CHAPTER V

REGIONAL DISPARITIES IN LEVELS OF DEVELOPMENT IN
HAVERI DISTRICT

5.1. INTRODUCTION

Dickinson, R.E (1936) has considered wholesale of cities as an indicator of centrality Berry and Garrison (1958) have considered all central functions for calculating centrality of all place. Davies W.K. (1967) has pointed out that consideration of all retail establishments for calculating centrality poses a problem of equivalence, therefore, due weight age should be given to each establishment in respect of floor space and turnover. Further, he points out that this problem can be solved to some extent by classifying the shops. Smales, A.E (1944) has used banks, shops, offices, schools, hospitals and cinema houses as important indicators of centrality. Brush (1953) has pointed out that the status of trade centers was determined by the functions they performed by a combination or association of distinctive sets of functions. Berry and Garrison (1958) have considered all central functions to identify the centrality of urban places. The attributes were correlated with the population totals of the centers in which they were found to fix the threshold of functions.

Abiodun J.C (1967) has specifically pointed out that the variables selected by various authors to measure centrality of a place in developed countries, if applied to developing countries, the results may be unrealistic. The same point has been given due importance by Deshmukh (1985) in his thesis. In developing countries and particularly in India where 80 Percent of her population lives in rural areas and supported by agrarian economy functions like banking, insurance, telephone and furniture shops which are commonly found in the urban places of developed countries are sometimes totally absent in the small towns of developing countries.

Bracey (1955) has measured centrality of a place by calculating the area dependent on the center for various goods and services. He has given equal points for all the services without considering their importance.

Green, F.H.W. (1948) has used bus service index to measure the centrality of a place. Carruther, W.I. (1957) has studied the ranking of the town based on motorbus
areas. Godlund (1956) has worked out the centrality of Swedish settlements on the basis of capacity for service and trade in urban settlements. He has used the total population in a settlement and number of persons employed in retail trade and services. This method gives sometimes-misleading results for the urban centers, which are well connected and developed in the metropolitan city regions as the numbers of people who are actually employed in metropolitan city are residents of small town and the census enumerates them as employees or tradesmen of the place of residence.

Davies, W.K. (1967) used a simple method for measuring the centrality in south wales. He has calculated the located quotient for the function available in the area by calculating the functional units of the function and the summation of all the values gives the functional index of a place. This functional index gives the aggregate importance of a place. To call this index as centrally index is not appropriate because this index cannot give any idea about the excess population served by the functions available at the place.

Mulik A.D. (1989) has applied the method of “excess population served by surplus function” to study the urban settlements of south Maharashtra plateau. In this method, the mean population served by any single functional unit in the entire region is calculated and with this mean value, the total population served by the number of functional units of any function available at urban center is calculated. The total population served by a particular function of an urban place is the total service capacity of the function. From this total study the service capacity, the population of an urban place when sub traced, we get the excess population serving capacity of that function. This excess population serving capacity is calculated for all the fifteen central functions. The summation of all excess population values gives the excess population served by the central functions of a place. For convenience all summation values of excess population are put under the square root.

The Scalorgrame analysis developed by Louis Guttman (1969), which is based on number of functions performed by a settlement i.e., a settlement having more functions will be treated as higher order settlement while a settlement having less number of functions treated as lower order settlement. This method of Guttman is not widely used because it is totally based and concentrated on quantity of functions.
Higher order functions and lower order functions are treated as equal in importance i.e., quality of functions are neglected. Results a settlement having lower order functions but more in number stands at higher order in hierarchy while a settlement having higher order functions or highly specialized functions but less in number treated as lower order in hierarchy.

Mishra R.N (2002) used two factors to calculate the centrality score value.

1. Number of different functions offered by a settlement (quantity)
2. Level of various functions available in a settlement (quality)

In this method both quality and quantity criteria have been taken into consideration, but it also has one major drawback. The frequency of occurrence of a function is not considered during the awarding of weight age i.e., settlement either having one or more than one institution or function awarded equal weight age. For example, a settlement having five primary school and a settlement having one primary school get equal weight age during computing the final centrality of a settlement.

Mishra R.N. and Sharma P.K (2003) suggested two indicators to find out final centrality score of a settlement.

i. **Functional Index Value:**

   It is based on the number of workers engaged in the secondary and tertiary activities. According to web (1959). Functional Index x (F.I) =P/mp

   P= Percentage of workers engaged in secondary and tertiary occupation.

   MP= Mean percentage of workers engaged in secondary and tertiary occupation and tertiary occupation (Sum of values of P for all the centers divided by total number of centers).

ii. **Social Amenity Index (S.A.I):**

   It is based on central facilities found in the settlement like education, medical, marketing, postal etc. For finding out S.A.I we have to find out weight age for each facility. To find out weight age the following formula has been used:

   \[ W = \frac{N}{F} \]

   W = Weight age of each facility
N= Total number of settlements in the study area.

F= Number of settlements having that particular facility.

Weight ages have been calculated for all the facilities. Facility, which is available more in number in settlements, have high weightage while facility found less in number in settlements would have a low weight age.

Thus the S.A.I can be calculated with the help of the following formula.

\[
S.A.I = \frac{E_A}{M_A}
\]

S.A.I= Social amenity index

EA = Aggregate facility score value of settlement.

