

# Statistical Analysis of Seasonal Rainfall Variability and Characteristics in Ahmednagar District of Maharashtra, India

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## ABSTRACT

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The three major characteristics of rainfall are mainly its amount, frequency and intensity. The value of rainfall varies greatly from day to day, place to place, month and year to year. Generally Akole tehsil receives the highest rainfall and Karjat and Jamkhed tehsils receives the least rainfall. The main reason for the highest rainfall in Akole tehsil is orographic type rainfall. The rainfall characteristics and distribution in drought prone area in study area. The research covers rainfall data from 1981 to 2014 and the rainfall data is taken from the statistical department website of Ahmednagar district.

**Keywords** : Drought Prone area, Watershed Management, Rainfall Characteristics, Rainfall Distribution

## I. INTRODUCTION

As India is an agricultural country, Indian agricultural is totally dependent on monsoon rainfall. But Indian monsoon rainfall in India is uneven and unregularly due to this there is a large amount of drought in India. Ahmednagar district falls in the rain fed region as the entire winds are blocked in the Sahyadri range and rest of the dry winds move to the rest other area. There are a total of tehsil in study area but the 13 tehsil are drought prone. There for the period of 1981 to 2014 has been studied in Ahmednagar district to study the

distributions and characteristics of rainfall. Water is the most importance natural resources as well as water is used by human for variety of purposes therefor, the development of a region depends on water for economic development, social, cultural and political etc[2,14,21]. The development of agricultural and agricultural in any area depend on water just as the growth of plants depends on distribution of plants [23, 24]. Topography is the most importance factor affecting the distributions of rainfall [4, 5, 16,]. Environment is powerful tool for determination, interpretation and analysis of spatial information

related to river basins [17, 18, 19]. Proper use of water and its good for this there planning of water reduce drought prone condition. For this there is a need to create awareness among the peoples and proper use and solution of various technology. Water is one of the elements that contribution to the economic development of any part and any area [11,12]. The level of development of any part is affected by many factors but water is the most importance factors [8,13].

## II. METHODS AND MATERIAL

### STUDY AREA:

The present study Ahmednagar district has been selected as a study area. It extends between 18° 20' and 19° 59' north latitudes and 73° 40' to 75° 43' east longitudes (Map.1) located in part in the upper Godavari basin. The district is very dense in shape and length of 200 km. a width of 210 km. This study region is divided into there are three physical divisions namely, first Sahyadri moutons ranges i.e. Kalsubai, Adula, Baleshwar and Harishchandragad, second Plateau third plains area. The Godavari, Bhima River is the main rivers in this district with the major tributaries are Paravara, Mula, Sina, Dhora, Kukdi etc. Ahmednagar district occupes 17,048 square km geographical area the administratively there are divided into 14 tehsils. The average annual rainfalls is 578.8 mm. (22.79") and mean daily maximum temperatures is 39°C and mean daily minimum temperature is 11.7° C. In study region 71.10 percent area under cultivation area out of them 32.40 percent is irrigated and 67.60 percent rain fed or rain shadow area. According to 2011 census population is 45, 43,083 in which male and female are 2,348,802 and

2,194,281 correspondingly and density of population was 266 persons per square kilometers.

### AMIS AND OBJECTIVE:

The main purpose of this research is Rainfall Characteristics and Distribution of Drought Prone Area in Ahmednagar District. Since then, the research has been conducted with various objectives, mainly in the spatio-temporal analysis of rainfall in the study area. The research period of this study is from period of 1981 to 2014 years.

### DATA SOURCE AND METHODOLOGY:

The present research article have secondary data use for Ahmednagar statistical department. The data analyzed and presented in the form of table and maps with analysis is done with the help of SPSS software and for mapping purposes used Arc GIS10.3 version GIS software. In this research she has drawn maps according to the difference between 1981, 1992, 2003 and 2014 the index value are namely divided into three groups high rainfall area above 650 mm, moderate rainfall area 575-650mm and low rainfall area below 575mm. in addition maps have been drawn in the positive and negative form for the years 1981 to 2014. Also line graph of average rainfall for the period rainfall 1981 to 2014 has been drawn.

