

CHAPTER-V

SPATIAL DISTRIBUTION OF URBAN CENTRES

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## CHAPTER-V

### SPATIAL DISTRIBUTION OF URBAN CENTRES

#### 5.1 INTRODUCTION :-

The most tangible changes associated with urbanization have centred around the growth in size and number of the urban places. Therefore, one of the basic purposes of geographic research is to analyse the spatial aspects of urbanization. It is, perhaps, only natural that geographers should regard the analysis of the location of urban places as a major focus of investigation.

Geographers are interested in spatial distribution, so it is essential to understand the meaning of the term. The term 'spatial' indicates that an occurrence occupies the portion of earth's surface. An occurrence is an identified phenomenon of specified magnitude. Whereas 'distribution' is spatial arrangement of occurrence of the same type (Mulik, 1989).

Geographers have long been fascinated by the galactic patterns of human settlement. What forms do they take? Are their forms random, clustered or dispersed? If there are regularities, what lies behind them? We look here at some of the answers to these questions. In this chapter, an attempt has been made to trace briefly the factors influencing the distribution of urban settlements, spatial distribution of urban centres by their population size and by different size categories, distributional

aspects of urbanization, concentration of urban population, rank size relationship of urban centres and patterns of urban settlements.

## 5.2 FACTORS AFFECTING DISTRIBUTION OF URBAN CENTRES :-

The distribution of urban centres is affecting by several factors in which relief, distribution of resources, land under cultivation types of agriculture, land under irrigation, accessibility, industrial growth and level of economic development have a great bearing on the distribution of urban settlements.

There are various factors responsible for the origin, growth and distribution of urban settlements. The physical factors are very important in the location of urban settlements, but the social and economic factors also play an important role in determining, whether a particular place should grow, develop and function as urban settlement or not (Deshmukh, 1985). Relief and climate play an important role and provide the basic frame for the location of urban settlements.

Administrative importance, transport nodes and religious sites are the other important factors which jointly or individually attract several functions and give rise to urban settlements. Exchange of goods, commodities and provision of services are equally important factors due to which towns originate and flourish.

Development of road network plays a vital role in the origin and growth of urban settlements. Industrialization has the greatest impact on the growth of urbanization. The density of

urban places is mostly associated with the process of industrialization. Development of irrigation, types of agriculture and improvement of technology are also the important factors which are responsible for the concentration of urban centres in certain areas.

Concentration of economic activities, especially manufacturing trade, commerce and a variety of services is a major governing factor that causes distortion in the distributional pattern of urban settlements.

Among other factors, market organization, communication and transport network, different high order civic amenities and level of economic development of a region etc. affect not only the growth of urban centres but also their distributional pattern.

### 5.3 DISTRIBUTION OF URBAN CENTRES :-

The region under study is essentially agricultural with an agrarian economic base with more than 72 per cent population living in rural settlements. A wide contrast in the topography, soil, agricultural practices and the level of economic development is well reflected in the spatial distribution of urban settlements in the study region.

The region under study has 86 tehsils covering an area of 96,988.9 sq.km. and a population of 19,974,020 persons. Of the total 10,063 settlements in the region, 9968 are rural settlements and 95 are urban settlements. One of the striking features of the urban scene in Western Maharashtra Plateau is that nearly 53 tehsils, out of the total 86 tehsils, possess

urban settlements and the remaining 33 tehsils (38.38 per cent) are purely rural in character. The distribution of urban centres is displayed in Fig.5.1

An examination of the figure shows that there are 95 urban settlements distributing unevenly among 53 tehsils of 9 districts in the study region. There are six urban agglomerations, namely Nashik, Ahmadnagar, Pune, Sangli, Solapur and Kolhapur. Pune agglomeration has the highest (9) urban components, followed by Nashik and Sangli urban agglomerations with five and three urban components respectively. While Kolhapur, Solapur and Ahmadnagar urban agglomerations have two each constituent urban units.

Districtwise distribution of urban settlements show that Pune district possesses 29 towns, followed by Nashik district with 19 towns. Kolhapur district includes 12 towns, while Solapur and Satara district comprise 10 towns each. Sangli district has 8 towns from four tehsils. The Haveli tehsil in Pune district has maximum number of 9 towns, followed by Nashik tehsil with 8 towns. Thirty tehsils have one town each and fifteen tehsils have two towns each. There are six tehsils, namely Pune city, Miraj, Purandhar, Koregaon, Akkalkot and Hatkangale, having three towns each.

The spatial location indicates a high concentration of urban settlements in the upper Bhima Valley, especially in Haveli and Pune city tehsils of Pune district. The second high concentration of urban settlements is observed in the upper Godavari Valley mainly covering the Nashik tehsil. In the South,

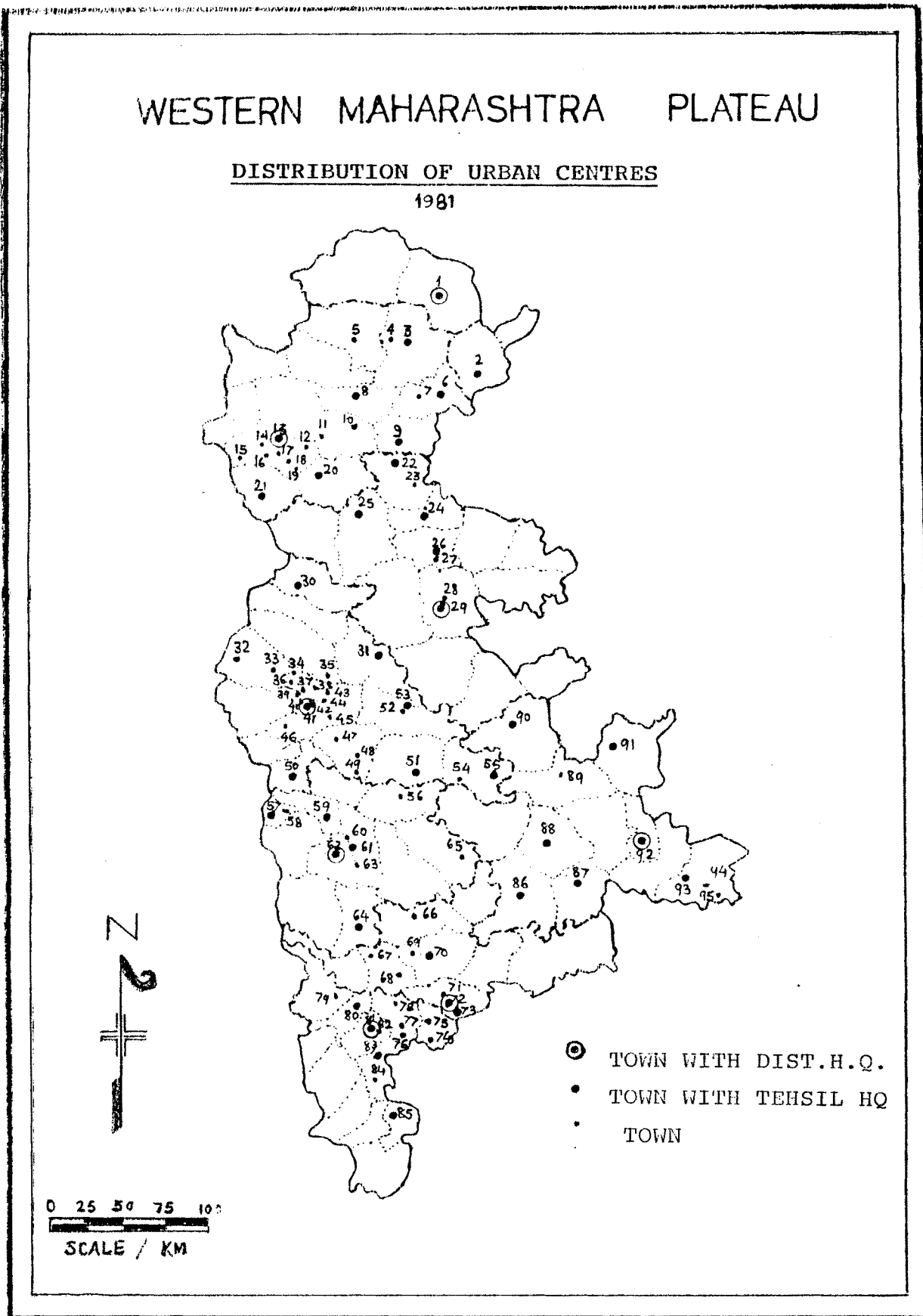


FIG.5.1

LIST OF TOWNS

Location Code No.	Name of City/Town	Location Code NO.	Name of city/town
1.	Dhule City	51.	Baramati
2.	Chalisgaon.	52.	Daund(N.M.)
3.	Malegaon city	53.	Daund(M)
4.	Ravalgaon	54.	Kalamb
5.	Satana	55.	Indapur
6.	Nandgaon	56.	Phaltan
7.	Manmad.	57.	Mahabaleshwar
8.	Chandvad.	58.	Panchagani.
9.	Yevla.	59.	Wai
10.	Lasalgaon.	60.	Satara Road
11.	Ozar	61.	Koregaon
12.	Eklahare	62.	Satara
13.	Nashik City	63.	Rahimatpur
14.	Satpur	64.	Karad
15.	Trimbak	65.	Mhaswad
16.	Vadner	66.	Vita
17.	Nashik Road Deolali	67.	Islampur
18.	Deolali Cantonment.	68.	Ashta
19.	Bhagur	69.	Kirloskarwadi
20.	Sinnar	70.	Tasgaon
21.	Igatpuri.	71.	Madhavnagar
22.	Kopargaon	72.	sangli city
23.	Wari	73.	Miraj city
24.	Shrirampur	74.	Kurundwad
25.	Sangamner	75.	Jaysingpur
26.	Rahuri	76.	Ichalkaranji city
27.	Warwandi	77.	Kabnur
28.	Ahmadnagar Cantonment	78.	Vadgaon(K)
29.	Ahmadnagar city	79.	Malkapur
30.	Junnar	80.	Panhala
31.	Shirur?	81.	Kolhapur city
32.	Lonawala	82.	Gandhinagar
33.	Talegaon(D)	83.	Kagal
34.	Dehu.	84.	Murgnd
35.	Alandi	85.	Gadhinglaj.
36.	Dehu Road Cantonment	86.	Sangola
37.	Pimpri-Chinchwad city	87.	Mangalvedha
38.	Kalas	88.	Pandharpur
39.	Sangvi-Haveli.	89.	Kurduwadi
40.	Kirkee Cantonment	90.	Karmala
41.	Pune city	91.	Barshi
42.	Pune Cantonment	92.	Solapur city
43.	Lohgaon.	93.	Akkalkot
44.	Vadgaon Sheri.	94.	Maindargi
45.	Hadapsar.	95.	Dudhani.
46.	Khadakwasala.		
47.	Sasvad.		
48.	Jujiri		
49.	Shival-kar(Nira)		
50.	Bhor.		

