CHAPTER I

GEOGRAPHICAL BACKGROUND AND REGIONAL DELIMITATION

A. PHYSICAL SETTING

1.0.0 Introduction
1.1.0 Position
1.2.0 Physiography
1.2.1 Geology
1.2.2 Economic Minerals
1.2.3 Soil
1.2.4 Drainage
1.2.5 Vegetation
1.3.0 Climate
1.3.1 Temperature
1.3.2 Humidity and Rainfall
1.3.3 Climograph
1.3.4 Wind
1.3.5 Climate and Man's Activities

B. REGIONAL DELIMITATION

1.4.0 Introduction
1.4.1 Commuters
1.4.2 Bus service
1.4.3 Weekly Market
1.4.4 News Paper Circulation
1.4.5 Educational Zone
1.4.6 Milk Supply
1.4.7 Medical Service
1.5.0 Zonal Sphere of Influence
CHAPTER I

GEOGRAPHICAL BACKGROUND AND REGIONAL DELIMITATION

A) PHYSICAL SETTING

1.0.0 Introduction

In order to measure the impact of industries over the study area, it is desirable to know some of the salient geographical features of the region. An attempt has been made in brief on the position, physiography, geology, drainage, climate and vegetation. These constitute the fundamentals of its regional geography. The environmental background has influenced the development of industries and effects on man's activities.

1.1.0 Position

The study area occupies a geographical centre of Karnataka State. Davangere is located at 14° 28' North latitude and 75° 59' East longitude. The Harihar town is located at 14° 31' North Latitude and 75° 51' east longitude on the bank of river Tungabhadra (Fig. 1). The two industrial centres are located on the National highway No. 4, connecting Poona and Bangalore. These are also linked by a metergauge railway line connecting Miraj and Bangalore. The
distance between the two units is only 14 Kms. and the distance between the outskirts of the two units is only 8.5 Kms. The location of these two units exhibits the concept of twin towns in the region (Fig. 2).

These twin towns are located at a road distance of 50 Kms. from Chitradurga on the southeast, 265 Kms. from Bangalore on the south, 94 Kms. from Shimoga on the southwest, 178 Kms. from Bellary on the northeast and 145 Kms. from Hubli-Dharwad on the northwest. These units are well served with a network of roads and railways, connecting the state capital as well as other important towns of Karnataka and neighbouring states like Andhra Pradesh in the east, Maharashtra in the north and Tamil Nadu and Kerala in the south. These two units are taluka headquarters of Chitradurga district. Most of the district level offices are located in Davangere. This is mainly on account of locational, industrial, commercial and other geographical aspects.

In the location of the cities and towns, site is an important factor and is influenced by environmental aspects. The cities generally arise out of the functions they perform

* Magistrate Court, Munsiff Court and Civil Court, Electrical Engineering Office, Commissioners for labours, District labour union, etc.
ENVIRONS OF
DAVANGERE AND HARIHAR REGION

INDEX

- DISTRICT HEAD QRS
- IMP SETTLEMENTS
- DISTRICT BOUNDARY
- REGION BOUNDARY
- NATIONAL HIGHWAY
- ROADS
- RAILWAY
- RIVER
and derive many other characteristics from those functions. Nevertheless, the environmental factors of location are persistent and real. Davangere and Harihar units are no exception to this. Renner opines that the existence of a city is always to be accounted in terms of group adjustments to the natural environment. In these instances this adjustment is manufactural, in others saxicultural, and in still others agricultural, commercial, or of some other type.  

1.2.0 Physiography

The physiography of the study area is a matter of special interest to students of geography, particularly to those who endeavour to study its progress in the field of industrialization and the industrial impact on cultural activities.

The area is situated on an undulating plain with an average height of 602.6 mts, which is a part of Mysore plateau an example of multicyclic relief. The hills in this area are mostly situated in Molakalmuru, Hiriyur, Chitradurga, Hosadurga and between the twin towns of Davangere and Harihar. A marked hill range extends from Mayakonda to Anaji, within the eastern edge of the area. Except in the region of some hilly belt here and there, the whole area is open and plain, entirely devoid of picturesque sights but
TOPOGRAPHICAL FEATURES

CROSS SECTION ALONG A-B LINE

SCALE 1 cm = 700 mts
presenting in certain seasons, a vast expanse of verdant cultivation (Fig. 3, Photo 1 & 2).

