

## **Study of Pattern of Rural Settlements Through Shape Analysis in Kolhapur District**

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### **Abstract**

*Pattern of settlement also reflects space and settlement relationship and man's adjustment to the surrounding environment. Present paper aims to investigation distribution types and different pattern of rural settlements. Extremely southern part of Maharashtra state located Kolhapur district is selected as study area, lies between 150 43' north to 170 17' north latitude and 730 40' east to 740 42' east longitude. The index of shape has been computed by employing Hagget's (1965) method. The study of shape index and contact number reveal that, the elongated linear and triangular pattern of settlements highly observed in hilly part and squire hexagon pattern of rural settlements mostly found in plain part.*

### **Introduction**

Pattern of the rural settlements is one of the criteria to classify the rural settlements. The conceptual framework of area association is initially linked with pattern analysis (Husson and Fowler, 1972). Pattern of settlement also reflects space and settlement relationship and man's adjustment to the surrounding environment. All human settlements are different from one another depending upon the surrounding environment. Hence, rural settlements show the reciprocal relationship of human occupation features and environment (Singh, 1961). The difference between two settlements can be identify by studying different elements like pattern is visible element of rural settlements.

### **Objective**

Present paper aims to make shape analysis of rural settlements in Kolhapur district of Maharashtra.

### **Study Area**

Extremely southern part of Maharashtra state located Kolhapur district lies between 150 43' north to 170 17' north latitude and 730 40' east to 740 42' east longitude. The Kolhapur district comprises 7685 sq. km area and administratively divided into 12 tahsils supports 38,76,001 population (2011). In general the physiography of the district has Sahyadri hills in a north-south direction, plateau area situated to the east of the Sahyadri hills and eastern plain area. The climate of Kolhapur is generally temperate. The average annual rainfall varies widely from about 600 mm in Shirol tahsil in the east to 6000 mm in Bavada tahsil in the west. The temperature ranges between 14o c to 38o c. About 68.8 per cent of total population lives in rural area.

### **Database And Methodology**

The index of shape has been worked out by using Hagget's (1965) method. The shape analysis is based on the 'elementary packing theory'. The circles are preferred to other geometrical figures owing to their large packing capacity and more compactness and better accessibility. But 'packing' on area of circles either leaves unserved areas or overlapping. Hence, three other geometrical figures like triangular, squire and hexagonal can be used to avoid these difficulties. Out of these three, the hexagonal shape is preferred because it retained most of the characteristics of the circle and does not leaved any unserved gap without overlapping. The shape measurement initiated by the biological scientist Thompson (1917). The quantitative study of shape

of river has been done by Miller in the year 1953. The credit goes to Hagget (1965) to calculate the shape of villages first time in the field of settlement geography.

Hagget's (1965) formula:

$$S = \frac{A}{\pi R^2} \quad \text{Or} \quad S = \frac{4A}{\pi L^2} \quad \text{Or} \quad S = 1.27 \frac{A}{l^2}$$

Where, S = Shape index of rural settlements, L = Longest axis of the county drawn as a straight lines connecting the two most distant points on erimeter and A = Total area of county.

Here, the multiplier 1.27 is computed to adjust the shape index ranges from 1.00 which reflects total circular shape to 0.00 which reflects total elongated shape. The ideal values for triangular is 0.42, for square 0.64 and 0.83 for hexagonal regular lattices of coxeter. The shape of settlements can be also determined by studying contact number of boundaries. This technique of Hagget (1965) is also used to support the request of shape index. The observation of external and internal pattern of rural settlements in Google Earth images is also made. The study of cadastral map of some villages is also made wherever possible.

### **Patterns of Rural Settlements**

The dichotomy between environmentalism and possibilism is not new to geography. Human intervention and impact on the environment is mostly observed on urban face of the earth surface and rural area mostly affected by the environmental aspects. Hence, the pattern of rural settlements mostly determined by the surrounding environment but in the modernized period, pattern of rural settlement also affected by cultural factors. Settlement geography aims to study the size form function and regional association of human Settlement and traces their growth, pattern and distribution (Gautam, 2009). The 'pattern' is also known 'layout' or 'form' which includes two broad elements i.e. external pattern and internal pattern. The size and shape of settlements known as external layout and the internal layout includes house-house, house-road and road-road relationship. The quantitative study of the pattern of rural settlements gives an idea about the internal layout but its qualitative study helps to discover both external and internal layout of the settlements.