MA= Mean facility score value of all the settlements.

Facility score value of a settlement is calculated by multiplying, the weightage of a particular facility with the number of that facility available in that settlement. For example, if there are 5 primary schools in the settlement and weightage for primary school is 1 we multiply 5x1=5. Similarly, we can find out facility score value for other facilities and finally by adding the facility score value of all the facilities available in the settlement we get EA for finding out mA, we add the EA of each settlement and divided them with total number of settlement included in the study region.

a) Final Centrality Score:

The Final centrality score which decides the hierarchy of settlement is calculated by adding S.A.I and F.I. value of a settlement and settlements have been categorized into different hierarchical order on the basis of the final centrality score.

The review of various methods evolved to find out the centrality score value reveals that there is no single method applied to measure the centrality. Based on the regional situations and one the rational grounds any one of the method discussed here may be applied.

In the present study, all the amenities have been taken into account for the calculation of centrality of each village. The major functions and their sub-functions are given due weight age. The major function for example education has been given the weight age of 1 in case of primary school. While giving the weight age to a next
higher order education facility an increasing order method has been followed. This would not affect the result and all the methods explained here also ultimately give the same result. The education facilities of equal status with different nature have all been given the same weight age for example industrial school, training school, senior secondary school etc. The same method has been applied to other facilities also. The facilities, which have no sub-functions, have been given the weight age on the basis of their magnitude or scale of function. The following table represents the major functions their sub functions and their weightages. The score values of all the functions/ facilities in each village have been summed up and the aggregate score value had been obtained for each village. It is felt that the amenities/ facilities existed in a village generally gives an idea about the status of the village among the settlement system.

It is quite obvious that a multilevel functional hierarchy in Bidar district has been developed. For example, as illustrated in case of educational facilities, there is a hierarchy like primary school, middle school secondary school, senior secondary school, college etc. Since the entry points differ in case of other facilities like medical, postal, marketing, drinking water etc., an internal hierarchy of each basic function is being fixed first and weightage was given accordingly. Each sub function in the hierarchical order was given due weight age and multiplied by the number of that function existed in the settlement. For example a secondary school was given the weight age of 3. If there are 2 secondary schools then the total weightage will be 3 x2=6.

However, there are some sub-functions for which it is difficult to give proportionate weightages. In such cases for example, recreational facilities, newspapers, electricity etc, weightage has been given on rational grounds. Population size of each village has also been considered by giving weightage 1 per 1000 population.

Planning covers all the aspects of social and economic life of the community and also the management of natural resources. For the formulation of a development plan of a district, following general steps may be adopted (Planning Commission, 1984):

- Identification of the major objectives for district planning
Compilation of data for district planning

Bringing out the profile of the district in relation to the basic objectives

Formulation of the main strategy of planning, and

Analysis of the specific planning problems, with references to the strategy.

The planning at district level begins with the finalization of objectives to be considered for detailed investigation. This is followed with the collection and compilation of data with reference to these objectives. The data should be collected judiciously and thus only such data need to be collected which can be put to use for carrying out a particular study. This data may be transformed in the form of an integrated geographic database for faster handling and manipulation, which may be utilized more systematically and efficiently for various planning applications using GIS (Garg.2000).

Thus, the geographic database prepared for a district could be greatly strengthened by the utilization of technological tools, like remote sensing, GIS and DSS. Planning Commission (1984) has suggested that for every district in the country, the following thematic maps may be prepared for proper planning. Forest, Geology, Ground water, integrated resources, Land use, optimal land utilization, and Soil.

The actual use of above thematic information may however vary from district to district. The analysis for district planning may begin with the critical appraisal of its existing resources and the level of development. An integrated procedure, based upon the availability of the resources and hierarchy of priorities, may subsequently be formulated and investigated for its implementation.

5.2. METHODOLOGY DEVELOPMENT

District planning is a major continuous activity that requires multi-date thematic and related data. For the present work, some specific issues related to planning have been considered for detailed investigations, as follows:

Assessment of intra-district disparities
Spatial planning for educational and medical facilities in the least developed block.

Development of a DSS.

The major emphasis of any district plan always remains on assessing the present level of development and identifying the spatial gaps which may be taken up for the development of various resources in future. The methodology developed for the integrated analysis for one district may be different from that of another district because of their different profiles. As a result, it may not be possible to define a standard planning model that may be applicable for all the districts in the country. Nevertheless, the major steps followed in developing the methodology for planning in Haveri District for this research work are illustrated in chart 4.1.

The data collected for Haveri District consists of spatial as well as non-spatial information which have been obtained from various sources (Section 3.3). These two databases have been used to develop an integrated geographic database under GIS environment, as described in Chapter.

The different planning aspects considered in the present research work have been investigated by developing separate GIS-based models using ARC/INFO software. For implementing this, various computer programs using AML of ARC/INFO have been developed. A DSS is developed to incorporate all these GIS-based models. For better understanding, the methodology for the development of all these models has been described first, followed by the procedure for the generation of DSS.

