CHAPTER VI

DISTRIBUTION OF URBANIZATION CENCOGRAPHIC ANALYSIS
DISTRIBUTION OF URBANIZATION CENTROGRAPHIC ANALYSIS

The purpose of this section is to understand the spatial aspects of the central tendency of the distribution of urban centres and urban population in the Narmada Valley in Madhya Pradesh. The distributional changes of the indexes of central tendency are being here studied over a period of seven decades, i.e. from 1901 to 1971.

A brief note on Centrographic Analysis

Gravity models to describe the spatial interaction and centrography to describe the nature of central tendency had become common in geographical studies by 1950's. The quantitative revolution (I. M. Burton, 1963) had up held the significance of precise and objective measurement and thus encouraged the effective use of statistical concept and methods to come out with meaningful full quantitative expression. Added to this, the development of statistical calculator had immensely helped geographers in using the massive amounts of data. Studies concerned with areal variations are on the increase and the accurate description of them has become still more a difficult task in view of the interdisciplinary approach. For example, a study concerned with the spatial structure of urban areas faces the problem of providing a systematic

Centrographic analysis of areal distribution is primarily concerned with the understanding of the spatial aspects of the central tendency. The idea of measuring the centre of a population distribution originated a century ago and Hilgard was the first person to compute areal population centre (Hilgard, J.E. 1872). By 1874 the United States Bureau of the census gave the official recognition to the concept of 'population centre'.

Meanwhile a group of Soviet geographers headed by E.E. Sviatlovsy was trying to develop centrography as an independent field of investigation and it is appropriate to mention here that the Mendeleev school of Geography pointed out of the difference between 'mean centre' and meadian centre. This importance of centrographic method in regional analysis is made evident in the article of Sviatlovsky, E.E. and Weels, W.C. (1937).

Recently keen interest has been shown in the field of centrographic analysis by several social scientists and especially by the geographers in the United States, (Bachi, R. 1963, and Neft, D. 1966).
A Note of the Methodology

Centrographic study is really a study in social physics. The centrographic method is analogous to the principle of the moment, that is, the product of mass and distance and hence is also known as moment analysis (Raddy, 1970). The method essentially finds the moment of points or small areas, i.e., the products of distances and mass of individual points on an assumed frame work of coordinates, over the area in question, and locates the gravitational centres of these moments by analysis of these points for various distributions at a time; and by carefully tracing the movement of such points through time one can draw important conclusions for planning and many other applied purposes. In this method, a frame of rectangular coordinates is assumed covering the area under study, and $x$ - and $y$ - coordinate values of points are noted. They are then multiplied by the mass of points (such as population, size of industry, labour force or any other parameter), which gives their moments. Centres of these moments are determined to be at the intersection of central points (such as mean or mode or median) of the $X$ and $Y$ values.
\[ \bar{x} = \frac{\sum (P \times X)}{\sum P} \]

\[ \bar{y} = \frac{\sum (P \times Y)}{\sum P} \]

where:

- \( x \) is the vertical coordinate of the area.
- \( y \) is the horizontal coordinate of the area.
- \( P \) is the population of the area.

Tirnau, P., 1965, 244.

While the method in itself is a static one and capable of analysing the distribution at a given point of time, it can easily be employed in the study of growth of a distribution by adopting a historical approach, i.e., by tracing the shifts of these distributational centres at successive points of time. It is for this latter purpose that this method is applied here - for studying growth trends of towns and urban population, or, in other words, the trend of urbanism in the region.

However, notwithstanding its immense poten-
tialities, the method has its own intrinsic limitations
also. In the first place, the method gives only the
centre of mass of a distribution and its spatial pattern.
To quote Reddy (1970-14), study of mean centres of
distribution indicates the over-all effects and tendencies
of general pull of the distribution, it does not present
the complete picture of distributions. Secondly, whereas
the centre of moments is readily affected by (and, there-
fore, readily reveals) any distribution changes in boundary
areas, the changes – even big changes – in central areas
affect little the location of the moment centre.

This section of study seeks to analyse the trend
of movement of mean centres of urban places and of urban
population from 1901 to 1971, as well as the discordance
of the two centres and trends of changes therein. These
centres are shown in plate 12, B.

