



## Prediction of long-term pattern and its extreme event frequency of rainfall in Cauvery delta basin

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*Abstract: A rain gauge is an artifact used in meteorological stations to help measure and collect precipitations that fall in a certain place. Precipitations are all hydrometeor tumbling to the earth from the climate, including precipitation, shower, hail, snow, and slush, mist, and so forth. Downpour check networks give precipitation estimations a serious level of exactness at explicit areas at the same time, much of the time, the instruments are excessively inadequately conveyed to precisely catch the high spatial and worldly changeability of precipitation frameworks. Radar and satellite distant detecting of precipitation has become a suitable way to deal with address this issue adequately. Notwithstanding, among different wellsprings of vulnerabilities, the remote-sensing-based precipitation items are unavoidably influenced by testing blunders that should be assessed and described. While the rainfall is recorded by more than 3500 rain gauges set up by Indian Meteorological Department and State Government. The precipitation value fluctuates from one spot to another and from one year to another. The annual average rainfall for the country is about 120cm and the country's Geographical area of km<sup>2</sup> is equivalent to 3916 km<sup>3</sup>. The rainfall is measured by an instrument called a rain gauge. Rain gauge is also known as ombrometer or pluviometer. The rain gauge is classified as Recording and Non-Recording. The Standard non-recording rain gauge prescribed by the IMD is Symon's gauge. The details of the rain gauge can be obtained by Indian Standards IS 4986 2002. In our project, we have collected the data of rainfall from the year 2010-2020 in Mayiladuthurai District, Nagapattinam District, and Tanjore District. The details are to be studied then compared and analyzed in MS Excel and SPSS software. By using the collected rainfall data around 12 stations, we have prepared the chart. We have planned to set up the Standard Rain Gauge at AVC College of Engineering.*

**keywords - Hydrology, Rainfall, Cauvery delta zone, Trend, Monsoon, Frequency, Precipitation, Standard Rain Gauge, Data collection, Chart Analysis, volume, etc.**

