



सत्यमेव जयते

**GOVERNMENT OF PUDUCHERRY
DEPARTMENT OF SCIENCE TECHNOLOGY AND ENVIRONMENT
PUDUCHERRY CLIMATE CHANGE CELL**

**ANALYSIS OF TEMPERATURE AND
RAINFALL FOR ASSESSMENT
OF CLIMATE CHANGE IN THE
U.T. OF PUDUCHERRY (1976 - 2020)**



JUNE 2021



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Department of Science & Technology
Govt. of India

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ANALYSIS OF TEMPERATURE AND RAINFALL FOR THE ASSESSMENT OF CLIMATE CHANGE IN THE U.T. OF PUDUCHERRY (1976-2020)

1. Introduction:

Climate Change is taking up so much of importance in the recent times across the globe in all sectors ranging from global administration, policy making, resource mobilization, knowledge, and technology transfer etc. With the raising Climate Change scenarios across the globe in the likes of rise in temperature, sea level rise, droughts, urban flooding, shifting monsoon etc., and the impacts being so much so evident in the daily life of an average person in any part of the world, Climate Change has become a paramount concern in today's world. It is well established that global greenhouse gas emissions especially Carbon dioxide increases the temperature of the earth and this is leading to other significant global warming which is consequentially creating several Climate Change events in the recent decades (IPCC, 2018). This increase in CO₂ emission and the resulting global warming have been evidently altering the Meteorology of the planet, globally and regionally. Hence it becomes important to study and analyse the trends of basic meteorological parameters of any region, quantify the changes, understand the changes in trends and patterns that is observed and to forecast the variation – projections – for the years to come. Accordingly, the meteorological parameters namely, Temperature and Rainfall of Puducherry and Karaikal region in the U.T. of Puducherry have been studied and presented in this report for a better understanding of the variations of these meteorological parameters in the last 45-year period.

1.1 Temperature

It has been established in the “*IPCC Special Report on the Impacts of global warming 1.5°C above pre-industrial level, 2018*” that the global average temperature has increased by about 1.1°C in 2018 relative to the 1850-1900 temperature average (IPCC, 2018). It is observed globally that new record temperature is set every year in the recent times. The year 2016 has been the warmest year on record relative to 1901-2000 average with an anomaly of +0.99°C. Following the year 2016 is 2019 (+0.95), 2015(+0.93), 2017 (+0.91), 2018 (0.83) as the five warmest years of the earth in the recorded history relative to 1901-2000 average with their respective anomalies in braces. Also, the total heat content of the world's oceans was found to be record warmest in 2019. Besides, the record for daily average temperature and the daily maximum temperature are also being set in the summers of every passing year and the concept

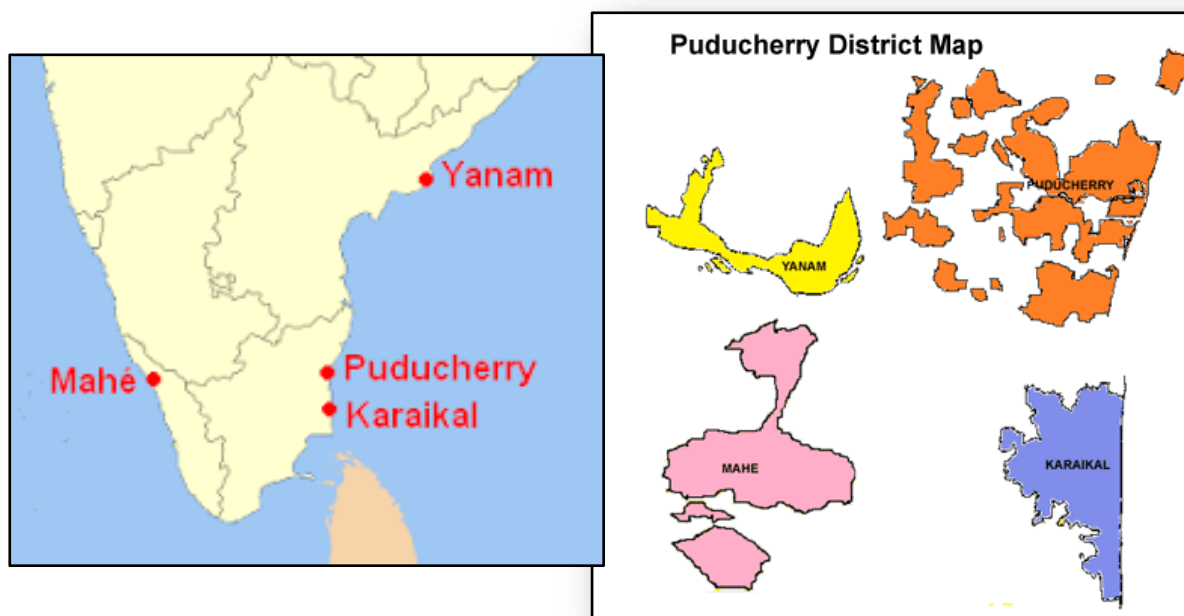
of heat wave of the recent past is largely related to these soaring maximum daily temperatures. 'Temperature' based extreme events are usually associated with diverse sectoral impacts, like impacts on physical environment, ecosystems, human health, and energy consumption etc. Hence it is important to distinguish between daily mean, maximum (daytime) and minimum (night-time) temperatures, as well as between cold and warm extremes, due to their diverse impacts. Though it might be presumable that, with the shifting climate a balance would be maintained in the absolute temperature, there exists only an unbalanced temperature shifts with the warming climate. More of record warming in temperature are set than record fall in temperature and that contributes to a statistic increase in the average temperature especially in the last few decades.

1.2 Rainfall:

The Indian coastal plains experiences one of the major monsoon systems of the earth known as the Asian-Australian Monsoon system, and the other being the West African Monsoon. The Asian Monsoon system, is particularly specific to India and plays along the two coastlines of India namely, the Arabian Coast and along the Bay of Bengal. The Indian Monsoon annually is of two folds, namely the South West Monsoon from June to September giving most of the rainfall to the Arabian coastal plains and North Western India and the other monsoon being the North East Monsoon from October to December showering most of the rainfall to the North Eastern India and the coastal plans of Bay of Bengal. These monsoons garner all the rainfall which is the major freshwater resource for the Indian Subcontinent with an annual average rainfall of around 1200 mm per year. But of later, the rainfall pattern, in terms and frequency and intensity, has become erratic, with particular regions of the country experiences scarcity of rains resulting in drought and other parts especially the cities experiencing abnormal showers – in the likes of downpours and deluges – causing urban flooding. This gives rise to a need to study the rainfall pattern in every region of the country to know and understand the changes that are experienced in the short term and long term in the rainfall intensity and frequency so as to understand the changes, extremities and vulnerabilities that would arise in the near and long future.

2. Study Area:

This report showcases visually and statistically the trends in meteorological parameters namely Temperature and Rainfall pattern in the region of Puducherry and Karaikal which are two discrete regions of the U.T. of Puducherry.



Puducherry and Karaikal are two of the four discrete regions of the U.T. of Puducherry along the Eastern Coast of India across the coastline of Bay of Bengal. The two regions are situated approximately 150 kms apart in a similar geographical plain and their meteorological parameters predominantly influenced by a common source of origin, which is the changes in the meteorological scenarios in the Bay of Bengal.

Puducherry region is located along the Bay of Bengal coast at 11°56'01" N Latitude and 79°49'47" E Longitude. The Puducherry region has a total geographical area of 292 sq.km and a population of 9,50,289 as per Census 2011. The population density is 3,232 inhabitants per square kilometre and the population growth rate is 29.23% in the decade between 2001 and 2011 (District Census Handbook - Puducherry, Census of India, 2011).

The region of Karaikal is located at 10.9254° N Latitude and 79.8380° E Longitude and has a geographical area of 157 sq. km with a population of 2,00,222 according to the Census –

2011. The population density of the region is 2075 persons per sq. kilometer with a population growth rate of 17.23% in the decade between 2001 and 2011 (District Census Handbook - Karaikal, Census of India, 2011).

3. Data:

This study on the temperature and rainfall analysis was made with the data procured from the Indian Meteorological Department (IMD) for the region of Puducherry and Karaikal for the period of 1976 – 2020.

4. Trends in Temperature in Puducherry and Karaikal Regions

4.1. Trends in Maximum, Minimum and Average Temperature

i) Trend of Average Maximum Temperature:

The trend of daily averaged Maximum Temperature over the years for the period of 1976 to 2020 is given in Fig. 1 for Puducherry and Karaikal regions. The graph depicts a very evident upward trend of average Maximum Temperature in these 45 years period in both these regions. Quantitatively, the region of Puducherry and Karaikal has been experiencing an increase of around 0.04°C of maximum temperature every year in these 45 years period. It is noted that India's increase in maximum temperature stands at $0.99^{\circ}\text{C} / 100$ years during 1901-2020.