1.2.1 Geology

The area is largely composed of crystalline schists, granitic gneisses and newer granites with a fewer later intrusive basic dykes, all belonging to the oldest rock formations recognised in India. Generally speaking, the schists rocks consist of complex series of crystalline schists, quartzites, conglomerates and lime stones.

The complex banded grey granitic gneisses occupying a large part of the district are grouped under a separate formation called 'peninsular gneiss'. These consist of true plutonic intrusives, granitised older crystalline schists, magmatites or mixed composite series of a granitised gneisses. This granite structural land forms are very suitable for the construction of heavy industrial plants, which require huge structural buildings. A vast stretches of firm but vacant land is available for the expansion of industrial plants and sprawl of urban settlements around the twins. These granitic and gneisses rocks provide suitable material for the construction of roads and buildings. Good roads and huge buildings, are found in this area due to the geological stability (Fig. 4).
FIG 4
GEOLOGICAL MAP
OF
KARNATAK
(After B Ramarao)
INDEX
HARIHAR
DAVANGERE
RECENT
DECCAN TRAP
KALADGI BASIN
BHIMA SERIES
CLOSEPET GRANITE
CHORNOTITE
CHAMPIA GNEISSES
DVARWAR SCHIST
PENINSULAR GNEISSES
1.2.2 Economic Minerals

The area is surrounded by very valuable minerals such as gold, iron ore, manganese, copper, limestone, china clay, granite etc. Gold, iron ore and manganese are located within a radius of 12 Kms. from Davangere and Harihar. Other minerals are located within a radius of 20-25 Kms. i.e. Chitradurg, Jagalur, Holalkere, have deposit of limestone, white quartzite, copper, etc.

1.2.3 Soils

Soils of Davangere and Harihar region possesses soils derived from a variety of parent materials such as schists, traps, sand stones, lime, shale, and latrites. There are extensive areas covered with black and red soils in the southern and northern parts of the region. They are shallow to deep and are ash to black in colour. The soil in this area is found to contain a high content of soluable salts which are either critical for growth or critical for germination. Medium red and mixed soils are found in the vicinity of Harihar town.

Soil structure and landscape texture are important factors for the construction of buildings. Black soil on the other hand is unsuitable for the construction of building as foundations do not stand in a stable condition. The existence
of hard granitic rocks and latraitic rocks in the region has influenced the construction of buildings.

1.2.4 Drainage

The river Tungabhadra is the only important river which runs in this area. It has helped in localization of some industries like Kirloskar and Harihar Polyfibres plants in Harihar town. The river banks are steep and suitable for lift irrigation. Two canals taken out of Bhadra reservoirs at Lakkavalli pass through Davangere and Harihar talukas. Other rivers and streams are Vedavati, Jangahalla, Garanihalla, Syagahalla in the study region (Fig. 3). The volume of water in rivers and streams varies considerably between the rainy and dry seasons.

1.2.5 Vegetation

The area itself is plain with very little thin vegetation. The vegetation in this area consist mostly of shrubs growth and pasture, here and there. The vegetation is much inferior to that of the western part which comes under Malnad region. The important trees are Ramara, Soynida-fiberfuga, Melia indica, Pongamia globra, Tamoriddus indica and others. When minerals were not exploited, industries were non-existent and if the full area was not used for
agriculture, forests were the fountain head of material prosperity for the people of this area.

1.3.0 Climate

The climatic conditions of a town are in a state of constant change depending on the density and physical structure of the town, conditions for urban development, green spaces, capacity of industrial enterprises, intensity of urban transportation, etc.  

The climate of Davangere and Harihar is characterised by the tropical monsoon which indicates the seasonal rhythm of weather. All the weather elements like temperature, pressure, wind, precipitation and relative humidity exhibits well marked seasonal variations. The twin towns are covered by the Koppen's and Thornthwaite's classifications of AW and CAW respectively. These symbols explain the distinct dry season combines, with a moderate annual range of temperature. According to recent Indian classification, the region falls in the semi humid zone.

