A Geographical Analysis of Population Concentration Index in Western Satpura Region

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I. INTRODUCTION

The concept of population distribution and density is a very useful tool for the analysis of man's distribution in space (Clarke, 1972). One of the important indices of population concentration is the density of population. The analysis of population distribution and density holds immense significance for population geographers, as its successful understanding holds the key to the analysis of entire demographic character of an area (Chandna, 2001). The concept of population density is relating numbers of people to the space occupied by them. It is one of the most intriguing and most hazardous correlations employed by geographers, which was initially used by Henry Drury Harness in 1837.The role of improving technology notwithstanding, the pattern of population distribution continues to reflect the influence of a variety of physical determinants. Although the degree of control being exercised by the physical factors may be on decline, yet the man shall have to wait for more technological innovations if he aims at the complete elimination of the role of physical environment in determining its pattern of distribution and concentration. There are various physical factors, which affect the distribution and density of population such as climate, landforms, soils, energy resources, mineral, raw materials and accessibility of the region. In an exhaustive world analysis of the distribution of population, population number and densities diminish with altitude, a reflection of the increasing difficulties entailed in the explanation of high geographic environment and adaptation to them. The preceding discussion mirrors the composite role of physical and cultural determinants. In certain situation, the physical factors may play a decisive role, while, in others the cultural and demographic factors may largely govern the aerial spread and degree of concentration of population. It has generally been agreed that the 49 advancement in science and technology increases the role of non-physical determinants. Among the various cultural factors that have controlling effect upon the population spread are history of settlement, rapid urbanization, type of economy, advancement in technology, political decisions and social organizations (Clarke, 1971). The changes in the distribution and density of population take place through the variations in the rate of natural increase and also through the migration between areas. Thus, the demographic factors of vital rates and migration introduce another dimension to the inventory of determinants of population distribution. Apart from these major physical, socio-cultural and demographic factors influencing the distribution and density of population, some physical and social disasters have also been mentioned as factors temporarily altering the population of the affecting areas. Earthquake, landslide, volcanic eruption, flood, severe drought, glacial advancement, storm, epidemic, and fire constitute the physical disasters. War, genocide, forced transfer and repatriation constitutes the social disasters. The pattern of population distribution and density in an area is the product of the inter-play between the physical milieu and the society through the matrix of time (Zelinsky, 1966). He also remarks that, "In order to understand the meanings lying behind the contemporary patterns of population, one must wield encyclopaedic knowledge of the area's physical settings, the minutes of its economic behaviour, the broader lineaments of its socio-cultural structure and virtually all aspects of its human geography". High increase in the density of population is a matter of great concern asset puts an immense pressure on our natural resources and it may adversely affect the quality of life. Therefore, here we

are going to discuss the spatial organization of population within the study region, with the help of two main indicators i.e. density and distribution of population, which have been analyzed in a spatio-temporal perspective. As far the study region is concerned, various factors which attribute to distributional patterns include physiography, amount of rainfall, productivity of soil, availability of surface and underground water, agricultural and industrial development, degree of urbanization and historical background of the places.

II. OBJECTIVES

1) To study the temporal and spatial variations in the distribution of population within the study region.
2) To Study the Population Concentration Index in study region.

III. METHODOLOGY

Present study is based on secondary data. Concentration index method have been applied in present study and then summaries findings in text. The Population Concentration Index (PCI) was calculated with the help of following equation

$$\text{Population Concentration Index} = \frac{\text{Tehsil's Total Population/Tehsil's Total Area}}{\text{District Total Population/District Total Area}}$$

Population Concentration Index (PCI) has been used to analyses the uneven pattern of population distribution in Western Satpura Region. Keeping in view the difficulties involved in the preparation of a dot map for a large sized area and another strong belief that the dots on such a map should be placed only at the actual location of the settlements; the distribution of population has depicted by using the Population Concentration Index (PCI) technique. The PCI technique is also preferred because of the limitation of the study unit i.e. the investigation unit, which is a tehsil. The figures, thus, obtained are grouped into three ranges i.e. from below 1.0 to 2.0 and above, with the regular interval of 0.5.The population concentration Index can be measured by following formula. Population Concentration Index = Tehsil ′ sTotal Population Tehsil ′ s Total Area ⁄ District Total Population District Total Area ⁄ When the population concentration index is 1.00 then it is considered as average concentration of population. It means that population concentration is similar to the district where the index value is less than 1.0 of a particular tehsil has low level of population concentration and when the value is greater than 1.5 showing particular tehsil has high level of population concentration and the index value between 1.0 to 1.5 indicates medium concentration.

