Relevance of Modern Techniques in the Micro Level Study of Human Geography

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Abstract

Understanding of special variation of physiographic as well demographic aspects can be a good geographical study. Folioing this principle attempt has been made to understand the level of development in the Rahuri tahsil of Ahmadnagar district. This paper has exhibited how micro level studies at village level can be carried out. The parameters related to physiographic and drainage pattern have been considered for scientific approach of geographic study of Rahuri tahsil by using GIS. Techniques. Understanding of the special variation of physiographic as well as the demographic aspects can be a good geographical study. Following this principle, an attempt has been made in this investigation. This paper has exhibited how micro level studies at village level can be carried out by using Modern techniques like GIS.

KEYWORDS: Geographical Information System, development. physiographic profile, Drainage pattern, demographic characteristics, Population growth, Sex Ratio, Literacy,

Introduction:

Geographical Information System and remote sensing play a very important role in the study of modern geography. Terrain mapping and scientific assessment of the any geographical region, ground conditions at speed, which no other survey can provide. Image analysis of satellite digital data and creating spatial geo-reference information of the geographical, social and infrastructural information of any location is possible today by using GIS tools. Land use/ land cover information of any physical settings are of great interest in every stage of technical and financial planning. This information provides the social costs and environmental costs to the planning. The use of Vector analysis of the drainage pattern done, by using SOI toposheet of 1:50,000 scale. Once mapped, drainage patterns can be saved as vector files and used as layers in forward modeling or simply overlaid on raster images for comprehensive interpretation and decision-making.

Selecting the most suitable dam site will require detailed studies of both surface and sub-surface structure of the dam site area and its surroundings. The field information can be easily integrated with remotely sensed data in GIS platform for the best dam site selection.

2. Importance of the Study:

Rural economy is an agro based economy, vulnerable to various climatic and socio-economic factors. In the drought-prone zone, the agricultural development is low. However, irrigation has caused the emergence of agriculturally developed regions. This kind of regional variation has been observed within a block or tahsil if micro-level study is carried out. It may be assumed that agronomic development is well reflected in the level of human resource development. This may be understood by carrying out a study at a tahsil level. This kind of study is expected to understand the

geo-environmental aspects of development and may throw light on causes and effects of socio-economic growth on the overall development in the rural sector.

By selecting the Rahuri tahsil in Ahamadnagar district of Maharashtra, as a study region, this kind of study has significance for future planning aiming at achieving inclusive growth. It would certainly be useful for planners, researchers and implementation agencies. Such studies can also exhibit a good example of utility of geographical studies for the socio-economic development. The Geographical Information System and remote sensing play a very important role in this type of study.

3.Study Area:

The Rahuri Tahsil of Ahmadnagar district in Maharashtra state(India) has been selected for the present work. The tahsil comprises of 95 villages and two urban centers spread over an area of are 100868 hectares (1,008 sq. Km). The absolute geographical location of the study area can be expressed as from **19º 15′ N to 19º 34′ N** latitude and **74º 23′ 30″ E to 74º 50′ E** longitude. Rahuri tahsil lies in the rain shadow zone of the Western Ghats in the middle of Pravara and Mula basin**.** About 45 % of the net Sown Area (NSA) is under irrigation which provides the base for establishment of two sugar factories and 14 chilling plants with a good network of dairy collection centres.

The population of the tahsil according to the 2001 census is 295093 with about 51.70 % as male and 48.30 % as female population. According to the provisional figures of 2011 census the total population of the tahsil increased to 325932 with decadal growth of 10.45 %.

The Rahuri tahsil is bounded by Rahata tahsil on the north, Nagar tahsil on the south, Nevasa on the east and Sangamner and Parner tahsil on the west, of the same district.

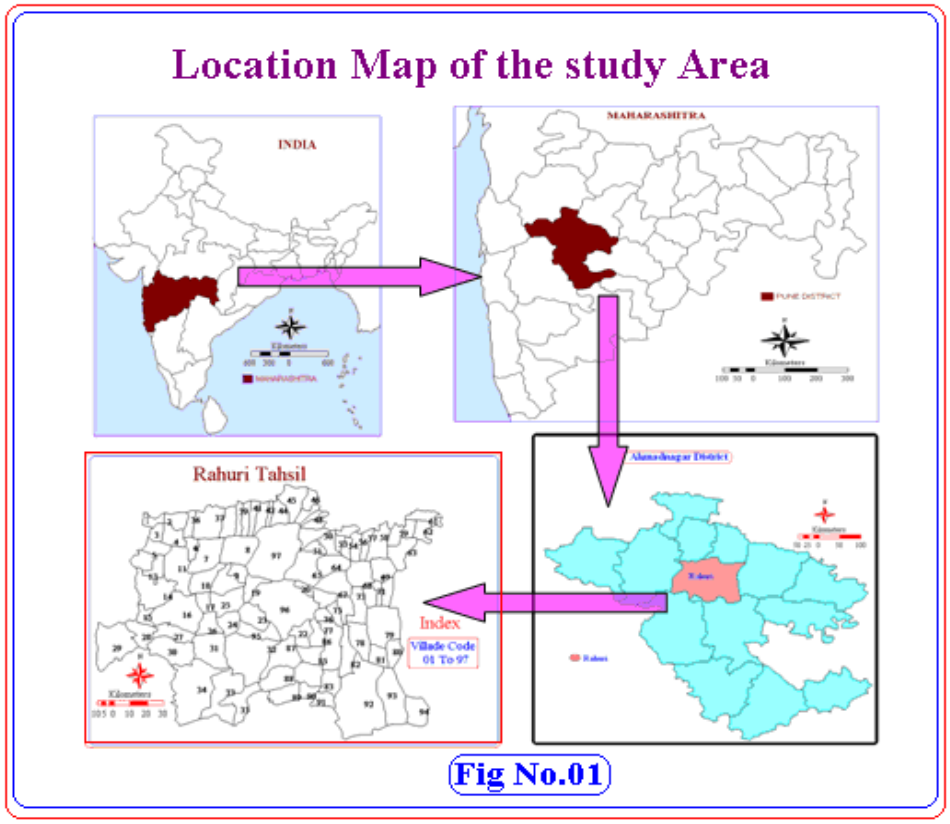
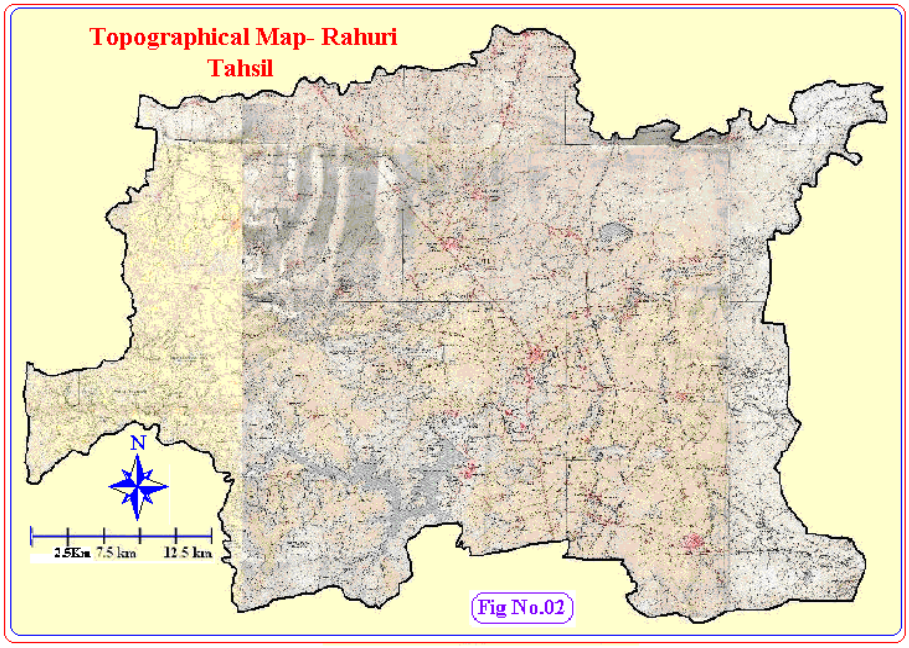