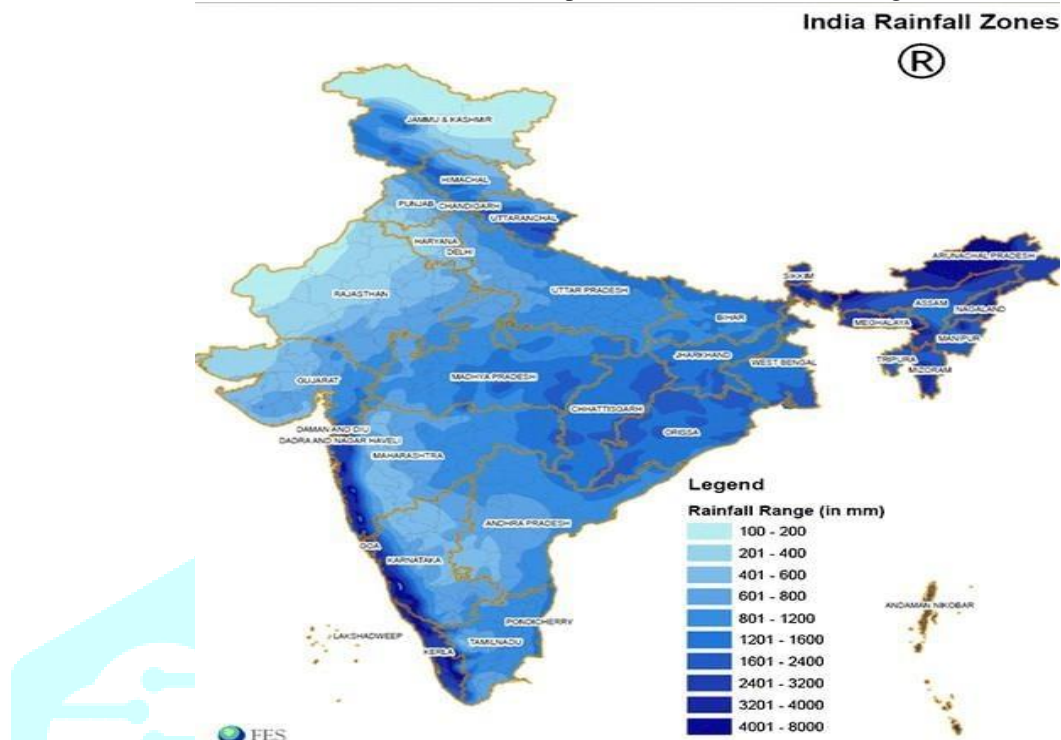
### I. INTRODUCTION

Hydrology is the science that envelops the investigation of water on the Earth's surface and underneath the outside of the Earth, the event and development of water, the physical and synthetic properties, and its relationship with the living and material parts of the climate. The average rainfall in India is 125 cm. India being a tropical country, its agriculture relies on the monsoon. In the current examination, the Cauvery delta zone (CDZ) was picked for precipitation investigation as it is the rice bowl of Tamil Nadu state. It covers the streams Cauvery, Vennaru, Kudamuruti, Paminiar, Arasalar, and Kollidam. The significant dams worked by this locale are Mettur and Bhavanisagar. Canal irrigation, well irrigation, and tank irrigation are being practiced in this zone. Thanjavur locale is a part of the Cauvery delta with rich and prolific soil. This region is contributing the significant piece of the food grains dominantly paddy to the state pool and subsequently ordinarily known as "Granary of South India". The northeast monsoon (NEM) is the wettest period with the highest mean rainfall falling in November and December at all stations examination, the southwest storm (SWM) is the driest season with the least mean precipitation tumbling from June to September. The Cold Weather period (CWP) occurs between January to February. The hot weather period (HWP) occurs between March to May. Mayiladuthurai districts receive the highest (405.61 mm) and Thanjavur districts (2.34 mm) recorded the lowest.

**II. MATERIALS AND METHODS**

**2.1 Estimation of Rainfall data**

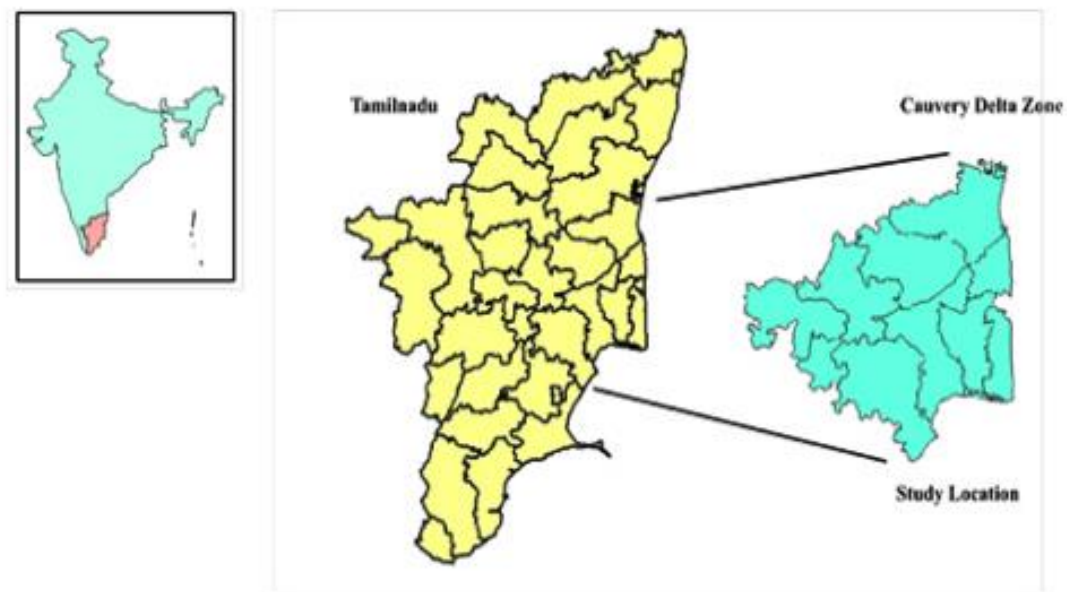
The ordinary precipitation is the normal worth of precipitation at a specific date, month, or year over a predetermined 30-year time span or something like that. The normal rainfall is updated every ten years like the Arithmetic average method, Comparison method, Normal ratio method, Isohyetal map method. The India Meteorological Department (IMD) defines four homogeneous rainfall zones to represent the geographical distribution of regional Indian rainfall. These four homogeneous rainfall zones are northwest India (NWI), northeast India (NEI), central India (CI), and south peninsula (SPIN), shown in Fig.1