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the Panchganga basin indicates the third zone of high concentration of urban settlements. It is also evident that big cities and large towns are found to be located along the major rail routes and national highways traversing across the study region. The spatial distribution of urban centres by their population size is shown in Fig.5.2.

The spatial distribution of urban settlements in different physiographic divisions shows that 34 towns are located in Bhima valley, 23 towns in upper Krishna valley and 18 towns in upper Godavari Valley zones. Among the remaining, 10 towns<sup>are</sup> distributed in Western hilly zone, 7 towns in northern plateau zone and 3 in the central dry plateau zone.

#### 5.4 CONCENTRATION OF URBAN CENTRES :-

The overall numerical value of concentration of towns in the region is 0.32 which indicates lower degree of concentration (Fig.5.3(A)). From the analysis it is observed that 27.37 per cent of towns are concentrated in only Pune district whose rank is 1; while 47.37 per cent of towns are located in both Pune and Nashik districts indicating their dominance in the urban landscape of the region (Table 5.1).

Nearly 70 percent of towns are concentrated in the first four districts of the region, while the remaining five districts share only 29.47 per cent of towns. The last two districts account for merely 1 percent of towns in the region. This is because of the inclusion of their areal extension as well as the number of urban settlements in region is too small. In brief, the



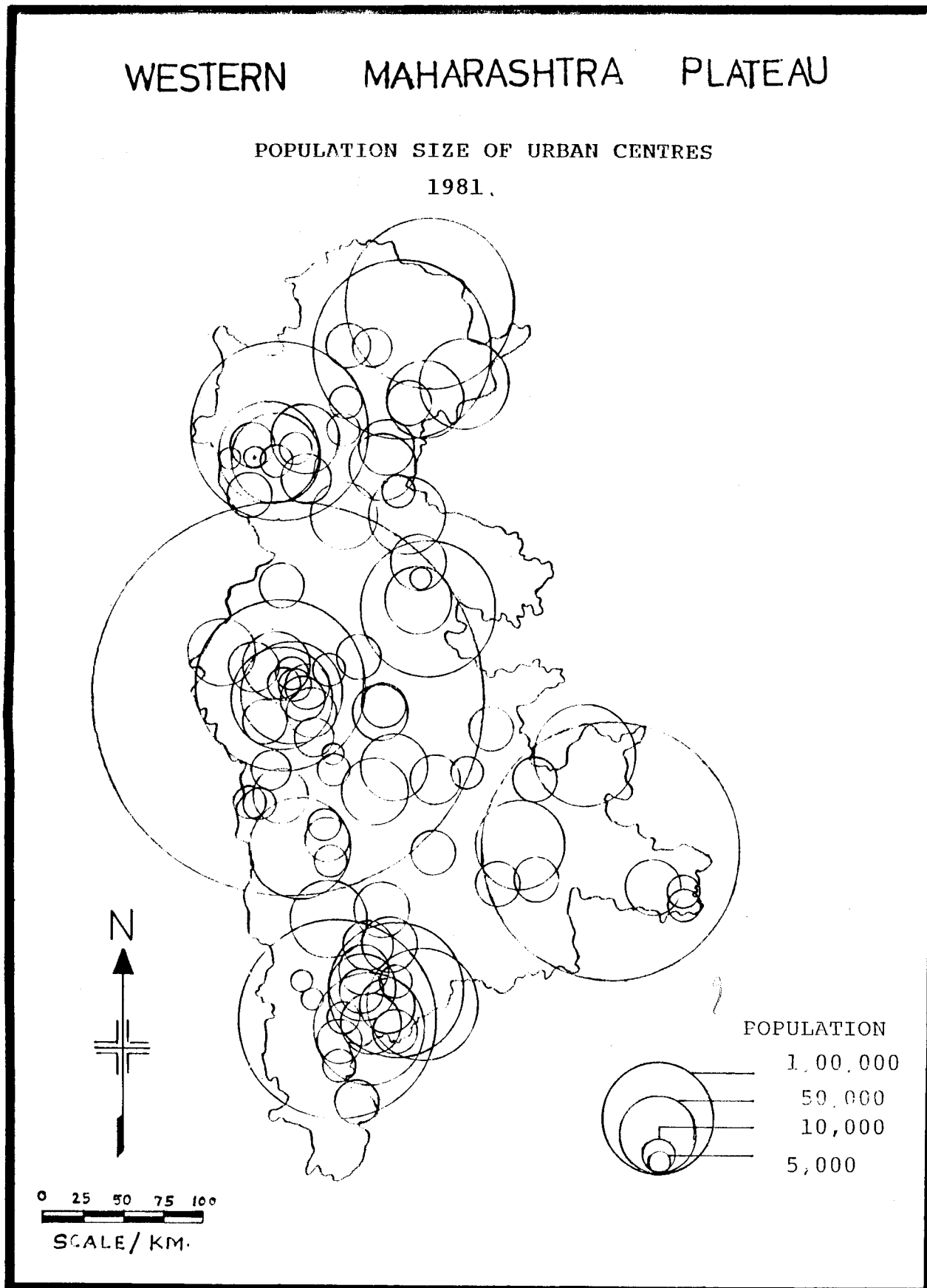


FIG.5.2

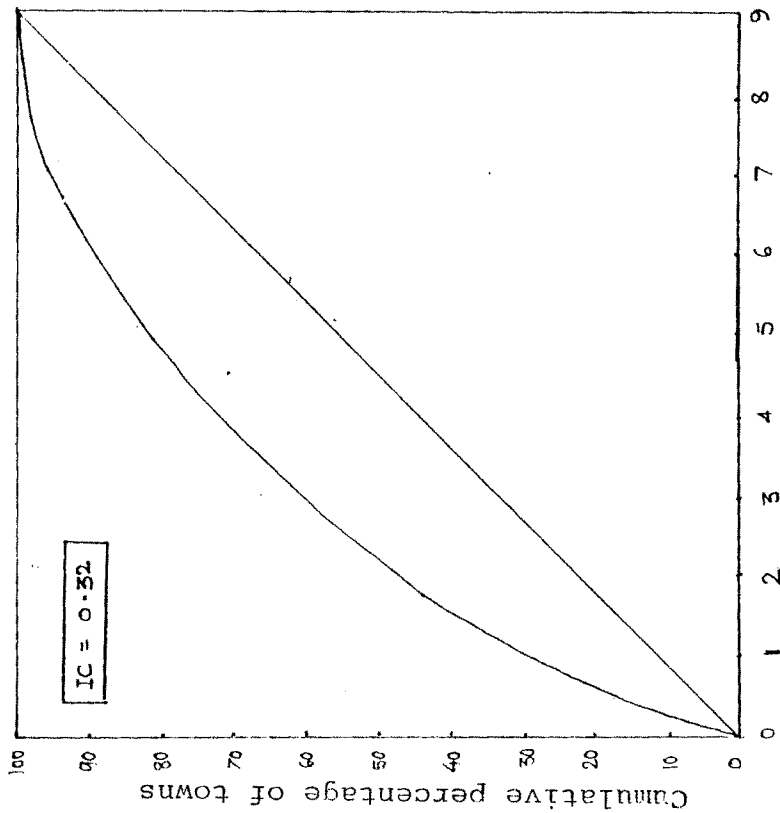
TABLE 5.1  
DISTRICT-WISE CONCENTRATION OF URBAN CENTRES, 1981.

<u>District.</u>	Rank of District	No. of Towns	% of towns to total	Commulative % of towns
Pune	1	26	27.37	27.37
Nashik	2	19	20.00	47.37
Kolhapur	3	12	12.63	60.00
Solapur	4.5	10	10.53	70.53
Satara	4.5	10	10.53	81.06
Sangli	6.5	8	8.42	89.48
Ahmadnagar	6.5	8	8.42	97.90
Dhule (Partly)	8.5	1	1.05	98.95
Jalgaon (Partly)	8.5	1	1.05	100.00
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Western Maharashtra Plateau.		95	100.00	

# WESTERN MAHARASHTRA PLATEAU

A) CONCENTRATION OF URBAN CENTRES

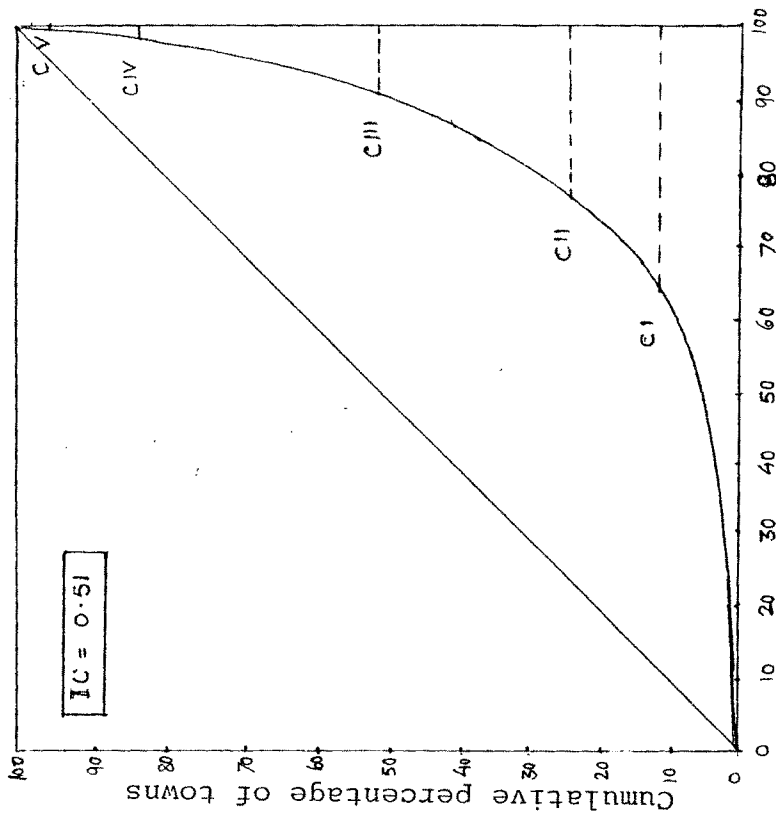
1981



Ranks of Districts.