Trend of the mean centres of urban places

Before embarking upon the actual interpretation
of the location of these centres, it is will be advisable
to reiterate that the region under study has almost a
rectangular shape. Its oblong dimension in the east-west
direction is more than three times the north-south breadth
size of the region. Thus, it is not very difficult to
locate at least approximately the geographical centre of the region by simple measurements. This would not be inferior to the method suggested by Reddy, 1970. The geographical centre of the Narmada Valley falls almost midway on a straight time joining the Harda and Seoni-Valva towns, and also almost on the border between the tahsils of the same name.

It may also be noted that in an analysis of the centre of urban places, an urban place is regarded to be of the same mass, i.e. having same unit value mass. Its mean centre is thus determined by the mean values of the abscissa and ordinate of town locations on the assumed framework of reference.

<table>
<thead>
<tr>
<th>Decade</th>
<th>X-mean value of $C_u$</th>
<th>Y-mean value of $C_u$</th>
<th>X-mean value of $C_p$</th>
<th>Y-mean value of $C_p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>14.86</td>
<td>5.65</td>
<td>18.00</td>
<td>6.68</td>
</tr>
<tr>
<td>1911</td>
<td>12.05</td>
<td>5.74</td>
<td>18.03</td>
<td>6.64</td>
</tr>
<tr>
<td>1921</td>
<td>14.56</td>
<td>5.58</td>
<td>18.45</td>
<td>6.67</td>
</tr>
<tr>
<td>1931</td>
<td>12.73</td>
<td>5.41</td>
<td>15.41</td>
<td>6.03</td>
</tr>
<tr>
<td>1941</td>
<td>13.13</td>
<td>5.51</td>
<td>15.9</td>
<td>6.29</td>
</tr>
<tr>
<td>1951</td>
<td>12.77</td>
<td>5.4</td>
<td>16.68</td>
<td>6.03</td>
</tr>
<tr>
<td>1961</td>
<td>12.68</td>
<td>5.49</td>
<td>16.78</td>
<td>6.40</td>
</tr>
<tr>
<td>1971</td>
<td>12.76</td>
<td>5.5</td>
<td>18.43</td>
<td>6.78</td>
</tr>
</tbody>
</table>
The centrophic mean centre of urban places of the region was located in 1901 in Sonei-Malwa tahsils, very near its headquarters and about 20 km to the east of the geographical centre. A decade later it shifted only slightly farther east. During the first decade of this century only two towns were recognised against none declassified. As one of these towns, Panagar, was located in the extreme east while the other, Sanawad, was located somewhat centrally in the western part of the region, the mean centre of urban places showed but a small shift to the east. During the next decade Panagar fell back to villagehood, while no new town was recognised, so that the mean centre of urban places shifted a little to west, now being located somewhat midway between the geographical centre and its 1901 position. The third decade marks a period of real resurgence from natural calamities of early decades that had greatly retarded the growth of population, and emergence of new towns. In 1931, as many as six new towns were recognised against none declassified — five in the western side of the region including one in the extreme west — Alirajpur. This emergence of new towns in the far western part of the region greatly pulled the mean centre of urban places to the west by about forty-five kilometres. This westward pull of the centre was enhanced also because
the centres located previously were in the eastern part of the region. Piparia stood only a little to the east of the 1931 position of the centre of urban place, the western towns stood far to the west of this centre. In 1941 the centre is found to be located only a little to the east of the 1931 position. In this decade (1931-41) five new towns were recognised - Sandhwa in the far south-west, Kannod a little to the north-west, Kareli in the north-west, Kareli in the far east, Baraily well to the north-east and Timurni in the central part. Thus the pull on this centre from the west and east was almost equal. However, declassification of Dharampuri in the far west, tilted the balance in favour of the east, so that the centre shifted about 12-13 kilometres to the east-north-east, also because of the rather northerly position of Baraily and Kannod. In 1951 the derecognition of Baraily in the north-east and recognition of Mandleshwar in the west caused the centre to shift a little to the west-south-west, very near to its 1931 position. In 1961 as many as nine new towns were recognised against none declassified - five in the west, three in the east, and one a little to the north-west. Yet, the centre moved only nominally to the north-west largely because the centre was already located well high to the west of
the geographical centre, so that the pull of western towns was diminished and that of eastern towns was correspondingly enhanced. Finally, in 1971, two more towns were recognised while none was declassified. As both these towns, Babai and Khirkiya, were located in the central part of the region, the centre of urban places moved only nominally to the west.

