



A Study of Spatio-Temporal Distribution of Population in Kumbhi River Basin, Kolhapur District, Maharashtra State

Dr.Rajekhan Shikalgar

Associate Professor, Department of Geography, Rajaram College, Kolhapur

Miss. Snehal Karpe

Ph.D. Research Student, Department of Geography, Shivaji University, Kolhapur

Abstract:

Population growth is an increase in the size of the population. This growth is one of the major concerns of the modern world. Therefore, it is necessary to study both population growth and the space occupied by the population. As the population grows, so will the pressure on natural and human resources. Therefore, it is important to know the trade of the future population in order to properly plan for the basic needs of future human development. The purpose of the study is to know the distribution of population and the growth of future population in Kumbhi river basin. Decadal variation of Population growth and least square methods are used to study the population growth and projection respectively. Also, to study the distribution of population, various criteria were created using population and population density variables. Although population growth has been continuously increasing in the Kumbhi River Basin along with India and Maharashtra, it seems to be declining in 2011 as compared to 1971. The population density is higher on the north-eastern side of the Kumbhi river basin. In terms of population density, Sangrul villages have the highest population density and Kuditre and Kale villages have medium density.

Keywords: *Population Distribution, Population Growth, Population Projection*

Introduction:

Population growth is a demographic feature which helps to predict future demographic features along with population change. (Singh.S, 2013) Population projection is an old field of study and its main purpose is to predict the future. (Varma, 2021). Population growth and distribution are the two main key concerns in population studies. When studying population distribution, distribution refers to the proportion of population in an area. (Kumar, 2018) Population estimation is important for government, business and research communities to achieve various objectives. (Chi, 2017) Population estimates are used for planning in both the public and private sectors, as well as to help predict any risk. (Rafterya, 2021)



The world's population continues to grow, the population was only 5 billion in 1986. It has grown to 7 billion in 2010 and 7.8 billion in 2020. The world's population is projected to grow by about 9.7 billion by 2050. (Gu, 2021) The population of India is 1229 to 1290 million in 2016 and 1314 to 1477 million in 2020 and is estimated to be between 1295 to 1889 in 2051. (Retnakumar, 2018) The population of Maharashtra was 11.23 crore as per 2011 census. Maharashtra has a share of 9.42 percent of India's population. The decadal population growth in the state of Maharashtra was 25.7 percent from 1981 to 1991. From 1991 to 2001, it declined slightly to 23.37 percent. This decade has seen very high growth rates in Pune, Thane and Aurangabad districts. Also, from 2001 to 2011, the percentage of population growth has come down to 16.1 percent. The growth rate of the Konkan, Mumbai, and Ratnagiri, districts have declined in the last decade. (Sule, 2011)

The world's average population density increased from 23 people per square kilometre in 1960 to 56 people per square kilometre in 2018. That's 2.69 times the density of the world's average population overall. (Li, 2018) India is the second most populous country in the world after China. It covers 2.42 percent of the world's land area and 17 percent of the total population. Maharashtra is the second most populous state in India with a total population of 11.24 crore and a density of 365 people per square kilometre. (Vyalij, 2020)

The total population of Kolhapur district is about 38, 76,001 in 2011. (District Census Handbook, 2011). Krishna, Warna, Panchganga, Dudhganga, Vedhganga, Hiranyakeshi and Ghataprabha are major rivers flowing through Kolhapur district. Kumbi, Kasari, Tulsi, Bhogavati are the tributaries of Panchganga river and the basin of these rivers is mainly spread in the hilly regions of Shahuwadi, Panhala, Radhanagari, Gaganbawda, Karveer talukas of Kolhapur district. In the present paper, the Kumbi river basin has been selected to study the population characteristics of hilly regions.

Objectives:

- To study the spatio-temporal population distribution in Kumbhi river basin

Data Source & Methodology:

The study of this paper is based on the secondary data. The population data obtained from the district census handbook of Kolhapur district. The Cartosat 1 DEM model is used to understand the shape of the Kumbhi river basin, using Dem data and the GIS Tool. The ArcSwat model is used to delineate the watersheds. The following formula is used for the analysis of population growth, distribution and population projection.

1. Decadal Population Growth:

$$R = \frac{P_2 - P_1}{P_1} * 100$$



R= Population Growth Rate,

P2 = Population of the next year,

P1= Population of base year (Shama, 2020)

2. Population Projection:

The Least square method is used to calculate the population projection in Kumbhi river basin.