## III. RESULTS AND DISCUSSION

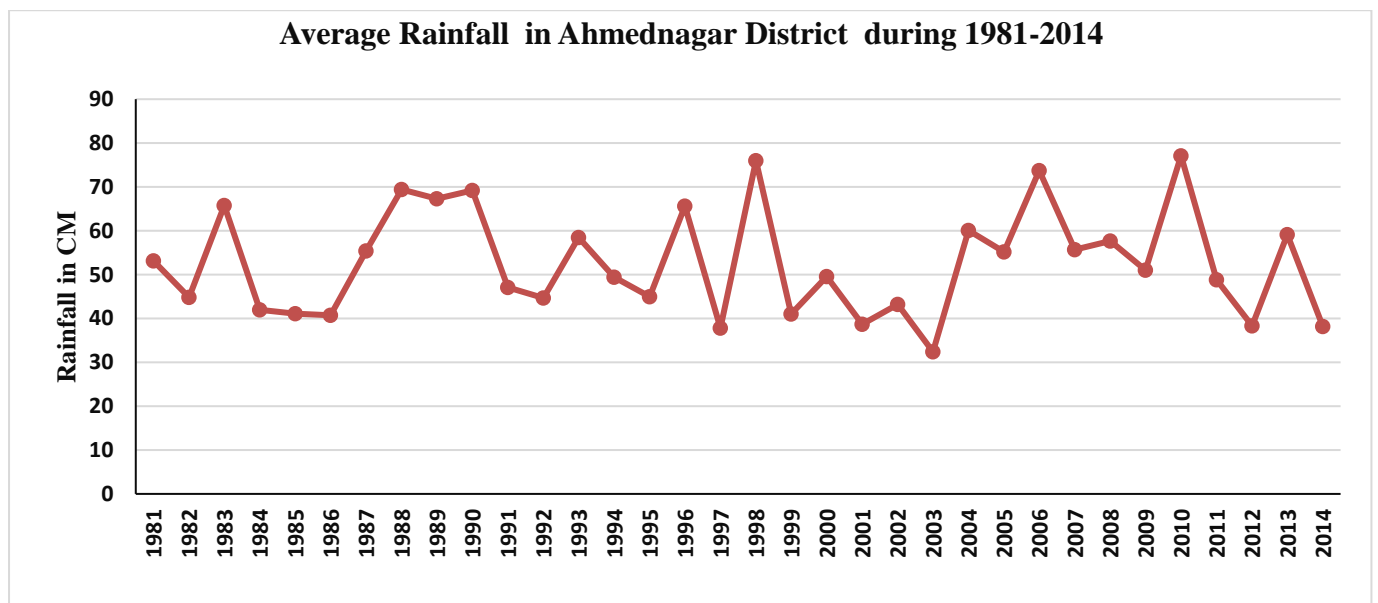
The Ahmednagar district is drought prone area of Maharashtra state. There for Ahmednagra district have facing problem of agricultural development within the economic. The Ahmednagar district is divided in two major zone in first Northern and southern Ahmednagar. The southern parts have major problem is water it is spite of canal irrigation facilities in the district the rural areas are facing problem of

scarcity of water and maximum number of villages have been tanker-affected. The drought prone zone in the state is not in position to achieve the agricultural growth, obviously due to scarcity of water [7,28, 29, 30]. Even the irrigated areas are facing the problem of retarding the growth of agriculture in the study area. Majority of the villages in the south Ahmednagar are facing problem of drinking water. This is main environmental issue observed due to over utilization of water resources for agriculture and for various other purposes.