5.3. ASSESSMENT OF INTRA-DISTRICT DISPARITIES

The development in a district is never uniform. Imbalances in the development of various segments of society have been a matter of great concern for planners. Minimization of these imbalances constitutes an important issue for any district planning exercise. For the formulation of a development plan for the district, a critical assessment of present scenario has to be made. This assessment is done on the basis of available resources and their potential, nature of local needs and problems. While assessing the existing situation, an important factor to be considered
is the manner in which the framework of infrastructure facilities is spread over different administrative regions of the district.

A district may be very large in area and also diverse in topographical, economic and social features to serve as a single spatial planning unit. Therefore, the district is generally divided into small spatial units (Sub-regions) to make the planning take manageable. Proper demarcation of sub-regions is of great importance because the characteristics and the basic potentials of the sub-region determine the patterns of economic activities and the requirements of infrastructure facilities. The administrative block within a district may be considered as the basic unit for eliminating intra-district disparities in the level of development (Planning Commission, 1984).

To measure the variations in the development of various blocks of a district, suitable indicators need to be developed. The methodology for this purpose may include consideration of a number of indicators, and a certain amount of normalization of values, so as to arrive at some form of cumulative facility indices for these blocks. This analysis may be performed using GIS and a ranking of various blocks in the district, either in ascending or descending order of their development may be obtained.

5.4. DEVELOPMENT OF A GIS-BASED STATISTICAL MODEL

Owing to the difference in the levels of economic development and provision of various facilities in the blocks of Haveri District, it is essential to carry out intra-district disparities analysis for prioritizing the developmental programmes. These disparities require utmost attention from the academia, the planners and the executives.

Although the use of computers for automating the various information at district level has increased, however, the use of GIS-based models in spatial planning is still in infancy. Therefore, a GIS-based statistical model for the assessment of intra-district disparities has been developed for Haveri District. The administrative block of the district has been taken as the basic unit for this analysis. The level of development for each block is ascertained on the basis of prevailing conditions of various resources by developing suitable indices for the existing facilities in its
villages. The development of present GIS-based model involves the assessment of the development in each block so as to find out the least developed block in the district. The various steps have been discussed in the subsequent sections.

5.5. SELECTION OF FACILITIES

The assessment of overall level of development in a block is generally derived based upon the existing facilities in all the villages of that block. There are no guidelines for selecting the facilities to study the intra-district disparities, and hence the selection of facilities for Haveri district has mainly been governed by the availability of relevant information at village level.

A facility may not homogeneous in nature and may be available at different levels in a village. Thus, within a particular facility, it is possible to identify different levels at which it is being used. The difference in their levels of provision in various villages has also been taken into account. For example, medical facilities are provided by medical practitioners, dispensaries and through specialized hospitals. Similarly, educational facilities may occur at different levels, namely, at primary schools, middle schools, high schools, etc. The various facilities considered for deriving the composite index of development for each block are given in Table 4.1.

The presence or absence of these facilities in the inhabited villages is recorded on a linear scale. The linear scale records the actual number of presence of a particular facility. If a facility is not present in a village, it is shown by zero. Thus, power supply and post office facilities have been considered on the basis of their presence or absence being recorded as one or zero respectively. For market/shopping centre, the actual number of days it is held in a village has been taken to record its presence. Further, if a village has been connected by metalled or non-metalled road, it is treated as having the facility for approach road. The literacy rate (in percent) for each village is obtained by dividing the number of literate by its total population. The literacy rate values have been ranked from 1 to 4. For example, if the literacy rate is between 0-25 percent, the value assigned is 1. Similarly, 2, 3 and 4 values are assigned for the literacy rates between 25-50, 50-75 and 75-100% respectively. The irrigated land area (in percent) has also been ranked in a similar fashion and values from 1 to 4 are assigned. For this, the irrigated land area (in percent) is obtained by dividing the area of irrigated land in a village by the total area of that village.
These facilities have been stored as relational tables in INFO module of ARC/INFO GIS package. This information is linked with the village boundary coverage as attributes of the respective villages by following the procedure outlined.

**Table No: 5.1 Indicators to measure regional disparities in Haveri District**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Educational (07) and their weightages</th>
<th>Health (04) and their weightages</th>
<th>Infrastructural (05) and their weightages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Literacy Rate(%) weightage&lt;br&gt;0-25%=1 26-50%=2 51-75%=3 More than 76%=4</td>
<td>No. of Sub centers weightage&lt;br&gt;1=1</td>
<td>Roads weightages&lt;br&gt;Village roads=1&lt;br&gt;District road=2&lt;br&gt;State highway=3&lt;br&gt;National Highway=5</td>
</tr>
<tr>
<td>2</td>
<td>No.of Primary Schools weightage 1=1</td>
<td>No.of P.H. Centers weightage&lt;br&gt;1=2</td>
<td>Industries weightage&lt;br&gt;Small scale=1&lt;br&gt;Medium scale=3&lt;br&gt;Large scale=5</td>
</tr>
<tr>
<td>3</td>
<td>No.of High Schools weightage 1=2</td>
<td>C.H.C weightage&lt;br&gt;1=3</td>
<td>Drinking water weightage&lt;br&gt;0-25%=1 26-50%=2 51-75%=3 More than 76%=4</td>
</tr>
<tr>
<td>4</td>
<td>No.of P.U Colleges weightage&lt;br&gt;1=3</td>
<td>No. of General Hospital weightage&lt;br&gt;1=5</td>
<td>Market weightage&lt;br&gt;Daily=1&lt;br&gt;Weekly=2&lt;br&gt;Regulated=3</td>
</tr>
<tr>
<td>5</td>
<td>No.of ITI Colleges weightage&lt;br&gt;1=3</td>
<td></td>
<td>Co-operative Societies weightage 1=1</td>
</tr>
<tr>
<td>6</td>
<td>No.of Diploma Colleges weightage&lt;br&gt;1=3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>No.of Technical Colleges weightage&lt;br&gt;1=5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.6. CONCEPT OF WEIGHTS

