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Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.isrj.org

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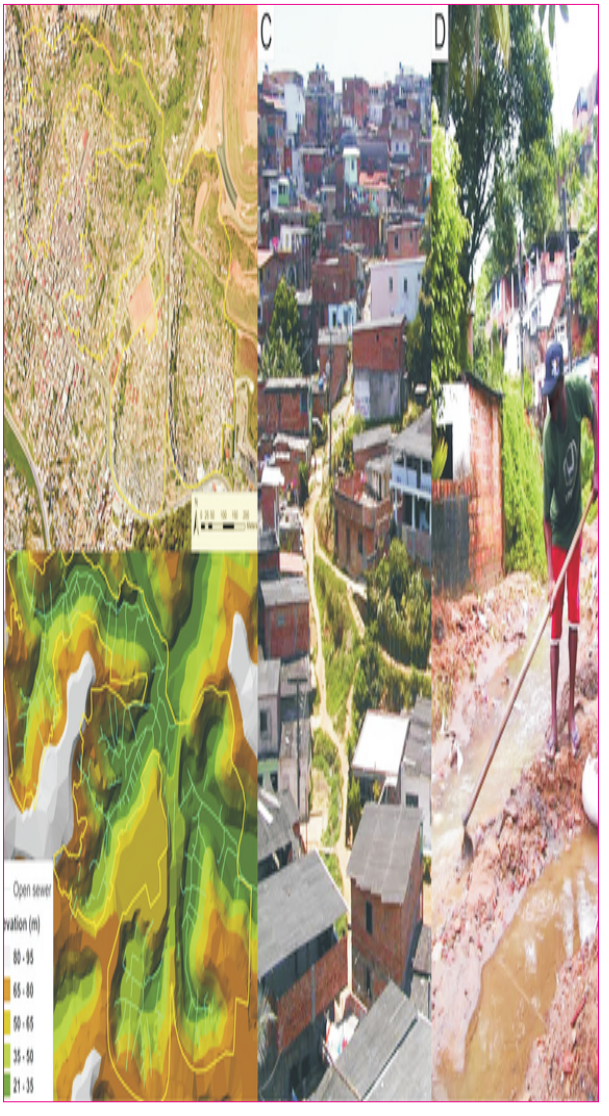
SPATIO-TEMPORAL VARIATION IN DENSITY OF POPULATION: A GEOGRAPHICAL STUDY

Dr. S. B. Ashture



ABSTRACT

Density and distribution of the population is one of the basicelements to understand population Geography at regional level.Density and distribution have quite interrelated terms and used simultaneously. While distribution refers to the way people are spaced over the surface of the Earth. In the other words, it emphasizes thepattern of actual place location of a population.The spatial spread of population in the world is not ubiquitous. It is fact that there are wide regional contrasts in the degree ofconcentration of population. Some tracts of the world are overcrowded (Ecumene) while there are some parts of land are practicallyuninhabited or very sparsely populated (non-ecumene).While thedistribution of population is studied in terms of density assuming evendistribution of population over a given area. The density of population also varies at both time and space.According to 2001 census, the density of population for Aurangabad district was 289 persons per sq. km. This was significantly lower than that of state of Maharashtra (314) and India (329).This was due to low degree of industrialization and urbanization in the study region comparing to the rest part of the state. However, density of the region remained low from 1951 to till 2001.

KEYWORDS:*Spatio, Temporal, Regional Variation, Population.*

INTRODUCTION :

The interaction between geographical factors and populationphenomena is very complex and that is why broad generalizations may be possible to made. Geographical factors such as terrain, climate, availability of water, soils and energy resources very crucially controls on distributional pattern of population. The nature of difficult terrain and high altitude, excessively high or low temperature regions

have generally low population densities. Precipitation and nature of soils affects the degree of erosion, land use and economic activities and it impacts on population distribution. Availability of water minerals and energy resources also exerts a pull on population. The power of an area to attract and support population may also be influenced by its location and space relationships.

Socio- economic factors also plays significant role indetermining the distribution of population on land. Type of economy may be agrarian or industrial it has special effects on population.Technological developments have strength to attract population in a particular area. According to James "the significance to man of the physical features of the land is determined by culture and therefore any change in the attitudes, objectives or technical abilities of the people inhabiting an area requires a revaluation of the significance of the land". Social form, standard of living and decision, policies made bygovernment are strong factors for altering the distribution of population.