The climate of this area is divided into four types such as hot monsoon or pre-monsoon-March to May, The Monsoon season June to September, The post Monsoon - October to November, Winter Season - December to February. The climate of the region is marked by the hot summer months, low rainfall
### Table - 1

**CLIMATIC ELEMENTS OF DAVANGERE AND HARIHAR**

<table>
<thead>
<tr>
<th>Name of Elements</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean monthly Temperature °F</td>
<td>72.9</td>
<td>77.2</td>
<td>82.9</td>
<td>83.9</td>
<td>80.7</td>
<td>77.9</td>
<td>77.5</td>
<td>76.5</td>
<td>76.5</td>
<td>76.3</td>
<td>73.2</td>
<td>70.3</td>
<td>76.9</td>
</tr>
<tr>
<td>Mean Daily Max. °F</td>
<td>84.8</td>
<td>89.6</td>
<td>94.9</td>
<td>97.3</td>
<td>95.1</td>
<td>87.1</td>
<td>82.6</td>
<td>82.6</td>
<td>84.3</td>
<td>85.0</td>
<td>83.4</td>
<td>82.4</td>
<td>87.4</td>
</tr>
<tr>
<td>Wet Bulb Temperature °F</td>
<td>61.6</td>
<td>62.9</td>
<td>65.8</td>
<td>70.1</td>
<td>80.8</td>
<td>69.7</td>
<td>68.8</td>
<td>68.4</td>
<td>68.4</td>
<td>68.7</td>
<td>65.8</td>
<td>62.4</td>
<td>66.9</td>
</tr>
<tr>
<td>Dry Bulb Temperature °F</td>
<td>68.7</td>
<td>72.2</td>
<td>76.8</td>
<td>78.2</td>
<td>76.7</td>
<td>73.9</td>
<td>72.0</td>
<td>71.6</td>
<td>71.8</td>
<td>73.3</td>
<td>71.3</td>
<td>68.3</td>
<td>72.9</td>
</tr>
<tr>
<td>Relative Humidity in %</td>
<td>65.7</td>
<td>57.0</td>
<td>53.0</td>
<td>65.0</td>
<td>74.0</td>
<td>80.0</td>
<td>84.0</td>
<td>84.0</td>
<td>83.0</td>
<td>78.0</td>
<td>71.3</td>
<td>68.3</td>
<td>72.0</td>
</tr>
<tr>
<td>Rainfall in mm</td>
<td>6.35</td>
<td>2.79</td>
<td>4.31</td>
<td>24.63</td>
<td>74.68</td>
<td>65.78</td>
<td>72.9</td>
<td>85.85</td>
<td>110.0</td>
<td>120.9</td>
<td>73.2</td>
<td>71.0</td>
<td>642.62</td>
</tr>
<tr>
<td>Prevailing winds from</td>
<td>SE</td>
<td>SE</td>
<td>SW</td>
<td>SW</td>
<td>SW</td>
<td>SW</td>
<td>SW</td>
<td>SW</td>
<td>SW</td>
<td>SE</td>
<td>SE</td>
<td>SE</td>
<td></td>
</tr>
<tr>
<td>Mean wind Speed in Kms.</td>
<td>7.3</td>
<td>6.0</td>
<td>6.1</td>
<td>6.8</td>
<td>9.7</td>
<td>12.0</td>
<td>13.1</td>
<td>11.6</td>
<td>9.4</td>
<td>6.0</td>
<td>6.0</td>
<td>7.3</td>
<td>8.48</td>
</tr>
<tr>
<td>Mean Daily Min. Temperature °F</td>
<td>66.2</td>
<td>66.4</td>
<td>70.4</td>
<td>72.9</td>
<td>71.9</td>
<td>70.2</td>
<td>68.9</td>
<td>85.5</td>
<td>68.0</td>
<td>68.2</td>
<td>64.8</td>
<td>61.8</td>
<td>67.9</td>
</tr>
</tbody>
</table>

and pleasant monsoon. The climate of any region or locality is not determined by a single climatic element but rather by the combinations of climatic elements and of weather type prevailing there. The study of these individual elements and types are necessary. They are explained as follows:

1.3.1 Temperature

The mean annual temperature is 76.9°F. The temperature of this region rises gradually from January to April. During the month of April the air temperature will be maximum and by the end of April thunder showers occur and occasionally cool the area. These are known as 'mango showers'. The daily mean maximum temperature during the period is found to be 97.3°F and the daily mean minimum is 61.8°F (Table -1, Fig. 5A). The mean monthly maximum temperature is 83.9°F and that occurs in the month of April. The mean monthly minimum temperature is 70.3°F that occurs in the month of December.