One of the problems faced in the multi-parameter analysis under GIS environment is the assessment of importance of each parameter. This problem requires human judgment ably supplemented by mathematical tools. In real world problems, importance of each parameter has to define to represent a more optimal model of the problem. The relative importance of parameters depends upon the end objective and is usually represented by a set of weights. These weights represent the “Preference information” of a parameter over other parameters and is usually translated into numbers (United Nations, 1966). The choice of the method for allocation of weight is dependent on the end objectives and on the characteristics of the data sets. Some of the common methods are described hereafter:

- The weight may be assigned on the basis of consensus and is subjectively defined for ‘n’ parameters. For this, the views of several experts are taken into consideration. A questionnaire may be designed to arrive at consensus for determining the weights. This method is easier to implement but is subjective.

- The cross-parameter relationships defined by the importance of each parameter may be used to assign weights in this approach. To implement this, an importance matrix is defined for ‘n’ parameters as per a standard scale of importance. Stay’s scale of importance is generally adopted for this purpose. It incorporates equality of importance and the scaled importance of one parameter over the other.

- The weight may be assigned using the instances of parameters. The importance of a parameter is defined by the instances of the occurrence of that parameter in a given data set. This method is appropriate where cross-parameter relationship is difficult to define or does not exist. This is true for applications related to facility planning for a region. As an example, the importance of a primary school may have nothing to do with the number of occurrences of hospitals in the district. Thus, the weights may be defined using the information on the availability of each parameter i.e., primary school, hospital, etc. One of the commonly adopted methods falling in this category is centrality index method (Khan, 1990).
Finally, the data orthogonalization procedure may be used to assign the weights. This approach is applicable for those problems in which parameter relationship cannot be defined. This involves the determination of the statistical relationships between ‘n’ parameters by a proper analysis of the data set. Statistical techniques, such as factorial and canonical analysis have generally been adopted in many planning studies (King, 1969; Aziz, 1986).

5.7. ASSIGNMENT OF WEIGHTS USING MEDIAN POPULATION THRESHOLD

In the present work, weight to each facility has been assigned to reflect the true indication of its importance in Dehradun district. The entry population denotes the population size at which the facility first appears in any of the villages of the region under consideration. The population size above which every village has the facility is known as the saturation population. The interval between the entry point and the saturation point is known as the entry zone. A facility at a particular location may exist on account of considerations other than the existence of a threshold population or need or availability of resources or some combination of the three. Hence, it may not be expedient to consider either the entry population or the saturation population as the threshold of population for providing a facility in a village (Mukherjee and Bhoosnurmath, 1993).

According to the principle enunciated by Hagget (1965), median population in the entry zone may be taken as population threshold for assigning the weight to each facility in an objective manner. This median population is known as Median population threshold (MPT). The MPT is defined as the population size where fifty-percent villages will have the facility and fifty-percent villages below it will not have the facility. The MPT value for a facility indicates the population threshold that can support the existence of that facility. Hence, villages with a population equal to or more than the MPT may support the respective facility.

The MPT value for each facility is computed using the method proposed by Reed and Muench (1938) to find out its weight. Mathematically, it may be represented as:

\[ \text{MPT} = \text{MR}_b + (\text{MR}_a - \text{MR}_b) \times (50-B)/(A-B) \]
Where:
MR\text{b} = \text{Mid-point of size group preceding } T=50
MR\text{a} = \text{Mid-point of size group succeeding the class of } MR\text{b}
A = \text{‘T’ Value of the size group preceding the value of } T=50
B = \text{‘T’ Value of the size group succeeding the value of } T=50

The value of ‘T’ may be computed as
\[ T = \frac{M_p}{M_p + A_g} \times 100 \]

Where:
P_s = \text{Villages with facility present at a particular population size and smaller levels}
A_g = \text{Villages with facility absent at particular population size and greater levels.}

Thus, the MPT values for all the facilities have been obtained using the Eq.5.1. A computer program using AML of ARC/INFO GIS has been developed for the computation of these MPT values.