Normal equation for a: $\sum Y = na + b\sum X$,

Normal equation for b: $\sum XY = a\sum X + b\sum X^2$

Y = Population

X = Decade Years

XY = Multiplication decades years and

Population X² = Decade Years Square

After solving both the equations, a trend line is obtained using the formula:

$Y = a + b(x)$ (Uddin, 2020)

3. Population Distribution:

To show the distribution of population, four criteria were created using population and population density variables with the help of the GIS framework, and villages were selected on that basis Criteria used to select the villages:

Criteria used to select the densely population villages:

- Consistently 400/km² population density in 1971-2011
- 500/km² population density in 2011
- Consistently 5000 population density in 1971-2011
- Population >8000 in 2011

Criteria used to select the moderate densely population villages:

- Consistently 200/km² population density in 1971-2011
- 250/km² population density in 2011
- Consistently 2500 population density in 1971-2011
- Population >4000 in 2011 (Shikalgar, 2017)

Study Region:

The Kumbhi river basin has been selected for this study area. There are five tributaries of the Panchganga River in the Kolhapur district, one of this is the Kumbhi river basin. The Kumbhi River originates in Lakhmapur village in Gaganbawda taluka. This river flows from west to east through Gaganbawda, Radhanagari, Panhala and Karveertaluka. Survey of India (SOI) toposheet figures 47H/14, 15 and 47L/2 by the scale of 1: 50000. The Kumbhi river flow includes various physical features. It has various features like hilly areas, moderately slopes,

flat areas and deep rivers valley. It is also covered with Laterite soil, reddish brown soil, and black soil. There is a tropical climate. The hilly part of the Kumbhi river basin is covered by the semi-evergreen forest, and deciduous forest. (Patil, 2019)

The latitudinal extent of Kumbhi river basin is 16 degree 24 minute 52 north to 16 degree 44 minute 3 second north and longitudinal Extent is 73 degree 49 minute 31 second east to 74 degree 7 minute 15 second east. The basin area of the Kumbhi river extends over 511 square kilometres.

RESULT & DISCUSSION:

I] Growth of Population:

A study of population growth in the basin of the Kumbhi River has shown that it has been increasing continuously from 1971 to 2011. The Kumbhi river basin has a population of 81,311 as per the 1971 census. The highest population growth since 1981 is 19.8 percent, after 1971. In 1991, the population again increased by 17.8 percent, but it was less than the previous rate. After 2001, only 7.3 percent of the population grew in 2011, which means that the overall average population growth rate is much lower than before. (Table 1)

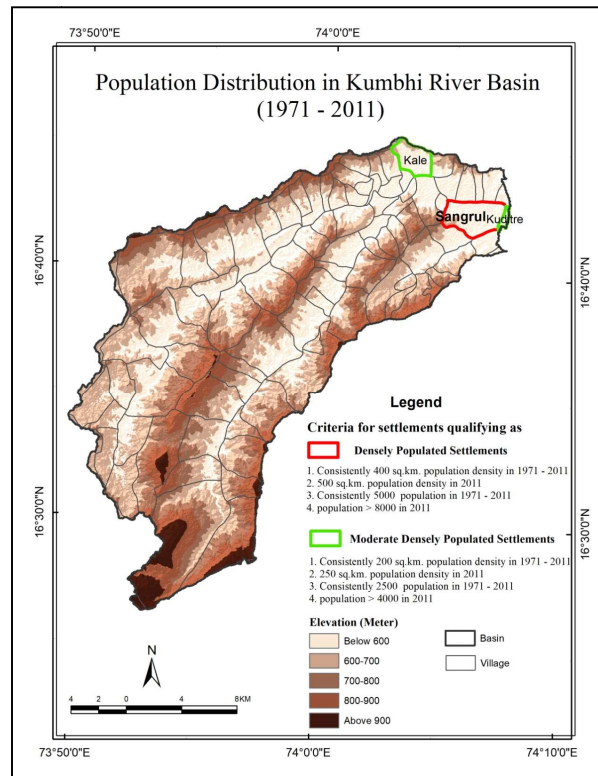
Decadal Growth Rate /Year	1971	1981	1991	2000	2011
Kumbhi River Basin	24.88	19.81	17.89	14.01	7.37
Maharashtra	27.46	24.54	25.74	22.73	15.99
India	24.8	24.66	23.87	21.54	17.64

Source: Calculated by author

After studying the growing population as a whole and estimating how much it will increase in the coming year, we can see that it has increased to 1,59,370 in 2021. In the future, population growth is expected to slow down to 2,05,953 in 2051. (Table 2)