1.3.2 Humidity and Rainfall

Relative humidity is high during the period from January to October and less in the month of March and it records 53 per cent. The annual average rainfall humidity
TEMPERATURE IN FIG-5

DAILY MAXIMUM
MEAN MONTHLY
DAILY MINIMUM

RELATIVE HUMIDITY & RAINFALL

CLIMOGRAHOP

B)

C)
is 72 per cent. The relative humidity is an important factor in localizing the textile industry. The minimum relative humidity needed in cotton spinning is 50 to 60 per cent. The required relative humidity is found in this region. This region is above the minimum relative humidity throughout the year (Table - 1). At a time of inadequate moisture weather required for spinning and weaving, an artificial moisture condition is created. As a result, textile industries have been established in large numbers.

From June to about the end of October, skies are generally clouded. The precipitation increases with the advance of south west monsoon which commences from the first week of June. The average rainfall of the region is 642.62 mm. The area receives rain both from south west monsoon and retreating monsoon. The maximum rainfall occurs in October and records 120.99 mm. The lowest occurs in the month of February (Fig. 5b).

1.3.3 Climograph

The climograph (Fig. 5c) is represented to show the interrelationship of two climatic data such as wet bulb temperature and relative humidity. The shape and position of the resultant graph provides as index to the general climatic characters of the study area. The figure roughly
projects in three directions - the first towards the west depicting dry weather conditions in the month of March. The second one projects towards the north in the month of May and it indicates highest wet bulb temperature. The third one towards the east depicts the maximum moisture weather condition. The figure exhibits a triangle in shape. The extent of the diagram itself indicates a moderate type of climate. Thus this figure reveals the influence of weather condition on human life.

1.3.4 Wind

It is clear from Table - 1 that the city is influenced by the south westerlies. On an average these winds blow over the region for about 214 days in a year. From January to April winds blow from moderate to higher velocity to an extent of 15 K.ph. and moderate to light velocity up to December. The highest velocity is from the South West. The moderate velocity is from the South east. On an average the velocity of the wind is 9.6 K.ph. over the region. Tropical air masses are very important factors in the mechanism of the Indian weather condition of the region.
1.3.5 Climate and Man's Activities

The combined climatic conditions of a region small in area or the parts of a region, characterize the micro-climatic of a particular place. The principle meteorological factors of a micro-climate are: temperature, humidity, mean radiation velocity of air movement and level of light intensity and distribution. The micro-climate is considerably affected by the terrain of the place, ground and soil conditions, plant life, the building pattern of the town, the degree of air pollution etc. The micro climate of an urban territory is thus regarded as the result of the interaction of natural and town planning factors such as water impounding, landscaping, asphalt paving, building density, etc. The scale of comfort formula can not be applied to all countries and races of the world. This region comes under the influence of tropical monsoon climate and the temperature and relative humidity on an average is high with 76°F and 72 per cent respectively. The temperature below 60°F is conducive to good health and energy. Although human beings can be quite active with the temperature at 90°F, a high percentage of relative humidity causes perspiration, exhaustion and weakness, rendering hand labour, physically strenuous in factories and fields. From this point of view, the industrial towns have temperature nearer the required climatic optima.
The maximum temperature is discomforting and impairs the efficiency of workers and sometimes they cannot endure sustained exertion during the day time, especially in Davangere. But this type of uncomfortable weather is experienced only during March to April. Excepting these two months, in the remaining months the effect is not so adverse. The mild winds, a high percentage of relative humidity helps the location of textiles. Most of the period coincides with increased production and efficiency and reduction in industrial events in this region.

On the whole, the climate of this area is most salubrious and pleasant compared to other neighbouring cities. The agricultural production mainly depends on the seasonal variations. Compared to southern and northern districts, this area is more facilitated by the monsoon. Generally this climate is well suited for factory workers, and farmers as well.