IV. LOCATION AND EXTENT

Western Satpura region extends between $21^0$16' North and $22^0$5' North latitudes and $73^0$45' East and $76^0$10' East longitudes. The study region is having an area about 5092.09 sq. km. and includes five districts. Western Satpura Region is a mountainous and mostly inhabited by tribal. This mountainous region is spread along the border of Maharashtra and Madhya Pradesh. It stretches from the Ashirgarh hills (from Burhanpur-Khandwa gap) in the east to the boundary of Gujarat in the west up to Rajpipla hills and between Narmada valley in the north and Tapi valley in the south. It comprises area of Jalgaon, Dhule and Nandurbar districts of Maharashtra and Khargone and Barwani districts of Madhya Pradesh. According to 2011 census, the total population of the study region was 1608564. Out of the total population more than 80% are tribal

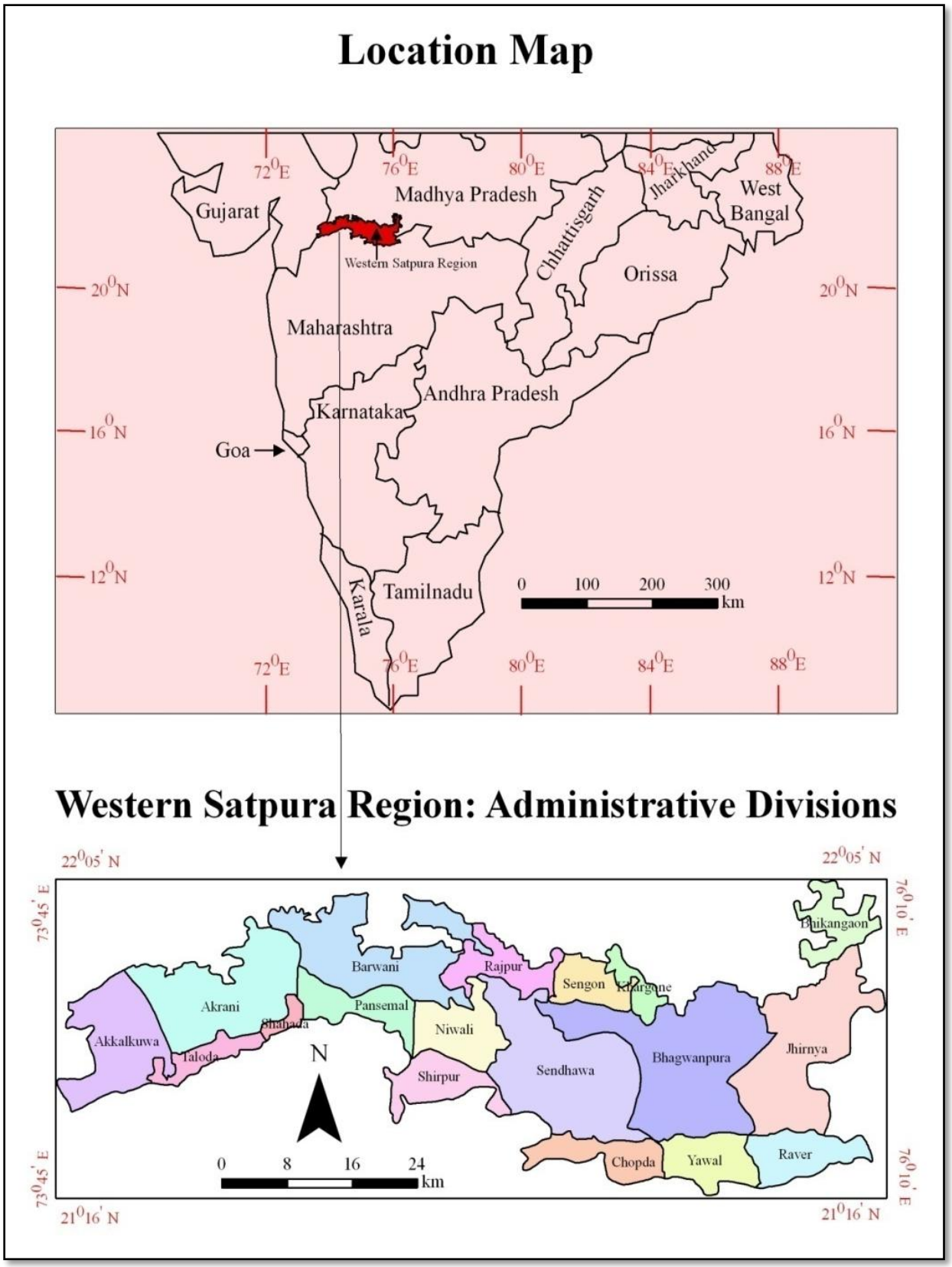
Location Map
72°E
76°E
80°E
84°E
88°E
20°N
16°N
12°N
Gujarat
Madhya Pradesh
Western Satpura Region
Chhattisgarh
Jharkhand
West Bangal
Orissa
Maharashtra
Andhra Pradesh
Karnataka
Goa
Tamilnadu
Karala
0 100 200 300
km
Western Satpura Region: Administrative Divisions
22°05' N
73°45' E
76°10' E
21°16' N
Barwani
Rajpur
Sengon
Khargone
Bhikangaon
Akrani
Pansemal
Niwali
Akkalkuwa
Taloda
Shahada
Shirpur
Sendhawa
Bhagwanpura
Jhirnya
Chopda
Yawal
Raver
N
0 8 16 24
km