Year	1961	1971	1981	1991	2001	2011
Actual Population	65115	81311	97412	114831	130917	140561
Year	2021	2031	2041	2051		
Estimated Population	159370	174898	190425	205953		

Source: Calculate by author



II] Population Distribution:

The Kumbhi river basin covers a total of 103 villages. A total of 3 villages with a densely population and moderate densely population were selected using four criteria. The village of Sangrul, which has a dense population, was highlighted. These villages have a population of over 5000 and a population density of over 400 from 1971 to 2011. Sangrul village is situated near the confluence point of Kumbhi and Bhogawati River. It is considered to be the main market of 12 hilly villages and surrounding small villages. There are mainly police stations, government hospitals, banks, post offices, bus stops, high schools and colleges, as well as mini-lakes and Jyotiba hills for tourism, so the attraction of the people is seen in this village. The moderate dense population includes the two villages of Kuditre and Kale, consistently showing a population of over 2500 and a population density of over 200 from 1971 to 2011. Due to the establishment of the KumbhiKasari co-operative Sugar Factory on the banks of river Kumbhi in Kuditre village, this place has a large population based on agriculture. Kale village is connected by state highways 115 and 127 networks, with the availability of primary amenities and a large market. According to 2011 census, the lowest population is found in Gothane, Salwan, Mhalunge Yard Asandoli, Talewadi, Menganewadi(n.v), etc. and the lowest population density is found in Manbet, Olavan, Gothane, Narveli, Tailyekh, Borbet etc. (Fig.1)



Conclusion:

- Although population growth has been continuously increasing in the Kumbhi River Basin along with India and Maharashtra, it seems to be declining in 2011 as compared to 1971.
- The population density is higher on the northeastern side of the Kumbhi river basin. In terms of population density, Sangrul villages have the highest population density and Kuditre and Kale villages have medium density.
- The estimated population in the Kumbhi river basin is growing continuously and the use of this information will facilitate future population growth in terms of control, planning, and policy-making.

References:

- Chi, G. (2017). Population projection accuracy: The impacts of sociodemographics, accessibility, land use, and neighbour characteristics. *Population Space and Place*, 24(2), 11.
- Gu, D. (2021). Major Trends in Population Growth Around the World. *China CDC Wkly*, Volume 24 (Issue 5)..
- Kumar, A. (2018). Spatio-temporal Analysis of Demographic Characteristics: A Case Study of Samastipur District, India. *American Research Journal of Humanities and Social Sciences*, Volume 4 (ISSN (Online) : 2378-7031), 14 pages.
- Li, M. (2018). Study on Population Distribution Pattern at the County Level of China. *Sustainability*, Volume 10.
- Patil, A. (2019). *Geological and Geomorphological Study Of Kumbhi River Basin Kolhapur District Maharashtra, India*. Theses, Swami Ramanad Teerth Marathwada University, Geology, Nanded.
- Rafterya, A. (2021, October 7). Probabilistic population forecasting: Short to very long-term. *International Journal of Forecasting*, pages 25.
- Retnakumar, J. (2018). Medium Term Population Projection For India, States And Union Territories, 2001-2051.
- Shama, Z. (2020). Resilient Housing System Strategies: Baghdad Governorate As a Model. *The Fourth Postgraduate Engineering Conference*, Vol. 745 (Issue 1).
- Shikalgar, R. (2017, January 1). Drought Assesment And Monitoring Using Remote Sensing Data In Man River Basin, Maharashtra. *Sécheresse*, Pages 148.
- Singh.S. (2013). District - wise Growth of Population in Western Himalayan states of India', 1981-2011. *International Household Survey Network*, Volume 1 (Issue 6).
- Sule, B. (2011). Growth of Population Change In Maharashtra(India). *Geoscience Research*, Vol. 2 (Issue 2), pp-70-75.
- Uddin, M. (2020). Modeling On Population Growth and Its Adaptation: A Comparative Analysis Between Bangladesh And India. *Applied and Natural Science Foundation*, Volum 12.
- Varma, A. (2021). *Population Projection Techniques And Demographic Changes In Indian Population A Bayesian Study*. Theses, Banaras Hindu University, Statistics, Uttar Pradesh.
- Vyalij, P. (2020). Maharashtra: Population Growth, Distribution and Density (Spatio-Temporal Analysis). *INTERNATIONAL JOURNAL OF RESEARCH CULTURE SOCIETY*, Volume-4 (Issue-6).