B) CONCENTRATION OF URBAN POPULATION

1981



Cummulative Percentage of Urban Population

FIG. 5.3

study region is characterised by the highest concentration of towns in Pune district, followed by the Nashik and Kolhapur districts. Pimpri-Chinchwad and Ichalkaranji are industrial townships.

#### 5.5 DISTRIBUTION OF URBAN CENTRES BY SIZE CLASS :-

The Census of India classifies towns into six categories - Classes I to VI. The main criterion for this classification is the size of population. The lowest class of town has a population of less than 5,000 and the highest has a population above 100,000 persons. In between these two, the other four classes have been fixed.

In the study region, there are 95 towns categorised in different size classes. According to the 1981 census, the spatial distribution of towns indicates that of the 95 towns in Western Maharashtra Plateau, 11 are class I, 11 Class II, 26 Class III, 31 Class IV, 12 Class V and 4 Class VI towns (Fig.5.4). Pune, Solapur, Kolhapur, Nashik, Malegaon, Pimpri-Chinchwad, Dhule, Sangli, Ahmadnagar, Ichalkaranji and Miraj are Class I towns of the study region. Among these eleven class I towns, seven are district headquarters and two (Malegaon, and Miraj) are tehsil headquarters. Pimpri-Chinchwad and Ichalkaranji are industrial townships. Pune (1,203,351-1981) is the largest urban centre of the study region and recognises 9th rank city among the million cities of the country.

Pune cantonment, Satara, Kirkee Cantonment, Nashik Road Deolali, Barshi, Pandharpur, Chalisgaon, Deolali Cantonment,

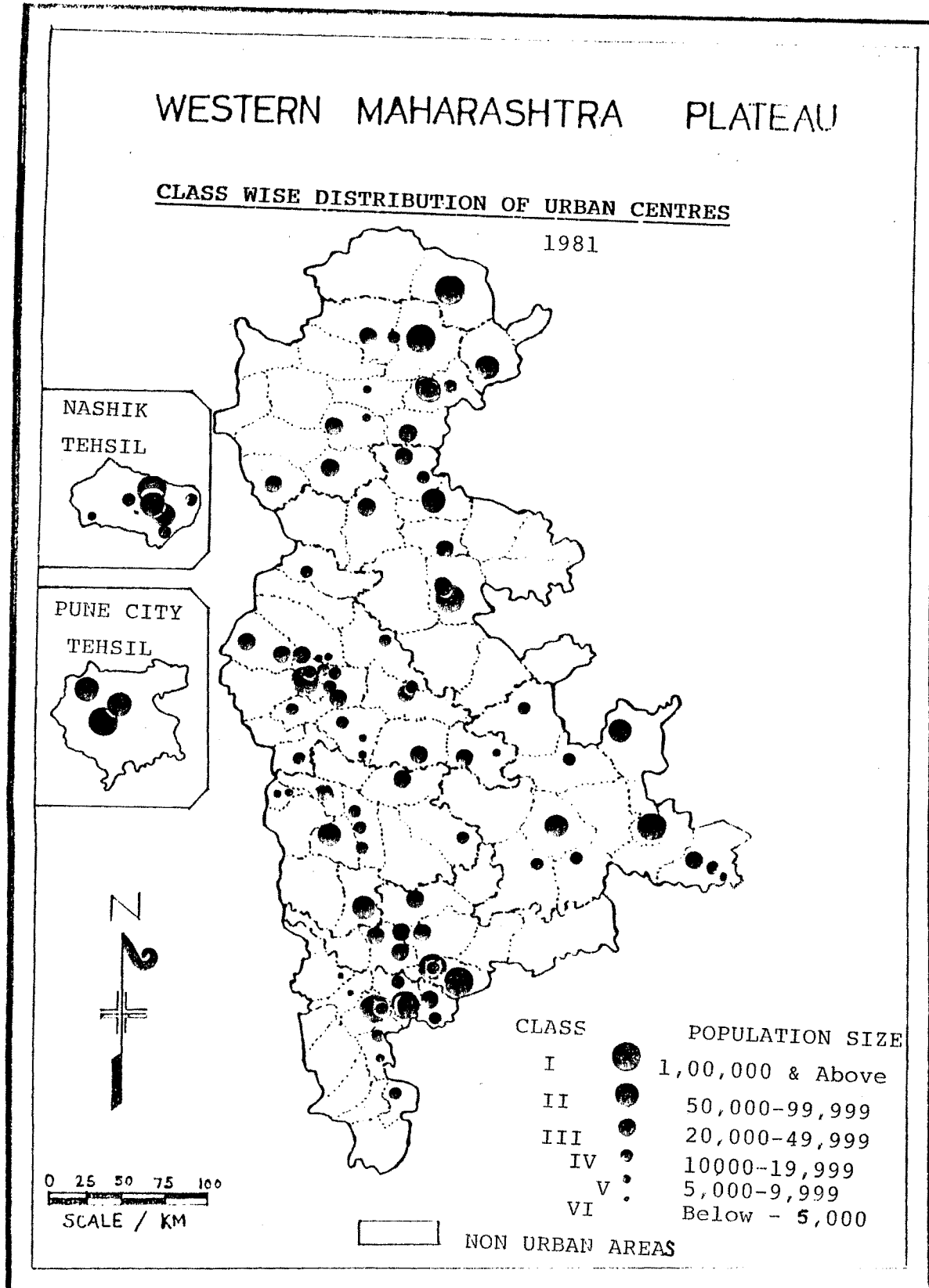


FIG. 5.4

Shrirampur, Karad and Manmad are Class II towns having a population between 50,000 and 99,999 persons. Out of these eleven towns, Satara is the district headquarter and Barshi, Pandharpur, Chalisgaon, Shrirampur and Karad are taluka headquarters. Three cantonment areas and two municipal towns are grouped in this size-class. Kolhapur and Sangli districts do not possess any town of this class.

Twenty six towns are classified as Class III towns of which seven are located in Pune district, five each in Nashik and Sangli districts, four in Ahmadnagar district, two each in Satara and Kolhapur district and one in Solapur district.

The highest percentage of towns is found in the Class IV category, where out of ninety-five towns, thirty one are placed in this class. Their regional distribution displays that Pune district possesses ten towns. Nashik, Solapur and Kolhapur districts consist of five towns each, Satara district has four towns and Ahmadnagar and Sangli districts include one each.

The next class of towns with a population range of 5,000 to 9,999 persons include twelve towns of the region. Out of these twelve towns, five towns are located in Pune district, three in Nashik district, two in Satara district and one each in Solapur and Kolhapur districts. Ahmadnagar and Sangli districts do not possess any town of this class. There are only four towns of the last order in the region. Their spatial distribution shows that two towns appeared in Kolhapur district and one each in Nashik and Ahmadnagar districts.

The regional distribution of urban centres by size class shows that Pune and Nashik districts have towns of all categories, while Satara, Solapur and Kolhapur districts are dominated by lower class towns. Almost all districts, except Satara district possess Class I cities.

Here an attempt has been made to find the concentration of urban population in the size order distribution of urban centres (Fig.5.2(B)). The overall numerical value of concentration is  $IC=0.51$  which indicates medium concentration of urban population in different size classes of towns.

Class-wise distribution of urban settlements and population concentration reveals certain points relating to spatial distribution of urban centres in the study region (Table 5.2).

From the analysis, it is observed that 63.45 per cent urban population of the region is concentrated in 11.58 per cent of urban centres of Class I size towns, 76.79 per cent population is concentrated in 23.16 per cent of towns in the category of Class I and II towns. The first three classes of towns account for 50.53 per cent of towns with a population concentration of 89.97 per cent. The remaining three categories share only 10.03 per cent of urban population. The analysis clearly shows that Class I towns share more than 63 per cent urban population alone.

#### 5.6 DISTRIBUTION OF URBAN POPULATION :-

The study of distributional aspects of urbanization brings better insight into the spatial distribution of urban population

TABLE 5.2

CLASS-WISE DISTRIBUTION OF TOWNS AND POPULATION CONCENTRATION, 1981.

Size-Class of towns	No. of towns	% of towns to total	Cummulative % of towns	Population in towns	% to the total urban population	Cummulative % of urban population
I. 1,00,000 & above	11	11.58	11.58	13,534,401	63.45	63.45
II. 50,000-99,999	11	11.58	23.16	743,121	13.34	76.79
III. 20,000-49,999	26	27.37	50.58	734,138	13.18	89.97
IV. 10,000-19,999	31	32.63	83.16	447,011	8.03	98.00
V. 5,000-9,999	12	12.63	95.79	96,642	1.74	99.74
VI. Less than 5,000	04	4.21	100.00	14,749	0.26	100.00
Total	95	100.00		5,570,065	100.00	



in the region. It has been studied by considering urban population density, degree of urbanization and urban concentration (Table 5.3).

#### 5.7 DISTRIBUTION PATTERN OF URBAN POPULATION :-

The Western Maharashtra Plateau accounts for about 24 per cent of the urban population of the State. Pune City tehsil tops the list with the largest size of urban population of over 13 lakhs followed by Solapur with over 5 lakhs. Nashik, Haveli, Karvir, Miraj, Malegaon, Dhule, Ahmadnagar, Hatkangale tehsils stand in their rank order with an urban population ranging between one lakh and five lakhs each. The largest size of urban population in the case of Pune city, Solapur North, Karvir, Malegaon, Miraj, Dhule and Ahmadnagar tehsils are due to the evolution of large cities within them, while in the case of Haveli, Nashik and Hatkangale tehsils, it is due to the presence of a large number of towns.