5.8. DERIVATION OF CUMULATIVE FACILITY INDEX

A facility in a district may be offered at different levels in various villages, depending upon its population and development. Thus, if a facility occurs at different levels in any village, its various sub-functions are aggregated to obtain cumulative facility index. The cumulative facility index \( C_j \) of j\textsuperscript{th} facility occurring at ‘m’ levels in a village is computed using the following equation:
\[ C_j = \sum_{i=1}^{m} w_t \times X_{ij} \]

Where: \( X_{ij} = \text{Value of } i\textsuperscript{th} \text{ sub-function of } j\textsuperscript{th} \text{ facility} \)
\( m = \text{Number of Sub-functions for } j\textsuperscript{th} \text{ facility} \)
\( w_t = \text{Weight of } i\textsuperscript{th} \text{ sub-function computed using MPT value} \)

Thus, a cumulative facility index has been compared for all the facilities. If a facility exists at one level only, like post office facility, the cumulative facility index for this facility has been computed by multiplying the weight of that facility by the number of that facility existing in that village.
5.9. COMPUTATION OF VILLAGE DEVELOPMENT INDEX

The village development Index (VDI) for each village has been computed from all its existing facilities. The objective of constructing the VDI for each village is to determine its level of development. The cumulative facility indices of all the facilities in a village have been aggregated together to obtain the VDI. For this, weighted sum of all the cumulative facility indices has been obtained for each village. The weights assigned to various cumulative facility indices for the purpose of combining them together have been termed as relative weights. The VDI for a village may be mathematically expressed as:

\[ VDI = \sum_{i=1}^{n} Rw_i \times CI_i \times \text{Population of the village} \]

Where:  
- \( CI_i \) = Cumulative Facility Index for a facility  
- \( Rw_i \) = Relative weight of cumulative facility index  
- \( l \) = Number of facilities existing in a village

As mentioned earlier, for assigning the relative weights, a variety of methods based upon the relationship between the variables are available. These relative weights, if assigned by following a subjective procedure, may contain an element of arbitrariness due to human bias. Alternatively, an objective procedure, based upon statistical techniques, can be adopted to reduce the human bias involved in deducing the relative weights.

Thus, these relative weights for different cumulative facility indices have been assigned in an objective manner by using a statistical technique. The principal component Analysis (PCA) is one such technique. Its use in studies related with planning is not as extensive as data compression technique in remote sensing. However, it can also be used for the assignment of weights as discussed by various researches (Bhat.et.al., 1976; Sen et al., 1979; Sharma, 1997 a). Keeping in view its potential to use as weight assignment technique, PCA has been adopted in the present work.

In order to implement PCA, a correlation matrix showing the correlation between total population and the cumulative facility indices of various facilities has been computed. This will give a measure of the extent of association between
different facilities. Eigenvalues are computed from the correlation matrix using method of linear algebra. The eigenvalues are measured in terms of units of variance. The eigenvector that occupies the maximum variance of these constituents’ variables is also computed, i.e., corresponding to maximum eigenvalue. Thus, the relative weights for these cumulative indices of various facilities are obtained from the eigenvector corresponding to the maximum eigenvalue. The eigenvectors are scaled by the square root of the maximum eigenvalue. The different values thus obtained provide the weights with which the cumulative facility index of each facility is to be multiplied.

5.10. COMPUTATION OF BLOCK DEVELOPMENT INDEX

To reflect the overall level of development, a Block development Index (BDI) for each block has been adopted. This may be computed by summing the VDI values of all the villages of a block. However, various blocks of a district may differ from each other in terms of their spatial size and the number of villages. If these BDI values are compared without normalization, a larger block having more number of villages with low level of distribution of facilities may show a higher value of BDI. While, a smaller block having lesser number of villages, with a high level of distribution of facilities, may show a lower value. Therefore, removal of biasness due to spatial size of the block is a pre-requisite to assess the realistic pattern of facility distribution before carrying out a comparative analysis (Vyas, 1991).

Thus, in the present study, the BDI values are normalized by the number of villages in the block. The final index for each block is obtained per hundred villages and this value has been termed as BDI, which is considered to be an indicator of overall development of that block. Based upon the BDI values, all the villages have been ranked in order of their level of development.

A user interactive program has been developed for implementing this model using AML of ARC/INFO GIS.

5.11. USE OF A CONVENTIONAL MODEL

The statistical model, developed for assessing the intra-district disparities in the previous section, has been compared with a conventional model. The steps followed for the development of the conventional model is the same as those for
statistical model, except for the procedure of computation of weights. The weights of each facility and the relative weights of cumulative facility indices have been computed differently in the conventional model, as explained in subsequent paragraphs.

In this model, the weight to each facility has been assigned using the centrality index method. In this method, weights to different facilities are assigned on the basis of their distribution in all the villages of the district. The assignment of weight is based upon the principle that greater the scarcity of facility, the greater is its importance in terms of centrality and thus the higher is its weight (Khan, 1990; Phanse and Kaur, 1997). To implement this, the weight for a facility existing in the district may be obtained by dividing the total number of villages in the district by the number of villages having that particular facility. Mathematically, weight of \( i \)th facility \( (w_i) \) for a village has been computed as:

\[
    w_i = \frac{N}{F_i}
\]

Where:
\[
    N = \text{Total number of Villages}
\]
\[
    F_i = \text{Number of villages having } i \text{th facility}
\]

The relative weights to different facilities for the computation of VDI have been assigned using Saaty’s Analytical Hierarchical Process (Saaty, 1980). Remaining of the procedure for the computation of the BDI is same as for the statistical model. Thus, the BDI value for each block has been computed using the conventional model under GIS environment. Based upon these values, the blocks of Haveri District have been categorized according to their level of development.