The changes in the distribution and density of population take place through variations in the rate of natural increase and also through the medium of migration between areas. Thus the demographic factors of vital rates and migration introduce another dimension to theinventory of determinants of population distribution and density.

OBJECTIVES:

1.To study density of population
2.To study spatio-temporal variations in density

DATABASE:

The present research work is based on primary & secondary sources. Therefore required data is collected from field work and from following sources

1.Censes of India, district censes hand books 1961-91
2.Socio economic abstracts of Aurangabad district of the year 1961-2001
3.Gazetteer of Aurangabad district –1972.
4.Annual vital statistics report of Maharashtra state, DeputyDirector of Health, Pune.
5.Censes of India, provisional population totals – 2001.
6.Government of Maharashtra, socio- cultural tables,migration tables of the year 1961-91.
7.Indian council of medical research, New Delhi.
8.The Director of remote sensing, Nagpur.
9.Published, unpublished maps, information and reliable data of I.I.P.S. Deonar, Mumbai, J. N. Library, University of Mumbai, Tata research instutite, Mumbai and Gokhale research institute in economics and politics, Pune.

METHODOLOGY:

In the present study taluka level has been considered as a basic unit for investigation. The study of spatio temporal changes inpopulation includes density and distribution, growth rates, sex and age composition, literacy and occupational structure, population projections and urbanization in the study region. It has been carried out from1961-2001.

Data collected on such aspects of population is tabulated,processed and given spatial dimensions. Most of the studies under reviews were designed in areal differentiation paradigram based on the conventional method of analysis. The areal patterns were displayed by using simple cartographic techniques followed by description ofpatterns which emerged on thematic maps.

The density of population is calculated to analyze the degree of population concentration. It is expressed in various ways to knowpopulation and resource relationship.

1. Arithmetic density = Total population / Total area (sq. km.)

The correlation between population density and releif as well aspopulation density and rainfall is analyzed by using Karl Pearmans Product movement method.Formula is as following-

$$r = \frac{\Sigma XY - \frac{\Sigma X \Sigma Y}{N}}{\sqrt{\Sigma X^2 - \left(\frac{\Sigma X}{N}\right)^2} - \sqrt{\Sigma Y^2 - \left(\frac{\Sigma Y}{N}\right)^2}}$$

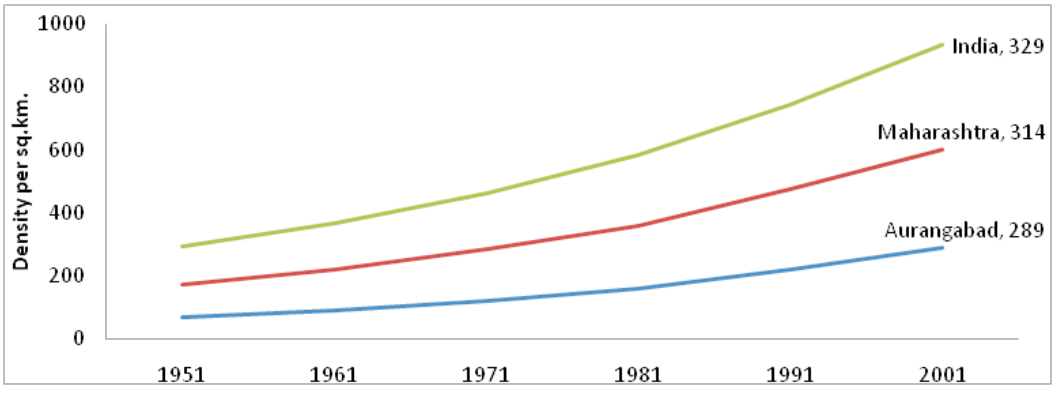
Temporal variations in density of population

According to 2001 census, the density of population for Aurangabad district was 289 persons per sq. km. This was significantly lower than that of state of Maharashtra (314) and India (329).This was due to low degree of industrialization and urbanization in the study region comparing to the rest part of the state. However, density of the region remained low from 1951 to till 2001 but table no. 1.1 shows that there was continious increase in the density of the study region (Fig. no. 1.1).

Table No. 1.1 Aurangabad District -Temporal Variations in density of Population (1951-2001) (Persons Per sq. km.)