Of the remaining forty three tehsils of the region 8 tehsils have an urban population ranging between 50 thousand and less than one lakh each, 21 tehsils have an urban population ranging between 20 thousand to 50 thousand each and 14 tehsils have less than 20 thousand population each. Nearly thirty three tehsils of the region are entirely rural areas.

There is a wide disparity in the spatial distribution of urban population in the region. As much as three-fourths of the urban population of the region is distributed in merely 9 of the 53 tehsils of the region and the remaining partly left over is

DISTRIBUTIONAL ASPECTS OF URBANIZATION, 1981.

Sr. No.	Name of Tehsil	No. of towns	Urban Population	Density of urban population (per/sq.km.)	Degree of urbanization	Degree of urban concentration
1.	2.	3.	4.	5.	6.	7.
1.	Nashik.	8	449,762	355.12	71.75	257.26
2.	Baglan	1	20,821	12.88	8.56	30.69
3.	Malegaon	2	259,136	133.74	50.09	179.60
4.	Chandvad	1	9,946	10.38	7.47	26.78
5.	Nandgaon	2	69,207	63.38	40.84	146.43
6.	Yevla	1	28,343	26.73	19.17	68.73
7.	Niphad	2	48,543	46.13	16.64	59.66
8.	Sinnar	1	21,926	16.36	11.36	40.73
9.	Igatpuri	1	20,461	20.04	12.24	43.89
10.	Dhule	1	210,759	108.26	43.57	156.22
11.	Chalisgaon	1	59,342	48.74	23.64	84.76
12.	Ahmadnagar	2	181,210	119.56	49.52	177.55
13.	Rahuri	2	27,434	26.34	13.44	48.19
14.	Shrirampur	1	55,491	68.82	19.03	68.23
15.	Sanganner	1	40,088	23.86	14.30	51.27

1.	2	3	4	5	6	7
16.	Kopergaon	2	47,145	45.12	16.17	57.98
17.	Pune city	3	1,370,172	7446.59	99.26	355.90
18.	Haveli	9	352,014	263.38	53.71	192.58
19.	Khed	1	7,523	5.37	3.24	11.62
20.	Junnar	1	18,311	13.23	7.43	26.64
21.	Shirur	1	12,181	7.82	6.66	23.88
22.	Daund	2	44,893	34.80	23.80	85.33
23.	Indapur	2	32,547	22.18	14.30	51.27
24.	Baramati	1	37,121	26.85	14.42	51.70
25.	Purandhar	3	24,706	22.39	15.31	54.89
26.	Bhor	1	12,834	14.39	9.93	35.60
27.	Mawal	2	58,780	51.96	31.30	112.23
28.	Satara	1	83,336	91.04	28.48	102.12
29.	Wai	1	24,661	41.56	17.22	61.74
30.	Koregaon	3	37,127	39.32	19.48	69.85
31.	Phaltan	1	33,859	28.68	15.11	54.18
32.	Man	1	14,749	10.24	10.16	36.43
33.	Karad	1	54,364	50.83	14.21	50.95

Conti.....

1.	2	3	4	5	6	7
34.	Mahabaleshwar	2	17,696	78.27	48.52	173.97
35.	Miraj	3	268,998	290.45	53.13	190.50
36.	Tasgaon	2	46,671	41.99	15.53	55.68
37.	Khanapur	1	24,081	18.16	11.05	39.62
38.	Walwa	2	54,349	69.08	18.04	64.68
39.	Solapur North	1	514,860	699.25	83.63	299.86
40.	Barshi	1	72,537	44.61	26.21	93.98
41.	Akkalkot	3	47,750	34.35	22.16	79.45
42.	Mangalvedha	1	16,802	14.73	14.32	51.34
43.	Pandharpur	1	64,380	49.39	27.09	97.13
44.	Sangola	1	14,854	9.40	8.16	29.26
45.	Karmala	1	16,729	10.39	10.10	36.21
46.	Madha	1	19,554	12.66	9.42	33.78
47.	Karvir	2	351,392	523.60	57.99	207.92
48.	Panhala	1	2,540	4.46	1.49	5.34
49.	Hatkangale	3	178,456	292.84	41.73	149.62
50.	Shirol	2	41,096	80.91	16.69	59.84
51.	Kagal	2	25,158	45.95	13.75	49.30
52.	Gadhinglaj	1	18,535	38.52	10.61	38.04
53.	Shahuwadi	1	4,845	4.64	3.50	12.55
Western Mahara-		95	5,570,065	57.43	27.89	79.59
-shtra Plateau						

distributed in as many as 44 tehsils. The significant feature that may be noted is that the Pune city tehsils alone share about 25 per cent urban population of the region.

#### **5.8 DENSITY OF URBAN POPULATION :-**

The density of urban population has been studied at tehsil level. Out of 53 tehsils, 19 have a very low degree of urban population density, while 16 tehsils have low degree of urban population density, ranging from 25 to 50 persons per sq.km.

Tehsils like Satara, Mahabaleshwar and Shirol have an urban population density ranging between 75 and 100 persons per sq.km. and tehsils, namely Nandgaon, Shrirampur, Mawal, Karad and Walwa have an urban population density ranging between 50 and 75 persons per sq.km. All these tehsils have medium urban population density.

Moderate urban population density ranging from 100 to 200 persons per sq.km. is observed in Malegaon, Dhule, and Ahmadnagar tehsils; while Haveli, Miraj and Hatkangale tehsils have an urban population density ranging between 200 and 300 persons per sq.km.

Only one tehsil, Nashik, has an urban density of 355 persons per sq.km. Higher density of urban population is found in Sholapur North and Karvir tehsils because of the larger urban centres of the study region are located in these tehsils. Very high urban density (7447 persons per sq.km) is recorded in Pune city tehsil (Fig.5.5).

Tehsilwise distribution of urban population density clearly reveals the real fact that the number of towns and their

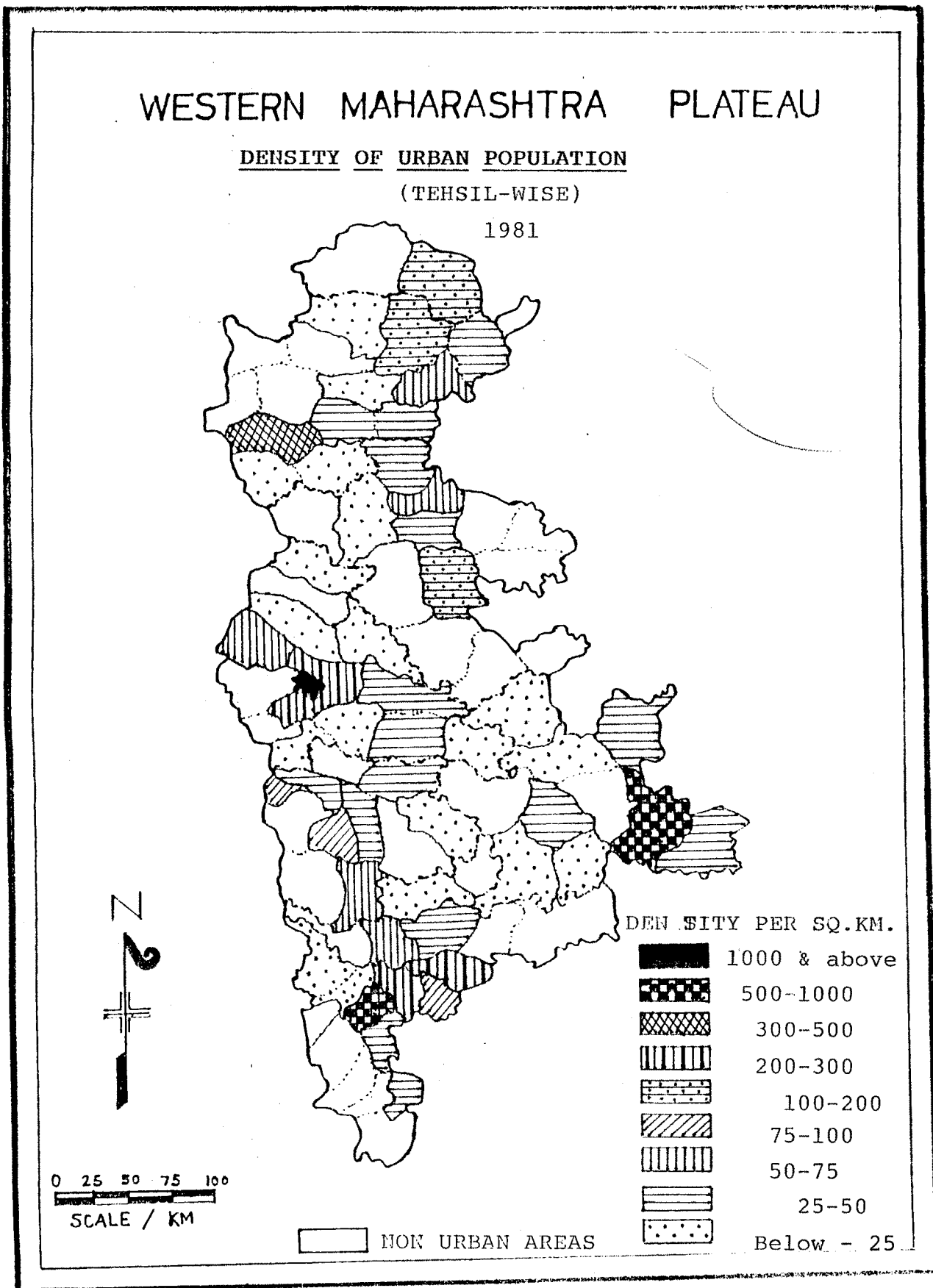


FIG.5.5

size govern the urban density of each tehsils. It is noteworthy that Pune city, Solapur North, Karvir, Nashik, Haveli, Miraj, Hatkangale, Malegaon, Dhule and Ahmadnagar tehsils are industrially progressive parts of study region and hence, they have attained high degree of urban population density.

### 5.9 DEGREE OF URBANIZATION :-

The degree of urbanism in its spatial occurrence does not indicate a clear cut pattern. However, a faint trend is discernible in its distribution (Reddy, 1970).