Fig. No. 1

Table No. 1 Western Satpura Region: Population Concentration Index (1991-2011)

Sr. No.	Name of Tehsil	Census Year			Variation 1991-2011
		1991	2001	2011	
1	Barwani	0.79	0.77	0.8	0.01
2	Rajpur	0.85	0.84	0.82	-0.03
3	Jhirnya	0.99	0.96	0.93	-0.06
4	Segaon	0.85	0.81	0.73	-0.12
5	Bhikangaon	0.64	0.57	0.55	-0.09
6	Khargone	1.50	1.44	1.16	-0.34
7	Niwali	0.98	1.01	0.96	-0.02
8	Pansemal	1.38	1.48	1.25	-0.13
9	Sendhawa	1.10	1.10	1.19	0.09
10	Bhagwanpura	1.04	1.09	1.05	0.01
11	Chopada	3.11	2.95	3.36	0.25
12	Yawal	1.13	1.01	1.12	-0.01
13	Raver	1.19	1.05	0.88	-0.31
14	Taloda	0.96	1.15	1.22	0.26
15	Akkalkuwa	0.63	0.61	0.65	0.01
16	Akrani	1.58	1.69	1.79	0.21
17	Shahada	1.00	0.94	0.92	-0.08
18	Shirpur	2.44	2.41	2.41	-0.03
Region		1.00	1.00	1.00	0.00

Source : Disrict census handbook of Nandurbar, Dhule,Jalgaon, Barwani and Khargone Districts.

a) Population Concentration Index (1991) : In 1991 population concentration index is quite uneven in the study region. It varies from tehsil to tehsil throughout the region. The concentration index, less than 1.0 is seen in 8 tehsils in the study region and more than 1.0 is in about seven tehsils, implying that, about one fourth of the tehsils were either sparsely populated or densely populated. The sparsely populated tehsils were confined largely to the western, north eastern and northern parts of Western Satpura Region. While, thickly populated tehsils were located in the river basins of Tapi and Aner because of the soil conditions and irrigation facilities encourage the development of agriculture and agro-based industry, in general. According to 1991 census, Chopda Tehsil was the most thickly populated tehsil with the PCI of 3.11 and Akkalkuwa was the most thinly populated tehsil, with PCI of 0.63 only. Besides Chopda Tehsil, there were other tehsils, which displayed a relatively high degree of concentration of population, and these tehsils were Shirpur (2.44), Akrani (1.58), Khargone (1.50) and Pansemal (1.38). In contrast, besides Akkalkuwa there are Bhikangaon (0.64), Barwani, (0.79), Rajpur and Segaon (0.85), Taloda (0.96), and Jhirnya with 0.99 PCI value, display relatively thin or sparse population.