Fig No.01



4 Main Objectives:

The present study proposes to analyse the level of rural development, particularly in the context of the physiographic profile of the study area and demographis set up of the Rahuri Tahsil of Ahmadnagar district. The study intends to adopt a geographical approach. Any geographical study can start with an understanding of the physiographic profile of the study area. This may be followed by the analysis of the demographic characteristics at the village level.

1. To study the physiographic profile of the Rahuri tahsil, district Ahmadnaga by using GIS techniques.
2. To study the Drainage pattern of the Rahuri tahsil, district Ahmadnagar by using GIS techniques.
3. To analyse the demographic characteristics of the tahsil using the village and the circle level information.

5.Methodology:

5.1 Database:

The data of the physiographic factors associated with the human activities particularly the level of human resource development were studied. The parameters like topography, climate, soil, drainage pattern etc. have been considered for this study. The data regarding rainfall and temperature have been collected from the India Meteorological Department (IMD). The Data related to the topography of the study area is procured from Survey of India topographical Maps (47 I/6, 47 I/7, 47I/10, 47 I/14, 47 I/15 and 47I/16).

Considering a village as a unit for the Rahuri tahsil in Ahmadnagar district of Maharashtra, the data pertaining to different aspects of the study area is collected from the Village Talathi Office, Grampanchayat, Panchayat Samiti, Tahsil office Rahuri, Department of Irrigation, Department of Education and other departments of the Rahuri tahsil and District Census Handbook. The data pertaining to the period from 1981 to 2001 and the provisional census figures of 2011 are considered for the study. Moreover, some information regarding issues of human resource development was collected through the group interviews of the villagers and knowledgeable

persons. A questionnaire was prepared for collecting information from Talathi and Gram Sevak.

5.2 Approach:

5.2.1 Physiographic Study:

Any geographical study requires a physiographic profile of the study region as the basic work. Therefore, the present study has also carried out a brief physiographic study of the region to identify the dominant or prevailing factors in the region, for example the climatic factors may not be considered as prevailing factors affecting the intra-regional variation as they are common for almost all the villages in the study area. The topographic factors have shown their direct influence on the accessibility and in turn the amenities and hence have been explained thoroughly.

5.2.2 Demographic Study:

The demographic data have been analysed to understand the population resources which has direct bearing on the human resource development. The parameters like density, growth and sex ratio have been considered as the indicators of the demographic resources.

5.3. Techniques:

5.3.1 Computer Techniques:

The database has a matrix of number of parameters x 97 villages (rows), for such a large size quantitative data, computer techniques are essential to obtain mean, standard deviation and bivariate correlation and also for using GIS software.

5.3.2 GIS Techniques:

The analysis and integration of the multivariate and multi date data may be carried out and presented by using the GIS techniques. The vector based GIS software Gram++, Global Mapper and Surfer has been used to prepare the maps to show the intraregional variation. In addition, this physiographic maps like slope, drainage and relief maps were prepared and presented by applying the GIS techniques.

6. Interpretation:

6.1. Physiography:

Population characteristics of any area are closely related to the physical factors of those areas. The physical factors directly or indirectly affect the distribution, density and economic activities of the population. The physical factors like topography, drainage, climate, soil, vegetation and water resources are important. The data related to these factors is collected from the Gazetteer of Bombay Presidency Ahmadnagar district, District Census Hand Book of Ahmadnagar district .The data related to the climate like rainfall, temperature, humidity are collected from the India Meteorology Department, Pune. These factors are discussed in the following paragraphs.

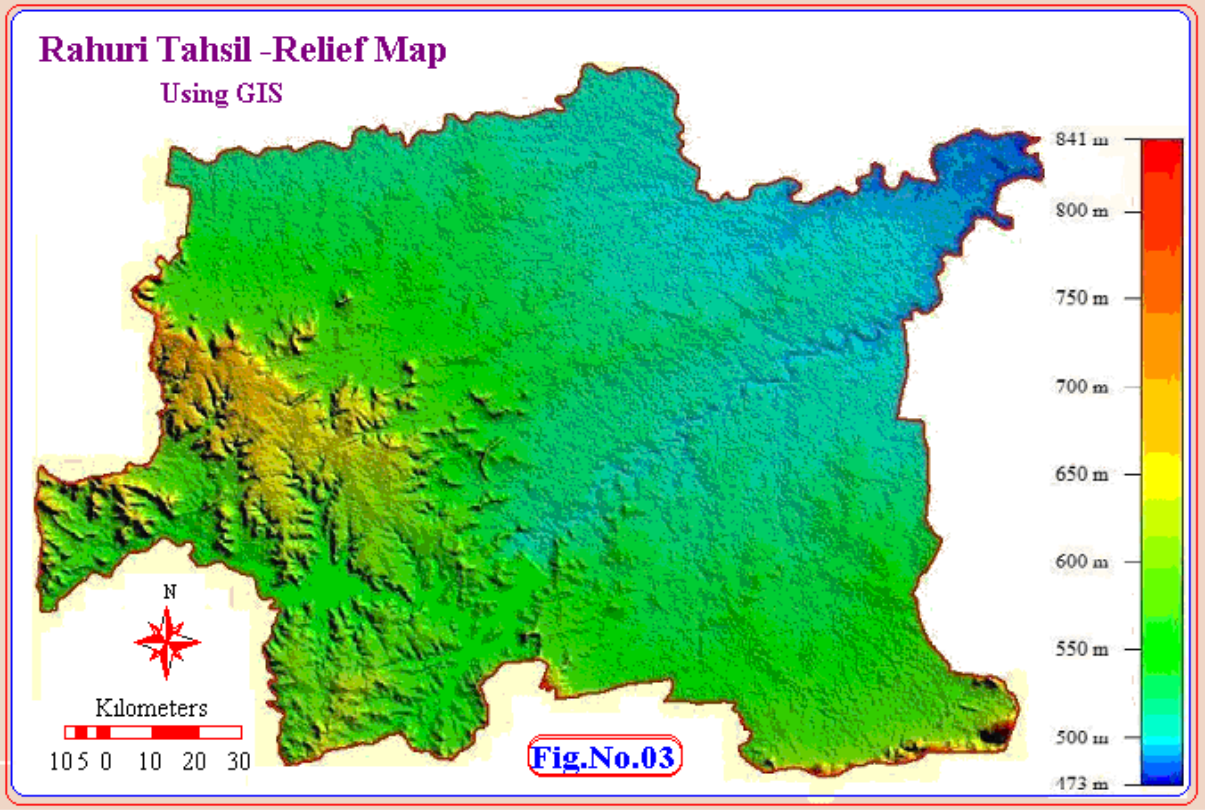
6.1.1. Topography:

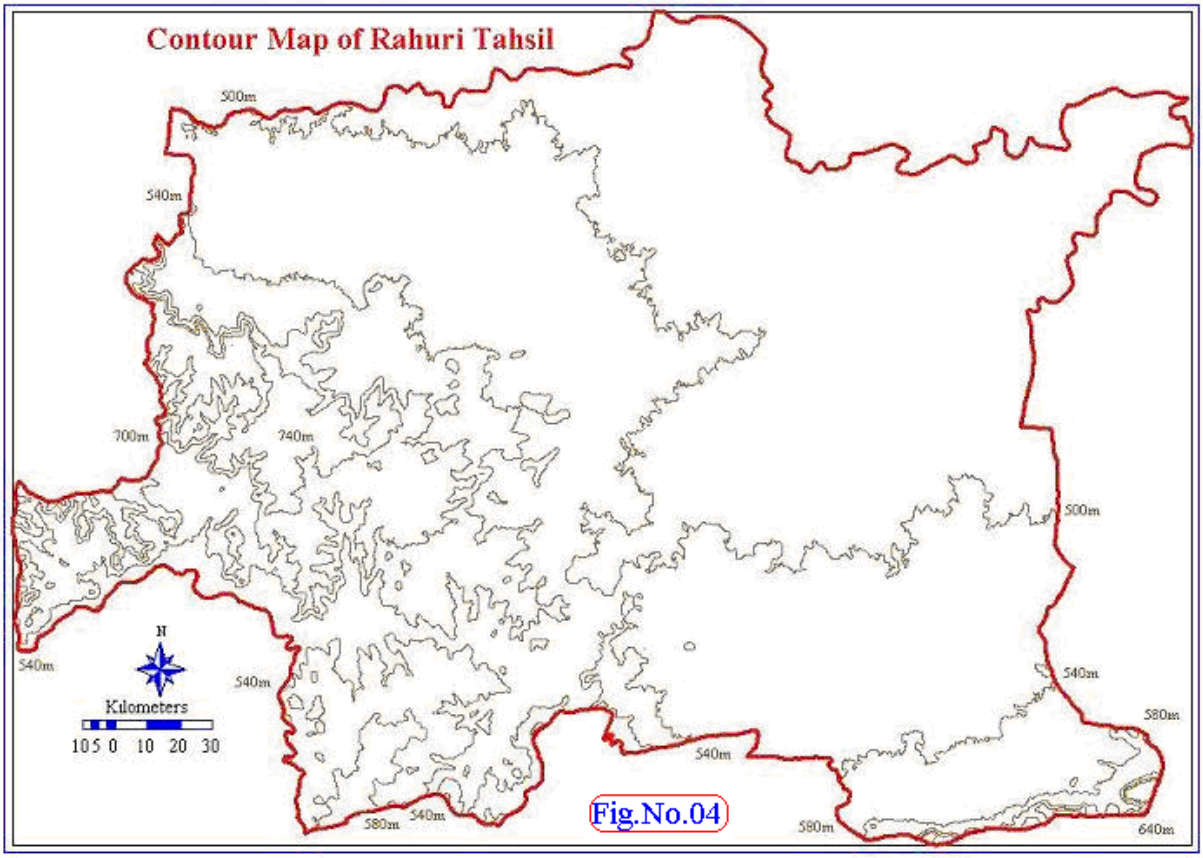
Rahuri tahsil is in the middle part of the Ahmadnagar district. The relief Pattern of tahsil has immense variety. The tahsil is covered with the mountains, small hills, and plateau and reverie plains created by Mula, Pravara and Dev rivers. The tahsil can be divided in the three parts, the map (fig No.03 and 04) shows the elevation and contour pattern of the tahsil by using GIS software.

1. Baleshwar ranges from Sahyadri in the south-west part of the tahsil with the height of 580 to 740 meters from the mean sea level.
2. Middle part of the tahsil has a gentle slope with a height of 500 to 540 meters from the mean sea level.

3. Northeast and eastern plain part of the tahsil with a height of 500 meters from the mean sea level.

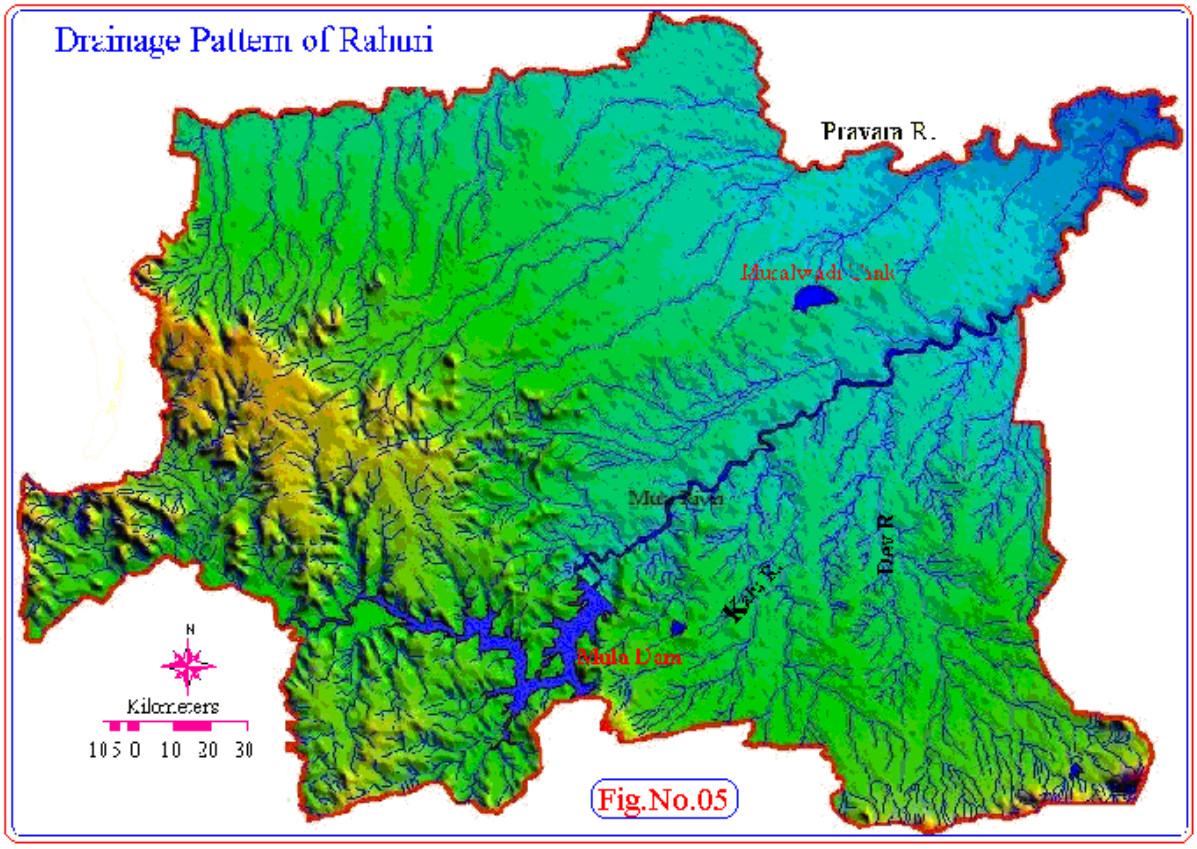
The slopes of the study region are from southwest to northeast and towards the north in northern part of the tahsil. Generally, the western part of the tahsil is hilly and the eastern part is a plain area. Relief features are shown in the map (Fig No.2.1). It gives the broad idea of the hilly regions and plain area in Rahuri tahsil. The western part and small area from southeast corner of the tahsil shows rugged topography having altitude above 700 m. It is mainly the foot hills of Sahyadri. Baleshwar ranges are the foot hills of Sahydri, which is run on the entire western part of the tahsil. The altitude of this Baleshwar hilly area is 580 to 740 meters from the mean sea level. The small part of the south east corner of the tahsil covered by Dhumalya Dongar. Dhumalya Dongar is a border between Nagar and Rahuri tahsil. Ghodekar Dongar, Masale Dongar, Viralwadi Dongar. Mahadev Dongar and Vankada hill have covered the western part of the tahsil. Mula Reservoir was built in these hilly regions. Devi Dongar, Mahadev Dongar and Malle Dongar are surrounded by plain the area. (According to Indian Topographical map-sheet (47 I/6, 47 I/7, 47I/10, 47 I/14, 47 I/15, 47I/16,56 D/11).