In the present study, degree of urbanization has been calculated by using the following equation:

$$\text{Degree of urbanization} = \frac{\text{Urban population of the areal unit}}{\text{Total population of the areal unit}} \times 100$$

In the present case the areal unit is tehsil. After calculating the degrees of urbanization for all tehsils, they are classified into various classes. In the study region highest degree of urbanization is found in Pune City tehsil, where degree of urbanization is 99.26 per cent (Fig. 5.6). Solapur North tehsil stands second in this respect with 83.63 per cent degree of urbanization. Only one tehsil, Nashik is included in the next class, where the degree of urbanization is ranging between 60 and 80 per cent.

Malegaon, Nandgaon, Dhule, Ahmadnagar, Haveli, Mahabaleshwar, Miraj, Karvir and Hatkangale tehsils fall in the range of 40-60 per cent. These nine tehsils owe their moderate

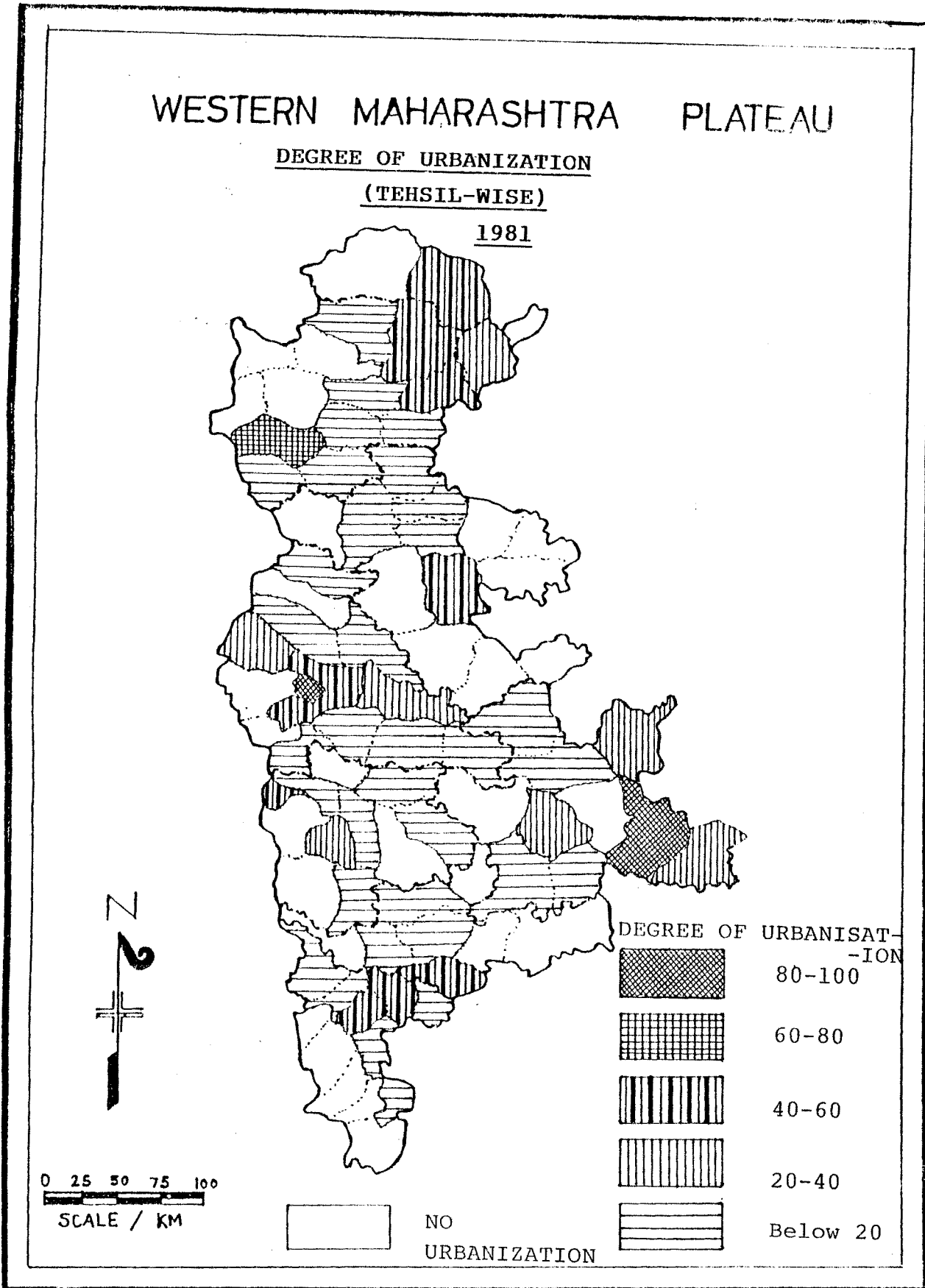


FIG. 5.6



degree of urbanization to the presence of big towns in them. Another seven tehsils like Chalisgaon, Daund, Mawal, Satara, Barshi, Akkalkot and Pandharpur show low degree of urbanization ranging between 20 and 40 per cent. Only Mawal and Satara tehsils from this group cross the regional average mark (27.89 per cent) of degree of urbanization.

Poor degree of urbanization is found in nearly 34 tehsils of the study region. These tehsils cover mostly the Western hilly part, central dry plateau, drought-prone areas of the eastern portion and the northern most part of the study region, where degree of urbanization is less than 20 per cent.

There are 10 tehsils, Baglan, Chandvad, Khed, Junnar, Shirur, Bhor, Sangola, Madha, Panhala and Shahuwadi having a degree of urbanization less than 10 per cent. Panhala tehsil (1.49 per cent) has the lowest degree of urbanization.

In the study region, distribution of the degree of urbanization and the spatial distribution of urban population show related trends. High degree of urbanization is associated with the tehsils which contain big urban settlements and larger number of urban settlements. Such cases are found in Haveli, Nashik, Pune city, Hatkangale and Miraj tehsils through which major transport and communication lines pass. They have a high degree of urbanization because of their industrial development. Low degree of urbanization is observed in the relatively western hilly tracts and in dry plateaus in which favourable conditions for the growth of large settlements are absent.

### 5.10 CONCENTRATION OF URBAN POPULATION :-

The proportion of urban population to total population brings out more clear picture of the concentration of urban population. Hence, the degree of concentration of urban population is measured by considering the proportion of urban population with the following simple equation :

$$DC = \frac{P_i}{PI} \times 100$$

Where -

DC is degree of concentration

P<sub>i</sub> is percentage of urban population in an areal unit

PI is percentage of urban population of study area.

Under this method, areas having values less than 100 are supposed to have no concentration. But, here we have considered the values which are less than 100 to indicate the poor concentration of urban population. Urban concentration zones have been delimited on the basis of the degree of urban concentration of each tehsils. Thus, four zones of urban concentration are identified (Fig.5.7).

The highest concentration of urban population is noticed in the Pune city tehsil (355.90). This is mainly due to manufacturing, well developed transport system, clusters of a variety of services and facilities trade and commerce and educational and administrative factors. All these conditions favour to grow the Pune city and its townships tremendously.

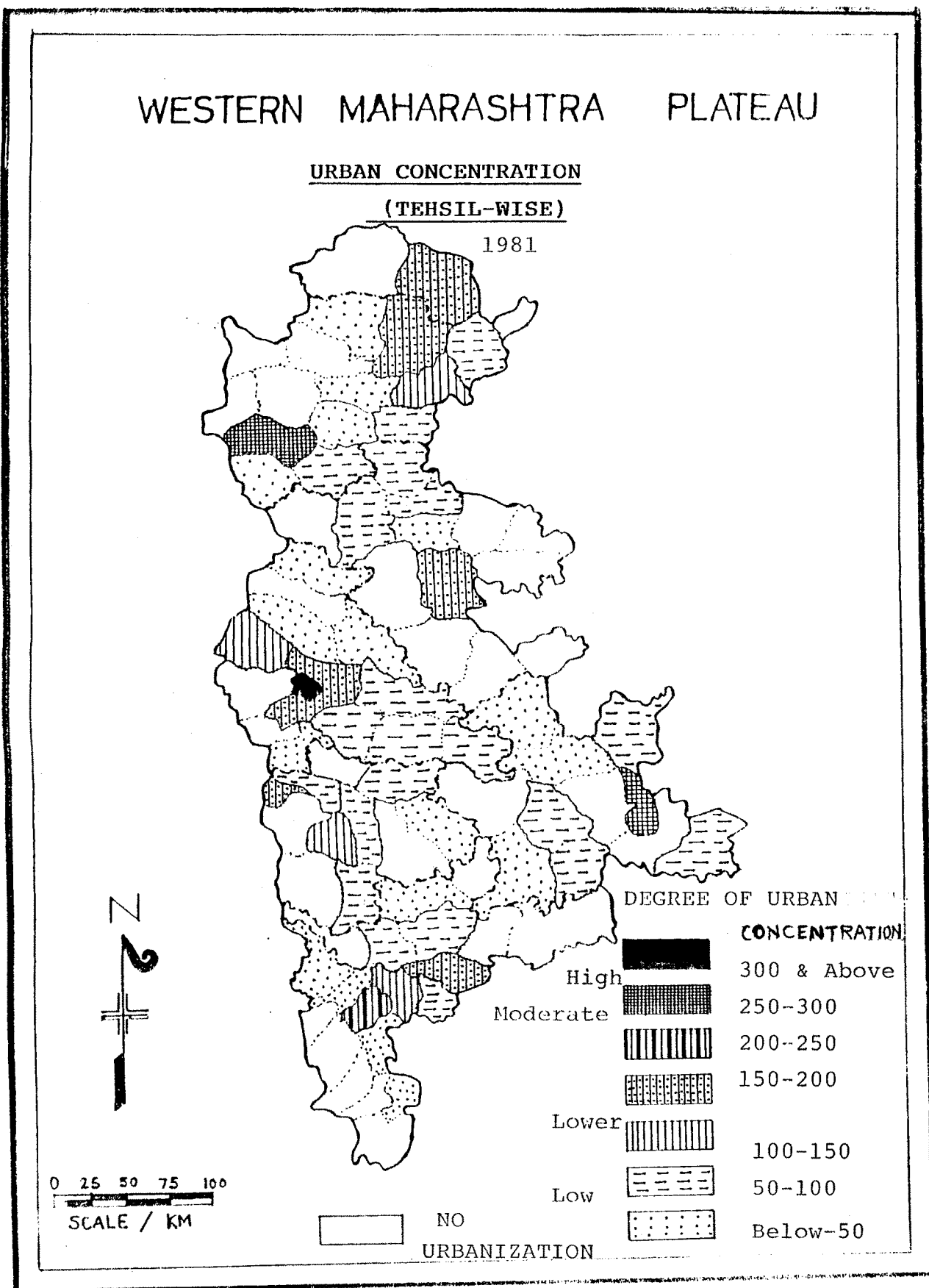


FIG. 5.7

Moderate concentration of urban population ranging from 200 to 300 is found in Nashik, Solapur North and Karvir tehsils. These tehsils have the facilities of transport, industries, administration and educational. Urban centres in these tehsils are located in the plains of river valleys.