**Average Rainfall:**

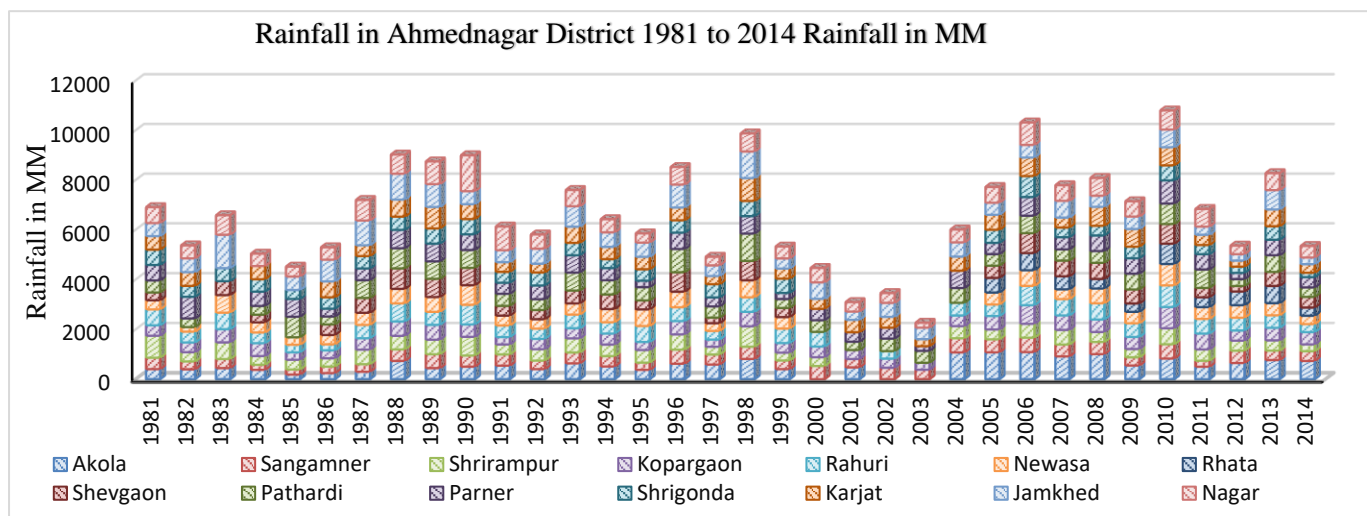
The rainfall is vital role for growth of vegetation and effect of forest density [7, 22]. Also rainfall influence on agricultural pattern and development [9, 25, 26] therefore need of study of rainfall distribution. Graph number one show the average rainfall in Ahmednagar district during periods is from 1981 to 2014. There is a large amount of various moment in this periods in which no such constant rainfall has fallen. The highest rainfall was seen in 1998 and 2010 and at the same time the lowest rainfall fell in 2003 and 2014 it was lower than the average appears to have fallen short.

**Graph no 01: Average Rainfall (Rainfall in CM)**



Graph number two shows the average rainfall in the entire tehsil of study area period in 1981 to 2014. The lowest rainfall falls in the (Less than 450 mm) tehsil Shrigonda, Shevgaon, Karjat, Jamkhed, Pathardi and Nagar and moderated rainfall (450-550mm) Rahata, Rahuri, Shrirampur, Kopergaon, , Parner as well as highest rainfall fall in more than 650 mm is akole tehsil. The most importance feature in the total rainfall over a periods of 36 years is that Karjat, Jamkhed, Shrigonda, Shevgaon, Pathardi and Nevasa tehsils is drought prone area is the exporter with the lowest rainfall. Here all the other information shown in Graph number two.