#### **1. Shape index**

The shape index of about 35.95 per cent rural settlements of the study area ranges between 0.41 to 0.70. It means, most of the rural settlements of the study area have triangular to square shape. The shape of 13.21 per cent rural settlements of the study area reflects squire pattern and mostly from Shirol and Hatkangale tahsils. Triangular settlements are observed in 11.70 per cent rural settlements of the study area, which are highly observed in Gadhinglaj and Panhala tahsils. The shape value of elongated shape and near elongated records in 11.37 per cent rural settlements of the study area and most of which are located in Radhanagari, Chandgad and Ajra tahsils. Most of the roadside and hill foot rural settlements have linear shape and shape of hill top rural settlements are triangular in shape. The shape index of hexagonal shape has been recorded only in 7.69 per cent rural settlements of the study area. These rural settlements are highly found in Hatkangale, Kagal, Karvir and Shirol tahsils. Only 5.20 per cent rural settlements records nearly circular shape and this proportion is high in Hatkangale, Shirol and Kagal tahsils (Table 1). The overall picture of shape index of the rural settlements reveals that, the proportion of rural settlements is decreased with increasing shape in Radhanagari, Chandgad, Bavda, Bhudargad,

**Table 1 Kolhapur District: Shape Index of Rural Settlements, 2001**

| Sr. No.    | Tahsils ↓   | Shape Index → | <0.10 | 0.11-0.20 | 0.21-30 | 0.31-0.40 | 0.41-0.50 | 0.51-0.60 | 0.61-0.70 | 0.71-0.80 | 0.81-0.90 | >0.91 | Total |
|------------|-------------|---------------|-------|-----------|---------|-----------|-----------|-----------|-----------|-----------|-----------|-------|-------|
| 1          | Shahuwadi   | No.           | 15    | 12        | 26      | 6         | 8         | 11        | 14        | 12        | 9         | 20    | 133   |
|            |             | %             | 11.28 | 9.02      | 19.55   | 4.51      | 6.02      | 8.27      | 10.53     | 9.02      | 6.77      | 15.04 | 100   |
| 2          | Panhala     | No.           | 17    | 8         | 19      | 12        | 22        | 14        | 16        | 9         | 7         | 6     | 130   |
|            |             | %             | 13.08 | 6.15      | 14.62   | 9.23      | 16.92     | 10.77     | 12.31     | 6.92      | 5.38      | 4.62  | 100   |
| 3          | Hatkanangle | No.           | 3     | 2         | 3       | 1         | 2         | 2         | 15        | 9         | 12        | 9     | 58    |
|            |             | %             | 5.17  | 3.45      | 5.17    | 1.72      | 3.45      | 3.45      | 25.86     | 15.52     | 20.69     | 15.52 | 100   |
| 4          | Shirol      | No.           | 6     | 2         | 0       | 1         | 7         | 5         | 12        | 9         | 6         | 6     | 54    |
|            |             | %             | 11.11 | 3.7       | 0       | 1.85      | 12.96     | 9.26      | 22.22     | 16.67     | 11.11     | 11.11 | 100   |
| 5          | Karvir      | No.           | 12    | 15        | 13      | 21        | 12        | 11        | 8         | 13        | 16        | 4     | 125   |
|            |             | %             | 9.6   | 12        | 10.4    | 16.8      | 9.6       | 8.8       | 6.4       | 10.4      | 12.8      | 3.2   | 100   |
| 6          | Bavda       | No.           | 3     | 2         | 0       | 4         | 6         | 10        | 5         | 1         | 3         | 5     | 39    |
|            |             | %             | 7.69  | 5.13      | 0       | 10.26     | 15.38     | 25.64     | 12.82     | 2.56      | 7.69      | 12.82 | 100   |
| 7          | Kagal       | No.           | 7     | 14        | 9       | 5         | 14        | 2         | 6         | 9         | 12        | 8     | 86    |
|            |             | %             | 8.14  | 16.28     | 10.47   | 5.81      | 16.28     | 2.33      | 6.98      | 10.47     | 13.95     | 9.3   | 100   |
| 8          | Bhudargad   | No.           | 9     | 15        | 0       | 18        | 10        | 19        | 29        | 5         | 2         | 7     | 114   |
|            |             | %             | 7.89  | 13.16     | 0       | 15.79     | 8.77      | 16.67     | 25.44     | 4.39      | 1.75      | 6.14  | 100   |
| 9          | Ajra        | No.           | 15    | 11        | 14      | 4         | 13        | 9         | 12        | 5         | 3         | 10    | 96    |
|            |             | %             | 15.63 | 11.46     | 14.58   | 4.17      | 13.54     | 9.38      | 12.5      | 5.21      | 3.13      | 10.42 | 100   |
| 10         | Gadhinglaj  | No.           | 11    | 14        | 7       | 5         | 20        | 11        | 8         | 7         | 2         | 6     | 91    |
|            |             | %             | 12.09 | 15.38     | 7.69    | 5.49      | 21.98     | 12.09     | 8.79      | 7.69      | 2.2       | 6.59  | 100   |
| 11         | Chandgad    | No.           | 28    | 16        | 11      | 20        | 22        | 13        | 26        | 5         | 9         | 6     | 156   |
|            |             | %             | 17.95 | 10.26     | 7.05    | 12.82     | 14.1      | 8.33      | 16.67     | 3.21      | 5.77      | 3.85  | 100   |
| 12         | Radhanagari | No.           | 24    | 16        | 12      | 8         | 5         | 17        | 10        | 9         | 8         | 5     | 114   |
|            |             | %             | 21.05 | 14.04     | 10.53   | 7.02      | 4.39      | 14.91     | 8.77      | 7.89      | 7.02      | 4.39  | 100   |
| Study Area |             | No.           | 150   | 127       | 114     | 105       | 141       | 124       | 161       | 93        | 89        | 92    | 1196  |
|            |             | %             | 12.54 | 10.62     | 9.53    | 8.78      | 11.79     | 10.37     | 13.46     | 7.78      | 7.44      | 7.69  | 100   |