Year	1951	1961	1971	1981	1991	2001
Aurangabad	71	92	122	159	219	289
Maharashtra	104	129	164	204	257	314
India	121	147	177	220	267	329

Source- census of India- 2001



Regional variations in density of population:

The arithmetic density of population in Aurangabad district was 71 persons per sq. km. in 1961 which increasedto 289 persons per sq. km in 2001.Table no. 1.2 reveals that there are wide variations in the rate of increase in density in different parts of the district since 1961.It is clearly understand that the rate of increase in density was highest in Aurangabad tahsil, this is due to high industrialization and consequent urbanization. During the period of fifty years density increased by eight times in Aurangabad tahsil. According to 1961 density of the district was ranging between highest in Gangapur tahsil with 123 persons to lowest in Paithan tahsil with 82 persons per sq. km.

Table no. 1.2 -Aurangabad District -Regional variations in density of population (1961-2001)

Talukas	1961	1971	1981	1991	2001
Aurangabad	105	219	230	516	874
Khuldabad	95	130	135	168	208
Kannad	84	118	124	163	192
Soegaon	63	77	95	112	138
Sillod	86	125	147	193	235
Paithan	82	119	131	170	201
Gangapur	123	113	123	144	213
Vaijapur	83	140	116	186	220
Fulambri	-	-	-	-	222
District	92	122	122	219	289

Source- census of India- 2001.

According to 1971, density of the district was recorded with 122persons per sq. km which was ranging between 219 in Aurangabad tahsil to 77 persons in Soegaon tahsil. In 1981, density of the district increased to 159 persons per sq. km. All tahsils have registered density between the range 147 in Sillod to 95 in Soegaon.All tahsils haverecorded increase in density of population since 1961 to 2001 except in Vaijapur tahsil between 1961-71 density declines to 113 persons per sq. km. Average density of the study region was 219 persons per sq. km. Aurangabad tahsil registered highest (516) and lowest density was in Soegaon tahsil (112).

SPATIAL VARIATIONS IN DENSITY OF POPULATION:

According to 2001, study region have recorded 289 persons per sq. km. Taluka level density varies from 874 persons in Aurangabad tahsil to 192persons in Kannad tahsil. Density above 200 persons per sq. km. was found in Sillod, Fulambri, Vaijapur, Paithan and in Khuldabad tahsil.

Correlation of coefficient between density of population and releif and between density and rainfall is calculated using Karl personsproduct movement method. Correlation between density and relief is + 0.48, between density and rainfall - 0.17 which is negative correlation between those attributes.

PHYSIOLOGICAL DENSITY:

The arithmetic density which gives a simple quantitativerelationship between man and land, which cannot offers correctimpression regarding population pressure on land. To assess thepopulation pressure on land at true manner, it becomes necessary to analyze population in relation to cultivable land. Physiological density is a ratio between total population of the region and the total cultivated or cropped area of the region. It is quite useful for the region whose economy is based on agriculture.

Table no. 1.3 is showing tahsil wise Physiological density of the study region since 1961- 2001.The physiological density was 119persons per sq. km. according to 1961 in Aurangabad district. It was ranging between 87 in Soegaon tahsil to 208 in Aurangabad tahsil. In Aurangabad, Kannad (123), and in Sillod (118). Physiological density was found to be high, probably is due to low proportion of area under cultivation and use of land in nonagricultural sectors.

Accordingly to 1971, average physiological density of the study region was counted with 158 persons per sq. km. comparing to last decade it has increased. However there were wide variations inphysiological density at taluka level. High density again was found in Aurangabad tahsil (312) and lowest was in Vaijapur tahsil (115). All tahsils have registered an increase in density. In 1981, Physiological density of the district was 194 persons per sq. km. District follows same pattern as per 1971 in Physiological density.

Physiological density per sq. km. was reached to 291 persons from 194 persons in 1991. It was highest in Aurangabad tahsil (789) and followed by Sillod (248), kannad (247), and Soegaon (238).Lowest density was observed in Gangapur(193) and Vaijapur tahsil(157) those tahsils are known to be agricultural prosperous regions so area under cultivation is major and hence low Physiological density is found.