**Graph no 02: Average Rainfall in Tehsil wise**



**Rainfall Distribution (1981 to 2014):**

Map no 02 shows the distribution of rainfall in the 1981 periods and there are three rainfall zone or tehsil have mainly high more than (650mm), moderate (575-650mm) and low (less than 575mm) rainfall. The highest rainfall in this periods in Shirampur (880mm) tehsil and followed by moderated rainfall tehsil are Rahuri (639mm), Parner (622mm), Shrigonda (614mm), Nagar (639mm). and the lowest rainfall tehsils are Akola (404mm), Sangamner (459mm), Kopargaon (420mm), Newasa (366mm), Shevgaon (314mm), Pathardi (483mm), Karjat (542mm), Jamkhed (527mm)

Table No 1: Rainfall distribution in 1981

Index	Index value	Number of Tehsils	Name of the Tehsil
High Rainfall	Above 650 mm.	01	Shrirampur
Moderate Rainfall	575 -650 mm.	04	Rahuri, Parner, Shrigonda, Nagar.
Low Rainfall	Below 575 mm.	08	Akola, Sangamner, Kopargaon, Newasa, Rahata, Shevgaon, Pathardi, Karjat, Jamkhed

Map no 03 show the distribution of rain fall of 1992 but no high rainfall has fall in any tehsil this year but in the moderated rainfall zone this year only one tehsil has received above average rainfall in Jamkhed tehsil (603mm). The lowest rainfall falls this year as a total of 12 tehsils in the low rainfall zone this year, those tehsil are Shirampur (456mm) Rahuri (407mm), Parner (551mm), Shrigonda (522mm), Nagar (572mm). Akola (405mm), Sangamner (456mm), Kopargaon (418mm), Newasa (380mm), Shevgaon (369mm), Pathardi (435mm), Karjat (352mm).

Table No 2: Rainfall distribution in 1992

Index	Index value	Number of Tehsils	Name of the Tehsil
High Rainfall	Above 650 mm.	00	Nil
Moderate Rainfall	575 -650 mm.	01	Jamkhed
Low Rainfall	Below 575 mm.	12	Shrirampur Rahuri, Parner, Shrigonda, Nagar. Akola,Sangamner,Kopargaon,Newasa ,Shevgaon , Pathardi ,Karjat.

The map number four shows the distribution of rainfall in 2003, during tis periods no tehsil in high and moderated has received this types of rainfall. This means that there was a severe drought in the year. This year low rainfall has also fallen in 14 tehsils, Jamkhed(460mm), Shrirampur (313mm) Rahuri (299mm), Parner(190mm), Shrigonda(87mm), Nagar(199), Akola(489) ,Sangamner (380mm),Kopargaon(280mm),Newasa (219mm) ,Shevgaon (320) , Pathardi (476mm),Karjat (281mm) , Rahata (249mm).

Table No 3: Rainfall distribution in 2003

Index	Index value	Number of Tehsils	Name of the Tehsil
High Rainfall	Above 650 mm.	00	Nil
Moderate Rainfall	575 -650 mm.	00	Nil
Low Rainfall	Below 575 mm.	14	Jamkhed, Shrirampur Rahuri, Parner, Shrigonda, Nagar, Akola ,Sangamner ,Kopargaon,Newasa ,Shevgaon , Pathardi ,Karjat, Rahata.

Map number shows the 2014 rainfall distribution. There is only one tehsil in high rainfall this year is Akole (733mm), but no tehsils included in the moderated group in this year. But in the remaining 13 tehsils the rain fall is below average grouped those tehsils area Jamkhed(268mm), Shrirampur (273mm) Rahuri(322mm), Parner(414mm), Shrigonda (176mm), Nagar (465mm), ,Sangamner (392mm),Kopargaon(491mm),Newasa (337mm) , Shevgaon (429mm) , Pathardi (379mm), Karjat(344mm), Rahata(328mm).