Lower concentration ranging between 100 and 200 is found in Malegaon, Dhule, Ahmadnagar, Haveli, Mahabaleshwar, Miraj, Nandgaon, Mawal, Satara and Hatkangale tehsils of the region.

Low concentration of urban population is found in 39 tehsils of the region. Out of these 39 tehsils, eighteen have a very low concentration of urban population, where the degree of concentration is less than 50. It includes four tehsils each of Nashik, Kolhapur, Solapur and Pune districts and one each from Sangli, Ahmadnagar and Satara districts. These tehsils have low concentration of urban population probably because of the absence of proper transport network, unadequate incentives to industries inspite of agricultural prosperity and a greater percentage of rural population. The process of urbanization in these tehsils is observed very low.

The concentration of urban population in the real sense is found only in 14 tehsils of the region. The regional degree of urban concentration is poor when compared to the State degree of urban concentration. The degree of urban concentration in the study region when compared with that of State level indicates a value of 79.59.

### 5.11 RANK-SIZE RELATIONSHIP OF URBAN CENTRES :-

Urbanization is a process in which some cities grow at a more rapid rate than others. The actual population size of urban centres exhibits their ranks in the distributional pattern of urban centres in a region. The rank size rule (Zipff, 1949) has been applied to examine rank size relationship of urban centres in the study region.

The rank size rule states that if all the urban centres in an area are ranked in a descending order of population size, the population of n<sup>th</sup> town will be 1/n<sup>th</sup> the size of the largest city (the primate city) and the population of other urban centres will be arranged according to the series, 1, 1/2, 1/3, 1/4,..1/n. The Statement of rank size rule in mathematical terms is given below.

$$P_r = \frac{P_1}{r^q}$$

Where,

$P_r$  - is the population size of the city/town of rank  $r$ .

$P_1$  - is the population of the largest city in the system.

$r$  - is the rank of the city/town in question.

$Q$  = is an exponent.

This rule shows statistical regularity in the population size of a town and its rank. Generally, any region is likely to contain many small towns, a lesser number of medium size towns and a few larger cities. This pattern of city sizes has been observed to be quite regularly from one region to another. There are a

number of ways to express the rank size relationship and deviation from it. In the present study, the rank size rule has been expressed by plotting the rank by size of town on a log-log scale graph and by calculating the number of urban places and the population which would be anticipated for various population sizes (Table 5.4).

The rank size relationship of towns has been shown on a log-log scale graph. It is evident that shape of the curve is not in conformity with the rank size rule (Fig.5.8(A)). Since, it has no linear relationship. The appearances of marked "plateaux" on the curve reveal the large gap in the hierarchy of population sizes.

Another way of studying the rank size relationship of towns is to calculate expected population of individual urban settlement and to compare these figures to actual population of corresponding towns. The expected population of the primate city is calculated by using the following simple equation :

$$P_1 = \frac{\sum P}{\sum IR}$$

Where,

$P_1$  is the expected population of the primate city.

$\sum P$  - is the total of actual population of all towns.

$\sum IR$  - is the total of reciprocal of ranks.

The expected population of all towns calculated so far, has been plotted on a log-log scale graph (Fig.5.8(B)).

The rank size distribution of urban centres in the study

RANK SIZE RELATIONSHIP OF TOWNS, 1981

Rank	Urban Population	Reciprocal of $R(I/R)$	Actual Population (Pa)	Expected Population (Pe)	Difference (Pa-Pe)	Difference as % of expected size
1	2	3	4	5	6	7
1.	Pune	1.0000	1,203,351	1,084,979	118,372	10.9
2.	Solapur	0.5000	511,103	542,489	31,386	-5.8
3.	Kolhapur	0.3333	340,625	361,659	21,034	-5.8
4.	Nashik	0.2500	262,428	271,244	-8817	-3.2
5.	Malegaon	0.2000	245,883	216,996	28887	-3.2
6.	Pimpri-Chinchwad	0.1666	220,966	180,830	40136	22.2
7.	Dhule	0.1428	210,759	154,997	55762	35.9
8.	Sangli	0.1250	152,359	135,622	16767	12.4
9.	Ahmadnagar	0.1111	143,937	120,553	23383	19.4
10.	Ichalkaranji	0.1000	133,751	108,498	25253	23.3
11.	Miraj	0.0909	105,455	98634	6821	7.2
12.	Pune Cantt.	0.0833	85,986	90415	-4429	-4.9
13.	Satara	0.0769	83,336	83,460	-124	-0.1
14.	Kirkee Cantt	0.0714	80,835	77,499	3336	4.3
15.	Nashik Rd. Deolali	0.0666	77,666	72,332	5334	7.4
16.	Barshi	0.0625	72,537	67,811	4726	6.9
17.	Pandharpur	0.0588	64,380	63,822	558	0.9
18.	Chalisgaon	0.0555	59,342	60,277	-935	-1.5

1	2	3	4	5	6	7
19.	Deolali Cantt	0.0526	57,745	57,104	640	1.1
20.	Shrirampur	0.0500	55,491	54,249	1,242	2.3
21.	Karad	0.9476	54,364	51,666	2698	5.2
22.	Manmad	0.0454	51,439	49,317	2122	4.3
23.	Sangamner	0.0434	40,088	47,173	-7085	-15.0
24.	Ozar	0.0416	39,905	45,207	-5302	-11.7
25.	Ahmadnagar Cantt	0.0400	37,273	43,399	-6126	-14.1
26.	Baramati	0.0384	37,121	41,730	4609	-11.0
27.	Kopargaon	0.03704	36,886	40,184	-3298	-8.2
28.	Lonawala	0.0358	36,260	38,749	-2489	-6.4
29.	Phaltan	0.0344	33,859	37,413	-3554	-9.5
30.	Dehu Rd.Cantt.	0.0333	33,267	36,166	2899	-8.0
31.	Islampur	0.0322	33,016	34,999	1983	-5.7
32.	Kabnur	0.0312	30,275	33,906	-3631	-10.7
33.	Akkalkot	0.0303	28,343	31,911	-3568	-11.2
35.	Tasgaon	09.0285	26,159	30,999	-4840	-15.6
36.	Daund(N.M.)	0.277	25,575	30138	-4563	-15.1
37.	Wai	0.0270	24,661	29,324	4663	-15.9
38.	Vita	0.0263	24,081	28,552	-4471	-15.6
39.	Jaysingpur	0.0256	24,012	27,820	3808	13.7
40.	Rahuri	0.0250	23,721	27,124	-3403	-12.5
41.	Kalamb	0.0243	23,129	26,463	3334	-12.6
42.	Talegaon(D)	0.0238	22,520	25,833	-3313	-12.8
43.	Sinnar	0.0232	21,926	25,232	-3306	-13.1
44.	Ashta	0.0227	21,333	24,659	3326	-13.5
45.	Satana	0.0222	20,821	24,111	-3290	-13.6

Conti-----



1	2	3	4	5	6	7
46	Hadapsar	0.0217	20,563	23,587	-3023	-12.8
47	Kirloskarwadi	0.0212	20,512	23,085	-2573	-11.1
48	Igatpuri	0.0208	20,461	22,604	2143	-9.5
49	Satpur	0.0204	19,952	22,142	-2190	-9.9
50	Kurduwadi	0.0200	19,554	21,699	-2145	-9.9
51	Daund(M)	0.0196	19,318	21,274	-1956	-9.2
52	Gadhinglaj	0.0192	18,535	20,865	-2330	-11.2
53	Junnar	0.0188	18,311	20,471	-2160	-10.5
54	Nandgaon	0.0185	17,768	20,092	2324	11.6
55	Kurundwad	0.0181	17,084	19,727	-2643	-13.4
56.	Lohgaon	0.0178	16,918	19,375	-2457	-12.7
57.	Mangalvedha	0.0175	16,802	19,035	-2233	-11.7
58	Karmala	0.0172	16,729	18,707	-1978	-10.6
59	Khadakwasala	0.0169	16,654	18,389	-1735	-9.4
60	Kagal	0.0166	16,545	18,083	-1538	-8.5
61	Sangola	0.0163	14,854	17,787	-2933	-16.5
62	Mhaswad	0.0161	14,749	17,500	-2751	-15.7
63	Koregaon	0.0158	14,594	17,222	-2628	-15.2
64	Vadgaon(K)	0.0156	14,430	16,953	-2523	-14.9
65	Ravalgaon	0.0153	13,253	16,692	-3439	-20.6
66	Shirur	0.0151	13,050	16,439	-3389	-20.6
67	Vadgaon Sheri	0.0149	13,050	16,194	-3144	-19.4
68	Bhor	0.0147	12,834	15,956	-3122	-19.6
69.	Sasvad	0.0144	12,526	15,724	-3198	-20.3
70.	Sangvi Haveli	0.0142	11,969	15,500	-3531	-22.8
71.	Rahimatput	0.0140	11,666	15,281	-3615	-23.7