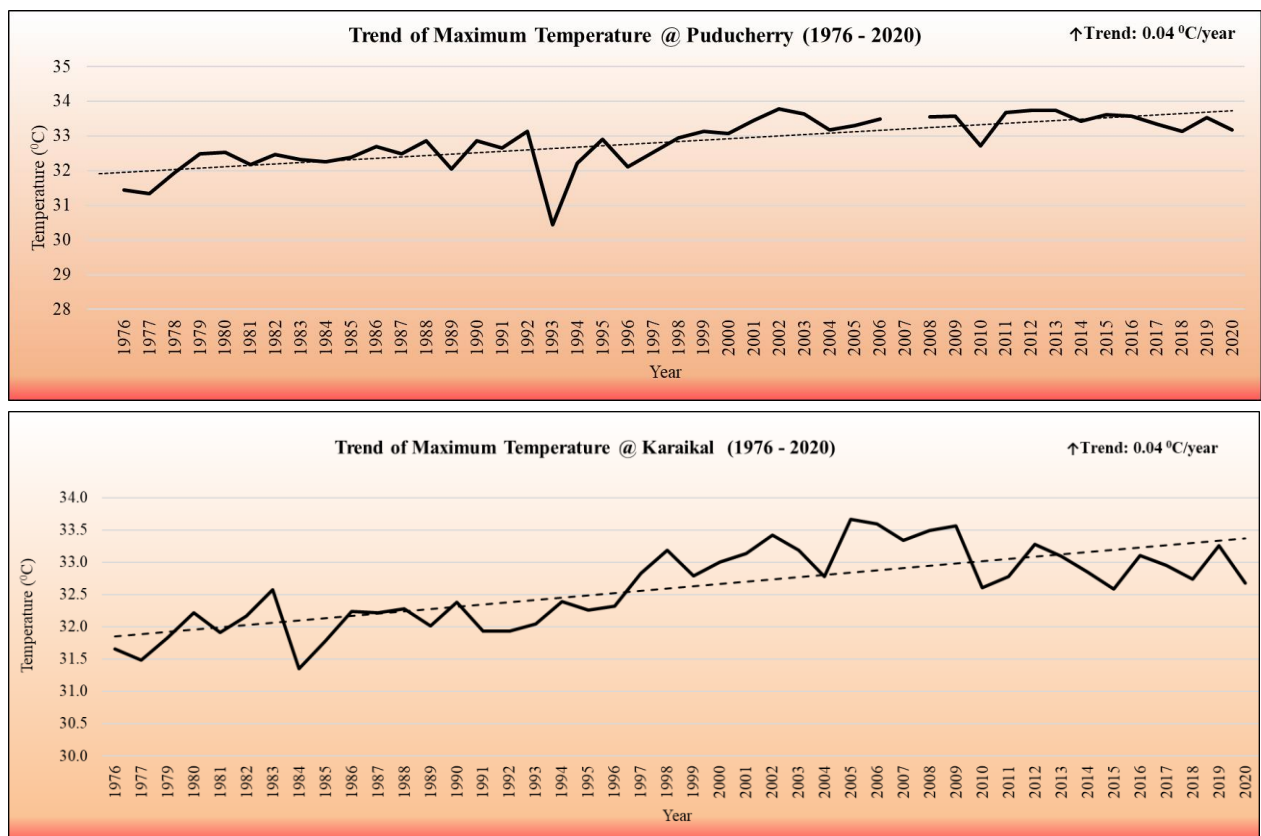


Fig. 1: Trend of Maximum Temperature from 1976 – 2020 at Puducherry and Karaikal regions.

ii) Trend of Average Minimum Temperature:

The trend of daily averaged Minimum Temperature over the years for the period of 1976 to 2020 is given in Fig. 2 for Puducherry and Karaikal regions. The graph shows a downward trend ($-0.01^{\circ}\text{C}/\text{year}$) of average Minimum Temperature in these 45 years period in Puducherry region. On the other hand, the region of Karaikal, has been experiencing milder increase in the average minimum temperature at around 0.01°C per year. The nation's average Minimum Temperature trend stand at an increasing trend of 0.24°C per 100 years in the last century.

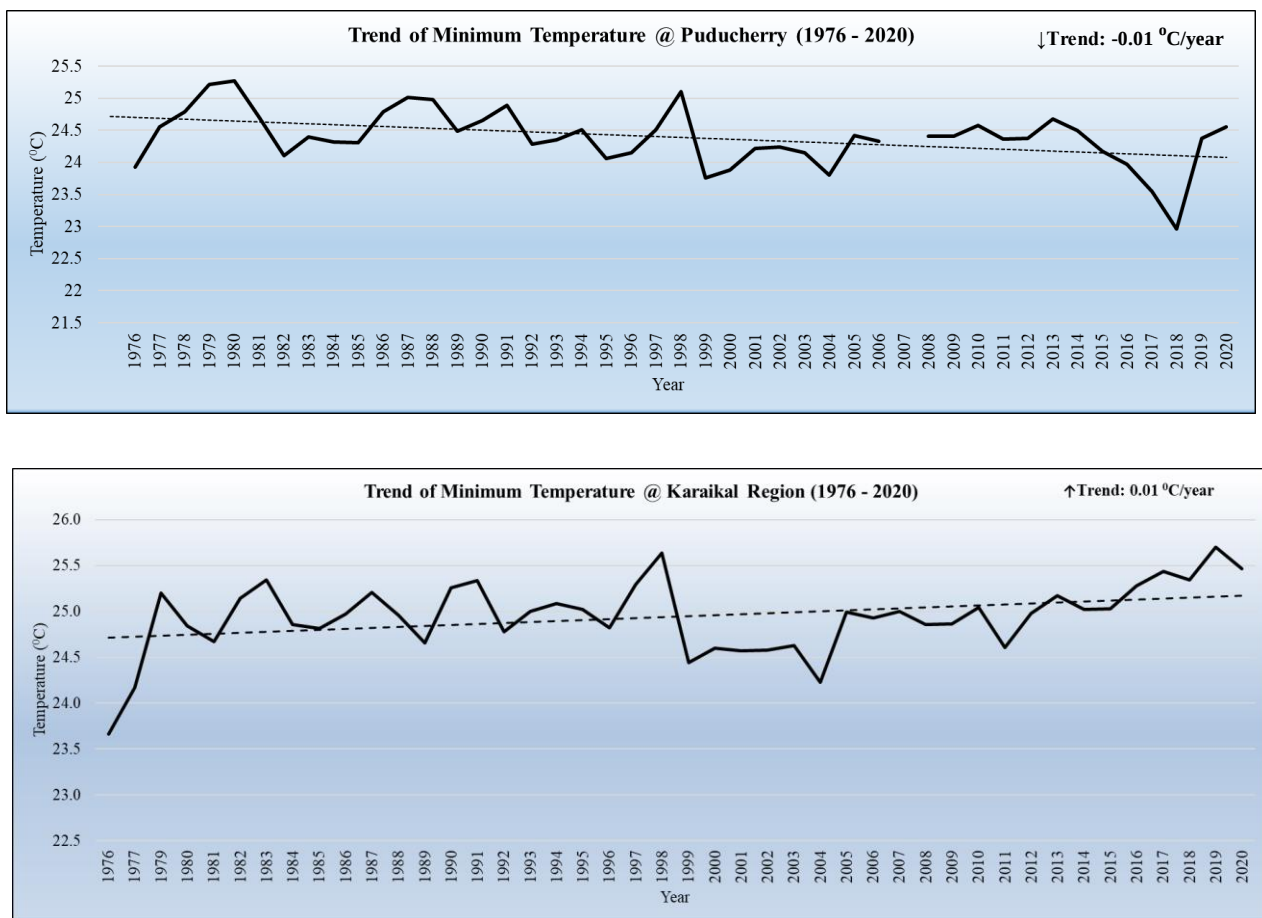


Fig. 2: Trend of Maximum Temperature from 1976 – 2020 at Puducherry and Karaikal region.

iii) Trend of Average Temperature:

The trend of daily averaged Average Temperature over the years for the period of 1976 to 2020 is given in Fig. 3 for Puducherry and Karaikal regions. The graph shows an upward trend of mean Average Temperature in these study period from 1976 to 2020 in both these regions. The region of Puducherry has been experiencing an increase of around 0.01°C of mean average temperature every year in these 45 years period and the region of Karaikal has been experiencing an increase of around 0.02°C of mean Average Temperature every year. The country's mean average temperature during 1901-2020 showed an increasing trend of $0.62^{\circ}\text{C} / 100$ years in the last century.

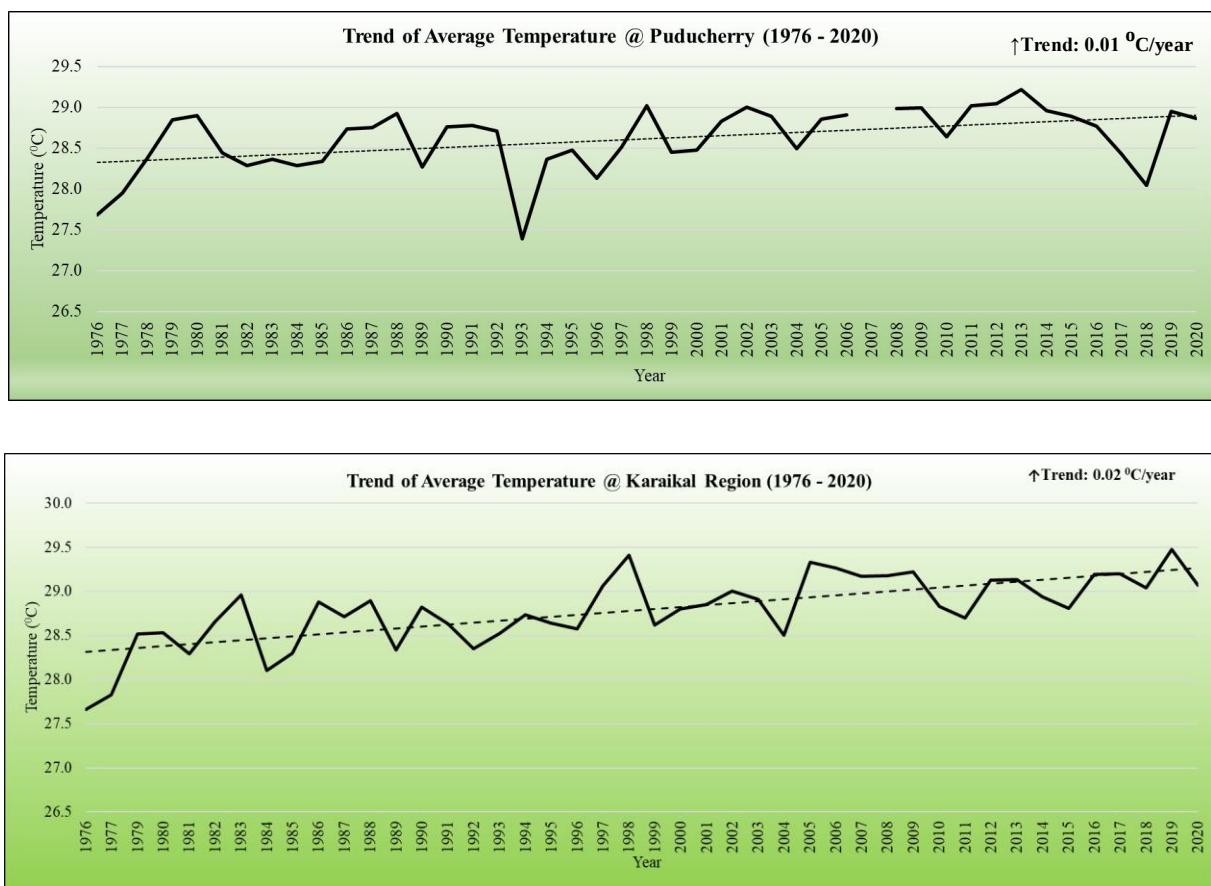


Fig. 3: Trend of Average Temperature from 1976 – 2020 at Puducherry and Karaikal region.