**Fig.1 Variability of precipitation**

**2.2 Kaveri delta zone**

The Vennar River or Vennaaru is a waterway and distributary of the Kaveri River in the Kaveri delta. It moves through the Thanjavur, Tiruvarur, and Nagapattinam locale of Tamil Nadu, India. Nagapattinam has a tropical savanna environment (Köppen As) with a wet season from the upper east storm between October and December. During the remainder of the year, precipitation is light to direct and well underneath expected evapotranspiration. Temperatures are hot to boiling consistently, with severe stickiness



**Fig.2 Cauvery Delta Zone Highlighted from Tamil Nadu**

**2.3 Study Location**

Mayiladuthurai lies between 11° 10'18" northern latitude and 79° 6'26" of eastern longitude. Thanjavur lies between 9° 50' and 11° 25' northern scope and 78° 45' and 79° 25' of eastern longitude. Nagapattinam lies somewhere in the range of 10°10' and 11°20' northern scope and 79°15' and 79°50' eastern longitude.

**2.4 Analysis and tools**

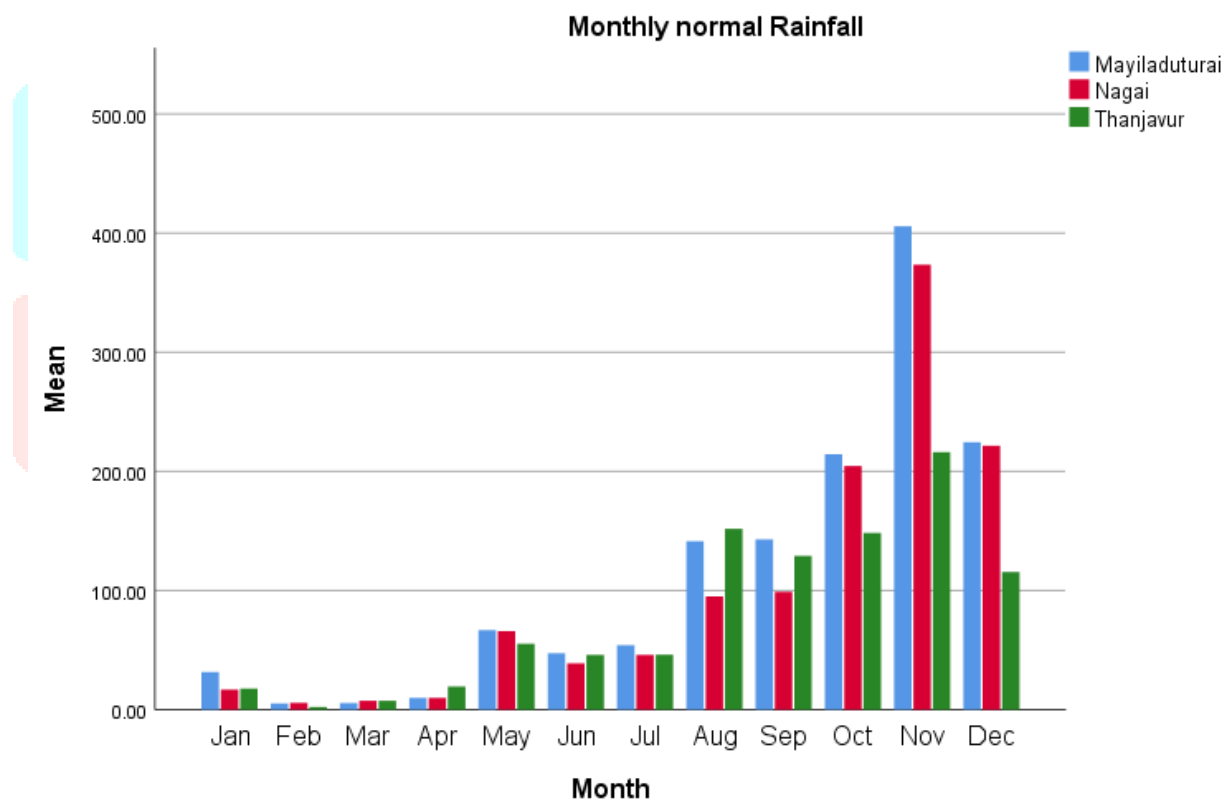
Mean, Standard Deviation (SD), and Coefficient of Variation (CV) was computed for rainfall and rainy days using MS word. SPSS programming was utilized to examine the pattern of precipitation and Rainy days.