Spatial variations in physiological density:

According to 2001, Physiological density for the district as a whole was 404 persons per sq. km of cultivable land. The lowest density was found in Sillod tahsil with 272 persons and highest was in Aurangabad tahsil with 1074 persons per sq. km. Soegaon is another tahsil where high physiological density is found with 307 persons per sq. km., it may be due to low proportion of cultivated land and low fertility of soils and raugh terrain. In Aurangabad tehsil due to growingindustrialization and urbanization land use pattern has changed decade to decade. Agricultural land is turning into nonagricultural use. Such uses of land reflecting continuously increase in density through thisregion since 1961.

Agricultural density:

Agricultural density is fundamental tool to assess agriculturaldevelopments and to find clear and realistic picture of the pressure ofpopulation on land. Therefore it is expressed in terms of agriculturalpopulation per unit of cultivated area.

According to 1961, within the study region agricultural density was 49 persons per sq. km. Highest density was observed in Aurangabad, Sillod tahsil (57) and lowest was in Soegaon, Vaijapur tahsil (45). In 1971, Agricultural density of the district was decreased to 45 persons per sq. km. of cultivable land. The study region was ranging between 36 in Vaijapur tahsil to 56 in Aurangabad tahsil. Other tahsils namely Kannad Sillod (49)and Soegaon (46) tahsils also counted low agricultural density.

Agricultural density of the district has increased to 52 persons per sq. km. and was ranging between 66 to 42 persons per sq. km.in 1981. Aurangabad, Khuldabad, Kannad, Soegaon, Sillod and Paithan tahsil includes in medium density group whereas Gangapur and Vaijapur tahsil can consist in low density group. According to 1991, Agricultural density as a whole for the district was 81 persons per sq. km. At taluka level it shows little variations. Highest agricultural density was found in Soegaon tahsil (103) whereas lowest was counted in Vaijapur tahsil (58). Aurangabad tahsil ranks second with 95 persons per sq. km. All tahsils excluding Soegaon consisted in medium density group.

Spatial variations in Agricultural density:

Accordingly to 2001, Agricultural density of the district was 86 persons per sq. km. of net sown area. Average density of the district has increased within the decade. It was ranging between 74 persons in Vaijapur to 114 persons in Soegaon tahsil. High density was found in Soegaon tahsil only. In Aurangabad (75), Khuldabad (78) and in Sillod tahsil (77) agricultural density has been decreased comparing to 1991. Soegaon (114), Paithan (85), Gangapur (81) and Vaijapur tahsil have registered an increase in agricultural density within the decade.

Caloric Density:

Caluric density is a reatio between rural population and area under food crops. As per 1961 Caloric density for the study region Aurangabad district was 157 persons per sq.km. which decrased to 340 in 2001. This was due to change in agricultural land use patteren, particularly due to decrease in under food crops. In the year 1991 highest caloric density was observed in Gangapur tahsil (345) followed by Sillod tahsil (337) caloric density above than the avarage of the study region was noticed in Paithan (373) and Vaijapur tahsil (373) in 2001.

Spatial variations in caloric density:

According to 2001, avarage caloric density for the study region is 340 persons per sq. km. to total cropped area. It was rangingbetween 102 persons per in kannad tahsil to 649 persons in Vaijapur tahasil. In Kuldabad, Kannad, Soegaon, Sillod and in Gangapur tahsil caloric density is decreased comparing to 1991.

CONCLUSIONS:

During the period of fifty years density increased by eight times in Aurangabad tahsil. According to 1961 density of the district was ranging between highest in Gangapur tahsil with 123 persons to lowest in Paithan tahsil with 82 persons per sq. km.Correlation of coefficient between density of population and releif and between density and rainfall is calculated using Karl person'sproduct movement method. Correlation between density and relief is + 0.48, between density and rainfall - 0.17 which is negative correlation between those attributes.Physiological density per sq. km. was reached to 291 persons from 194 persons in 1991. It was highest in Aurangabad tahsil (789) and followed by Sillod (248), kannad (247), and Soegaon (238).Lowest density was observed in Gangapur(193) and Vaijapur tahsil(157) those tahsils are known to be agricultural prosperous regions so area under cultivation is major and hence low Physiological density is found.Agricultural density as a whole for the district was 81 persons per sq. km. At taluka level it shows little variations. Highest agricultural density was found in Soegaon tahsil (103) whereas lowest was counted in Vaijapur tahsil (58). Aurangabad tahsil ranks second with 95 persons per sq. km. All tahsils excluding Soegaon consisted in medium density group.

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