4.2 Anomalies in Temperature:

In climate change studies, temperature anomalies are more important than absolute temperature. A temperature anomaly is the difference from an average, or baseline temperature. A positive anomaly indicates the observed temperature was warmer than the baseline, while a negative anomaly indicates the observed temperature was cooler than the baseline. This was computed with a baseline of 1976 – 2000 for the maximum, minimum and average temperature for both Puducherry and Karaikal regions and the results are visualized as shown below.

a) Anomaly of Maximum Temperature:

The anomaly of Maximum Temperature plotted for Puducherry and Karaikal region for the years 1976 to 2020 is shown in Fig. 4. It is observed that an obvious increase in temperature is seen in both the regions post the year 2000. The increase in temperature is around 1.04°C in Puducherry region and 0.09°C in Karaikal region in the last two decades (2000-2020) in comparison to the baseline of 1976-2000 average.

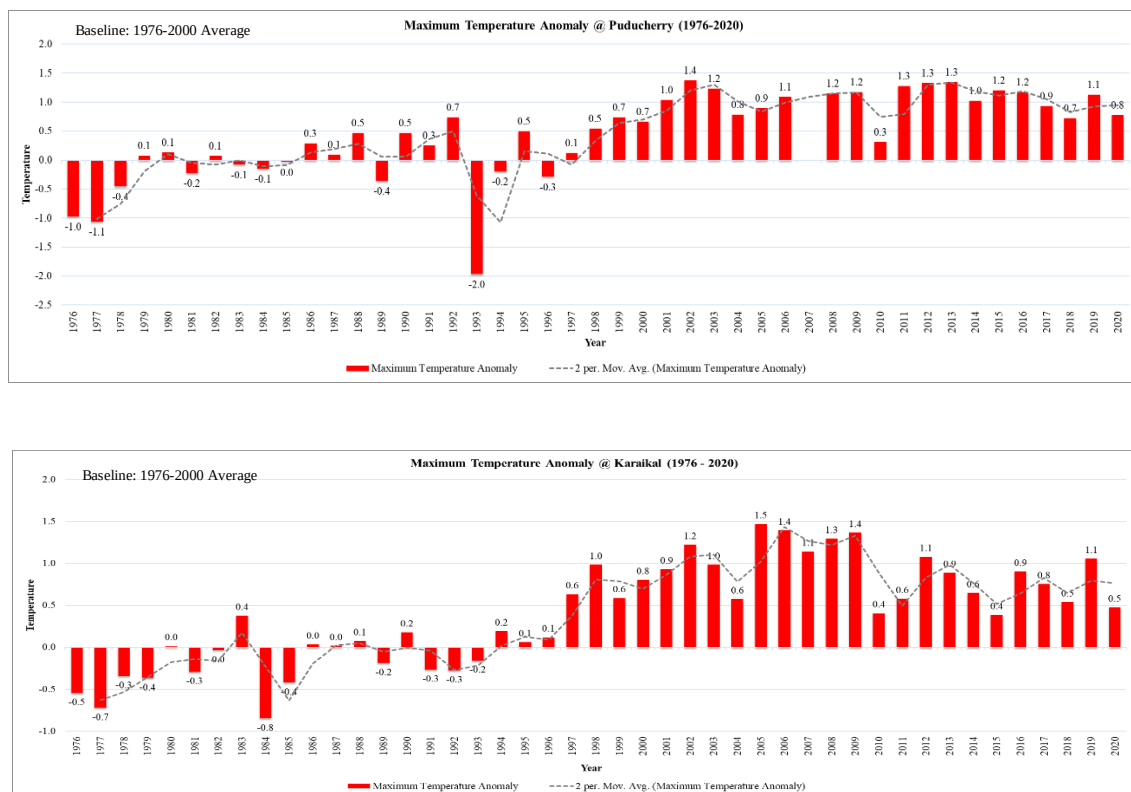


Fig. 4: Anomaly of Maximum Temperature from 1976-2020 at Puducherry and Karaikal regions

b) Anomaly of Minimum Temperature:

The anomaly of Minimum Temperature plotted for Puducherry and Karaikal region for the years 1976 to 2020 is shown in Fig. 5. It is observed that in the region of Puducherry, the minimum temperature has been consistently below the baseline average in the last two decades denoting that the minimum temperature has been in the decreasing phase in the last two decades in Puducherry region. In the region of Karaikal, the minimum temperature has observed to be below baseline minimum temperature in the 2000-2010 decade, but has been observed to be above the baseline average in the 2010-2020 decade, in comparison to the baseline of 1976 to 2000 average.

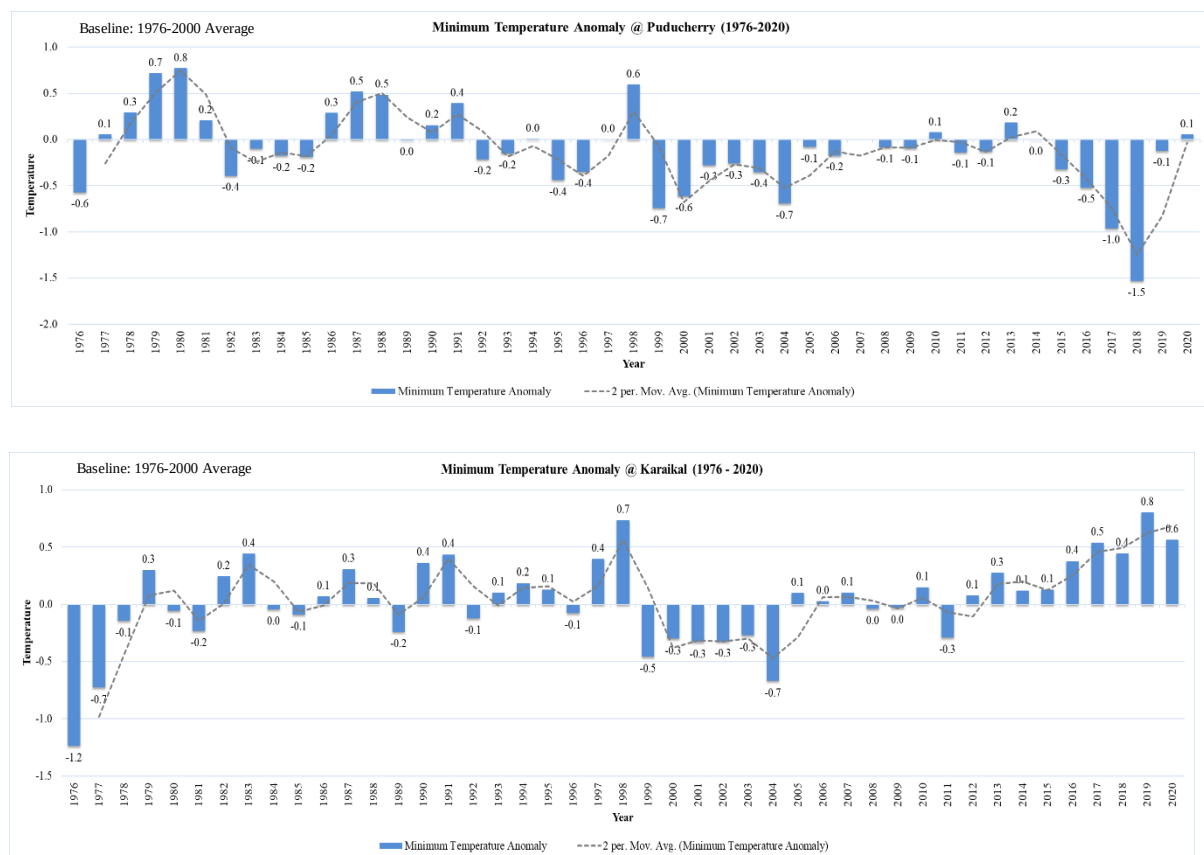


Fig. 5: Anomaly of Minimum Temperature from 1976-2020 at Puducherry and Karaikal Region

c) Anomaly of mean Average Temperature:

The anomaly of Average Temperature plotted for Puducherry and Karaikal region for the years 1976 to 2020 is shown in Fig. 6. It is observed that the average temperature of Puducherry region has almost always been above the baseline average temperature in all the study period. The average temperature in the region of Karaikal has also been predominantly in the increasing phase remaining above the baseline average post the year 1995.

The average temperature being consistently over the baseline average in the last 25 years is obvious of the fact that the maximum temperature has always been going up in these period and the minimum temperature not dipping that well to counter the increase that is observed in the average temperature. But, either way, consistent increase of Maximum temperature coupled with consistent decrease in minimum temperature – or – consistent in maximum temperature coupled with no significant decrease in minimum temperature, both are defined to be the evidence of warming globe (or a particular region) and hence this is a case of warming that induces climate change.