Table No 4: Rainfall distribution in 2014

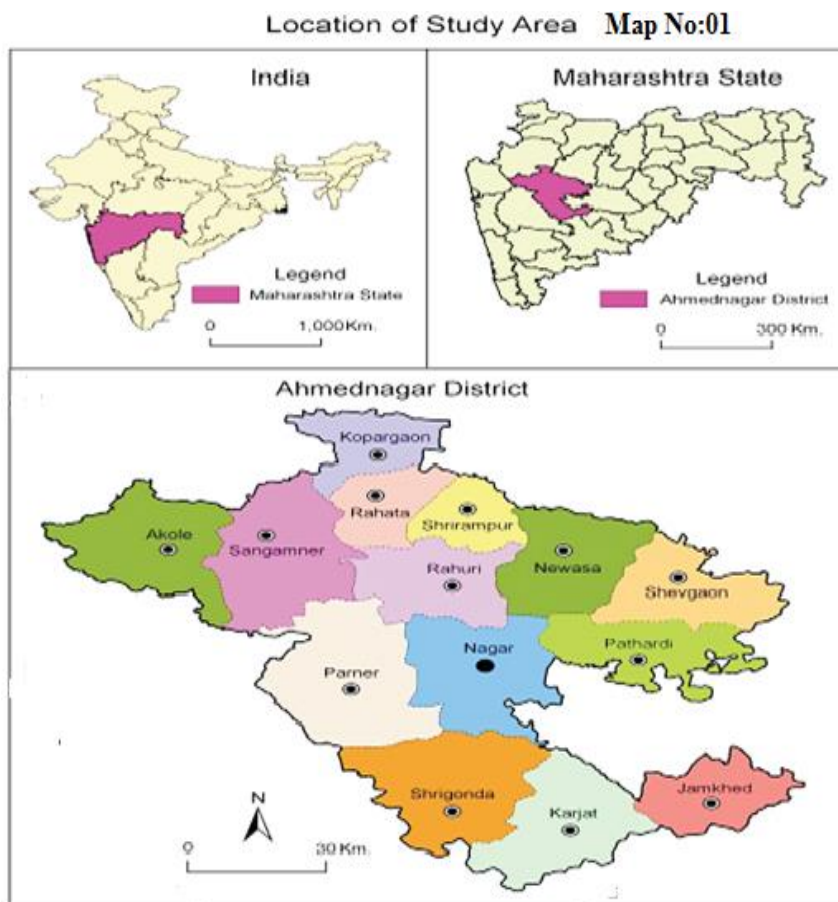
Index	Index value	Number of Tehsils	Name of the Tehsil
High Rainfall	Above 650 mm.	01	Akole
Moderate Rainfall	575 -650 mm.	Nil	Nil
Low Rainfall	Below 575 mm.	13	Jamkhed, Shrirampur Rahuri, Parner, Shrigonda, Nagar, ,Sangamner,Kopargaon,Newasa ,Shevgaon , Pathardi ,Karjat, Rahata.

The map no. 06 shows the changes rainfall during in 1981 to 2014 this difference is for a total of 33 years. It mainly shows positive and negative changes 181to 2014. In theses 33 years there has been a positive changes in three tehsil namely Akole (329 mm), Kopargaon (71mm), Shevgaon (115mm). During this periods negative rainfall is seen in the remaining ten tehsils namely Jamkhed (- 259 mm), Shirampur (-607mm), Rahuri(- 317mm), Parner (-208mm), Shrigonda (-438mm), Nagar(-174mm), Sangamner (-67mm),Newasa(-29mm) , Pathardi (-104mm),Karjat (-198mm), Newasa(-29 mm) but it does not show Rahata Tehsil because of Rahata Tehsil was created in 2001, so does not show all detail show in Map no 6and Table no.5.