5.12. SPATIAL PLANNING FOR THE LEAST DEVELOPED BLOCKS

The rapid growth of population as well as expectation for better quality of life deserve better provision and management of urban utilities, infra-structural facilities and healthy environment. Proper planning, based upon an assessment of the existing level of development, is essential for mitigating these problems and for overall development of a district.
The actual location of a specific facility in relationship to other facilities depends on the general level of development of that region, its demand, accessibility, etc. Many rural areas may be deprived of some basic facilities of life due to one or a combination of such factors, whereas in some areas there may be a concentration of these facilities. Thus, in the overall context of development, the proper location of various facilities is an important aspect, which needs to be considered. If spatial relationships among existing facilities are observed, it may be seen that there is a definite pattern in the dispersal or concentrations of activities in space (Sen et al., 1979). The spatial interrelationship goes a long way toward the development of the area because an appropriate location of a new function may start a chain reaction of development with far-reaching effects.

5.13. FRAMEWORK OF SPATIAL PLANNING

Most of the programmes at district level are related to geographical location for their implementation. Carefully selected locations make these programmes more effective. Spatial planning may be used for obtaining the suitable locations for various facilities considered under different programmes at district level. The major functions of spatial planning may be summarized as:

a) To identify the requirements of support infrastructure to improve the quality of life
b) To identify and correct the imbalances in the development of various blocks of a district, and
c) To identify the areas where new infrastructure may be created to reduce the gaps between the availability and the requirements.

Thus, a major task to be accomplished through spatial planning is to design a pattern of villages for human activities for fulfilling the present needs in terms of support infrastructure. The village pattern so devised helps in the development of a district. Planning Commission (1984) has identified three main categories of villages, based upon the population threshold and distance threshold for different facilities:

a) Villages which have the facility
b) Villages which do not have, but should have the facility, and
c) Villages which do not have, and need not have the facility.
It is the task of planners to ensure that all the villages falling in the second category have the facilities warranted by the accepted norms for their location. Further, it is also equally important for the planners to ensure that the villages classified as falling into their category have access to such facilities.

The spatial planning for any facility may be done within the framework of the objectives of the district plan, its priorities and the norms prescribed for different facilities. To the extent possible, the spatial planning proposals should be kept within existing administrative boundaries of the respective spatial unit of planning to minimize the jurisdictional overlap in their implementation.

The village has been adopted as the spatial unit for planning the two facilities, i.e., education and medical in this study. Education and medical are the two most important facilities to be considered for the development. Often the level of development of other infra-structural facilities is dependent on the educational development. Though medical is also important but a highly developed health care system may yield poor results unless its development is coupled with that of the educational facilities. A planner should identify the gaps between prevailing and required levels of availability of these facilities in all the villages. The villages should be identified where new or additional educational and medical facilities are to be located to reduce this functional gap.

5.14. DEVELOPMENT OF A RULE-BASED MODEL USING GIS

A rule-based spatial model at block level for Haveri District has been developed under GIS environment for planning the educational and medical facilities. This model may assist in identifying the villages that lack the facilities and the villages where new facilities have to be provided. The type of facilities for spatial planning can broadly be classified as (Mukherjee and Yoogandhar, 1991).

a) Point-bound; e.g., School, hospital, etc., and
b) Connective; e.g., road, canal, power lines, etc.

In the present study, the rule-based spatial model for point-bound facilities has been developed. The normative analysis forms the basis for the development of rule-based spatial model. The normative analysis is a method for determining where are what facilities are to be located in each village and is a kind of deficiency/gap analysis
process (SAC/TCPO, 1992). Planning Commission (1984) has defined two types of norms for most of the facilities as:

a) Distance norm: a definition of nearness of a facility, and

b) Population norm: a definition of population, based on the existence of a facility

It was observed that these norms could not be directly adopted for Haveri District, because:

a) These norms have been defined as general guidelines and have not been refined with time to keep pace with the developments in the districts. Further, these may have not been derived from the actual data sets.

b) Population in most of the villages in hilly area of Haveri District is thin, and

c) The norm precedence between the distance and population is not very clearly defined.

Therefore, the Planning Commission norms have been taken as the guidelines, and the norms that are suitable for Haveri District have been structured. The population norm is modified using the concept of MPT value, which determines the population above which all the villages should have a facility. The MPT value for a facility is estimated based on the perusal of the existence of that facility and the population of the village. Thus, the population norm based on MPT value is more appropriate for a region as against adopting the national standards set by different agencies (SAC/TCPO, 1992). However, no modification has been made to the distance norm.

The adequacy for educational and medical facilities in the district and the need for their development have been determined using these norms. The stepwise procedure adopted for this has been described henceforth.

a) All the villages are categorized into two classes on the basis of distance norms, i.e., the villages which are within the distance norm, and which are outside the distance norm. All the villages that are within the distance norm have not been considered for planning the additional facilities. On the other hand, the villages that are outside the distance norm have been termed as non-functional
villages, and are compared with the specified population norm to determine whether their population is more or less than the MPT value for that facility. If the population of a village is less than the MPT value and also less than the entry population, the village is identified as “low priority village” for the development.

b) However, if the population of these non-function Villages is more than the entry population but less than MPT value, then these villages are identified as “medium priority villages” for the development of that facility, and

c) Lastly, all the non-function villages, where the population is more than the MPT value, have been marked as the “high priority villages” for the development of that facility.