b) Population Concentration Index (2001) : In 2001, with the marginal change, the same trend of unevenness of concentration index has persisted. In this decade also wide range of disparities in the PCI values were observed at tehsil level. The tehsil of Chopda had the distinction of having highest degree of concentration of population in the study region (2.95), while again Bhikangaon was the most thinly populated tehsil with lowest PCI of 0.57. Broadly speaking, agriculturally prosperous tehsils, which were also experiencing industrial development, displayed high incidences of population concentration. On the other hand, the districts, which suffered from some kind of physical handicap of terrain, climate, subsoil water table, etc. and where

the developmental process has been suffered, exhibited a low degree of population concentration. A very low concentration index of less than 1.0 was observed in about7 tehsils. These tehsils were Bhikangaon (0.57), Akkalkuwa (0.61), Barwani (0.77), Segaon (0.94) and Jhirnya (0.96), on the other hand, Chopda tehsil was steel leading with very high concentration index value of 2.95, followed by Shirpur (2.4) and Akrani (1.69). Majority of the tehsils (68.0 %) in the study region showed moderate PCI values of1.0to 1.5.If compared with the PCI values of the previous decade, 5 tehsils in the study region showed positive change in PCI while 12 tehsils showed negative change and only one tehsil that is Sendhawa showed no change in their concentration index value. Niwali, Pansemal and Bhagwanpura tehsils from Khargone district and Taloda, Akrani tehsils from Nandurbar district showed positive change. 88

c) Population Concentration Index (2011): The analysis of PCI values during 2011 also revealed the uneven patterns of population distribution. The range of below 1.0concentration index value comprised of 9 tehsils showed very low concentration of population, while there were three tehsils, which showed very high value of PCI, which was above 1.5. The range from 1.0 to 1.5 i.e. moderate concentration index values comprised of 6 tehsils. As far the trend of change is concerned, 7 tehsils showed positive change in the concentration index value, while 10 tehsils in the study region showed negative changes and only one tehsil recorded no change in their PCI values from those of previous decade. According to Table, there were three tehsils, which showed PCI more than 1.5 during 2011. Chopda tehsil was again settling at number one position with concentration index value of 3.36, followed by Shirpur (2.41), and Akrani (1.79). While the tehsils, which were located in the northern part of Western Satpura Region and the water scarce region of draught prone area exhibited extremely low PCI value. Bhikangaon tehsil recorded lowest concentration index of 2011, which was having PCI value of 0.55. Other tehsils having low PCI values were Akkalkuwa (0.65), Segaon (0.73), Barwani (0.80), Rajpur (0.82), Shahada (0.92) and Jhirnya (0.93). To Summarize, the wide regional disparity in population concentration is observed at the tehsil level and physical conditions in the study region. Tehsils, which suffered from some physical handicaps of uneven topography of water, poor local resources, resulted in limited socio-economic development and those indicated low indices of concentration. While those tehsils, which existence of cultivable land, ample water resources, agricultural development intense transport network exhibited a higher degree of population concentration.

V. CONCLUSION

Population concentration index is quite uneven in the study region. It varies from tehsil to tehsil throughout the region. According to 1991 census, Chopda tehsil was the most thickly populated tehsil with the PCI of 3.11 and Akkalkuwa was the most thinly populated tehsil, with PCI of 0.63 only. Bhikangaon tehsil recorded lowest concentration index of 2011, which was having PCI value of 0.55. The sparsely populated tehsils were confined largely to the western, north eastern and northern parts of Western Satpura Region. While, thickly populated tehsils were located in the river basins of Tapi and Aner because of the soil conditions and irrigation facilities encourage the development of agriculture and agro-based industry. The tehsil of Chopda had the distinction of having highest degree of concentration of population in the study region (2.95), while again Bhikangaon was the most thinly populated tehsil with lowest PCI 0.64, 0.57 and 0.55 respectively 94 throughout investigation period. Broadly speaking, agriculturally prosperous tehsils, which were also experiencing industrial development, displayed high incidences of population concentration. On the other hand, the districts, which suffered from some kind of physical handicap of terrain, climate, subsoil water table, etc. and where the developmental process has been suffered, exhibited a low degree of population concentration To Summarize, the wide regional disparity in population concentration is observed at the tehsil level and physical conditions in the study region. Tehsils, which suffered from some physical handicaps of uneven topography, poor local resources, resulted in limited socio-economic development and those indicated low indices of concentration, While those tehsils, which existence of cultivable land, ample water resources, agricultural

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