Table No. 6.2

Growth of Towns

<table>
<thead>
<tr>
<th>Decennial census year</th>
<th>Number of urban centres</th>
<th>Addition per decade</th>
<th>Declassified</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1911</td>
<td>21</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1921</td>
<td>20</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1931</td>
<td>27</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>1941</td>
<td>31</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>1951</td>
<td>31</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1961</td>
<td>39</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>41</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Thus, finally - i.e. in 1971 - it came to stand in the centre of northern Harda tahsil, about thirty kilometres west of the geographical centre, and almost fifty kilometres west of its initial position.

Mean Centre of Urban Population

The centre of urban places ($c_u$) unrelated to their mass, i.e. population size, signifies little about the position of urbanization. A more significant pointer in provided by the mean centre of urban population, i.e. locations of towns multiplied by their population sizes.

The centurographic mean centre of urban population of the region was located in 1901 in Schagpur tahsil very near its headquarter, and about 70 kilometres to the east of the geographical centre. In 1911 the mean centre of urban population ($c_p$) was shifted to the north marginally. In this decade of general depression, though certain towns in the southern part of the region increased fairly high, through moderate growth of Jabalpur city along with the new town of Panagar in the most northerly location pulled the urban population centre marginally to the north. Over the next decade the centre shifted much to the east-south-east- by about 15 kilometres. This came about in the
following way: the small town of Panagar in the extreme northeast was declassified. While Jabalpur grew by only eight per cent and Gadarwara highly by 58 per cent, certain towns of the western part also registered a high growth rate such as Hoshangabad (118%), and Sanawad (116%). However, the markedly larger size of the eastern towns involved a large net increase of urban population even with their moderate growth rate than the smaller towns in the western part. The net result was an east-south-eastward shift of the centre of the urban population.

The third decade - 1921-31 - marks a significant shift to the west - of about seventy-five kms. from very near Sohagpur town to the western border of the Hoshangabad- tahsil. This is well in consonance with a similar shift of mean centre of urban places during the same decade and indicates the decisive role of the five new towns in the far western part against only two in the eastern part. This was further supported by markedly slow-growth dynamism of the eastern towns, particularly Jabalpur (14% as against 32% urban growth of the region as a whole) and faster growth of the western towns, such as Khandwa, Narda, Itarsi etc. In 1941 the centre is found to have shifted about fifteen kilometres to the north-east, again in harmony with the corresponding shift of the centre of
urban places. However, in this shift the high growth rate of Jabalpur (44%) has had a decisive role, against rather slow growth rates of many western towns. The northern component of the shift was due almost solely to the new towns on the northern border, Kanhod and Barailey. During 1941-51, the centre shifted about 20 kilometres to the east-south-east. The eastern component of this was due largely to the high growth of Jabalpur city (44% against the regional urban growth of 29%), further supported by 47 per cent growth of Kareli, while the growth of certain western towns was rather slow or even negative such as in the case of the north-west. Declassification of Barailey and the stagnant position of the north-western towns are largely responsible for the southward component of the shift. The growth trend in the 1951-61 decade was rather different from the preceding decade. There was notably smaller variation in growth rates of towns (S.D. being about 2/3 the size of the mean), so that there was practically no east-west shift. However, as many as nine new towns were recognised, out of which six were on the northern belt, while others, except Bhikangaon, were from the central part. This factor pulled the centre about twelve kms. to the north.
This is the biggest northward shift and of the whole chain of decennial position of both centres, that of urban places ($C_u$) and of urban population ($C_p$). The last decade, 1961-71, registered a long eastward move of the centre — about fifty-five kilometres. This was brought about to a very large extent by the enormous absolute increase of Jabalpur City — from 367 thousand to 534 thousand, or about 46 per cent. Also, while the eastern towns grew pretty rapidly — upward of 40 per cent — the growth of western town was mostly markedly slow. Only two new towns were recognised, both in the central part, and they have had little impact on the centre.