**2.5 Study period**

The daily Rainfall observation from 2010 to 2020 were collected for all three Districts viz., Mayiladuthurai, Thanjavur, and Nagapattinam district and were used for various calculations involved in the study.

**Rainfall and rainy days variability statistics Rainfall Rainy days**

		Statistics		
		Mayiladuthurai	Nagai	Thanjavur
N	Valid	12	12	12
	Missing	0	0	0
Mean		112.4318	98.6625	79.6075
Median		60.4500	55.9350	50.7700
Std. Deviation		120.75189	113.13441	69.91706
Variance		14581.018	12799.395	4888.395
Minimum		5.20	5.65	2.34
Maximum		405.61	373.45	216.19



**Fig 3 monthly normal of 10 years rainfall**

The monthly rainfall normal arrived using observed data revealed that November the month having highest rainfall (405.61mm, 373.45 mm, and 216.19 mm for Mayiladuthurai, Nagapattinam, and Thanjavur respectively) for a month in all the three study locations.

2.6 DATA COLLECTION

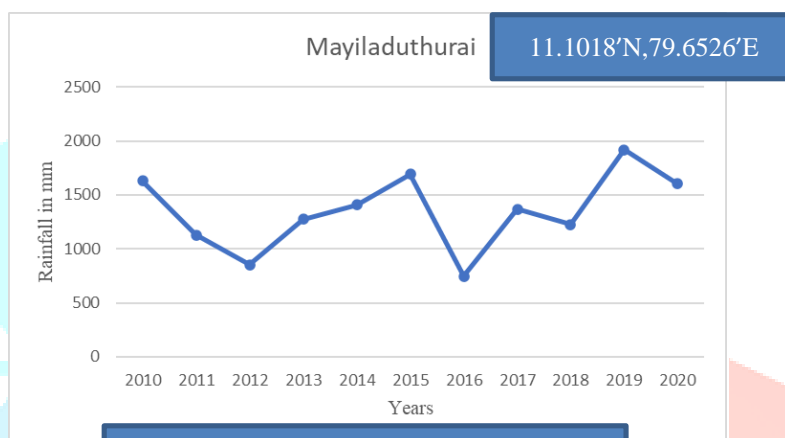
The below table shows the comparison of rainfall data, it was very helpful in the study of hydrological and finding volume.