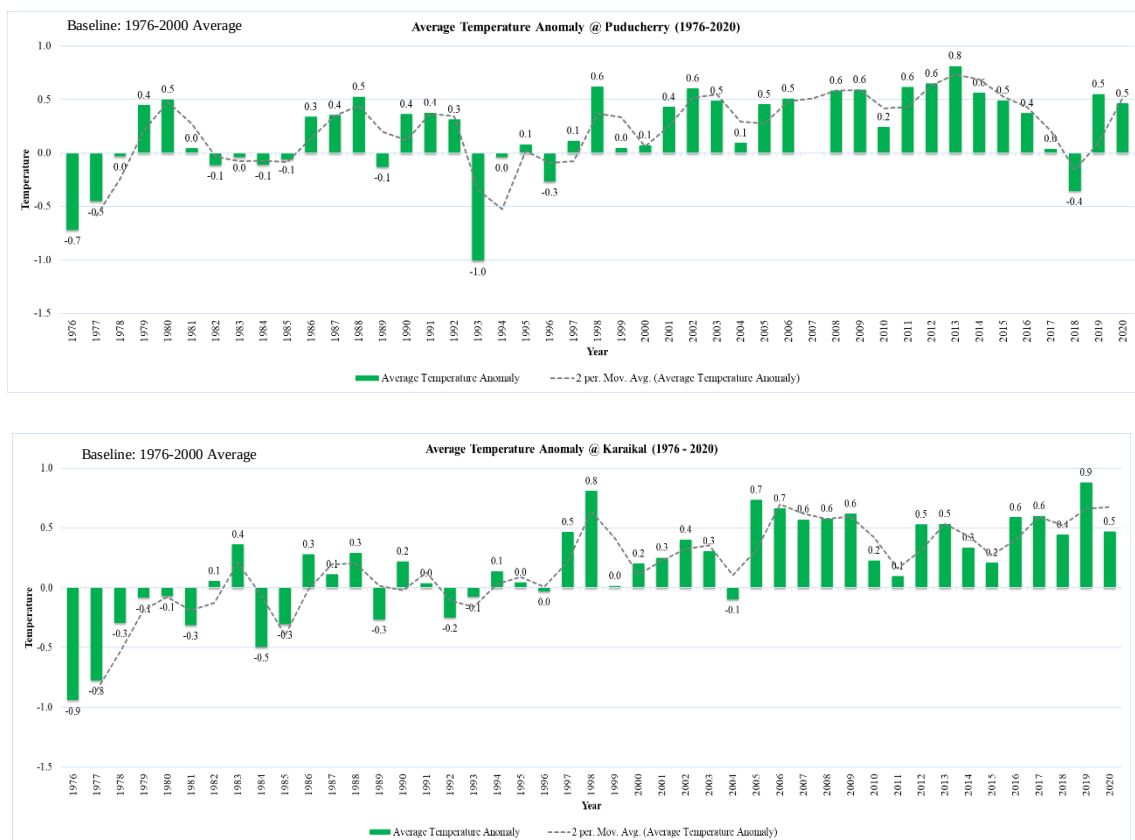


Fig. 6: Anomaly of Average Temperature from 1976-2020 at Puducherry and Karaikal Region

4.3 Temperature Trends by Months of the Years

a) Mean Monthly Maximum Temperature

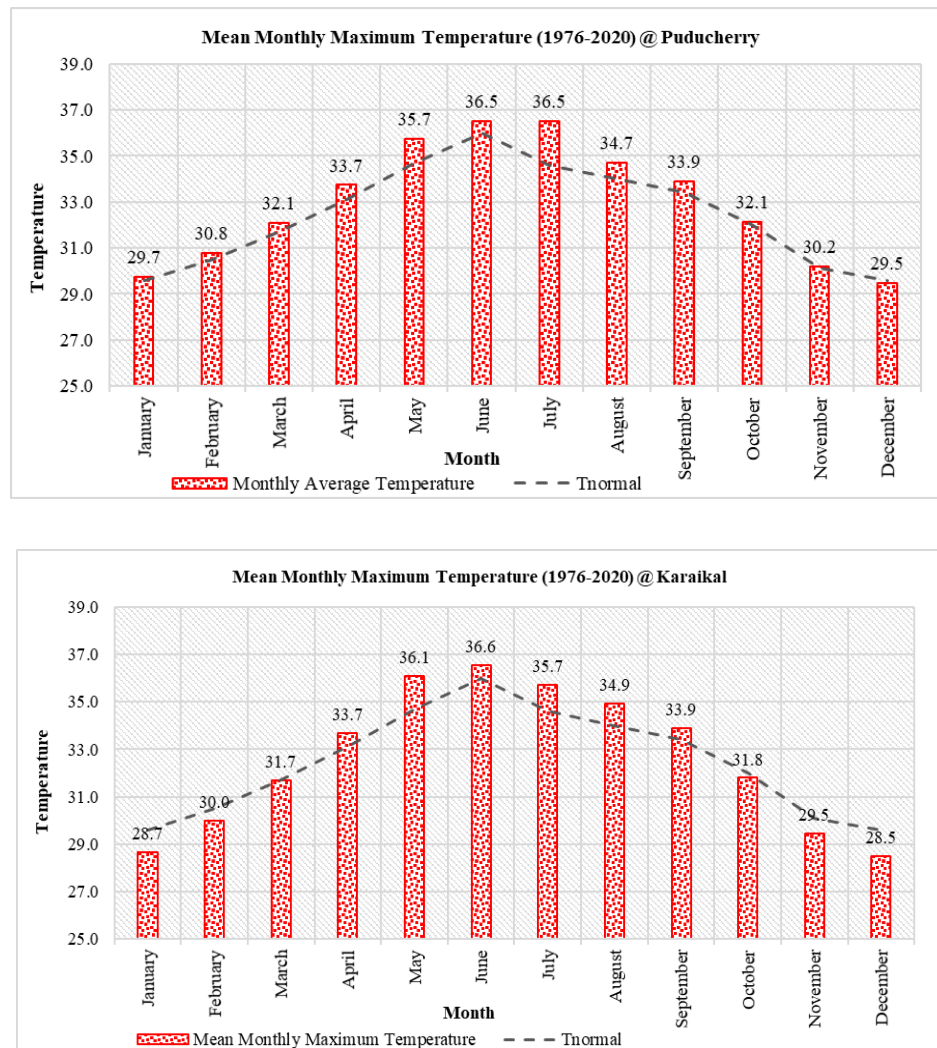


Fig. 7: Monthly Maximum Temperature from 1976-2020 at Puducherry and Karaikal

Fig. 7 shows the monthly averaged maximum temperatures of each month from the year 1976 to 2020 for Puducherry and Karaikal region. The summer months (April – June) apparently have experience higher temperature compared to other months of the year, and in the region of Puducherry the month of July too has been experiencing temperature almost similar to the month of June.

These observed maximum temperatures are superimposed by the Normal Temperature line for each month of the years and it is observed that, most of the months and especially the summer months have been witnessing temperatures above normal. The months of April, May,

June and July have been experiencing 0.7⁰C to 2.0⁰C above their respective Normals in Puducherry region and around 0.6⁰C to 1.2⁰C above respective Normals in Karaikal region.

On the other hand, in the region of Karaikal the winter months viz, November, December, January and February have been experiencing below normal temperatures by a margin of 0.5⁰C to 1.0⁰C reiterating the fact that the winters are getting colder than normal while the summer months remain warmer than normal.

b) Mean Monthly Minimum Temperature

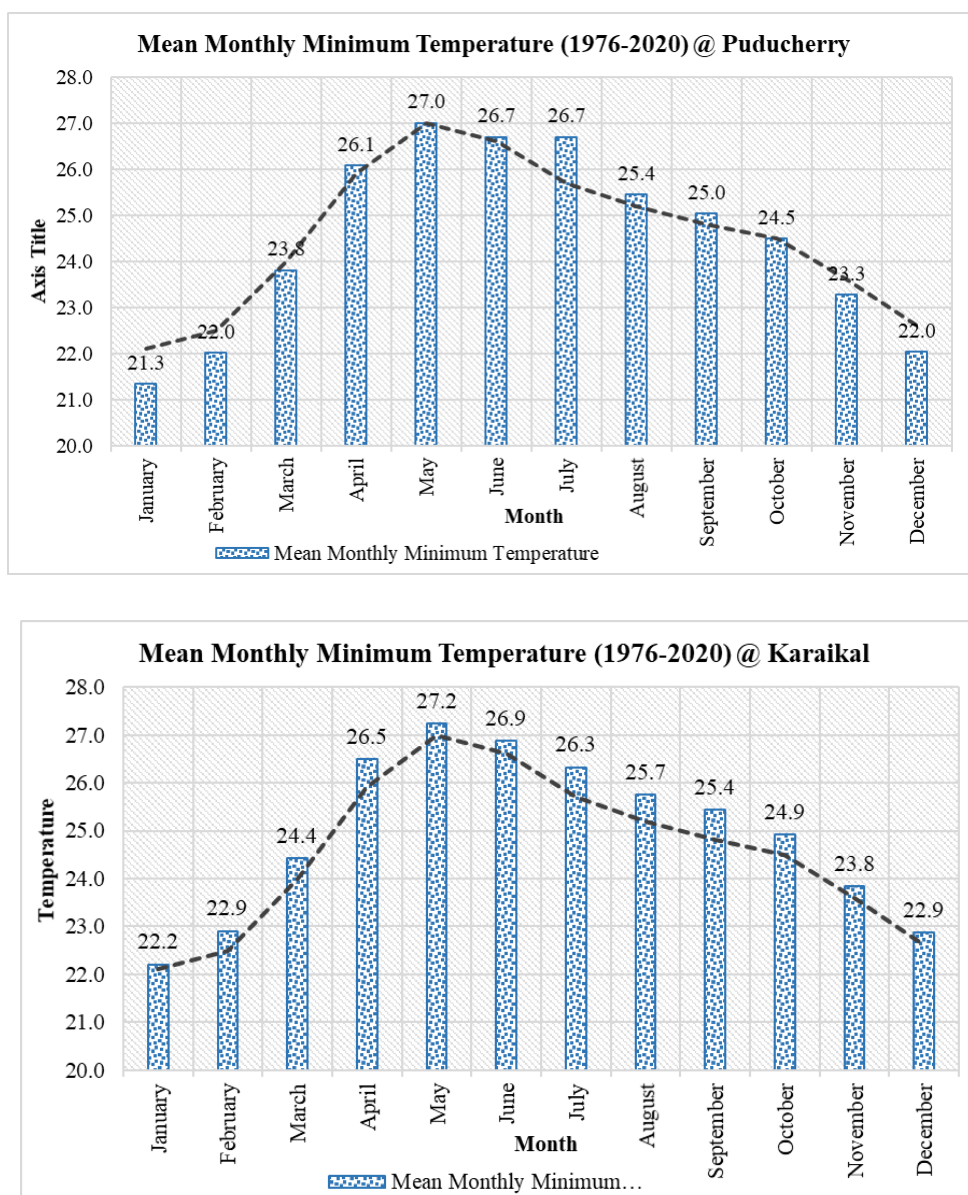


Fig. 8: Monthly Minimum Temperature from 1976-2020 at Puducherry and Karaikal

Fig. 8 shows the variation in the mean monthly Minimum Temperature for all the months of the year in Puducherry and Karaikal region in the period 1976-2020. In Puducherry, the mean minimum temperatures of winter months are clearly below normal indicating that winters in Puducherry are getting colder than normal. Also the minimum temperatures of pre-monsoon months viz., July, August and September are above their respective normal, with the month of July being 1°C above normal, which implies that the nights of pre-monsoon months are getting warmer than their respective normals, and the nights of winters are getting colder than normal in the region of Puducherry, since minimum temperatures are usually the measure of temperatures experienced during nights