Table 6.3

<table>
<thead>
<tr>
<th>Census year</th>
<th>Urban population</th>
<th>Growth</th>
<th>Distance between $C_p$ and reference to $C_g$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>236 683</td>
<td></td>
<td>104 kms. East.</td>
</tr>
</tbody>
</table>
Thus, except during 1911-21 the centre from 1901 onward, first shifted persistently to the west upto 1931, and thereafter moved back at varying rate to east, so that finally, 1971, it stood about 12 kilometres east-north-east of its initial position of 1901. Almost in every decade, whereas the major east-west was due largely to the differential growth dynamism of towns in the eastern and western part of the region, the minor north-south component of the shift was due mostly to the declassification - reclassification of small towns. Obviously due to the east-west physical cast of the region, these movements of centrographical centres are naturally along this axis.

Relation of Mean Centre of Urban Population to Urban Centres:

Considering the trend of the two centres together, one finds that in the initial year - 1901 - both centres were located to the east of the geographical centre. However, the centre of urban places was only slightly to the west of the geographical centre, that of urban population was far to the east, thus giving a difference of about 85 kilometres. Obviously, this was due primarily to the overwhelming size of Jabalpur in the extreme east. During the first decade there was little change in the locations
of both. In the next decade, the two centres shifted moderately in opposite directions, so that the distance between them increased to about hundred kilometres. However, during the 1921–31 decade both centres moved greatly to the west. As the centre of urban population took a much larger shift to the west, the distance between the two centres again was reduced to about seventy kilometres. Even in this most westerly position, the centre of urban population was still located about 32 kilometres east of the geographical centre. Over the fourth decade both the centres moderately moved back to the east. During 1941–51, however, the two centres again moved away - town centre slightly to the west-south-west, and urban population centre moderately to the east-south-east. Thus the distance between them again touched the high mark of a hundred kilometres. This was slightly increased further in the next decade as the town centre moved slightly westward and the urban population a little north-wards. In the last decade 1961–71, the urban population centre took a big eastward stride while the town centre moved little, so that the distance between them increased to the highest mark of about 140 kilometres.
The study has revealed that the distribution of urbanism in the region is uneven and the mean centre of urban places is concentrated in the Harda tahsil. This aspect is made evident when the spatial aspects of the central tendency for the distribution of urban centres and urban population are considered. The shifts of mean centre of urban population and mean centre of urban places has thrown light on the changing economic situations in the region as reflected in the distribution of urban centres and urban population.

Table No. 6.4

<table>
<thead>
<tr>
<th>Census year</th>
<th>Distance between $C_u$ &amp; $C_g$</th>
<th>Direction of location of $C_u$ with reference to $C_g$</th>
<th>Distance between $C_p$ &amp; $C_g$</th>
<th>Direction of location of $C_p$ with reference to $C_g$</th>
<th>Distance between $C_u$ &amp; $C_p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>19 kms</td>
<td>East</td>
<td>104 kms</td>
<td>East</td>
<td>85 kms</td>
</tr>
<tr>
<td>1911</td>
<td>24 kms</td>
<td>East</td>
<td>103 kms</td>
<td>East</td>
<td>90 kms</td>
</tr>
<tr>
<td>1921</td>
<td>13 kms</td>
<td>East</td>
<td>114 kms</td>
<td>East</td>
<td>101 kms</td>
</tr>
<tr>
<td>1931</td>
<td>36 kms</td>
<td>West</td>
<td>32 kms</td>
<td>East</td>
<td>71 kms</td>
</tr>
<tr>
<td>1941</td>
<td>25 kms</td>
<td>West</td>
<td>51 kms</td>
<td>East</td>
<td>74 kms</td>
</tr>
<tr>
<td>1951</td>
<td>34 kms</td>
<td>West</td>
<td>60 kms</td>
<td>East</td>
<td>100 kms</td>
</tr>
<tr>
<td>1961</td>
<td>37 kms</td>
<td>West</td>
<td>71 kms</td>
<td>East</td>
<td>105 kms</td>
</tr>
<tr>
<td>1971</td>
<td>33 kms</td>
<td>West</td>
<td>116 kms</td>
<td>East</td>
<td>149 kms</td>
</tr>
</tbody>
</table>


The areal shift of \( c_u \) and \( c_p \) has thrown light on the changing economic situation in the region as reflected in the distribution of urban centres and urban population. The changing locations of \( c_u \) and \( c_p \) with reference to the geographical centre \( c_g \) specially after 1931, has revealed the urban potentialities of the settlements close to Jabalpur. The centrographic analysis of the urban centres of the region has provided an insight into the urban economic problems of the region, from the point of view of distribution of urbanization.

REFERENCES