B) REGIONAL DELIMITATION

1.4.0 Introduction

Aurousseaus opines that a city is to be interpreted as an organic part of a social group with influenced by its existence. As such the city for its vitality depends not only on its own internal resources but also on its
capacity to tap the sap for its growth from a vast region surrounding it. It obtains articles of daily consumption viz. vegetables, fruit, milk, foodgrains, etc. as it produces little on account of its limited space. It taps also raw materials and labour force for its industries. It uses urban fringe areas to provide residential accommodation for its habitants to develop estates for allied industrial concerns. In return for these services, the city works as a social and political base for the neighbouring areas.

Every city, therefore, besides being a centre of human settlement, is also the focus of social, economic, cultural and political activities on account of which it extends its unbounded influences over the surrounding rural areas. Thus it not only utilizes the resources of the area but also serves the region through its various centralised services, institutions, centres of recreations which the countryside cannot maintain. Hence the influence of an urban centre is not only confined to its municipal boundaries, but rather extends into surrounding rural areas. But there is an areal limit set to the region in which there interrelated services operate efficiently and beyond which centrifugal trends begin. Thus the area on which the region and the city are socially, culturally, economically, politically, interrelated, forms the umland, omland, urban field of a particular city. Other expressions used
to describe such an area are urban hinterland, catchment area, sphere of urban influence, and tributary area.

Presently the author has selected the term sphere of urban influence to study the impact of industries over the surrounding area. The inter influence, however, is integrated in such a way that both the units and the surrounding country become inter-dependent on each other. As the hinterland part is both supplier and receiver, it is the core of the hinterland or the sphere of influence of the urban region.

The relationship between a city and its sphere of influence is not simple; it is rather a complex one. Davangere and Harihar is the kingpin of different functions it serves, such as employment, shopping, educational services, etc. As a consequence, its pattern of influence becomes very complicated and therefore, the boundary of its sphere of influence is neither definite in nature nor wholly hypothetical. It cannot be easily considered with mathematical accuracy like a political boundary.

To the author sphere of influence seems more expressive than other terms and he has used this word in his analysis to denote the territory, which links economically and culturally with the twins towns.
Geographers have attempted to determine the nature and extent of the sphere of influence of cities. Horris has made a comprehensive study of the tributary areas of a salt lake city. Dickenson also studied the regional functions and zones of the influence of Leeds and Bradford. They have selected for study certain important elements which are pivots of interrelationships between the city and the surrounding region. Further the relations between the town and surrounding area are subject to change according to increased communication facilities. Recently motor lorries, trucks, and bus services, in the rural areas have brought the countryside into closer contact with the city and have extended the range of its services. The city finds employment for thousands of persons who come to the city from the rural areas, the town and country relations, therefore are dynamic and not static. The several factors like geographic, economic, demographic, social and political, determine the capability of each town in exerting its influence on surrounding region.

Harris selected 12 services for a salt lake city, such as retail trade, wholesale, commuters, etc. Besides these conventional methods which may be termed as empirical methods cum-intuitive method, some more objective methods than these have been used to delimit the umland of the towns. One such model is the 'gravity potential model', which has
been taken into account the weights of "population" and 'distance' and measures the factors of city influence quantitatively, thus minimizing the chances of intuitive results and value of adjustments. Since the sphere of urban influence is determined after taking into consideration the different services and their sphere of influence, it is not easy to demarcate the various impact zones as no prepared data is available for most of elements of impact. Therefore, the boundary of the impact of different elements is tentative and suggestive; but it is based on facts and figures and reliable to greater extent.

The following indices or elements have been taken into account to know the influence of twin towns on the basis of field work: (1) Commuters (2) Bus services (3) Weekly market zone (4) Newspaper circulation (5) Educational zone (6) Milk supply (7) Medical service (Fig. 6).

1.4.1 Commuters

Here the word 'commuters' refers to the city workers who daily go to the twin towns to earn their livelihood and return home daily. In both places a large number of people commute to the city from the neighbouring villages. They have been employed in various kinds of works and industries. The commuters role is very important to know the industrial
impact on surrounding region. The following figures show
the impact of industries on surrounding villages in view of
commuters. The total number of villages supplying commuters
is 20. The total number of commuters working at both places
is 5000 and the average numbers per village is 250. The
twenty villages have direct impact on the twin towns. They
are daily coming to the city on foot, on cycles, scooters
and by buses. The workers reside in these villages
mainly due to low rent in the villages as they cannot pay
high rent in the cities. Secondly some of the labours are
natives of the surrounding villages. On the one hand some
people are flowing from the city as they prefer to reside
in adjacent villages for cheap living while on the other
hand, people from the most remote and isolated rural villages
move closer to the city, where they can profitably avail
themselves of the city contacts but they are not forced to
surrender all of their traditional forms of living. As the
growth of twin town takes place, the zone of commuters is also
spread. Presently it has reached the radius of 20-25 Kms.