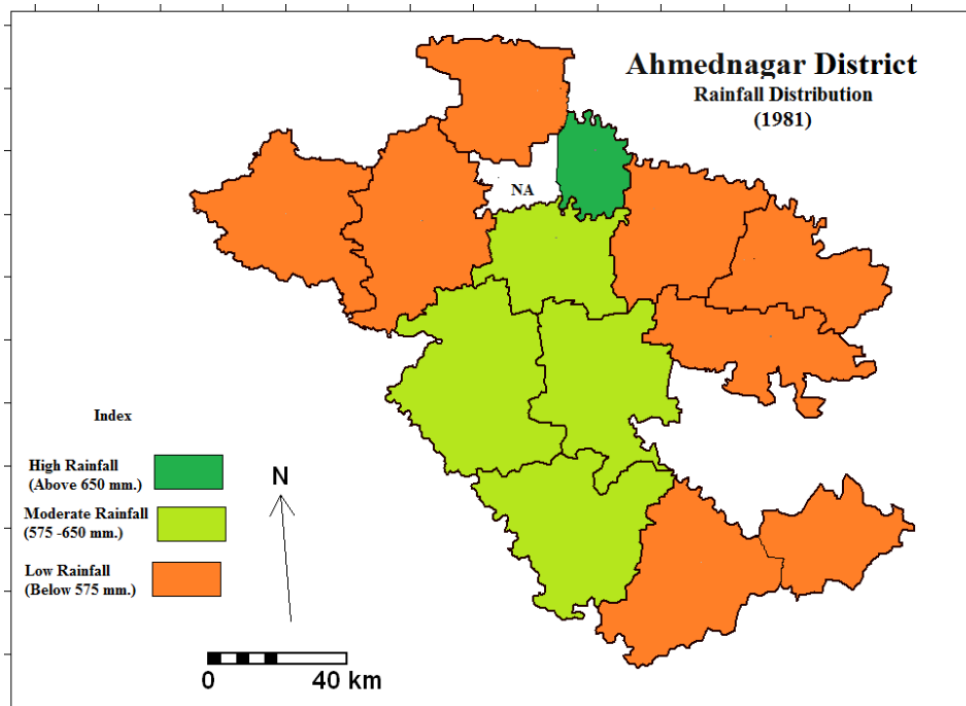
Table No 5: Change of Rainfall (1981 to 2014)

Index	Number of Tehsil	Name of the Tehsil
Positive change	03	Akole, Kopargaon,Shevgaon
Negative change	10	Jamkhed, Shirampur Rahuri, Parner, Shrigonda, Nagar, ,Sangamner ,Newasa ,Shevgaon , Pathardi ,Karjat.