Source: Based on 1. Google Earth Images 2. District Census Handbook, Kolhapur District, 2001 and 2011.

Shahuwadi, Panhala and Ajara tahsils (Fig. 1). The hilly tract and other unfavorable conditions results in large big longest axi and comparatively small area in shape of rural settlement and hence the shape index is observed less in western and southern tahsils of the study area.

These rural settlements are mostly dispersed in nature with linear, triangular or amorphous shape. On the other hand, the proportion of rural settlements is increasing with increasing shape index in Hatkangale, Shirol, Kagal and Karvir tahsils (Fig.5.6). The fertile plain region and other favorable conditions results balance between longest axis and area of the rural settlements. These rural settlements are mainly compact in nature and having squire, hexagonal and circular shape.

**2.Contact numbers**

The mean contact number of the rural settlements of the study area is 4.65. Out of the all 1196 rural settlements of the study area about 589 (49.25%) rural settlements have contact number in between 4 to 6. Less than 3 contact number observed in 24.67 per cent rural settlements of the study area most of which found in Shahuwadi, Panhala, Chandgad and Radhanagari tahsils. The shape of these rural settlements is linear to triangular. The contact number of 26.09 per cent rural settlements is above 7 and most of which are records from Shirol, Hatkangale and Karvir tahsils (Table 2). The high contact number of these rural settlements reflects squire to circular shape.

The combine consideration of shape index and contact numbers of rural settlements reflects that most of the rural settlements of plain part have squire to circular shape and on the other hand most of the rural settlements of hilly and forested part have linear to squire shape.

**Factor affecting on pattern of rural settlements**

The pattern of rural settlements of the study area is mainly determined by their site, agricultural pattern, road pattern, etc. the hill slope location leads to amorphous pattern. The road site location leads to linear pattern. The compact rural settlements of agricultural developed area have circular, square and rectangular shape. In some cases, the agricultural land limits shapes the rectangular or square shape of villages. The road side settlements of western part have linear pattern (due to single road) and of eastern part have radial or circular or agglomerated irregular pattern (due to nodal point). In the study area the size of settlements is also affects on their pattern but mostly the pattern of rural settlements of study area are determined by their site.

**Table 5.4**  
**Kolhapur District: Contact Numbers of Rural Settlements, 2001**

| Sr. No. | Tahsils ↓   | Contact Numbers → | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10   | Total |
|---------|-------------|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1.      | Shahuwadi   | No.               | 20    | 19    | 29    | 22    | 12    | 13    | 7     | 9     | 2    | 133   |
|         |             | %                 | 15.04 | 14.29 | 21.80 | 16.54 | 9.02  | 9.77  | 5.26  | 6.77  | 1.50 | 100   |
| 2.      | Panhala     | No.               | 19    | 17    | 13    | 19    | 26    | 18    | 13    | 4     | 1    | 130   |
|         |             | %                 | 14.62 | 13.08 | 10.00 | 14.62 | 20.00 | 13.85 | 10.00 | 3.08  | 0.77 | 100   |
| 3.      | Hatkanangle | No.               | 2     | 2     | 6     | 6     | 7     | 9     | 13    | 9     | 4    | 58    |
|         |             | %                 | 3.45  | 3.45  | 10.34 | 10.34 | 12.07 | 15.52 | 22.41 | 15.52 | 6.90 | 100   |
| 4.      | Shirol      | No.               | 2     | 3     | 4     | 6     | 11    | 14    | 8     | 4     | 2    | 54    |
|         |             | %                 | 3.70  | 5.56  | 7.41  | 11.11 | 20.37 | 25.93 | 14.81 | 7.41  | 3.70 | 100   |
| 5.      | Karvir      | No.               | 5     | 9     | 21    | 19    | 17    | 19    | 20    | 11    | 4    | 125   |
|         |             | %                 | 4     | 7.2   | 16.8  | 15.2  | 13.6  | 15.2  | 16    | 8.8   | 3.2  | 100   |
| 6.      | Bavda       | No.               | 5     | 9     | 8     | 5     | 5     | 3     | 3     | 1     | 0    | 39    |
|         |             | %                 | 12.82 | 23.08 | 20.51 | 12.82 | 12.82 | 7.69  | 7.69  | 2.56  | 0.00 | 100   |