1.4.2 Bus service

As an industrial centre, transportation is a very
significant factor to know the contact of people with other
area. Roads are the veins and arteries of a country through
which every improvement takes place and the urban impact is
reflected on the country side. The buses carry passengers from the places where regular inflow and outflow of people is found. It is quite apparent that the study area is directly connected with Belgaum, Hubli-Dharwad in the north west, Shimoga and Bhadravati in the south west, Chitradurga and Bellary in the northeast and Bangalore in the south east. In addition to these inland rural marts are also connected with these twin towns. Most of these routes are operated by private motor transport and government service is meagre. In general, the range of private buses has made important changes in transportation. Almost all villages within a radius of 35-40 Kms., are connected by buses (Fig.6).

The recent development of the roadway towards Shimoga has tremendously increased the volume of motor and other vehicular traffic flow towards Davangere and Harihar. The total area of the traffic zone is about 41400 Sq. Kms. It extends along the national highway No. 4 i.e. from North west to south east.

1.4.3 Weekly Market Zone*

This zone is roughly rectangular in shape extending 120 Kms. from north to south and about 108 Kms. from east to

* This zone includes vegetables, foodgrains, and agricultural products for industries as raw materials. It excludes the supplies coming from other centres through railways and other means of transport. It is primarily taken into account the traffic which moves by local transport.
west covering an area of about 12960 Sq. Kms. Davangere forms the choice of the consuming centre for agricultural products like groundnut, cotton, rice, linseed etc. In return they trade in cloth, vegetable oil, cake, fodder, etc. Harihar is not a big commercial centre. Hence the important trade does not take place here.

The zone encroaches over the areas of Dharwad, Bellary, Shimoga, Chikkamagalur, districts whose surplus and specific goods are sold out in twin towns. During other period the surplus goods are conveyed by other means of transport. The role of village traders in commerce is very significant in the region. Over 35 per cent trade in groundnut and grain in the surrounding villages is handled by village agents. The average annual arrival of cotton, jowar, groundnut, and rice is 1621900 bales, 268949, 283850, 120138 quintals respectively at twin towns. The major share of Davangere is 28110 tons of groundnut and 1611000 bales of cotton for industrial purposes, most of which comes partly through village agents and partly from farmers. Surplus goods are sent to Bangalore, Hubli, Belgaum, Kolhapur and Poona.

A glance at the map (Fig. 6) gives an idea of the commercial zone of the study region. The map is based on interviews and personal observations in the neighbouring villages and on the routes through which the goods are moved into the city. All the cultivators prefer to grow commercial
crops and perishable goods due to great demand. Perishable goods like vegetables (onions, potatoes, chillies, tomatoes, cabbages, etc.), come even from longer distances. During the period of inadequate supply from the local zone, vegetables are supplied from Bangalore, Hubli, Belgaum, Bellary, etc.

1.4.4 News Paper Circulation

The news paper circulation area of an urban centre is considered an important index of sphere of urban influence. Today news papers, radios, and television have become an important sources through which cultural and political influences are transmitted into different parts from a few properly selected centres. Besides reflecting the existence of social associations in the district, the local news paper can itself be an important factor in promoting and focussing a sense of community. Thus both the urban centres and the area of circulation of its papers, culturally become one unit. Virtually local news papers show the area for which a town or village acts as a centre; an analysis of the contents gives some indication of the social and economic life of the region.

There are three daily news papers and six weeklies published from Davangere. The total circulation of these news papers, namely, 'Davangere Times', 'Davangere News',
'Davangere Express', etc. are 20,420, 9864 and 6855 respectively. The circulation of weeklies account for about 10500. Recently one Daily newspaper (Loka Sandhesh) has been published from Harihar town. About 6000 copies are circulated in and around the twin towns. All these papers give much information on local activities. The papers from outside also compete with local papers in the twin towns. The newspapers published from Davangere and Harihar are circulated within a radius of the 15 Kms. and it covers 32 villages.