On the other hand, the minimum temperatures of almost all the months are above their normal in the region of Karaikal and the difference being maximum in April, June and September at around 0.6°C and the difference being minimum at around 0.2°C in the months of November, December and January. This implies that the summer nights in the months from April to September are getting warmer than normal in the region of Karaikal.

4.4 Number of days of observed Maximum Temperature greater than 37°C and 40°C



Fig. 9: Number of Days of observed Maximum Temperature greater than 37°C and 40°C at Puducherry and Karaikal region.

The number of days of temperature greater than 37°C and 40°C in both Puducherry and Karaikal region is shown in Figure 9. The analysis of number of days of observed maximum temperature greater than a certain degree is an important measure of rise in regional temperature as it indicates the increase or decrease in the number of warmer days in a year. Moreover the analysis of number of days of temperature greater than a certain degree in a year is more important than tracing the occurrences of record warming of temperature. Because computing the prevalence of observed temperature greater than a certain degree of temperature evidently signifies the real issue of warming temperature, whereas occurrences of record

warming of temperature on odd days of an year can potentially be mere outliers when the annual daily average could still be at normal.

Accordingly, the years with number of days of observed Maximum Temperature greater than 32°C , 37°C and 40°C for each of the year from 1976 to 2020 for Puducherry and Karaikal is given in Figures 9.

Also, for ease of interpretation, the years with number of days of observed Maximum Temperature greater than 32°C , 37°C and 40°C for each of the year from 1976 to 2020 for Puducherry and Karaikal on a decadal comparison is shown in Figure 10. From the chart, it is observed that the years with number of days of Maximum Temperature greater than 32°C has been around 1800 days in the decades 1980-90 and 1990-2000 respectively, which has increased to 1913 days in the decade 2000-2010 and to 2460 days in the decade 2011-2020.

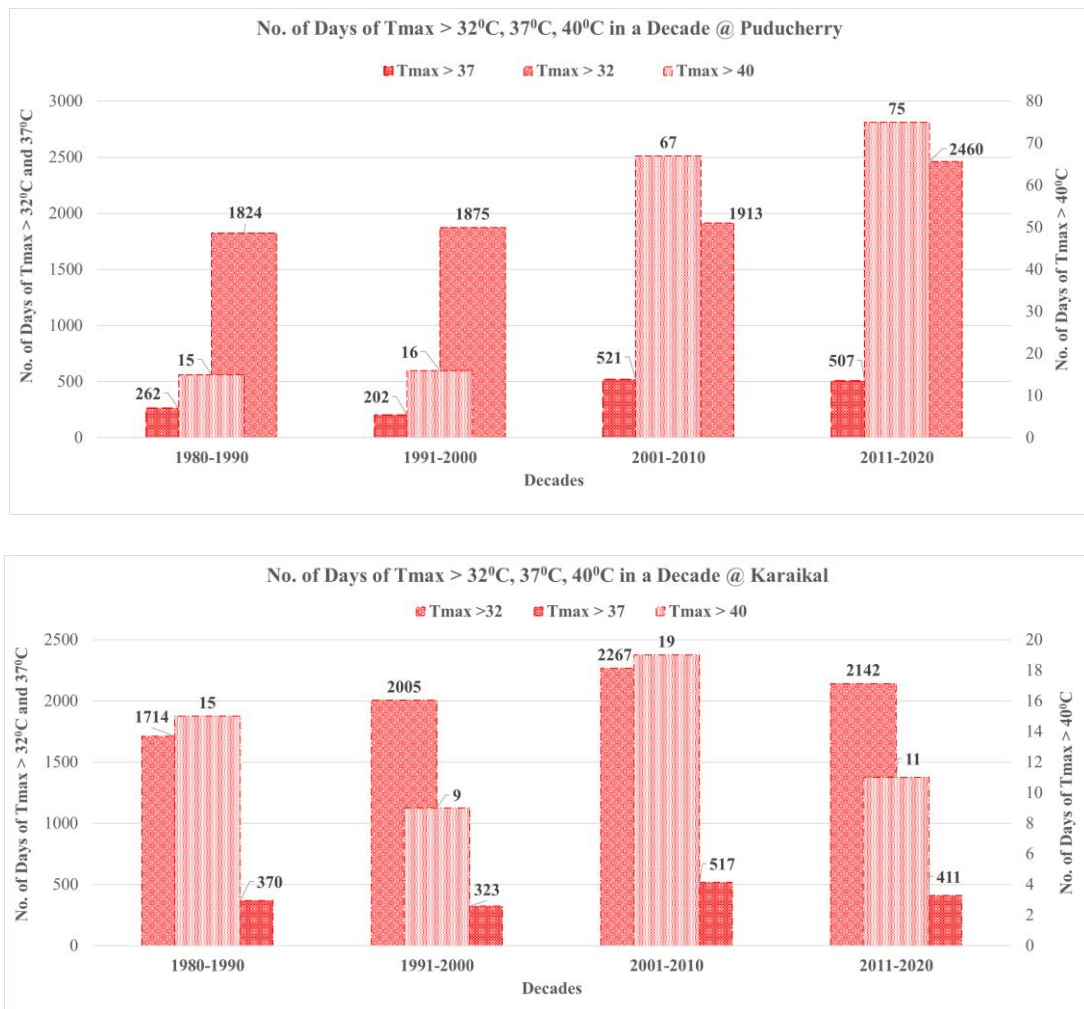


Fig. 10: Decadal comparison of number of days of the year greater than 32°C , 37°C and 40°C for each of the year from 1976 to 2020 for Puducherry and Karaikal.

Similarly, number of days of Maximum Temperature greater than 37°C has been 262 days and 202 days in the decades 1980-90 and 1990-2000 respectively. But this has increased to 521 days and 507 days in the decades 2001-10 and 2011-2020 respectively, which is obvious of an apparent increase of recorded daily maximum temperature. Also, the number of days with observed Maximum Temperature greater than 40°C has increased 15 days in the decades 1980-90 and 1990-2000 to around 70 days in each of the decade in 2001-10 and 2011-2020.

A similar case of warming temperature is observed in the region of Karaikal in the last two decades in comparison to the former two decades. The number of days with observed Maximum Temperature greater than 32°C has increased from around 1800 days in the decades 1980-2000 to around 2200 days in the decades 2001-2020. The number of days with T_{max} greater than 37°C has increased from around 350 days in the decades 1981-1990 and 1991-2000 to around 517 and 411 days in the decades 2001-2010 and 2011-2020.

All these data imply that the region of Puducherry and Karaikal had experienced a very significant warming in the last two decades i.e., post 2001 in comparison to the previous 20 year period, which is evidently the region falling in line with the global temperature rise in the recent past.

4.5 Percentile Comparisons

In order to establish the trend of observed maximum temperature on a generalized perspective, the 95th percentile and 10th percentile can be tested to understand the trend of Maximum Temperature and Minimum temperature respectively, which will eliminate the outliers that could be mere odd cases in a year. Accordingly, the trend of 95th percentile for Maximum Temperature and 10th percentile for Minimum Temperature is plotted in Fig. 11.

The figure depicts that, 95th percentile of Maximum Temperature trendline is increasing with a positive slope, indicating an increasing in trend of Maximum Temperature at the rate of $0.05^{\circ}\text{C} / \text{year}$ for Puducherry and $0.01^{\circ}\text{C} / \text{year}$ for Karaikal region from the period 1976 to 2020. On the other hand, the 10th percentile of Minimum Temperature trendline is seen to have a negative trendline for the region of Puducherry with a decrease in minimum temperature trend at the rate of $0.05^{\circ}\text{C} / \text{year}$ indicating that the observed minimum temperature is decreasing in the study period. But, the same trendline for the region of Karaikal is seen to produce a positive trendline at the rate of 0.013°C indicating a positive trendline which shows that on an average the minimum temperature has been increasing in the study period.