|            |             |     |              |              |              |              |              |              |             |             |             |             |
|------------|-------------|-----|--------------|--------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|
| 7.         | Kagal       | No. | 3            | 2            | 17           | 21           | 16           | 10           | 9           | 5           | 3           | 86          |
|            |             | %   | 3.49         | 2.33         | 19.77        | 24.42        | 18.60        | 11.63        | 10.47       | 5.81        | 3.49        | 100         |
| 8.         | Bhudargad   | No. | 14           | 19           | 28           | 23           | 12           | 9            | 5           | 3           | 1           | 114         |
|            |             | %   | 12.28        | 16.67        | 24.56        | 20.18        | 10.53        | 7.89         | 4.39        | 2.63        | 0.88        | 100         |
| 9.         | Ajra        | No. | 12           | 17           | 13           | 20           | 9            | 16           | 3           | 5           | 1           | 96          |
|            |             | %   | 12.50        | 17.71        | 13.54        | 20.83        | 9.38         | 16.67        | 3.13        | 5.21        | 1.04        | 100         |
| 10.        | Gadhinglaj  | No. | 10           | 16           | 14           | 23           | 11           | 8            | 5           | 2           | 2           | 91          |
|            |             | %   | 10.99        | 17.58        | 15.38        | 25.27        | 12.09        | 8.79         | 5.49        | 2.20        | 2.20        | 100         |
| 11.        | Chandgad    | No. | 22           | 29           | 35           | 29           | 22           | 9            | 7           | 1           | 2           | 156         |
|            |             | %   | 14.10        | 18.59        | 22.44        | 18.59        | 14.10        | 5.77         | 4.49        | 0.64        | 1.28        | 100         |
| 12.        | Radhanagari | No. | 15           | 24           | 26           | 21           | 13           | 11           | 3           | 1           | 0           | 114         |
|            |             | %   | 13.16        | 21.05        | 22.81        | 18.42        | 11.40        | 9.65         | 2.63        | 0.88        | 0.00        | 100         |
| Study Area |             | No. | <b>129</b>   | <b>166</b>   | <b>214</b>   | <b>214</b>   | <b>161</b>   | <b>139</b>   | <b>96</b>   | <b>55</b>   | <b>22</b>   | <b>1196</b> |
|            |             | %   | <b>10.79</b> | <b>13.88</b> | <b>17.89</b> | <b>17.89</b> | <b>13.46</b> | <b>11.62</b> | <b>8.03</b> | <b>4.60</b> | <b>1.84</b> | <b>100</b>  |

Source: Based on 1. Google Earth Images 2. District Census Handbook, Kolhapur District, 2001 and 2011.

### Conclusion

The study of shape index and contact number reveal that, the elongated linear and triangular pattern of settlements highly observed in hilly part of Chandgad, Radhanagari, Bavda, Shahuwadi, Panhala, Bhudargad and Ajra tahsils the squire hexagon pattern of rural settlements mostly found in Hatkangale, Shirol, Kagal and Karvir tahsils. In fact, varies pattern of settlement found in study area mostly determined by the site and age of settlement. This increases the significance of site analysis.

### References

- Gautam A (2009): "Advanced Geography of India", Sharda Pustak Bhavan, Allahabad.
- Hagget, P (1965): "Locational Analysis in Human Geography", Edward Arnol, London.
- Hudson, J.C. and Fowler,P.M.(1972): "The concept of pattern in Geography", in space,&Environment ,ed.English,P.W. AND Mayfield,R.C. ,London, oxford university press, pp.540-549.
- Singh, R. L. (1961): "Meaning, Objectives and Scope of Settlement Geography", National Geographical Journal of India, Vol. VII, Part-1, pp. 12-13.
- Thompson, D. W. (1917): "A Ridged Edition 1961", On Growth and Form, Cambridge, pp. 102-125.