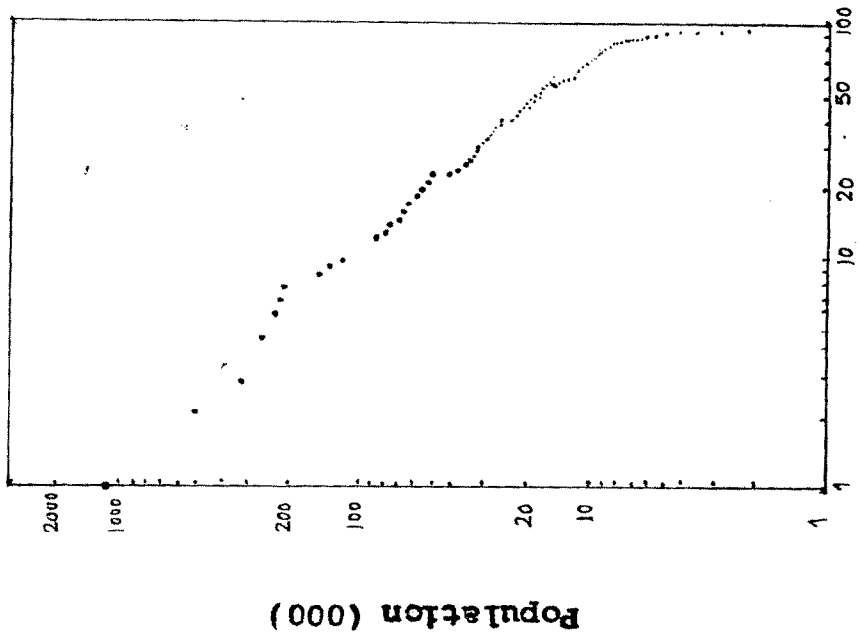
72	Bhagur	0.0138	11,243	15,069	3826	-25.4
73	Madhavnagar	0.0136	11,144	14,863	-3719	-25.0
74	Maindargi	0.0135	11,079	14,662	-3583	-24.4
75	Kalas	0.0133	11,058	14,466	-3408	-23.6
76	Satara Road	0.0131	10,867	14,276	-3409	-23.9
77	Gandhinagar	0.0129	10,767	14,091	-3324	-23.6
78	Ektlahare	0.0128	10,318	13,910	-3592	-25.8
79	Wari	0.0126	10,259	13,734	-3475	-25.3
80.	Chandvad	0.0125	9,946	13,562	-3616	-26.7
81.	Indapur	0.0123	9,418	13,395	3977	-29.7
82.	Mahabaleshwar	0.0121	9061	13,231	-4170	-31.5
83.	Lasalgaon	0.0120	8,638	13,072	-4434	-33.9
84.	Panchagani	0.0119	8,635	12,916	-4281	-33.1
85.	Murgud	0.0117	8,613	12,764	-4151	-32.5
86	Dudhani	0.0116	8,300	12,616	-4316	-34.2
87	Dehu	0.0114	7,569	12,471	-4902	-39.3
88.	Alandi	0.0113	7,523	12,329	-4806	-38.9
89.	Shivatkar(Nira)	0.0112	7,054	12,191	5137	-42.1
90.	Trimbak	0.0111	6,759	12,055	-5296	-43.9
91.	Jujiri	0.0109	5,126	11,923	-6797	-57.0
92.	Malkapur	0.0108	4,845	11,793	-6948	-58.9
93.	Warwandi	0.0107	3,713	11,666	-7953	-68.2
94.	Vadner	0.0106	3,651	11,542	-7891	-68.4
95.	Panhala	0.0105	2,540	11,420	-8880	-77.7
N=95		Σ= 5.1338	5570065	5541323	6775913	1761
EX/N		-	58632	58330	7133	18.5

# WESTERN MAHARASHTRA PLATEAU

## RANK SIZE RELATIONSHIP.

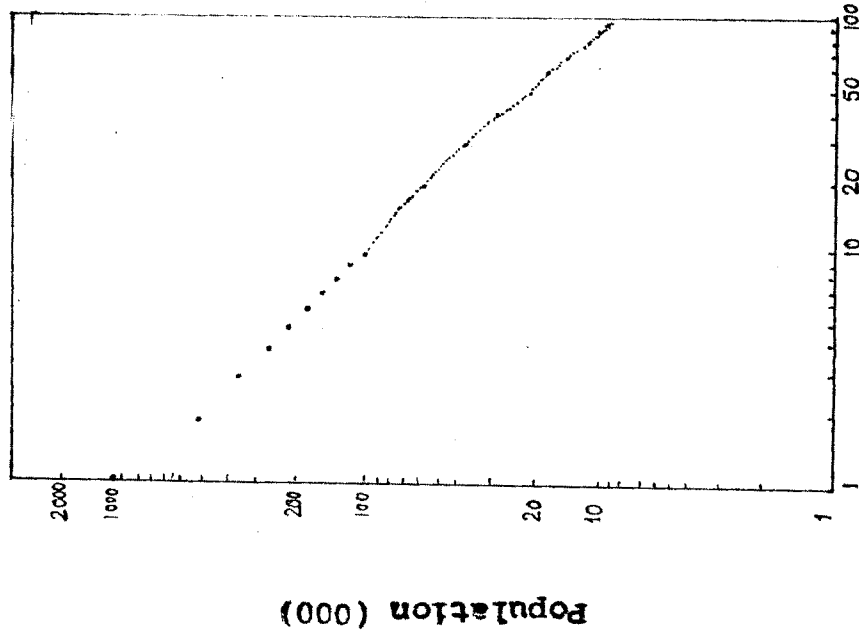
1981

(A)



Rank of urban centre

(B)



Rank of urban centre

region indicates that the actual population of the first ranking city in the region is larger than the expected population. But Solapur, Kolhapur and Nashik cities indicate less actual population than the expected. Almost all cities except Solapur, Kolhapur and Nashik and all big towns except Pune cantonment, Satara and Chalisgaon having their population more than 50,000, show more actual population than the expected. All the remaining 73 urban centres show less population than the expected population.

The rank size rule does not suit to small size towns. The degree of deviations between actual and expected population increases further in the case of small size towns. In the study region, the difference between the actual and expected population of urban centres is observed less upto the 64th rank (Table 5.4). From the 65th rank actual population begins to deviate highly. The last ranking town has an actual population of 2540 persons; on the other hand, the expected population of the 95th ranking town is 11,420, which shows - 77.7 per cent deviation.

#### 5.12 PATTERN OF URBAN CENTRES :-

The size and spacing are the two intimately connected aspects in the locational analysis, for they exhibit a certain order of relationship in the distributional pattern of urban centres over the space (Misra, 1988). The distribution of urban centres over the different parts of the world is irregular. The high order urban centres are widely spaced, while lower order centres are closely spaced. This observation leads us to the

spatial arrangement of urban centres giving a typical distribution pattern of urban settlements.

The distribution of urban centres is quite uneven in the study region. There are clusters of urban settlements in some parts while in others they are sparsely distributed (Fig.5.9). In order to test the hypothesis that the distribution of urban centres in the study region is uneven, here, an attempt has been made to work out the value of chi-square <sup>test</sup> (Table 5.5.).

The statistical technique called the 'Nearest Neighbour Analysis' developed by plant ecologist (Clark and Evans, 1954) has been used to analyse the spatial distribution pattern of urban centres. The technique of nearest neighbour analysis shows the degree to which any observed distribution of points deviate from the random distribution. Dacey (1962), Brush (1963), King (1962), Gettis(1954) and Reddy (1970) have applied nearest neighbour technique to analyse the nature of distributional patterns of settlements. Stewart (1958) and Haggett(1967) explored the idea of relationship between size and spacing on the regional and national levels.

The technique of nearest neighbour analysis <sup>is</sup> very useful in studying the point pattern. The nearest neighbour index value is calculated by the following formula :

$$R = \bar{D} \text{ obs} / \bar{D} \text{ ran}$$

Where,

$\bar{D} \text{ obs}$  - is the measured mean distance between the nearest neighbour point observed in the given area.

TABLE 5.5

SPATIAL DISTRIBUTION OF URBAN CENTRES AND CHI-SQUARE TEST.

District	% of Area	No. of urban centres(O)	Expected No. of urban centres(E)	O-E	(O-E) <sup>2</sup>	(O-E) <sup>2</sup> / E
Nashik	16.01	19	15	+4	16	1.07
Ahmadnagar	17.58	8	17	-9	81	4.76
Pune	16.13	26	15	+11	121	8.07
Satara	10.81	10	10	0	0	0
Sangli	8.84	8	8	0	0	0
Solapur	15.48	10	15	-5	25	1.67
Kolhapur	8.30	12	8	+4	16	2.00
Dhule	5.10	1	5	-4	16	3.20
Jalgaon	1.75	1	2	-1	1	0.50
Western Maharashtra Plateau	100.00	95				

$\chi^2 = 21.27$

The value comes out to be 21.27. The degrees of freedom(n-1) in this case are 9-1=8. For 9.d.f. tabulated value of chi-square at 1% level of significance is 20.09. Our computed value(21.27) is slightly more than the tabulated value and hence it is significant. Thus the hypothesis that urban centres are equally distributed is rejected and we may conclude that the spatial distribution of urban centres in the study region is uneven.

$\bar{D}$  ran - is the expected mean distance for a similar number of points randomly distributed in the same area.

R - is the nearest neighbour index.

$\bar{D}$  ran is obtained from the following formula :

$$\bar{D} \text{ ran} = \frac{1}{2 \sqrt{\left(\frac{N}{A}\right)}}$$

Where,

N is the number of urban settlements in the study region.

A is the area under study.

Therefore,

$$R = \frac{\bar{D} \text{ obs}}{1 + 2 \sqrt{\left(\frac{N}{A}\right)}}$$

It can be written in a simplified form as :

$$R = 2 \bar{D} \text{ obs} \sqrt{\left(\frac{N}{A}\right)}$$

( Source : Hammand,R.and McCullagh, P.S.(1974): Quantitative Techniques in Geography: An Introduction, pp.238-239.).

Using the above formula, the nearest neighbour index is calculated for the entire region considering a single unit. The value of  $R = 0$ , indicates a clustered distribution,  $R = 1$ , a random pattern and  $R = 2.15$ , a more or less uniform distribution. It is observed that the overall pattern of spatial distribution of urban centres in the study region approximates more closely to a random pattern ( $R = 0.89$ ).

### 5.13 SPATIAL PATTERN OF DISTRIBUTION :-

The study region presents a wide contrast in size and spacing of urban centres. So, the entire region is divided into six

physical divisions for the purpose of calculating 'R' value. The spatial pattern of distribution of urban centres has been studied by considering the revised 'R' value scale. From the different 'R' values calculated for the six broad physiographic divisions, the following inferences are drawn.

