clear-cut policy on how the state will ensure education and training for girls. We can see only a few token programmes like the 'beti bachao – beti padhao' in India without substantially grounded implementation strategies. Discriminatory gendered practices in the arena of education and training are rooted in patriarchal structure and the reasons are many. Without addressing those structural problems, this principle cannot work.
5. *Enterprise development, supply chain and marketing practices*: Ensuring this principle needs a high level legal framework against marketing principles and practices which are controlled by multinational companies in the present world. It also asks for systematic depiction of women and men as empowered actors with progressive, intelligent and multi-dimensional personalities. When the states are run by the dictates of such corporate houses, how can we expect gender-just policies from them?
6. *Community initiatives and advocacy*: Asking for community initiative to reduce gender inequality and to bring in women's voices in consultation and advocacy is a problematic idea, as almost all the communities have a patriarchal structure which is highly biased towards the male voices of the community.
7. *Measurement and Reporting*: This principle emphasizes collection, analysis and use of gender-disaggregated data to measure and report results. Many member countries

still do not collect gender disaggregated data in most cases, so that they can cover up gender-based discrimination in practice. It also indicates that sharing lessons learned and good practices will help in other areas in the women's empowerment programme. However, in reality it is observed by scholars that copying good practices in one space does not work in other spaces of different socio-political environments. For example, copying the microfinance model of women's self-help groups from Bangladesh and using it in many other developing countries did not work well.

From the above analysis it seems to be quite clear that we can only attain the goal of gender equality under the broader goal of SDGs if the social and political structures do change and become sensitive enough to address the gender questions in the specific context of member countries. Otherwise, all these women's empowerment principles have no value in the lives of women, which constitute half of the population of the world.

Conclusion

Under the question of sustainable development it is also expected that people learn from their mistakes and rectify them. The level of rectification vis-à-vis achievement will be dependent on the level of understanding the mistakes. However, in a complex world dominated by neoliberal market economy, how can we expect that the decision makers will learn from their mistakes? The very reason that they will never learn, is that the decision makers are not going to suffer. In contrast, the sufferers do not have any decision making power, as in most cases they are poor and marginal communities and are easily silenced by the oppressive state machineries in nexus with the political power structure. Therefore, the idea of learning from mistakes is an almost impossible proposition. Although it was proposed that the state will take initiative in consultation with the local community, the Governments backed by corporate capital are unable to do so in most of the countries of the world. The ruthless exploitation of natural resources will continue, to meet the needs of the consumerist societies by increasing displacement and poverty of people, and will create new axes of inequalities. The gap between who learns from mistakes and who makes decisions is relevant at all levels of governance, and there is no sign in the near future that this gap can be mended, thus making sustainable development goals unsustainable in the longer term.

The same is true for setting goals. The goal-setters, like planners, in most cases are either not aware about the ground reality or they do not have enough sensitivity to address the gross anomalies across countries. However, the UN as an international body will continue to make goals which will never be fulfilled. It is just like a ritual that does not have much effect on the change of ground situations. Is there any modality in the hands of the UN to enforce these goals? We all know the answer—it is just like the pre-election campaign agenda in India. There is no compulsion to follow after the election is over and another set will come before the next election! We can just wait till 2030 to have another goal to replace the SDGs.

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BOOK REVIEW

R.S. Dixit (2019): Bundelkhand-Born, Lucknow-Geographer, Akansha Publishing House, Delhi, pp.xvi+223, Photographs 46, Price Rs.800/-(ISBN 978-81-8370-525-4)

The book under review is quite interesting in the sense that by reading the title of the book one will assume that it is a personal journey or biography of some individual. However, while scanning through the book one is bound to an entirely different opinion about the book. While moving through his personal life, academic and professional achievements, and personal experiences, the author has tried to encompass a broad canvas covering various facets of the discipline of Geography in general and Marketing Geography, in particular. When ever the author of the book under review went to attend Conference/Seminar/Symposia in India or abroad, he has tried to incorporate the meetings, discussions and debate he had with well-known geographers in concise details.

The author of the book, Dr R.S.Dixit, is former Head, Department of Geography, Isabella Thoburn College, Lucknow. He has made a significant contribution to the development of Marketing Geography through his teaching and research. His is the largest contribution by any Indian Geographer to teaching and research in Marketing Geography. He contributed numerous research paper published in the research journals and edited volumes in India and abroad. He visited several countries to attend conferences, chair sessions, special invitee and working group member. He has reproduced in the book his discussions and meetings with eminent geographers of several countries such as England, France, Germany, China, and Japan. He has also listed his research contribution done in the field of Marketing Geography. Also, he has shared his teaching experiences relating to Marketing Geography.

There is a comprehensive list of research work Dr Dixit has accomplished in the field of Marketing Geography. May it be the sponsored research project he completed and books or research papers published. Hence, the book is expected to prove highly useful for those interested in this branch of Geography.

Moreover, his personal life and academic achievements are highly inspiring. How a lean and thin boy born in a dusty village of the Bundelkhand region in Uttar Pradesh travels through his life journey, completes his education, did his doctoral research from the University of Allahabad and finally settled at Lucknow, the core centre of Awadh politics a nd culture.

On the whole, the book is not simply a biography of a geographer but a serious scholarly attempt to peep into the field of Marketing Geography from a teaching and research point of view. The book will prove quite interesting and useful for those interested in teaching and research Marketing Geography.