These criteria have been implemented in the form of rules through AML programming.

In this study different weights are assigned to the selected variables depending upon the its importance, for assessment of regional disparities in Educational, Medical, Infrastructural and combined of all the three sectors i.e, regional development (combined of social, economic and industrial) is measured by assigning weights to the service based on it is present in the settlements and level of service served by the particular institution. Later all the weights of the individual settlements are summed and total score of the individual sectors are divided by the total number of villages in the taluks least scored taluk is treated as least development taluk in the district. (Refer appendix no 1).

**Table No.5.2: Haveri district: Level of Development in Education Facility**

(Based on 07 variables)

<table>
<thead>
<tr>
<th>Classes</th>
<th>Range</th>
<th>Name of the Taluk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>6.48 to 6.83</td>
<td>Haveri and Ranebennur</td>
</tr>
<tr>
<td>High</td>
<td>6.05 to 6.47</td>
<td>Byadgi</td>
</tr>
<tr>
<td>Medium</td>
<td>5.89 to 6.04</td>
<td>Shiggaon and Savanur</td>
</tr>
<tr>
<td>Low</td>
<td>5.0 to 5.88</td>
<td>Hirekerur</td>
</tr>
<tr>
<td>Very Low</td>
<td>Less than 4.99</td>
<td>Hangal</td>
</tr>
</tbody>
</table>

Source: Computed by the Researcher
The levels of Education facilities in Haveri district are grouped into five categories as very high developed, high developed, medium developed, low developed and very low developed taluks based on 7 variables of High school, PUC, Diploma College, Technical College, and ITI College. The same as shown through the map, The level of development in Education facilities in Haveri district, is distributed unevenly. The development assessment of education facilities is based on these seven variables. Very low level of development is concentrated in Hanagal Taluk, which is in the western part of Haveri district, which falls in the range between less than 5.49 and further low level, of development is focused in the Southern part of the district in Hirekerur taluk where as the range between 5 to 5.88 falls under the category of low development. Finally the trend shows low development in Education facilities in south and eastern part of the Haveri district.
Map No.5.1:

HAVERI DISTRICT
Levels of Development in Education Facilities - 2013
(Based on 07 Variables)

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

Legend
Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary
In case of Medium developed group development of education facilities is focused in the Northern part of the district in Shiggaon and Savanur taluk and the range falls between 5.89 to 6.04 followed by high level of education facilities is seen in the central part of the district i.e in Byadgi taluk where as the range falls between 6.05 to 6.47. The most important point in the map there is an increasing trend of Education facilities Which has been drastically high in two taluks of Haveri district namely Haveri and Ranibennur taluk having the range between 6.48 to 6.83 which falls under the category of very high development.

All the high developed taluks are concentrated in region where the education facilities and accessibility is good. Medium developed taluks are concentrated where facilities are available in moderate way were as low developed taluks are concentrated where the education facilities and accessibility is very poor in the region.

Finally the two taluks namely Haveri and Ranibennur is having all the mentioned seven variables of education facilities and the Hangal taluk posses very less education facilities compared to all other taluks of Haveri district.

**Table No.5.3: Haveri District: Levels of Development in Medical Facilities**
*(Based on 05 variables)*

<table>
<thead>
<tr>
<th>Classes</th>
<th>Range</th>
<th>Name of the Taluk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>More than 0.97</td>
<td>Haveri</td>
</tr>
<tr>
<td>High</td>
<td>0.79 to 0.96</td>
<td>Ranebennur</td>
</tr>
<tr>
<td>Medium</td>
<td>0.73 to 0.78</td>
<td>Hirekerur, Savanur</td>
</tr>
<tr>
<td>Low</td>
<td>0.68 to 0.72</td>
<td>Shiggaon</td>
</tr>
<tr>
<td>Very Low</td>
<td>Less than 0.67</td>
<td>Hangal, Byadgi</td>
</tr>
</tbody>
</table>

Source: Computed by the researchers
Map No.5.2:
The levels of Medical development of Haveri district measured on the basis of Sub centers, PHC, CHC and General hospital. Based on these 4 variables the levels of medical development is categorized into very high developed, high developed, medium developed, low developed and very low developed taluks.

The very high level of medical development is noticed in Haveri taluk because the Haveri itself is district head quarter and having relating more number of health institutions. The high development is noticed in Ranebennur taluk, Ranebennur is commercial centre and neighring settlements are also having medical institutions. The medium medical development is observed in Hirekerur and Savanur taluks. The low and very low medical development is noticed in Shiggaon, Byadgi and Hanagal taluks.