The Western hilly zone which covers 22.81 per cent area has 10.53 per cent urban centres with a poor level of development. The area has 10 towns distributed in a clustered manner where the degree of randomness is 0.67. In this part, more than 80 per cent land has rough topography land under irrigation is limited the soil is poor. This conditions give rise to a cluster of urban centres at the most favourable sites.

The upper Krishna valley zone is the most prosperous part of the study region. It covers 21.66 per cent of the total area. Nearly 23 urban centres (24.21 percent) are located in this valley zone. The density of road network land under irrigation, fertility of soil and high level agricultural development have promoted the growth of urban settlements in the area, where the degree of randomness ( $R = 0.26$ ) shows linear clustering pattern (Fig.5.9).

The central dry plateau zone covers 2.78 per cent of the total area where three urban places (3.16 per cent) are distributed randomly ( $R = 1.10$ ). This zone is characterised by very low densities of the total population and urban population, poor road network and insignificant land under irrigation.

The Bhima Valley zone comprises, 42.15 per cent of total area. The region possesses a fertile soil and irrigated areas are located in a few tehsils. The development of road network industrial development, market organization, concentration of a



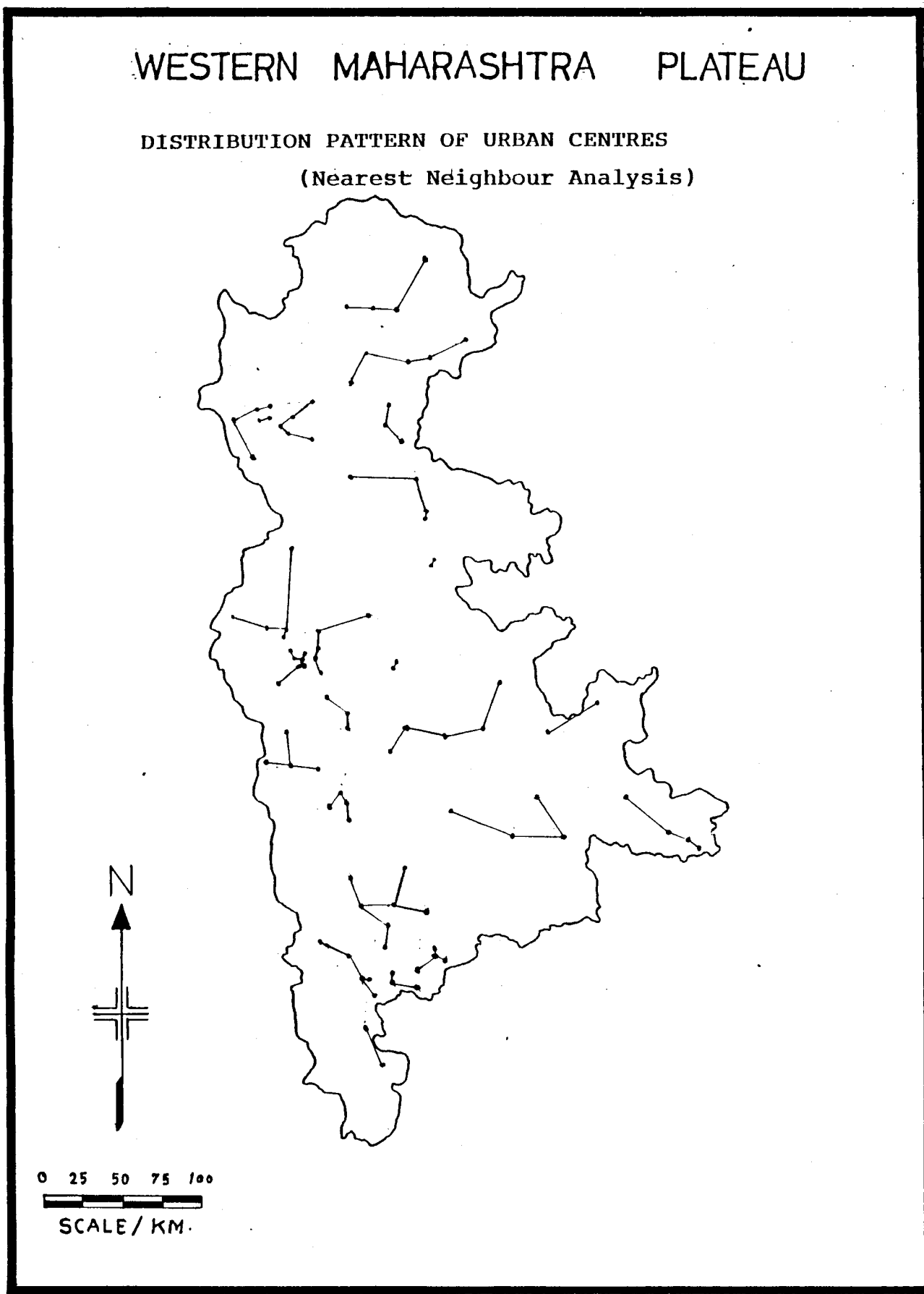


FIG. 5.9

# WESTERN MAHARASHTRA PLATEAU

DISTRIBUTION PATTERN OF URBAN SETTLEMENTS  
(Nearest Neighbour Analysis)

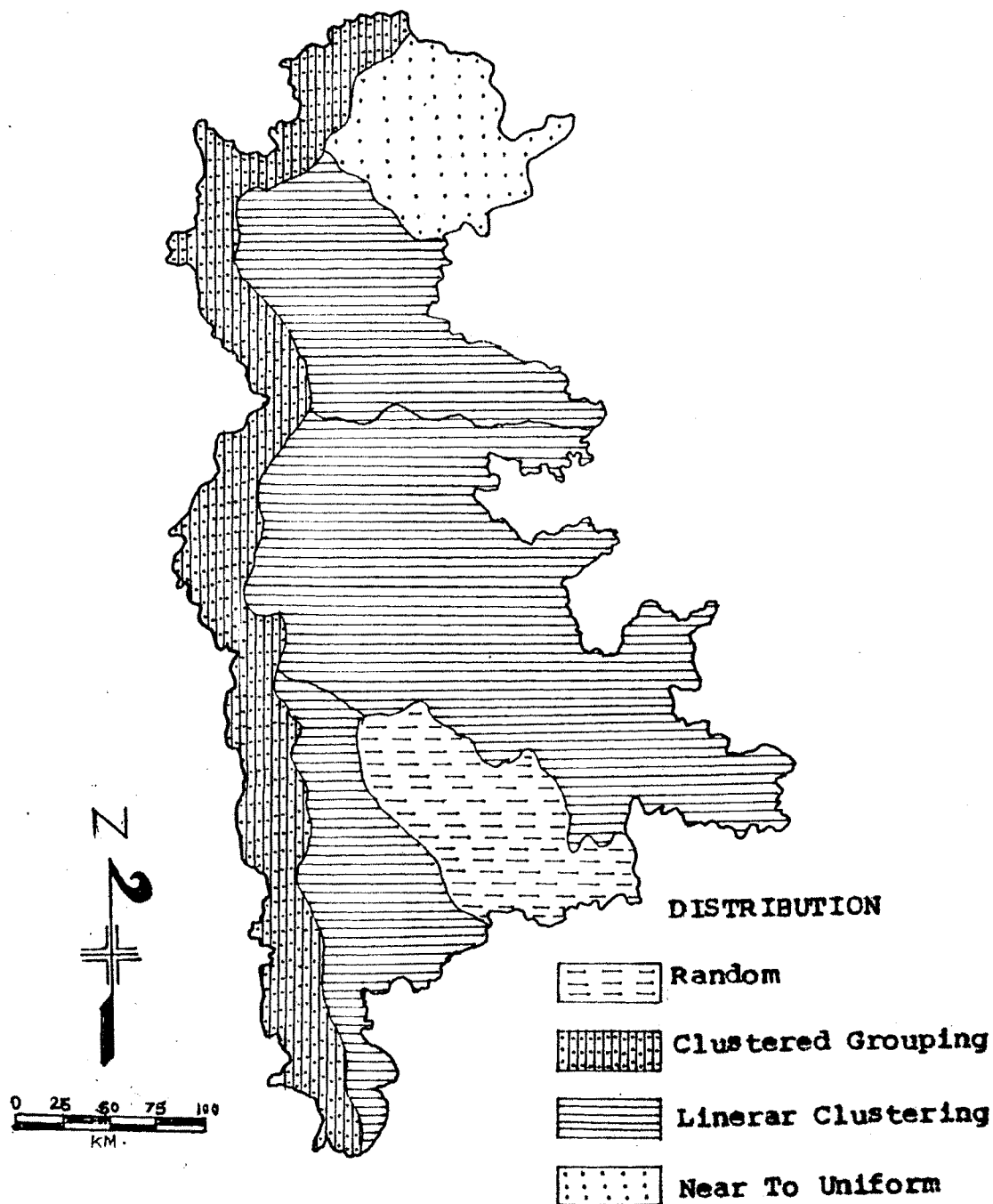


FIG. 5.10

variety of services and facilities in a few areas encourage the growth and development of urban settlements. This zone comprises the maximum number (34) of towns with 35.79 per cent of the total, where the nearest neighbour index ( $R = 0.36$ ) shows a <sup>linear</sup> clustering pattern (Fig. 5.10).

The Godavari valley zones consists of 18 urban settlements (18.95 per cent) indicating linear clustering pattern with a degree of randomness  $R = 0.45$ .

The northern most plateau includes 7 urban centres (7.37 per cent). The spatial distribution of these urban places shows near to uniform pattern with  $R = 1.24$ .

#### SUMMARY :-

From the above discussion, one might observe that apart from physiography the social and economic factors play an important role in the distribution of urban centres. Summarising the characteristics of the distribution of urban centres in the study region, it is observed that the urban centres are widely spaced and relatively small in size and are found in less developed areas. In contrast, in developed areas they are more closely spaced and their size is relatively large. The spatial distribution of urban centres, distribution of all aspects of urbanization, rank size relationship and the spatial patterns of the distribution of urban settlements in the study region provides a framework for a detailed analysis of the association of regional development and urbanization in the chapter to follow.

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