6.1.2. Drainage:

Drainage is one of the important factors in the physiographic study. A detailed idea of the drainage pattern is essential in the study of population, because drainage pattern affects on the origin of the settlement. Drinking water proximity is one of the basic needs of settlement. Irrigation and distribution of water resources are totally dependent on the drainage pattern, considering the above facts, it is essential to study the drainage pattern of the study area. The origin of most of the rivers in Rahuri tahsil is out side the study area. Mula, Pravara, Kalu, Dev and Karpara are the main rivers in the Rahuri tahsil.



Mula River originates in Harischandragad range and flows towards the east. Mula River is the border between Parner and Rahuri tahsil. Kalu and Kapri are the main tributaries of Mula River. Kalu Nadi originates in Parner tahsil and flows towards north and joins Mula River on the west side of Tarawadi village from right side. Kalu River in the tahsil is only 11 Km. Kalu forms the west side border of Rahuri and Parner tahsil. Kapri Nadi originates in Parner tahsil and flows towards the north and joins Mula river right in the Mula reservoir. Mula dam (with 2600 TMC capacity) constructed on Mula river near village Baragaon Nandur. Almost 60 percent of the irrigation in Rahuri tahsil is through Mula dam and its canals. The length of River is 74 Km and the length beyond Mula reservoir is 38 Km. the river flows towards northeast and forms border between Rahuri and Newasa tahsil.

In the south-east part of the tahsil, Karpara and Dev are the main streams. These originate in Dhumalya Dongar and flow towards the north. Dev Nadi joins river Mula near the village Deshwandi. River Karpara joins Mula River near the village Shilegaon. The length of Karapara River in the tahsil is 22 K.ms and the length of Dev Nadi in the tahsil is only 18 K.M. Dev nallah and Lendi nallah are also important in south-east part of the tahsil. They originate in Dhumalya Dongar and join Karapara River. All these streams are seasonal and flow only in the rainy season. The map (Fig No 2.6) shows the drainage pattern of Rahuri tahsil.

Pravara is the second major river in the drainage pattern. River Pravara originates at Harischandragad near Kalsubai peak (1646 meters) in Akole tahsil. The river forms the entire northern border of the tahsil. The total length of the river in Rahuri tahsil is 62 Km. Bhandardara dam is constructed on this river in Akole tahsil. Irrigation of the northern part of the tahsil is mostly dependent on this dam. There is one reservoir near Musalwadi village. It is filled by water from right bank canal of Bhandardara dam. In the northern part of the tahsil, small streams originate in Devi dongar, Mahadev

Dongar and Malle Dongar these streams flow towards the north east and merge with Pravara.

6.1.3. Climate:

Rahuri tahsil is predominantly agrarian. Climate plays a very important role in the agriculture. It is, therefore, essential to study and know the climatic conditions of the tahsil. As we know, climate affects directly or indirectly upon the activities of the mankind. Chandna (1986), Ghosh (1995) and Baghel (1995) have discussed this issue in their literature and have come to the same conclusion. Human efficiency, knowledge, clothing pattern, food habits, traditions and economic activities are associated with the climatic conditions of a particular region. As stated above, agriculture is the main activity of the study area. Agriculture is almost totally controlled by climate. Therefore, it is important to study the climate and climatic conditions of the area. The climate of the region is studied on the basis of information provided by India Metrological Department (IMD) and Rahuri Agriculture University. The climate of the tahsil is characterized by a hot summer and general dryness except of course, during the southwest monsoon season. As far as Rahuri tahsil is concerned, the year can be divided into four seasons. The cold season stretches from December to February; this is followed by a hot season from March to June. The south west monsoon season is from the second week of June to September. While October and November constitute the post monsoon or retreating monsoon season.

The average annual rainfall of the study area is 549 mm according to the IMD. The distribution of rainfall is very uneven. The tahsil mostly lies in the rain shadow to the east of Sahyadris. September is the rainiest month. About 80 % of the annual rainfall is received during the southwest monsoon. The variation in the rainfall from year to year, similarly, from month to month of the southwest monsoon period, is large.