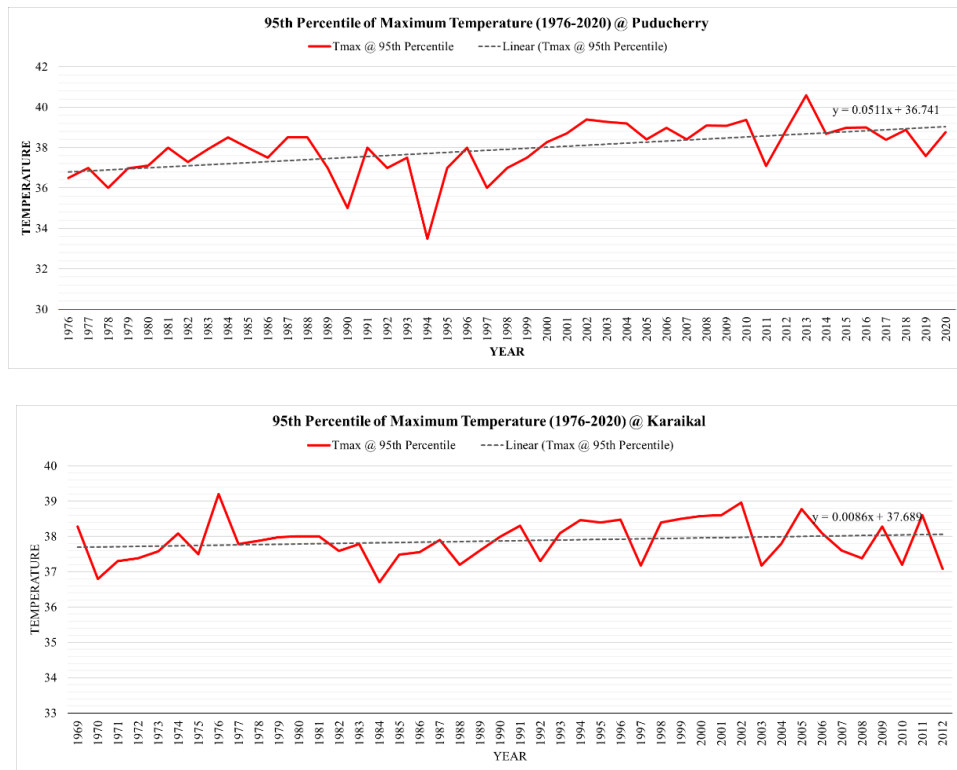


Fig. 11: 95th Percentile of observed Maximum Temperature from 1976 – 2020 in Puducherry and Karaikal Region.

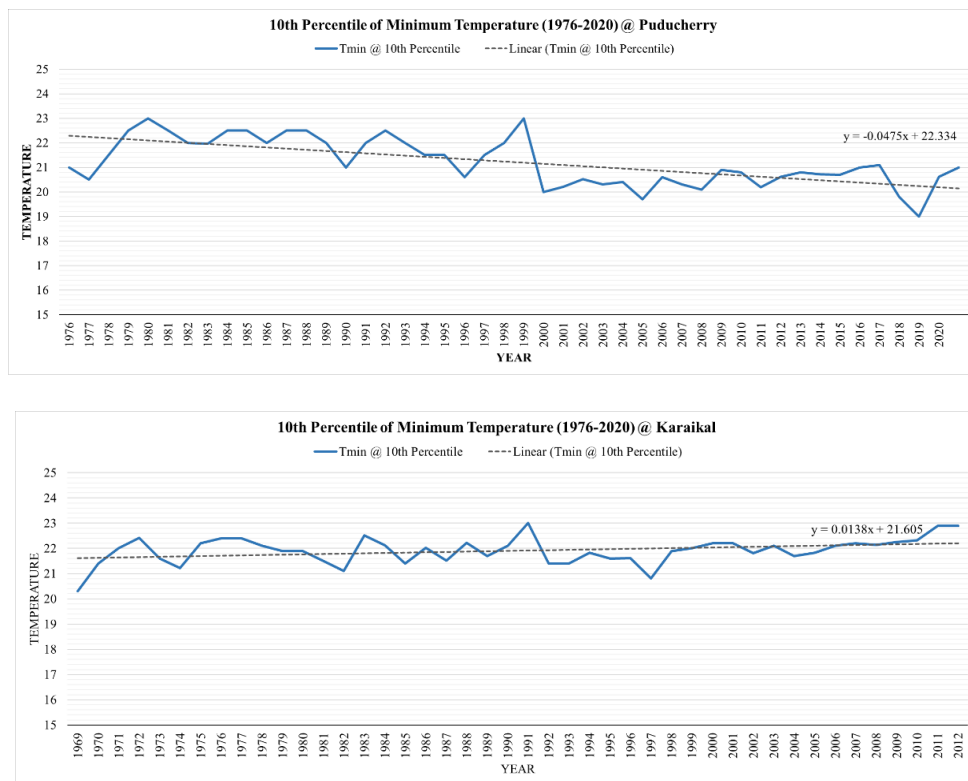


Fig. 12: 10th Percentile of observed Minimum Temperature from 1976 – 2020 in Puducherry and Karaikal Region.

5. Trends in Rainfall in Puducherry and Karaikal Regions

5.1 Average Annual Rainfall

The trend of annual rainfall for the region of Puducherry and Karaikal for the period 1976-2020 is given in Fig.13. The figure shows that the overall trend is in a relatively consistent pattern with the rate of change being only around 2 mm/year for Puducherry and 2.8 mm/year for Karaikal region. From this it could be inferred that on an annual basis, there is not much of variation (increase or decrease) in the amount of rainfall received in a year. The annual rainfall has reached a maximum of around 2000 mm of rainfall in a year and the least of around 500 mm in a year in mid 1990s in Puducherry region. The average annual rainfall considering all these years from 1976 to 2020 has been around 1310 mm in Puducherry region and around 1402 mm in Karaikal region.

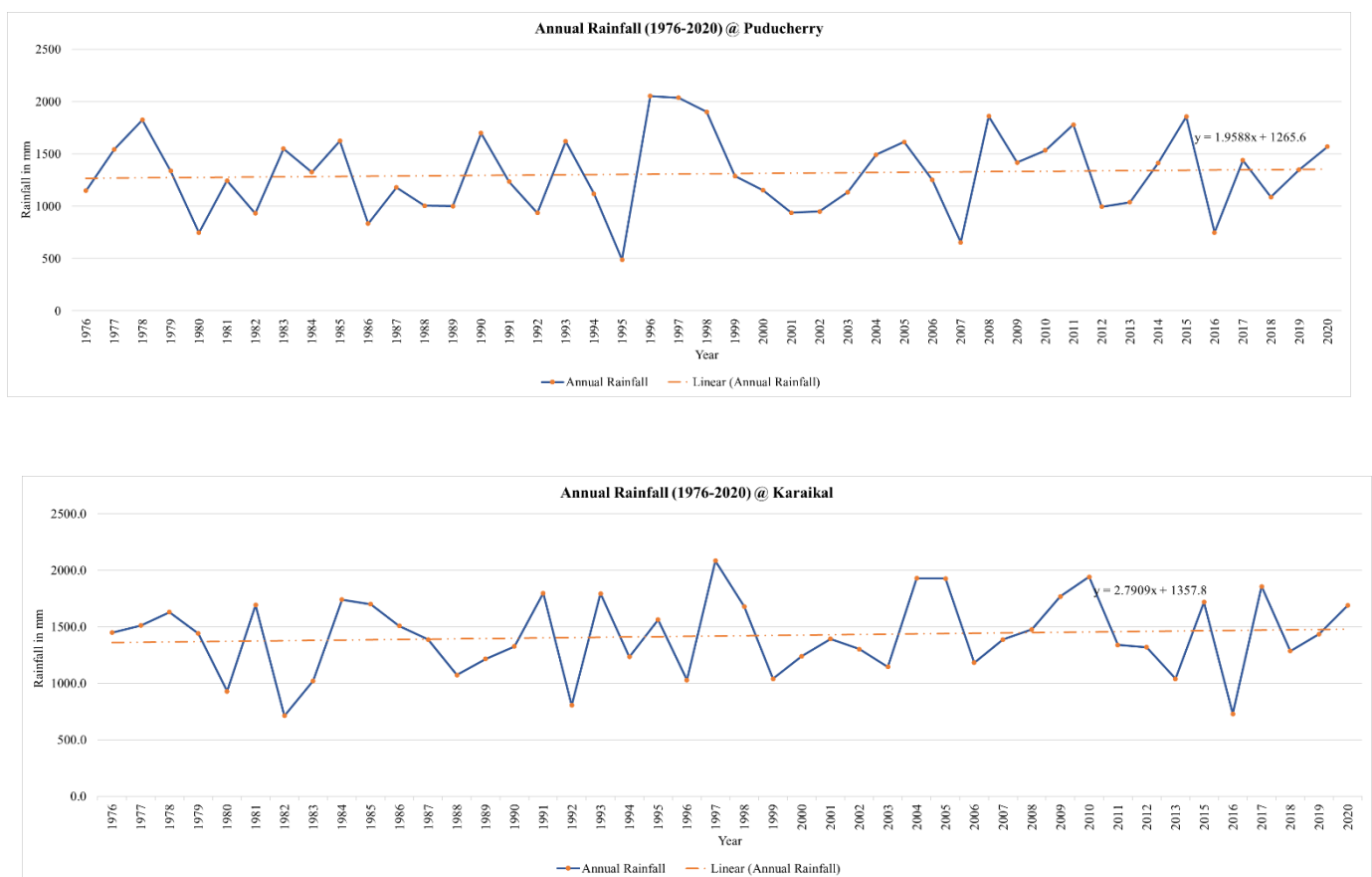


Fig.13: Trend of Annual Rainfall from 1976 – 2020 in Puducherry and Karaikal Region

5.2 Number of Rainfall Days

Number of Rainfall Days in a year through a definite study period is an important criteria in understanding if there exists any changes in the frequency of rainfall in a particular region. Accordingly to the criteria defined by the Indian Meteorological Department (IMD), a rainfall day is when on a particular day the total rainfall is more than 3 mm in a 24 hour period. Accordingly, figure 14 depicts the number of rainfall days in the region of Puducherry and Karaikal.