Surya Kant

A TRIBUTE

We are saddened to share with you that the Association of the Population Geographers of India (APGI) has lost its four Life Members between the December 2020 issue and the present one (June 2021) of our journal, **Population Geography**. While remembering their active participation and the good work done by them to strengthen the APGI, the members of the **Executive Committee** of the APGI and **Editorial Board** of the Population Geography journal, offer their sincere condolences to the departed souls and their families. May their souls rest in peace.

(Goodbyes hurt the most when the story was not finished)

L-24	Principal (Mrs.) Pushpa Ojha (Retd.), # 143, Sector 11-A, Chandigarh
L-135	Prof. Randhir Singh Sangwan, # 16-O "Suraj Villa", Sector-2, Rohtak-124001 (Haryana)
L-165	Dr. (Ms.) B. Hymavathi Reddy, "Om Sai" 1st Cross, Saptapur, Dharwad - 580 001 (Karnataka)
L-170	Dr. Darbara Singh Tiwana, # 90-B, Sarabhanagar, Bhadson Road, Patiala-147 004

Note: On the next page, we have published an obituary of Mrs Pushpa Ojha, contributed by her family members and friends

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IN REMEMBRANCE

Pushpa Ojha (1936-2021)

Mrs Pushpa Ojha, popularly known as Mrs Ojha among her colleagues, friends, well-wishers and admirers, is no more with us. She left for her heavenly abode on March 14, 2021, after a brief illness. She passed away at PGIMR, Chandigarh, where she was admitted due to ageing and other health issues. In her, we lost one of the senior-most life members of the Association of Population Geographers of India (APGI). She was very methodological and always punctual and regular in attending the meetings and often made apt suggestions for the furtherance of the goals set to be achieved by the APGI. We will not be able to see her ever-smiling face and relentless spirit to see APGI at the top of the professional world as an organization of the social scientists in general and demographers and population geographers in particular, but her sincere, mature and judicious counsel will always be there to guide us in our endeavours.

Born in 1936 at the residence of her maternal grandfather in the Multan Cantonment (now in Pakistan), where he was posted as an Army Officer. Her schooling was done from the best schools of the time. Her father, Shri Kesar Das, was a successful businessman, and a champion of women freedom and education. Her elder brother, Shri Radha Krishan, who had a keen interest in geography, did his graduation, with geography as one of the subjects, from Forman Christian College, Lahore. Later on, he did his Masters in Geography. Thereafter, he joined Punjab Education Service (PES) to serve as a Geography Lecturer in Government colleges of the then Punjab. He cultivated his younger sister's interest in Geography and motivated her to do Masters in Geography.

She did her Masters in Geography from the Government College, Ludhiana (then known as University College) in 1957, the year Shri O.P.Sarna joined the Department as a Cartographer. She was taught by Professors A.N. Kapur, O.P.Bhardwaj, Raja Ram, J.C. Sen and G.S.Gosal.

Beyond studies, she had a keen interest in college-level debates, discussions and above all this, she was a fine sportswoman. She was a born athlete, and had college colours from Government Colleges, Rohtak and Ludhiana, indicated by the wearing of a special tie or blazer.

Soon after the declaration of results, she was appointed as a Lecturer in Geography at D.A.V. College, Karnal in 1957. As we all know that college lecturers, in almost all parts of India, are known as Professors. She too was a Professor of Geography at D.A.V. College, Karnal. Soon she moved to Government College, Hisar after getting into the Punjab Education Service (PES). Enthralled by her teaching methodology and the hard labour put in, several students got attracted to Geography. Inspired by their teacher, Professor Pushpa Ji, many of them decided to do Masters in Geography and later became highly successful in their academic and/or professional careers. One such of her students is Dr R.C.Chandna, Formerly Professor and Head, Department of Geography, Panjab University, Chandigarh and an international known Population Geographer.

However, she was destined to accomplish much bigger responsibilities of founding departments and institutions; soon she was transferred to the Government College for Girls, Sector 11, Chandigarh to establish a new Department of Geography as its founder Teacher/Professor/Head. In 1985, she was appointed as the Principal, Government College for Girls, Sector 42 to stay as the Principal till 1991. The entire infrastructure took a concrete shape under her supervision as a Principal of the College. In 1991, she was transferred to Government College for Girls, Sector 11, Chandigarh wherefrom she superannuated in the year 1994. She is known for streamlining the college administration, laying down the procedures and bring out transparency in the system. It was her administrative acumen that she was honoured with the coveted position of a Member of the State Consumer Commission, Chandigarh Union Territory Administration for five years. Also, Chandigarh Union Territory Administration honoured her as an educationist and administrator par excellence for her distinctive contribution.

She was a devoted wife of an equally bright academician-bureaucrat, Shri Brahma Swarup Ojha. As an I.A.S. officer, working at different positions in the Government he retired as the Chief Secretary, Government of Haryana. Mrs Ojha was a proud mother and fine homemaker. The couple has two daughters and two sons. Dr Anita Kaushal, the eldest daughter, is married to Shri Sarvesh Kaushal, Ex-Chief Secretary, Government of Punjab. She is currently the Principal of the same college from where her mother superannuated as the Principal way back in 1994. Another daughter, Namita, is married to another top bureaucrat Shri Sanjeev Kaushal, Additional Chief Secretary, Government of Haryana. Their elder son, Sandeep, is a successful businessman, based in Delhi, and their younger son, Rajiv, is working abroad. Mrs Ojha left behind a legacy of successes, distinctive achievements, and a model family life.

May her soul rest in peace

(Contributed by Shri B.S. Ojha, her husband, Dr, Anita Kaushal, her daughter and Mrs Shashi Sharma, her student, colleague, and a friend)

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I, Surya Kant, hereby declare that the particulars given above are true to the best of my knowledgeand belief.

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