1.4.5 Educational Zone

Similarly, the sphere of influence of the educational institutions is also significant in showing the urban impact. There are 29 lower primary schools, 21 high primary schools, 10 high schools, 13 colleges are in Davangere and there are 19 primary schools, 3 high schools and 1 college in Harihar. The higher educational institutions like Law, Arts, Science and Commerce and other technical institutions are attracting students from a vast range. The catchment area of the primary, secondary and collegiate would closely corresponds to the area of dominance of the study area. The students of medical and engineering colleges come from longer distances because selection of students is done on the state level. As a result, the students from longer distance and outside
the state are also coming. Hence these institutions are not taken into account to delimit the zone.

In all about 1688 students come daily from the surrounding villages. They come to these twin towns by buses, on cycles, and on foot. This zone covers an area of 880 Sq. Kms. Taking these broad facts into consideration, the catchment area of the primary schools, high schools, and colleges has been mapped on the basis of actual survey.

1.4.6 Milk Supply Zone

Supply of milk is mainly a rural cottage industry but the saleable demand for fluid consumption is mostly concentrated in urban areas. The nature of milk in warm climate of the region makes it necessary to collect and distribute the milk within a few hours after milking. Hence, distance is primary and quantity is the secondary factor in the milk trade. Besides the large number of producers, several group of persons are engaged in its collection, handling and distribution. The main agents for distribution of milk are as follows: (1) Direct distribution (2) Agents (3) Dairies.

Field observation reveals that a large quantity of milk supply is obtained from surrounding villages. A number
of rural people are engaged in the milk supply which is collected from the villages. Davangere mainly depends upon outside supply to an extent of 58 per cent of the total supply. This is mainly on account of low degree of primary activities as well as a small quantity of local supply. The milk supply from outside accounts about 105,00 litres and locally it is 7500 litres in Davangere city.

Harihar town also gets milk from the surrounding villages to an extent of 51 per cent (3500 litres) and the rest is supplied from locally. The milk supply zone for the twin towns extends to about a radius of 36 Kms.

1.4.7 Medical Service

Medical service is another suitable media to find out the urban-rural association. The researcher’s field observation reveals that about 35-40 villages avail themselves of the medical service from the twin towns. The zone extends to about 30 to 40 Kms. of radius from the twin towns. This zone covers an area of Chitradurg, Dharwad and Bellary districts. As Davangere city is provided with medical colleges, the people of the surrounding village people derive the benefit of medical facilities (Fig. 6).
1.5.0 Zonal Sphere Influence

To have a perfect analysis of twin impact on the neighbouring villages, a precise delimitation of the area known as 'sphere of influence' has to be done, not arbitrary but scientifically and rationally*. So it encircles a large area of influence on the economic, social, and also cultural activities, though relatively of less intensity as distances grow longer^.

While in delineating the study area, the geographers have taken many principal indices like, transportation, market zone, education, commuting etc., and the relative elements comprising demographic features. However, while conclusively delimiting the sphere of influence of Davangere and Harihar, the respective impact zones prepared on the basis of each of the following 15 indices have been taken into account * (a) Five indices relate to rural supplies to the city (b) Eight relate to centralised services available to the rural areas. (c) The last two relate to changes in landuse and habitation. These fifteen indices exhibit a formation of a girdle of the study area. Each of these fifteen indices of influence of twin towns has been assigned. All villages with a weighted

* Agricultural production, poultry products, milk, vegetables, workers (commuters), shopping, education, medical, suburban bus service, paper circulation, recreation, banking, repair of agricultural goods, landuse, Habitation.
score of more than 10 are included under the high intensity range; the medium intensity range faces between the numbers 5 and 10 and the low intensity below the score of 6. As the distance increases the intensity of impact decreases.

The hinterland boundary does not coincide with that of the administrative boundary of the state. The boundary is a gradient in character and based on economic and cultural factors. The boundary of sphere of influence cuts across the neighbouring districts namely Dharwad, Shimoga, and Bellary. This area is classified according to the magnitude of individual zones (Fig. 7). It is as follows:

a) Area of dominance (area of high intensity)

b) Area of predominance (area of medium intensity)

c) Area of Association (area of low intensity)

The statement below shows the area of influence.