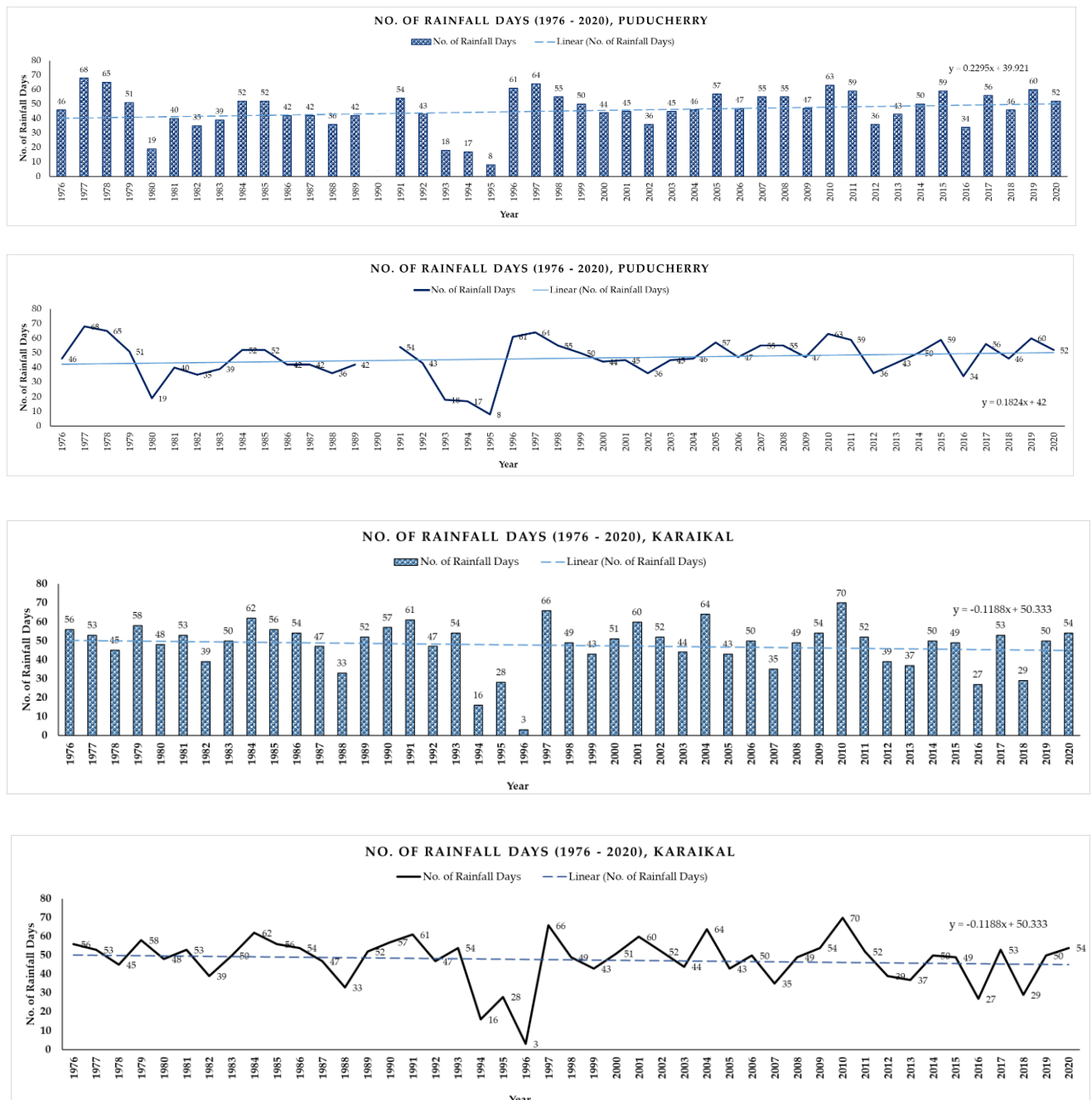


Fig. 14: Number of Rainfall Days (>3mm) in Puducherry and Karaikal Region from 1976-2020.

In both these regions, there has not been significant variation (increase or decrease) in the number of rainfall days in a year. Both these regions have been experiencing an average of 40-50 days of rainfall every year in these 45 years of study period.

5.3 Rainfall Extremes

An important weather extreme is the Rainfall extreme events which are categorised as “Heavy Rainfall” days and “Very Heavy Rainfall” days. The assessment of these rainfall categorization is important these days as the changing climatological scenario is bringing in more extreme rain of high intensity in short duration – in the likes of flash floods, downpours and deluges – affecting both or urban and rural livelihood. Hence in order to understand the occurrence of such heavy rainfall in short durations, the number of ‘heavy rainfall’ and ‘extremely heavy’ rainfall days have been studied and plotted in figure 15 and figure 16.

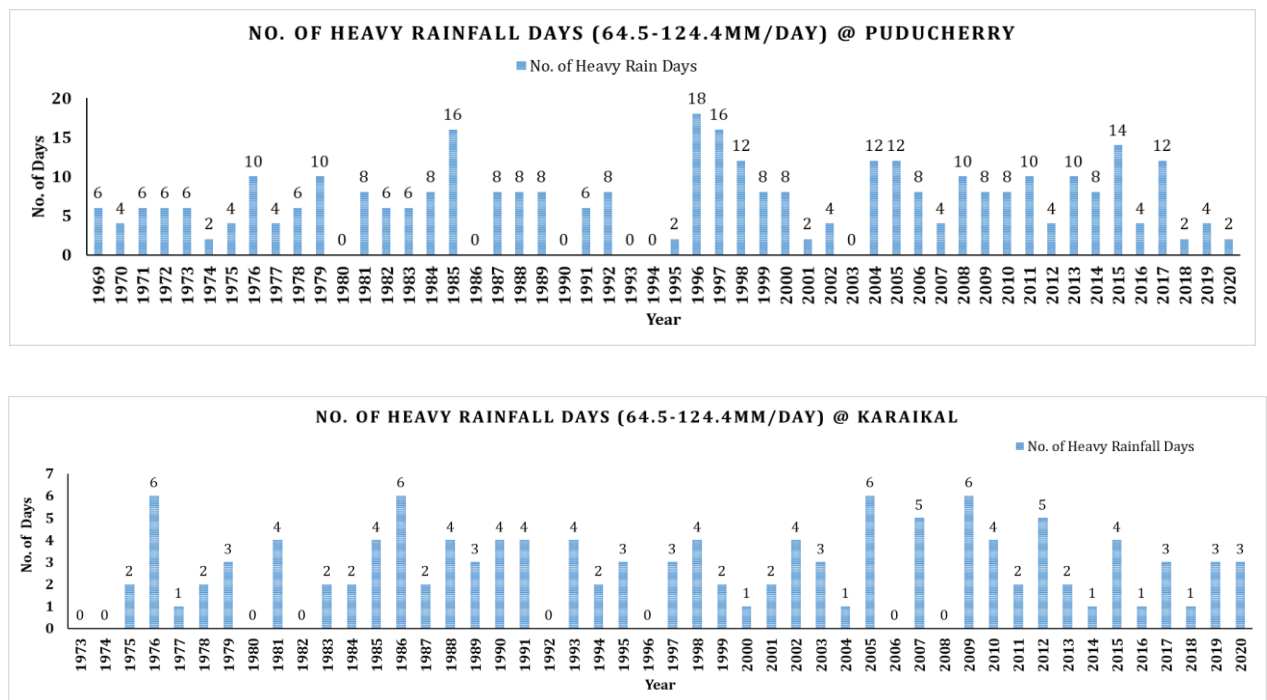


Fig. 15: Number of Days of Heavy Rainfall Days from 1976 – 2020 in Puducherry and Karaikal Region.

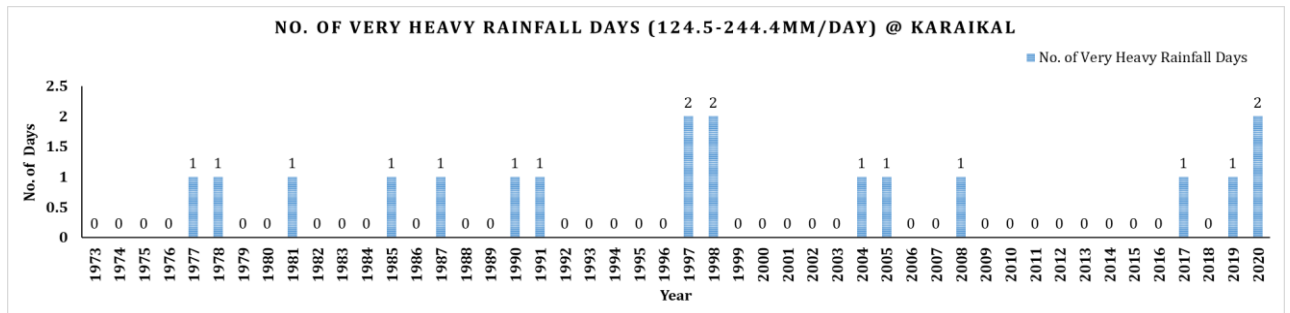
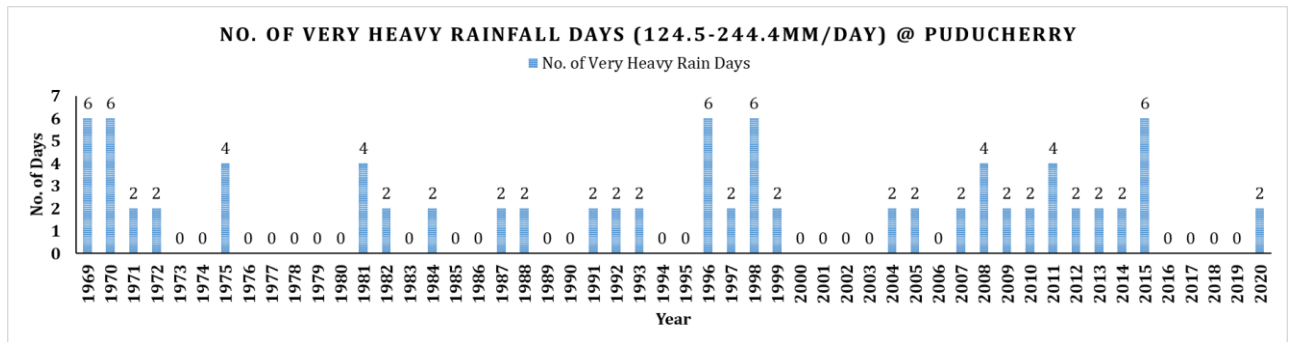
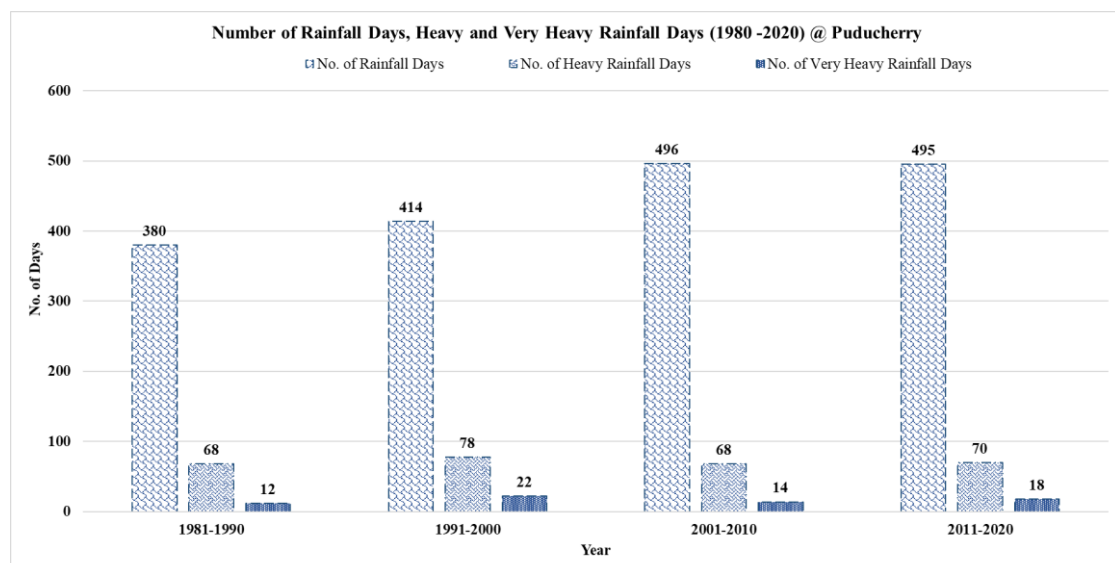