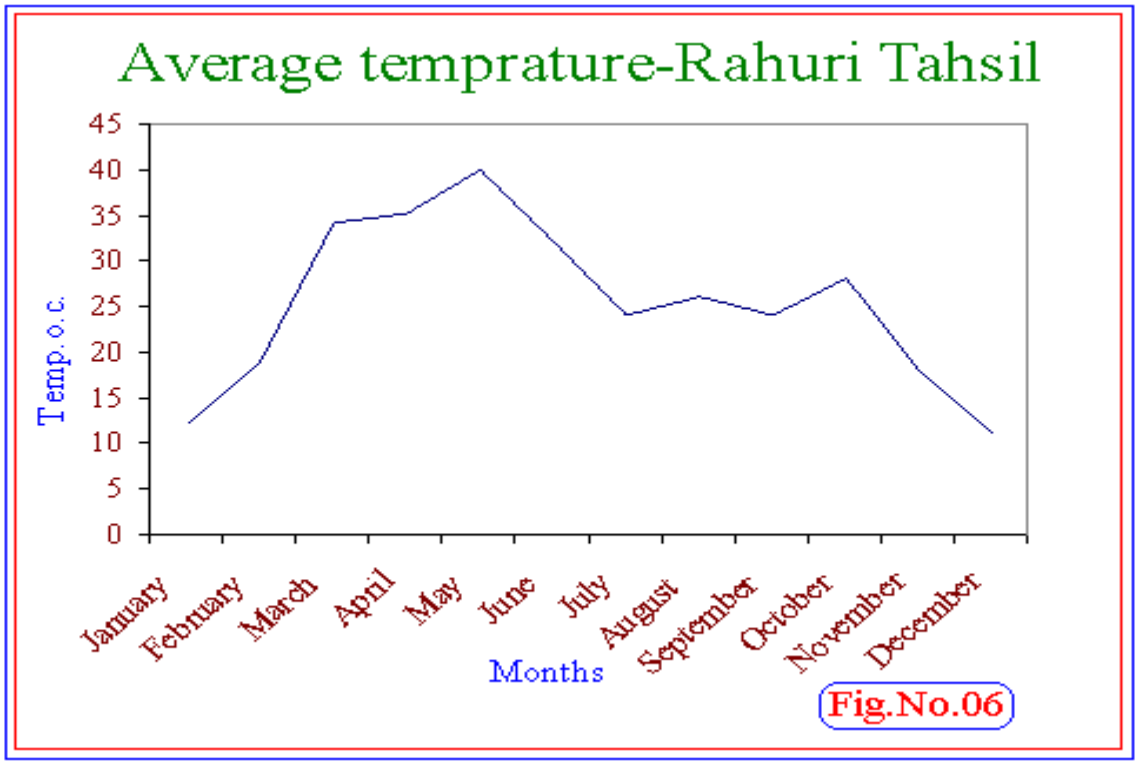
Seasonal variation in the temperature is quite large. From March onwards is a period of continuous increase in the day temperature, but during this period, the nights remain comparatively cool. May is the hottest month of the year with mean daily maximum temperature at 40˚c. On the individual days temperatures occasionally rise to 41 or 43.˚c. With approaching of the southwest monsoon, the day temperature starts dropping and after the actual onset of the monsoon, there is a considerable drop in the temperature and the climate becomes pleasant. With the end of the southwest monsoon in September, the day temperature starts progressively increasing till middle of November and from middle of November again the day temperature starts dropping progressively. December is generally, the coldest month of the year with mean daily minimum temperature at 11.03.˚c As a consequence of western disturbances in and across the north India during the winter season, the minimum temperature occasionally drops much below the winter average and may touch even 4 to 5˚c.Except during the southwest monsoon season, the air is generally dry particularly so in the afternoons. Skies are generally clear or lightly cloudy during the most part of the year. During the southwest monsoon season, however, the skies are heavily clouded to overcast. Winds are generally light to moderate in force with some strengthening during the monsoon season.

Thunderstorms occur during the months of March to June and also during the period of retreating monsoon i.e. during October and November. With in monsoon depressions in the Bay of Bengal and the movements towards the central part of India, the tahsil experiences cloudy to overcast skies and wide spread rain in a varying proportion. The range of temperature during the entire year enables the farmers to take up agriculture through out the year. This aspect is very important in the context of human resource development through agriculture.

Table No.01
Distribution Of temperature And Rainfall in Rahuri Tahsil

Sr. No.	Month	Temperature O^0 c.	Rainfall (M.M)			
			Rahuri	Deolali	Vambori	Average
01	January	12.04	12.03	10.03	8.0	10.02
02	February	19.02	16.08	10.02	8.03	11.38
03	March	34.07	00l	00	00	0.00
04	April	35.04	1.07	00	00	0.36
05	May	40.00	14.02	15.02	16.08	15.04
06	June	32.02	106	135.00	130.00	123.67
07	July	24.04	124	134.00	139.00	132.33
08	August	26.06	79.7	98.00	105.10	94.27
09	September	24.00	149.02	120.00	119.10	129.37
10	October	28.03	32.00	26.05	15.06	24.37
11	November	18.07	3.08	5.08	5.10	4.42
12	December	11.03	2.08	6.00	6.14	4.74
Average		**25.29**	**538.45**	**559.20**	**551.61**	**549.96**

(Source: Based on IMD Data, Pune.)



The climate of any area depends on mainly two factors viz. day night temperature range and rainfall and its pattern. Rahuri tahsil experiences following four main seasons;

1. The cold weather season (December to February)
2. Hot weather season (March to June)
3. The southwest monsoon season (second week of June to September)

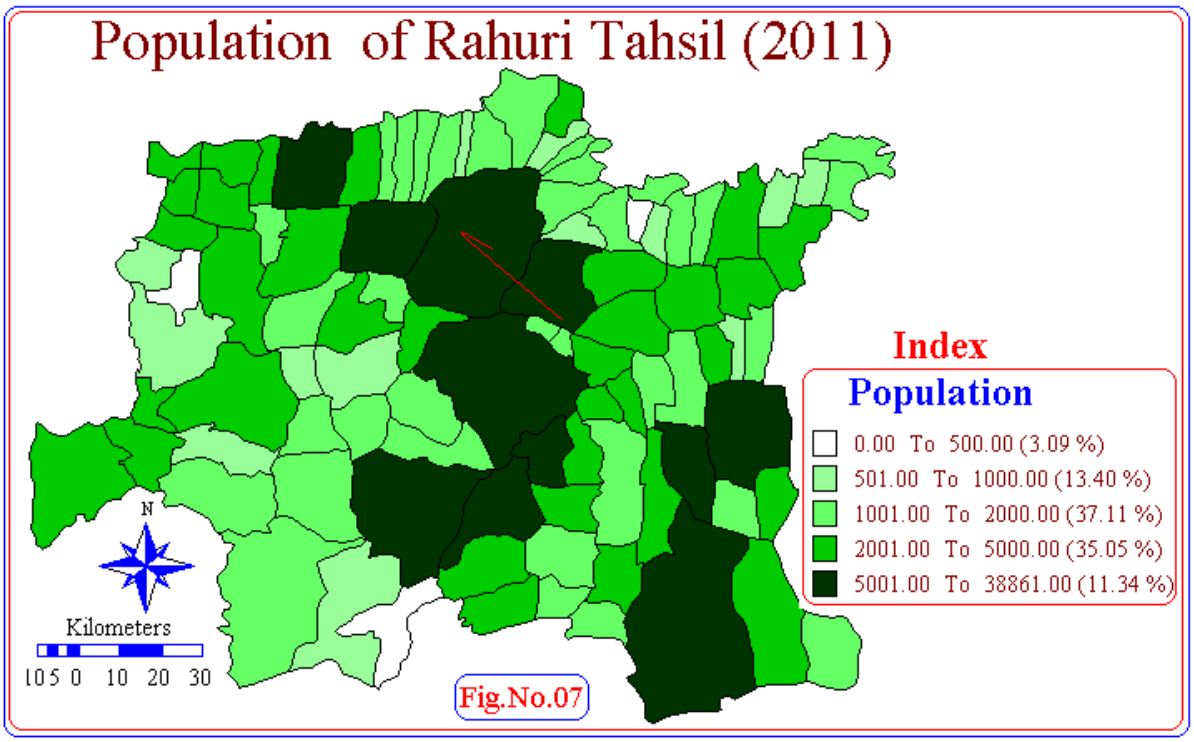
4. Post monsoon (October and November)

6.2. Demographic characteristics of the study area

6 2.1. Population Distribution at the Village Level:

There are two urban centres and 95 villages in Rahuri tahsil. A comparative study of the size of the population as per the census figures of 1991, 2001 and the provisional figures of 2011 will be interesting to note. The two urban area viz. Rahuri and Deolali-Pravara had a population of 28,408 and 25320 respectively in the year 1991. The corresponding figures for these two urban areas for the year 2001 were 34476 and 30340 respectively. Similarly, the provisional data of the 2011 Census shows the population of Rahuri and Deolali-Pravara 38,861 and 34893 respectively.