<table>
<thead>
<tr>
<th>Table - 2</th>
</tr>
</thead>
</table>

EXTENSION OF SPHERE OF INFLUENCE

| Type of influence | East to West in Km. | North to South in Km. | Area Sq.Km. | Percent-
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominance</td>
<td>40</td>
<td>35</td>
<td>30</td>
<td>2.46</td>
</tr>
<tr>
<td>Predominance (Prominence)</td>
<td>140</td>
<td>135</td>
<td>310</td>
<td>25.41</td>
</tr>
<tr>
<td>Association</td>
<td>350</td>
<td>500</td>
<td>880</td>
<td>72.13</td>
</tr>
</tbody>
</table>
The area of Dominance is influenced by industrial raw materials, commuters, perishable goods local newspapers, medical service and other socio-economic activities. This zone can also be called 'Trade area'. This zone covers an area of about 1076 Sq. Kms. It covers fifty four villages.

The area of Predominance is the second important extension, delimited by mainly educational institutions, suburban bus services, etc. This area is called 'educational' area or the area of 'social contact' with the two units. This zone covers about an area of about 16200 Sq. Kms.

The area of Association is called 'service zone' which is mainly covered by the circulation of traffic, higher educational institutions, etc. On the whole, the functions of this area are associated with the functions of Davangere and Harihar. Hence this area is called 'area of association'.

The final results of the impact of twin towns has been tested by 'Gravity Model' of Reilly's. Reilly's retail gravitation model may be used to estimate the linear extent of the hinter land of the two units. This has been studied by applying the breaking point formula. It assumes that the amount of interaction between two cities is directly proportional to the number of people living in those cities and inversely proportional to the intervening distance. As a result of it, when we talk of this breaking point or
'dividing line' between the hinterland of competing cities. We refer to the areas where the influence of the one city predominate.31

The characteristic of the population and the friction generated by the interaction between twin towns and other competing cities is to be found out. The following Reilly's retail formula is applied for delimitation of sphere of influence.

\[
D_j = \frac{D_{ij}}{1 + \sqrt{\frac{P_i}{P_j}}}
\]

Where \(D_j\) = the breaking point between city \(i\) and city \(j\)

\(D_{ij}\) = the distance between the two units \(i\) and \(j\)

\(P_i\) = Population of the \(i^{th}\) city and

\(P_j\) = the population of the \(j^{th}\) city.

The above geographical tool can be read as the distance from city 'j' to the edge of its hinterland with city i is equal to the distance between the two cities divided by 1 plus the square root of the size of the 'i' city divided by the size of city 'j'. The surrounding cities have been taken to test the breaking point which are all within 300 Kms. (Fig. 7). The table - 3 expresses the breaking points from mid point of Davangere and Harihar units.
Table - 3

BREAKING POINTS FROM TWO UNITS

<table>
<thead>
<tr>
<th>Name of Units</th>
<th>Name of other cities</th>
<th>Distance (Km.)</th>
<th>Population in Kms.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hubli-Dharwad</td>
<td>145</td>
<td>3,79,166</td>
<td>54.4</td>
</tr>
<tr>
<td>Bellary</td>
<td>178</td>
<td>1,25,183</td>
<td>84.7</td>
</tr>
<tr>
<td>Chikkamagalur</td>
<td>50</td>
<td>50,254</td>
<td>48.2</td>
</tr>
<tr>
<td>Bangalore</td>
<td>265</td>
<td>15,40,741</td>
<td>63.6</td>
</tr>
<tr>
<td>Shimoga</td>
<td>94</td>
<td>1,02,709</td>
<td>42.0</td>
</tr>
</tbody>
</table>

On the basis of the above test, the sphere of influence of the study unit has also been demarcated as in Fig. 7. This line of breaking point nearly coincides with the line of predominance.

In addition to the above explained nodal regional criteria, the area of dominance has the homogenous characteristics, where the region is determined by the greatest possible uniform socio-economic elements of region. In view of these characteristics, the area of dominance (Fig. 8) has been selected for study purpose to measure the impact of industries of the Davangere and Harihar units. When we
apply the revised Rn scale of Nearest Neighbour technique, the study region is within the zone of urban concentration (Fig. 9A & B). This technique strengthens the significance of the study region.
REFERENCES


ADDITIONAL REFERENCES