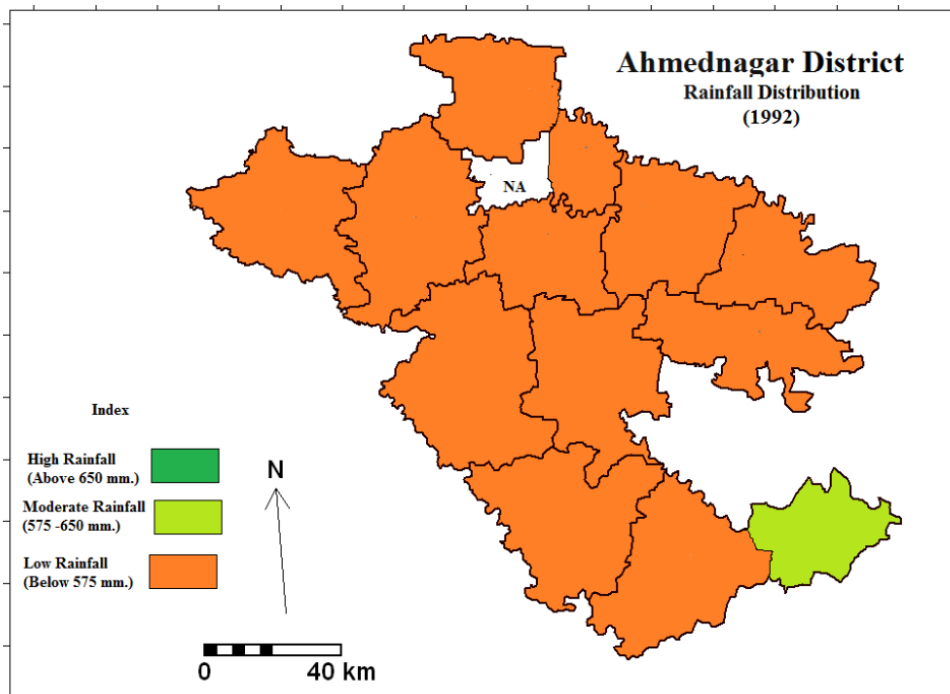
Map no 01: Location map



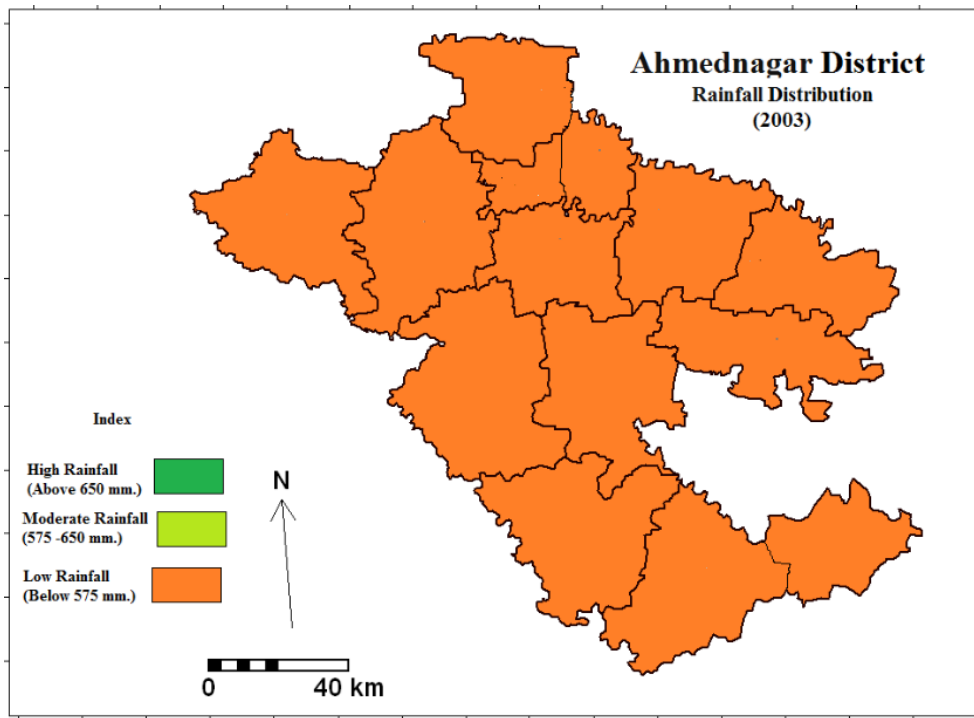
Map no 02: Rainfall Distribution in 1981



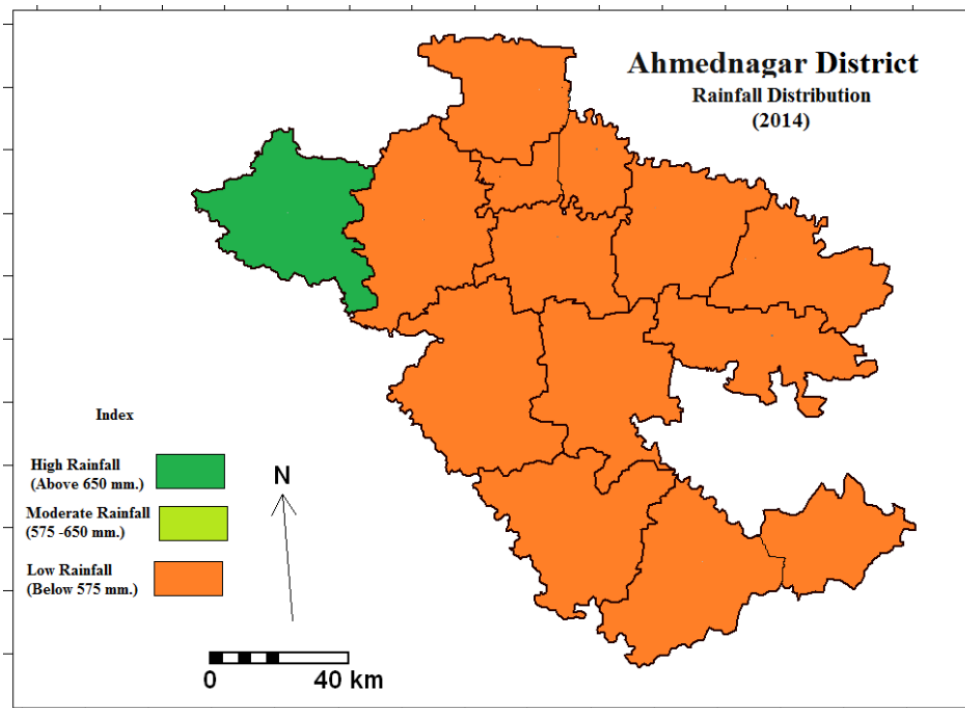
Map no 03: Rainfall Distribution in 1992