Thus, it is observed that the rate of population increase in these two towns is positive and steady. In Rahuri town, there was an increase of 4385 heads during the decade 1991-2001, whereas it was 6068 during the decade 2001-2011. This works out to 12.7 % and 15.7 % increase in these decades. Similarly, there was an increase of 5,040 heads in the town of Deolali- Pravara during the decade 1991 to 2001 and 3453 heads during the decade 2001-2011. This is an increase at the rate of 19.8 % and 11.89 % respectively.



It is worth noting that even though both the towns have shown substantial increase in the population in these consecutive decades, there is no fixed pattern in the percentage increase in the population. In Rahuri, there seems to be a steady increasing trend in the population in these two decades. However, in Deolali Pravara, there is a significant decrease in the percentage of population increase. Thus, as compared to Rahuri town, Deolali Pravara has shown a definite slowing down of the growth of population**.**

The table (Table No.02) is showing the analysis of the total population of the villages on the basis of 1991, 2001 and the provisional data of 2011 Census. The maps (Fig No.07) are showing the village wise population distribution of Rahuri tahsil in 2011.

Table No.02
Distribution of Population (Rahuri tahsil)

Sr. No	Population	Numbers of Villages		
		1991	2001	2011
1	More than 5000	10	11	11
2	2001-5000	23	28	34
3	1001-2000	37	39	36
4	501-1,000	20	15	13
5	Less than 500	07	04	04

6 2.2. Density of population (1951-2011).

The meaning of the demographic parameter of the density of population can be stated as it is a measure to understand in a comprehensive way the distribution of population in a given area at a given period of time. The term density of population was used by Henry in 1837, while preparing a railway map. This is a ratio between the population and the area. Population Density is used as an indicator to measure the concentration of population. The availability of various resources and their proper utilisation is more concerned for regional development.

From the table (Table No.03.) given below, it could be understood that the villages in Rahuri tahsil have been classified according to the density of population. The average density of population of the tahsil is 322 persons / sq. Km, as per the provisional data in the 2011 census. The figure in the earlier Census was 296 persons/sq .km. in the year 1991, 156 persons per sp. Km. in 1981, 123 persons per sq. km. in 1971. It was 91 persons per sq. km. in 1961 and finally 68 persons per sq.km. In the year 1951.

Table No.03.
Density of population (1951-2011)

Sr. No	Year	Population/ Sq. Km.	Increase in the density (%)
1	1951	68	-
2	1961	91	34
3	1971	123	35
4	1981	155	26
5	1991	247	59
6	2001	290	17
7	2011	322	10

(Source: Based on District Census 1951 to 2011)

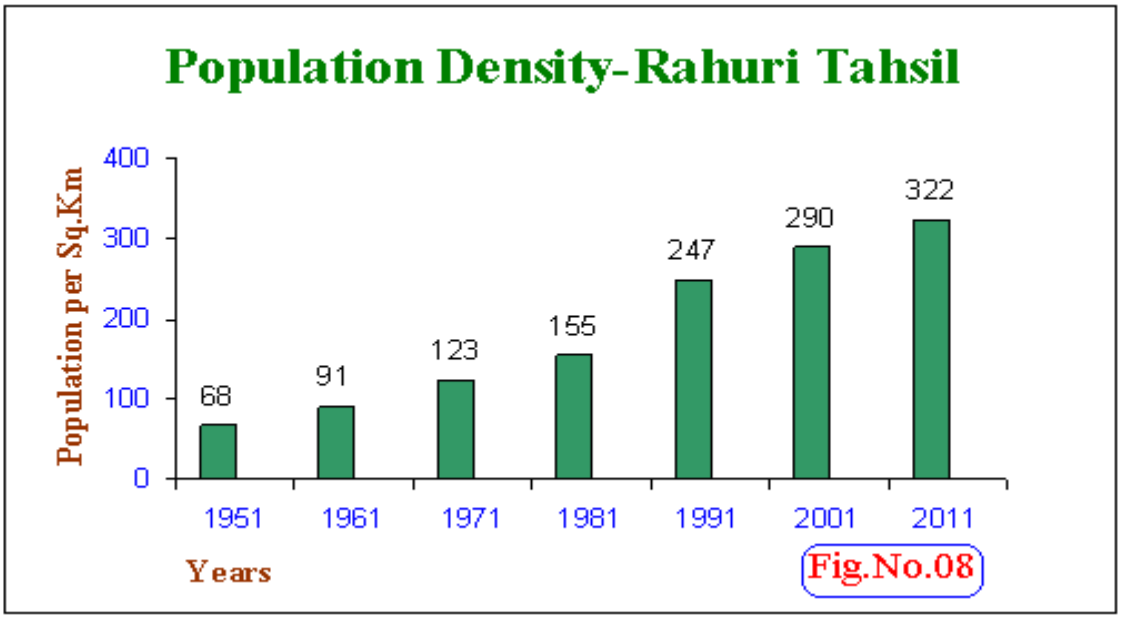
The increase in the density of population during the decade of 1951-61 is observed as 34%, it is 35% in the next decade period, 26% in the decade of 1971-81, 59% during 1981-91 and is considerably low in the next two decades, i.e. 17% and 10% in 1991-2001 and 2001- 2011 respectively.

From the above explanation, it could be understood that during the period from 1951 to1981, the density of population was increasing at an almost steady level. In the decade ending in 1981, the figure shows a drop of nine percent which can be considered as statistically significant. A particularly peculiar phenomenon was observed in the decade from 1981-1991, in which the increase in the density of population was shot to 59 %, thereafter it seems to slow down considerably. In the

decade 1991-2001, it shows an increase of 17 % over the previous decade and finally, the figure is only 10 % in the last decade, i.e. during 2001-2011.

It should be admitted honestly that from the data collected for the study, it seems to be difficult to state any definite reason behind the considerable change in the levels of the increase in the density of population in the tahsil during the span of five decades. However, some reasons could be found at the time of field visit in the pattern of urbanisation and economic development in the parts of the tahsil, such as villages like Takalimiya, Vambori and Songaon became developed market places in the region and also, the impact of formation of the municipal corporation at Deolali Pravara could have contributed positively for the increase in the density of population in the tahsil as a whole in the respective decades.