Year	Mayiladuthurai	Nagapattinam	Thanjavur
2010	1627.6	1340.39	1769.7
2011	1129.4	1046.17	848.3
2012	852.1	884.17	699
2013	1274.6	856.47	1083.7
2014	1408	1014.55	816.3
2015	1691.4	1520.07	1047.6
2016	744.4	767.01	1119.9
2017	1366.3	1202.64	811.1
2018	1225	908.45	591.9
2019	1918.4	1403.95	889.5
2020	676.1	753.9	831.7

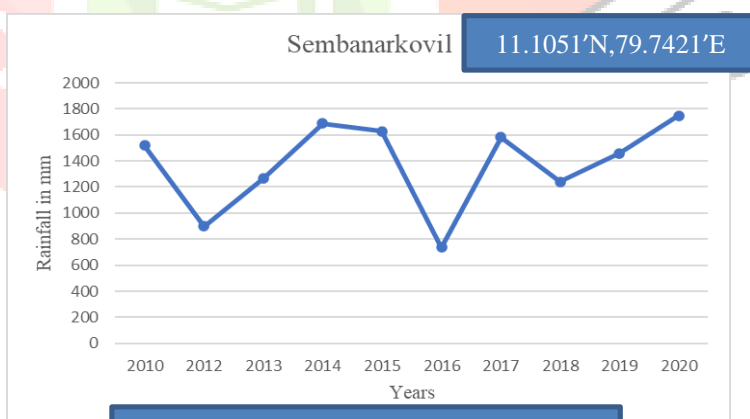
Table 1

Show of every day, week after week, month to month, or yearly precipitation information is shown either as specks or line joining the dabs is known as **Chronological chart**