Map no 04: Rainfall Distribution in 2003

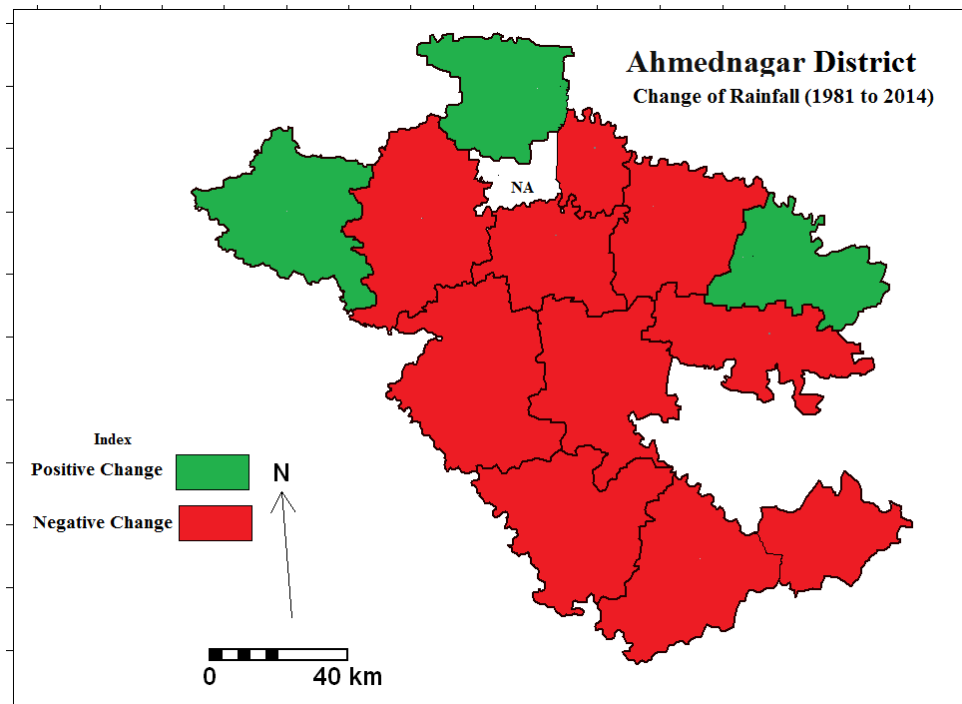


Map no 05: Rainfall Distribution in 2014





Map no 06: Rainfall Change from 1981 to 2014



#### IV. CONCLUSION

The topography is the most importance factors affecting the distribution of rainfall so above average rainfall falls in Akole tehsil. With the exception of Akole tehsil in Ahmednagar district all general all tehsils have come to drought prone area. With proper use and proper planning of water in drought prone area, there will be no shortage of water. From all the above it can be seen all the tehsil of study area in general water needs to be used properly. From all the above studies it is noticed that he rainfall is decaling fall in study area.

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