Thus, it is seen that the density of population in the tahsil has shown an increasing trend through out the period from 1951 to 2011. The increase in the density is shown in the Fig (Fig No.08).



6.2.3. The growth of population in Rahuri tahsil:

The growth of population and the spatio-temporal differentials are explained by the interacting processes of birth, death and migration (Siddiqui, 1995). The growth of population in the tahsil for the decadal periods from 1951 to 2011 has been tabulated and presented in the table (Table No.04).

Table No.04

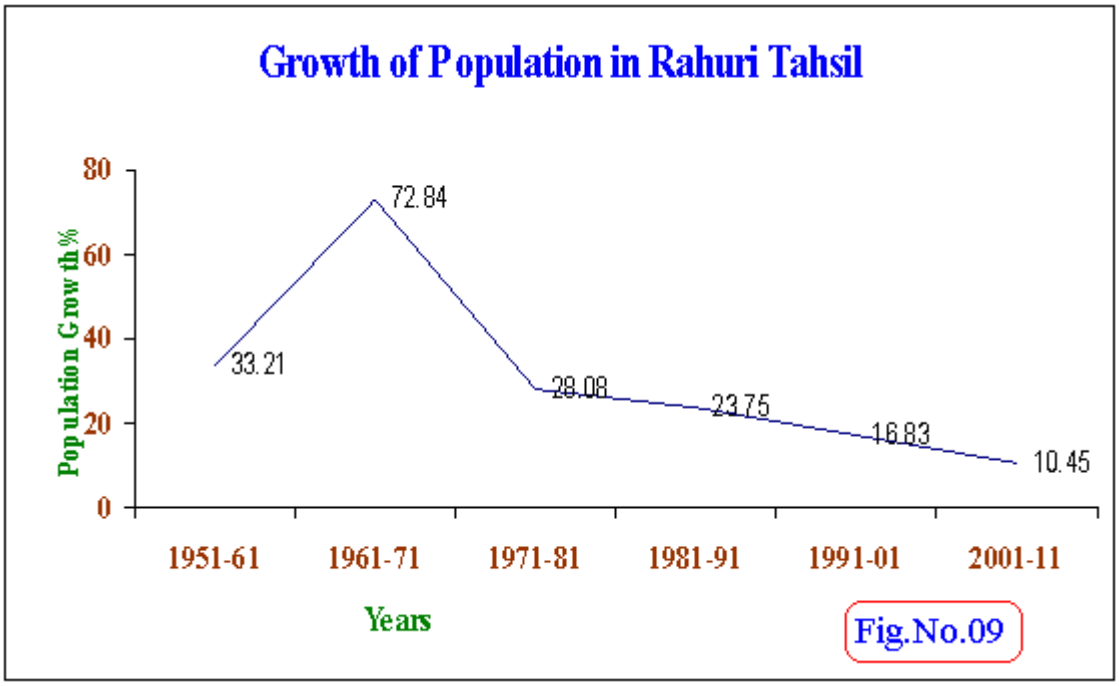
Growth of population in Rahuri Tahsil

Rahuri	1941 To 1951	1951 To 1961	1961 To 1971	1971 To 1981	1981 To 1991	1991 To 2001	2001 To 2011
Population	69204	92191	159343	204093	252570	295093	325932
Growth in Percentage	-	33.21	72.84	28.08	23.75	16.83	10.45

(Source: Based on District Census 2001 and 2011)

From the table (Table No.04), it is observed that the decadal growth of population is positive through out the observation period from 1951 to 2011. This is a natural and commonly observed feature of population. However, during the first three decades

ending 1981, the rate of population growth is on the higher side and at the same time it is in the ascending order. In the decade 1951-1961, the rate of growth of population was 33.21 % where as in the decade ending 1971, it was 72.84 %. Similarly, here is observed a higher rise in the decadal period ending 1971. The actual rise in the growth of population was 28.08% which represents 38.55 % fall in growth of population in the decadal period ending 1981. A particularly noteworthy phenomenon is, though positive, the rate of growth of population in Rahuri tahsil shows progressive decade wise fall in the growth rate. Thus, it was 23.75 % in the decade ending 1991. Similarly, the rate of growth of population in the decade ending 2001, it was further down to 16.83 % representing a slowing down by 29.39 % over the rate of growth of population in the tahsil of 23.75 % in the previous decade ending 1991. Finally, in the decade ending 2011, the rate of growth of population in Rahuri tahsil further came down to10.45 %, a reduction of 36.34 % over the percentage of growth rate of the previous decade. It can be stated doubtlessly that this is a healthy trend and is a sign of the growth rate coming down progressively and leading to stabilisation. The Fig (Fig.No.09) is shows the growth of population from 1961 to 2011 in the tahsil.



62.4.Sex Ratio of the Tahsil:

Like the status of the state and the district, the sex ratio never was ideal in the tahsil and was always in an imbalanced position. However, it has been observed that it was never at an alarming level.

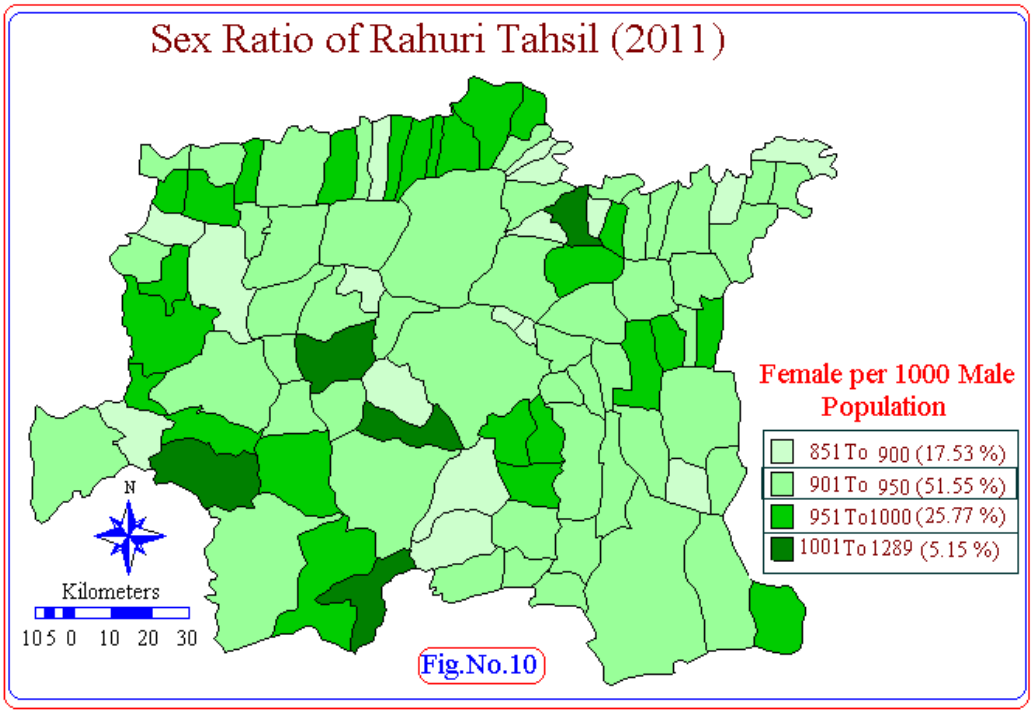
In the decade ending 1991, the sex ratio of the tahsil was 937 as compared to the state average of 934 and 949 for the district. Thus, it is observed that though, the sex ratio was marginally higher than the state; it was significantly lower than the district average for 1991. The sex ratio improved in the decade ending 2001 and was reported at 947 i.e. 1.11 % higher than that of the previous decade. However, it dropped down to 931 as per the figures in the 2011 Census, a fall of 1.80 % over the previous decade. Incidentally, this is the lowest ratio recorded by the tahsil in the last

three decades. It also shows a lower level than the state level for the first time in the period of the study.