Fig. 16: Number of Days of Very Heavy Rainfall Days from 1976 – 2020 in Puducherry and Karaikal Region.

For an easy understanding, interpretation and comparison, a decadal comparison of the number of rainfall days, number of heavy rainfall days and number of very heavy rainfall days are plotted in Figure 17. From the figure it is inferred that, in the region of Puducherry, the number of very heavy rainfall days has been around 12 to 22 days in all 4 decades from 1981-2020 and the number of ‘heavy rainfall’ days have been consistently around 70 days in the same period. But, there has been a significant increase per decade in the number of rainfall days (>3mm/day) between 1981-2000 to 2001-2020.



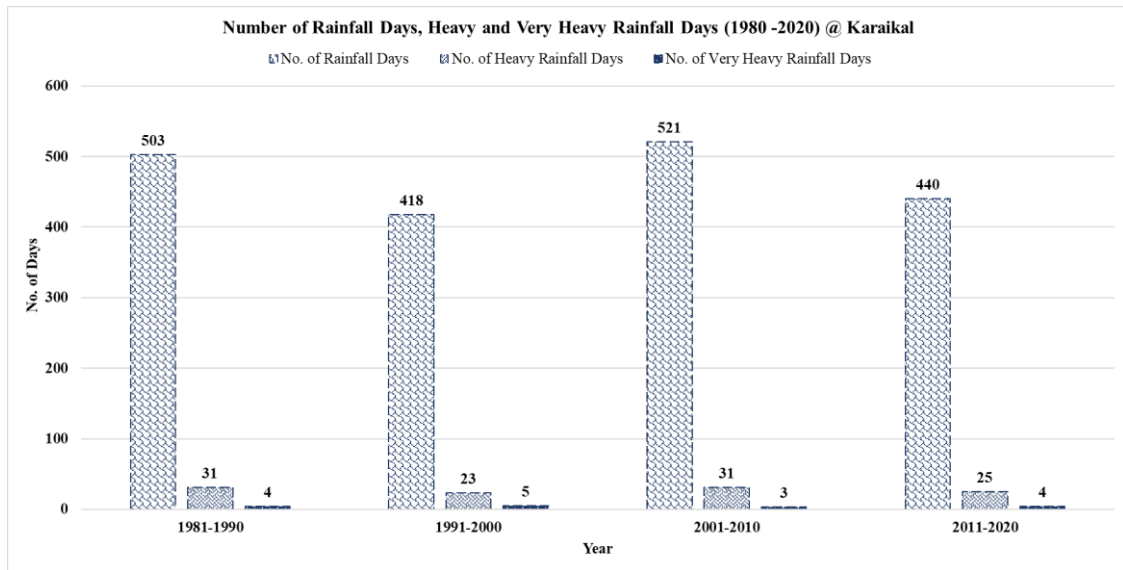


Fig. 17: Decadal Comparison of Number of Rainfall Days, Number of Heavy Rainfall Days and Number of Very Heavy Rainfall Days between 1980 – 2020 in Puducherry and Karaikal Region.

Similarly, for the region of Karaikal, there has not been more than 5 days of ‘very heavy rainfall’ days in all 4 decades between 1981-2020 and the number of ‘heavy rainfall’ days has been around 25-30 days in the same period. The number of rainfall days (>3mm/day) has seen been around 503 days between 1981-1990, 418 days between 1991-2000, 521 days between 2001-2010 and 440 days between 2011-2020, i.e., there has been variation in the number of rainfall days among each of the decade between 1981-2020 but without any significant trend in the variation.

6. Summary:

This report on the Trends of Temperature and Rainfall in the region of Puducherry and Karaikal based on the data from the Indian Meteorological Department (IMD) for the period from 1976 – 2020 gives an analysis of the trend of foremost meteorological parameters such as Temperature and Rainfall for the region of Puducherry and Karaikal.

I. Analysis of Trends in Temperature:

Puducherry

- (i) Maximum Temperature has increased at the rate of $0.04^{\circ}\text{C}/\text{year}$
- (ii) Minimum Temperature has decreased at the rate of $0.01^{\circ}\text{C}/\text{year}$
- (iii) Average Temperature has increased at the rate of $0.01^{\circ}\text{C}/\text{year}$
- (iv) Number of days of Maximum Temperature greater than 32°C – Decadal Comparison:
 - 1980-90: 1824 days
 - 1990-2000: 1875 days
 - 2001-10: 1913 days
 - 2011-2020: 2460 days
- (v) Number of days of Maximum Temperature greater than 37°C – Decadal Comparison:
 - 1980-90: 262 days
 - 1990-2000: 202 days
 - 2001-10: 521 days
 - 2011-2020: 507 days
- (vi) Number of days of Maximum Temperature greater than 40°C – Decadal Comparison:
 - 1980-90: 15 days
 - 1990-2000: 16 days
 - 2001-10: 67 days
 - 2011-2020: 75 days

Karaikal

- (i) Maximum Temperature has increased at the rate of $0.04^{\circ}\text{C}/\text{year}$
- (ii) Minimum Temperature has increased at the rate of $0.01^{\circ}\text{C}/\text{year}$

(iii) Average Temperature has increased at the rate of $0.02^{\circ}\text{C}/\text{year}$

(iv) Number of days of Maximum Temperature greater than 32°C – Decadal Comparison:

- 1980-90: 1714 days
- 1990-2000: 2005 days
- 2001-10: 2267 days
- 2011-2020: 2142 days

(v) Number of days of Maximum Temperature greater than 37°C – Decadal Comparison:

- 1980-90: 370 days
- 1990-2000: 323 days
- 2001-10: 517 days
- 2011-2020: 411 days

(vi) Number of days of Maximum Temperature greater than 40°C – Decadal Comparison:

- 1980-90: 15 days
- 1990-2000: 9 days
- 2001-10: 19 days
- 2011-2020: 11 days

II. Analysis of Trends in Rainfall:

Puducherry:

(i) Average Annual Rainfall for the period 1976-2020: 1310 mm in Puducherry Region

(ii) Number of Rainfall Days ($>3\text{mm}/\text{day}$) – Decadal Comparison:

- 1980-90: 380 days
- 1990-2000: 414 days
- 2001-10: 496 days
- 2011-2020: 495 days

(iii) Number of Heavy Rainfall Days ($>64.4\text{ mm}$) – Decadal Comparison:

- 1980-90: 68 days
- 1990-2000: 78 days
- 2001-10: 68 days
- 2011-2020: 70 days

(iv) Number of Very Heavy Rainfall Days ($>124.4\text{ mm}$) – Decadal Comparison:

- 1980-90: 12 days

- 1990-2000: 22 days
- 2001-10: 14 days
- 2011-2020: 18 days

Karaikal:

(i) Average Annual Rainfall for the period 1976-2020: 1402 mm

(ii) Number of Rainfall Days (>3mm/day) – Decadal Comparison:

- 1980-90: 503 days
- 1990-2000: 418 days
- 2001-10: 521 days
- 2011-2020: 440 days

(iii) Number of Heavy Rainfall Days (>64.4 mm) – Decadal Comparison:

- 1980-90: 31 days
- 1990-2000: 23 days
- 2001-10: 31 days
- 2011-2020: 25 days

(iv) Number of Very Heavy Rainfall Days (>124.4 mm) – Decadal Comparison:

- 1980-90: 4 days
- 1990-2000: 5 days
- 2001-10: 3 days
- 2011-2020: 4 days

The temperature analysis for the past 45 years period depicts that there has been an overall increase in the maximum temperature in Puducherry and Karaikal region, the positivity in the maximum temperature anomaly post the year 2000 for both Puducherry and Karaikal region substantiates the overall warming experienced in this region, in line with the apparent warming scenario of the global in the last two decades. The drastic increase in the number of days of observed maximum temperature over strengthens the possibility of increased climate change consequences in both these region in the recent past and in the years to come.

The increasing emissions of the recent times which causes increase in the global temperature consequentially brings in macroscopic alterations in the meteorology of a region and hence analysis on the trends on rainfall and rainfall patterns in terms of frequency and intensity has also been carried out in this report. The observations from the average annual

rainfall, number of rainfall days and the rainfall extreme events portray no significant variation in the amount of rainfall received during the study period in both the regions of Puducherry and Karaikal.

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