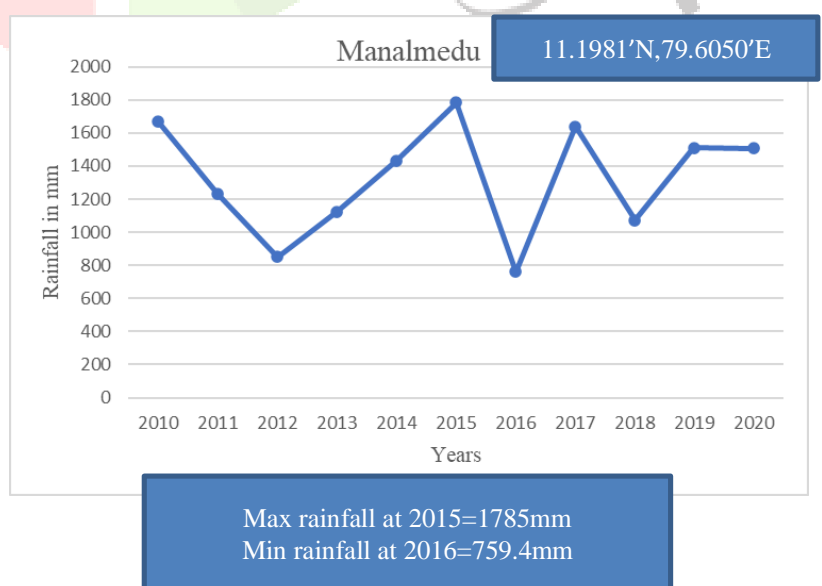
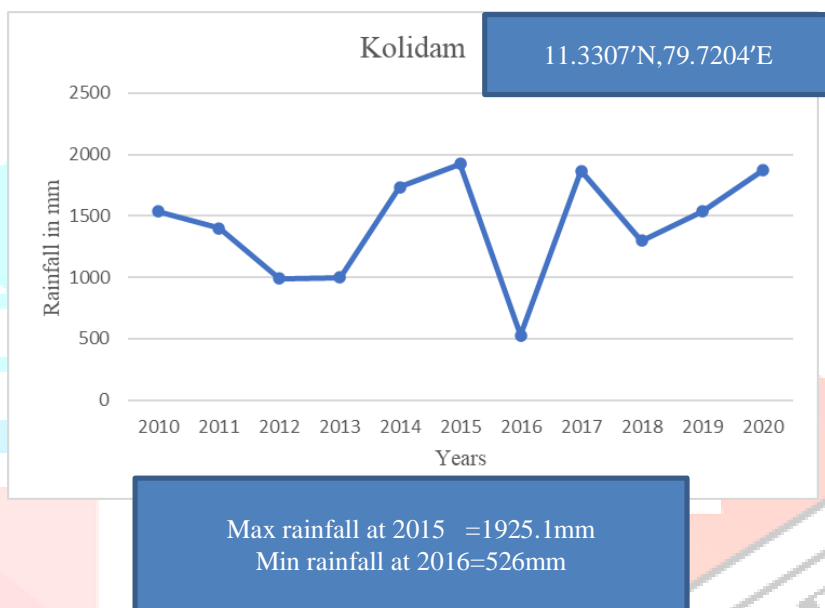
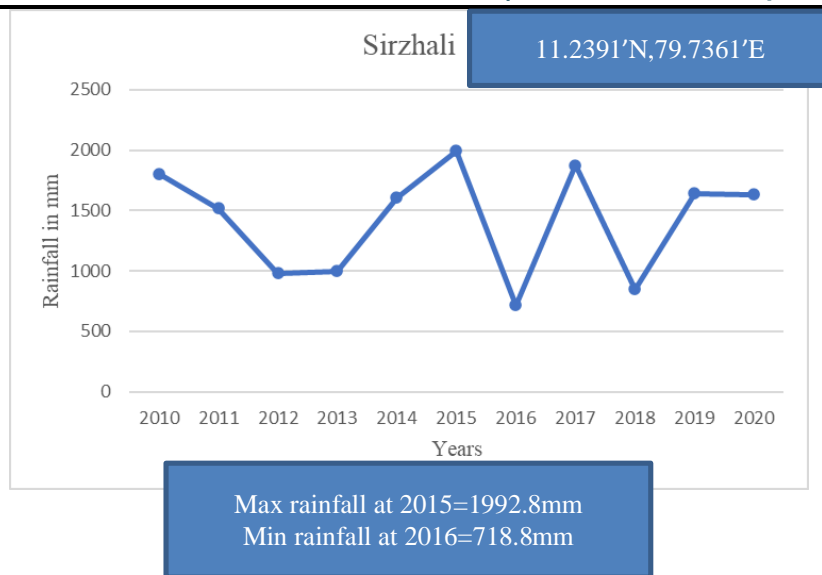
Yearly data-2010 to 2020



Max rainfall at 2019=1914.8mm  
Min rainfall at 2016=744.4mm



Max rainfall at 2020=1749.3mm  
Min rainfall at 2016=736.7mm



Chronological charts are plotted with a moving mean. A moving mean may be used to damp out or smooth out the oscillations of some of the random variables such as precipitation, streamflow, etc.

The above charts show the annual rainfall and average annual rainfall of stations in the chart.

### III. RESULTS AND DISCUSSION

#### 3.1 Results of Descriptive Statics of Study Variables

This study of rainfall in the Mayiladuthurai, Nagapattinam, and Thanjavur district for the past 10 years is carefully studied and the charts are prepared, based on the intensity of rainfall. Concerning the collected data and charts the maximum rainfall and the minimum rainfall is calculated. The Volume of rainfall in Mayiladuthurai, Nagapattinam, and Thanjavur district are 25371126.44kl, 19056730.760kl, and 11064669090kl. Then a Standard rain gauge is implemented in our institution as per IS code. The information acquired from this undertaking will assist us to take up comparable activities with mental fortitude and trust in the future course of activities.

### IV. ACKNOWLEDGMENT

We take great pleasure in conveying our thanks to our Head of the Department, <sup>1</sup>**Dr.R.JAYASANKAR M.E, Ph.D.**, for his technical idea for the completion of the project.

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