Table No.05
Sex Ratio (1991-2011)

Level	Sex Ratio- 1991	Sex Ratio-2001	Sex Ratio-2011
State	934	922	925
District	949	940	934
Tahsil	937	947	931

(Source: Based on District Census1991, 2001 and 2011)



6.2.5.Literacy in the state, district and tahsil Level:

It would be proper to study the literacy rate at the three different levels, i.e. the tahsil, the district and the state. The table (Table No.3.17) presents the data of the said parameter. It is seen that the literacy rate at the state level in 1991, 2001 and in 2011 was highest as compared to the district and the tahsil level literacy during those decades. Also, it is clear that during the last two decades there is a considerable progress in the literacy rate at all the three levels.

The literacy rate at the state level has increased from 64.87 % in 1991 to 66.03 % in 2001 and finally to 82.91 % in 2011. Similarly, it is improved from 61.03 % in 1991 to 64.31 % in 2001 and 80.22 % in 2011 at the district level. At the tahsil level, the literacy rate was 62.82 % in 1991, 64.57 % in 2001 and 71.27 % in 2011. Thus, it is seen that in the last two decades the tahsil has a slower rate of growth in the literacy level than the district and the state. A difference of ten percent or more as compared to the state and the district levels of literacy in 2011 can be considered as quite significant. The difference was just two percent in 1991. This clearly shows that the tahsil is lagging behind on the basis of the parameter of literacy which in turn may lead to further problems in achieving a high level of socio-economic development.

Table No.06
Literacy rate in the state, district and tahsil Level

Level	Literacy-1991			Literacy-2001			Literacy-2011		
	M	F	Total	M	F	Total	M	F	Total
State	76.56	52.32	64.87	73.78	57.62	66.03	89.82	75.48	82.91
District	75.30	45.99	61.03	72.83	55.25	64.31	88.81	71.15	80.22
Tahsil	76.22	48.52	62.82	72.62	55.96	64.57	77.11	63.28	71.27

(Source: Based on District Census 1991, 2001 and 2011)

A comparison of the male female literacy rates at the district level in 1991 and 2001 follows the same trend of reduction in the gap of the two levels by a two way change, i.e. increase in the level of female literacy and a small decline in the male literacy level. Coming to the male and female literacy levels of the tahsil during the three decades, which is a major focus of the study, it can be shown that the figures maintain a similar trend as that of the state and the district level male and female literacy.
From the above explanation, it can be concluded that the literacy level has shown a considerable improvement during the period between 2001-2011 at all the three levels and in the male and female categories.

7. Findings of the study:

Present study has the major objective to study the physiographic profile, Drainage pattern and demographic characteristics of the tahsil by using GIS techniques and village level information. With this major objective in mind, some specific objectives have been outlined. The finding of the study according to these objectives can be given below:

7.1 Position of the study area:

Rahuri tahsil has a population of 325932 according to the census of 2011 census (provisional), which ranks fourth in the district. The urban population of the tahsil is 21.36 percent and the rural population is 78.64 percent. So far as the geographical area is concerned, the tahsil stands 11th (1,008 sq. km.) in the district. The total work participation (49.96 %) is more than the district (45.96 %) and the state (42.05 %). The population growth during the decade ending 2011 has been 10.45%. The proportion of the marginal workers in the tahsil is 8.6 %. It is higher than the district (6.09 %) and the state (6.63 %). The higher proportion of the marginal workers indicates insufficient employment opportunities in the tahsil.

7.2. Physiographic profile:

The geographical aspects related to the physiographic, climatic, soil, vegetation and water resources suggest that there is a great deal of spatial disparity within the tahsil. The topography of the tahsil can be divided into the three parts i.e. the south west hilly region, the middle part with gentle slope and the north east and eastern plain area of the tahsil. The relief pattern of the tahsil is diverse showing its roots in the Western Ghats. The tahsil has hilly terrain, plateaus and plain. Human development coincides with the terrain characteristics. For example, backward villages are located in hilly terrain while, towns and developing villages are in the riverine flood plains of Pravara and Mula. Even though the dam is located in the south west part of the tahsil, it is deprived of its benefits due to the hilly region and hence, the area has remained with lower level of the human resource development. The northern and the eastern part of

the tahsil have rich soil and better irrigation facility. Due to immense variety of the relief pattern, the size of villages shows a wide range of variations depending upon the natural and topographical factors.

7.3. Demographic characteristics of the tahsil:

The level of human resource development in the rural part of the tahsil has been assessed with the help of the village level data and the RRA technique for the case study. The findings related to the level of human resource development have been briefly outlined below:

1) Population Distribution:

The tahsil reflects an uneven distribution of population as per the data for the three decades under consideration. The population is concentrated at the central and south-eastern part of the tahsil. Out of the total population of the tahsil, 31.11 % population is concentrated in the three villages and two towns, namely Vambori, Taklimiya and Baragaon Nandur and towns Rahuri and Deolali Prtavara.

2) Population Density:

The average density of population in the tahsil has gradually increased during the last three decades. However, about five villages have recorded low density,

3) Population growth:

The total population of the tahsil is growing continuously since last few decades. However, Taklimiya circle shows a negative growth of population during 2001-2011. The average decadal population growth of the tahsil is 10.45 %. The seven circles show a range of variation in the percentage decadal growth i.e.-1.37 to 19.69 % during 2001-2011.

Out of the total 95 villages, 15 villages have shown negative growth of population. The village Jambhulban has shown substantial decrease in the growth of population in the last decade, due to lack of accessibility and low level of agricultural productivity owing to physiographic factors to out migration in nearby villages.

4) Sex Ratio:

It is observed that the sex ratio has been reduced considerably in the tahsil during the last decade. However, the intra regional variation in the sex ratio has been from 923 to 942 females per 1,000 males. Comparatively a better sex ratio has been observed in only three villages from the backward region and that has not been exceeding 942 females to per 1000 male population.

5) Literacy:

The average literacy level as per the provisional census 2011 has been increasing steadily since the last two decades (1991-62.82 %), (2001-64.57 %) and (2011-71.27 %). It must be admitted here that the level is considerably lower than that of the district and the state. Some of the villages have recorded literacy as low as 14.79 % Jambhulban, 25.13 % Jambhali, and 27.98 % Wawrath.

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