**Table No.5.4: Haveri district: Levels of Development in Infrastructural Facility**

*(Based on 05 variables)*

<table>
<thead>
<tr>
<th>Classes</th>
<th>Range</th>
<th>Name of the Taluk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>15.87 to 17.72</td>
<td>Savanur</td>
</tr>
<tr>
<td>High</td>
<td>15.13 to 15.86</td>
<td>Haveri, Byadgi</td>
</tr>
<tr>
<td>Medium</td>
<td>11.22 to 15.12</td>
<td>Ranebennur, Shiggaon</td>
</tr>
<tr>
<td>Low</td>
<td>10.66 to 11.21</td>
<td>Hirekerur</td>
</tr>
<tr>
<td>Very Low</td>
<td>Less than 10.65</td>
<td>Hangal</td>
</tr>
</tbody>
</table>

Source: Computed by the author

The level of Infrastructural facilities is based on five variables of drinking water, small large and medium scale industries and market. The infrastructural development is measured on the basis of these variables. The development of Infrastructural facilities in Haveri district are grouped into five categories as very high developed, high developed, medium developed, low developed and very low developed taluk.
Map No.5.3:

HAVERI DISTRICT

Levels of Development in Infrastructural Facilities - 2013 (Based on 05 Variables)

Legend

Levels of Development
- Very Low
- Low
- Medium
- High
- Very High
- Taluk Boundary

N

Km
0 2.5 5 10

75°0'E
75°15'E
75°30'E
75°45'E
It is an attempt to identify the overall level of Infrastructural facilities in Haveri district. The level of Infrastructural facilities are not uniformly distributed, one can notice from the map that very low developed infrastructural facilities are concentrated in western region in Haveri district, of Hanagal taluk with a range less than 10.65 and further low development is concentrated in the southern tip of the district of Hirekerur taluk having the range between 10.66 to 11.21 which falls in the category of low level of infrastructural facilities.

Further medium developed infrastructural facilities are sparsely distributed mainly which falls under the range between 11.22 to 15.12. More concentration is seen in the northern portion of district of Shiggaon taluk and also in the eastern portion of district in Ranibennur taluk.

The pattern and trend of very high development infrastructural facilities are concentrated in the central portion of the district of Byadgi and Haveri taluk, having the range of 15.13 to 15.86 which falls under the category of high level of infrastructural development followed by very high development are concentrated in the Savannur taluk of Haveri district showing the range between 15.87 to 17.72 which indicates priority of very high infrastructural development.

This map reveals that all the high developed and medium developed taluks are concentrated in central portion of district further shows the drastic increasing trend towards northern portion of the district where these taluks seeks the good potential to develop its infrastructural facilities. Savannur taluk of Haveri district satisfy all the 5 variables of Infrastructural development where as the Hanagal taluk shows the poor level of infrastructural development compared to all other taluks.

**Table No.5.5: Haveri district: Level of Regional Development**
(Based on 16 variables)

<table>
<thead>
<tr>
<th>Classes</th>
<th>Range</th>
<th>Name of the Taluk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>23.02 to 26</td>
<td>Haveri, Savanur</td>
</tr>
<tr>
<td>High</td>
<td>21.55 to 23.01</td>
<td>Byadgi, Ranibennur</td>
</tr>
<tr>
<td>Medium</td>
<td>17.88 to 21.54</td>
<td>Shiggaon</td>
</tr>
<tr>
<td>Low</td>
<td>16.79 to 17.87</td>
<td>Hirekerur</td>
</tr>
<tr>
<td>Very Low</td>
<td>Less than 16.78</td>
<td>Hanagal</td>
</tr>
</tbody>
</table>

Source: Computed by the Researcher
This map is an attempt to identify the overall level of Regional development in Haveri district. Based on 16 variables levels of regional development are categorised into very high, high, medium, low, very low developed taluks in Haveri district. According to this level Savanur and Haveri taluks ranks first in regional development of Haveri district.

These 16 variables comprises of Education (5 Variables), Medical (5 Variables) Infrastructure (6) variables of development.

One can notice from map that, very low regional development is concentrated in western region of Hanagal Taluk of Haveri district which falls under the range less than 16.78 and means that this particular taluk shows poor growth of regional development in the case of medical, education and infrastructural facilities. and further low level of regional development is concentrated in the southern region of Hirekerur taluk which falls under the range between 16.79 to 17.87. The trend and pattern shows very slow growth of regional development is mainly concentrated in western and southern region of Haveri district.

Regional development in case of medium level of development are ranged between 17.88 to 21.54 which falls under the level of medium development concentrated in the northern region of the district in shiggaon taluk. Further the increasing trend of regional development is focussed in the central region of the district in Bydagi and Ranibennur taluk having the range between 21.55 to 23.01 shows the level of high development. Followed by this very high level of regional development are distributed in the central and north eastern region of the district in Savanur and Haveri taluk which falls under the range between 23.02 to 26 showing the peak of regional development.

All above the higher level of regional development is more concentrated in the central and north eastern region of the district where some essential variables are really very strong in this region. But the medium and low levels of the development are unevenly distributed in the district are concentrated mainly in the North, western and southern region of the district where these variables for the regional development is very weak in this region.
Here the level of regional development of Haveri district is measured on the basis of the 16 variables. This will help to make a proposed planning for the regional development.

6.16. CONCLUSION

The present study is explaining the taluk wise disparities in the different classes; these are infrastructure, education level and medical facilities. In the total regional development Haveri and Savanur taluks is well developed taluks in the Haveri district. Hangal taluk is the least develop block in the study region.