

## A STUDY OF PRECIPITATION MEASUREMENT OVER A POINT

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### ABSTRACT

*Water exists on planet Earth in three forms viz., Gaseous, Liquids and Solids and its circulated mainly by solar and planetary forces. Precipitation may take place in the liquid form as rain and also in solid form as snow, hail, dew, frost. Precipitation reaching the ground surface is called through fall. The basic source of water for India is the rainfall over the most part of country. While the rainfall is recorded by more than 3000 rain gauges set up by Indian Metrological Department and State Government. The rainfall varies from place to place and from year to year. The annual average rainfall for the country is about 119.4cm and with the country's Geographical area of  $3.28 \times 10^6 \text{ km}^2$  is equivalent to  $3916 \text{ km}^3$ . The rainfall is measured by the instrument called rain gauge. Rain gauge is also known as ombrometer or pulviometer. The rain gauge is classified as Recording and Non-Recording. Standard non-recording rain gauge prescribed by the IMD is the Symons gauge. The details of rain gauge can be obtained by Indian Standards IS: 5225-1969. In our project, we collected the data's of rainfall from the year of 1990-2017 in Mayiladuthurai Taluk. The details are to be studied then compared and analysed. By using the collected rainfall data's, we should prepare yearly and monthly charts. The Mayiladuthurai Taluk having a single rain gauge near the PWD office. So, we are planned to setup the Standard Rain Gauge in AVC college of Engineering.*

**KEYWORDS:** Hydrology, Rainfall, Standard rain gauge, etc...,

### 1. INTRODUCTION

Hydrology is defined as the science that deals with processes governing the depletion and replenishment of water resources of the land areas of the earth. Precipitation may takes place in liquid form of rain and also solid form of hail, snow, dew frost, drizzle, sleet, and graupel. It is usually measured in millimetres. Rainfall is defined as the

amount of water falling in rain within a given time and area, usually expressed as a hypothetical depth of coverage. Average rainfall is 300-650 millimetres. Precipitation was probably the first hydrological phenomenon to have been recorded by man. There are certain difficulties which come in the way of accurate measurement of precipitation. So, the precipitation is measured by an

instrument called as ‘rain gauge’. Average annual precipitation over the whole globe is about 86 cm, of which 77% falls on the oceans and 23% on land.

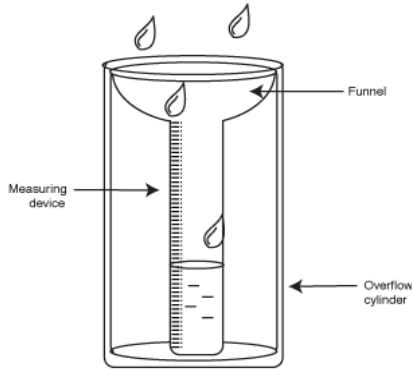


Fig 1.1: Rain Gauge

Avg.annual precipitation received in India =  $4000 \text{ km}^3$

1. Immediately lost to the atmosphere =  $700 \text{ km}^3$
2. Soaks into the ground =  $2150 \text{ km}^3$
3. Flow of surface runoff =  $1150 \text{ km}^3$

## 2. RAINFALL INTENSITY

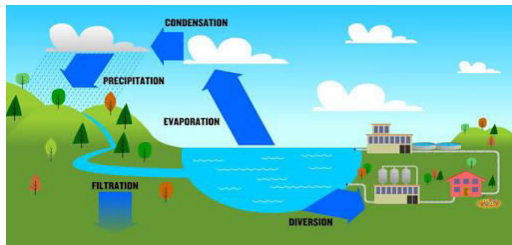


Fig 2.1: Hydrological Cycle

“The intensity of rainfall is a measure of the amount of rain that falls over time. The intensity of rain is measured in the height of the water layer covering the ground in a period of time. It means that if the rain stays where it falls, it would form a layer of a certain height”. Rainfall intensity is classified according to the rate of precipitation:

1. Light rain – when the precipitation rate is  $< 2.5 \text{ mm (0.098 in)}$  per hour.

2. Moderate rain – when the precipitation rate is between  $2.5 \text{ mm (0.098 in)}$  to  $7.6 \text{ mm (0.30 in)}$  or  $10 \text{ mm (0.39 in)}$  per hour.

3. Heavy rain – when the precipitation rate is  $> 7.6 \text{ mm (0.30 in)}$  per hour or between  $10 \text{ mm (0.39 in)}$  and  $50 \text{ mm (2.0 in)}$  per hour.

4. Violent rain – when the precipitation rate is  $> 50 \text{ mm (2.0 in)}$  per hour.

“One millimetre of rainfall is the equivalent of one litre of water per square metre.

## 3. RAIN GAUGE

A rain gauge is an instrument which is measure the amount of liquid precipitation over a set period time. There are two types of rain gauge; they are recording and non- recording type. Our project is about non – recording type

rain gauge which is standard rain gauge. This is a straight forward device and quite easy to use.



Fig 3.1: Standard Rain Gauge

## 4. DATA COLLECTED

The rainfall data’s are collected from PWD office, Mayiladuthurai. The collected data’s are very helpful to study of rainfall and identify the seasonal variation. The seasonal variation is plotted in forms of graphical representation.

- 4.1 Yearly data’s – from 1990 to 2017

Year	Rainfall in mm	Year	Rainfall in mm
1990	1114	2004	1631.1
1991	1017	2005	1689.9
1992	1197.4	2006	1141.4
1993	1724	2007	1493.5
1994	959.9	2008	1932.5
1995	928.1	2009	1965.8
1996	1988.6	2010	1639.6
1997	2003.7	2011	1127.8
1998	1329.6	2012	790.5
1999	1119.2	2013	1243
2000	1532.7	2014	1403
2001	1160.8	2015	1694
2002	1534.4	2016	699.7
2003	1081.7	2017	1326.5

Table 4.1-Yearly rainfall data

4.1.1 Yearly data's in graphical representation:

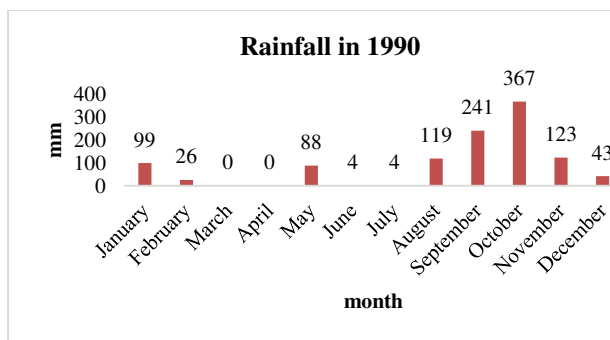


Fig 4.1 Rainfall in 1990

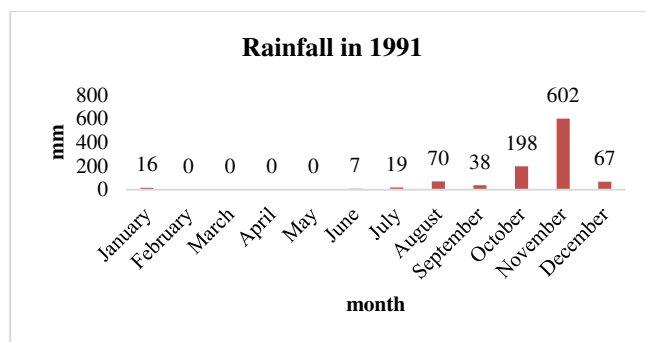


Fig 4.2 Rainfall in 1991

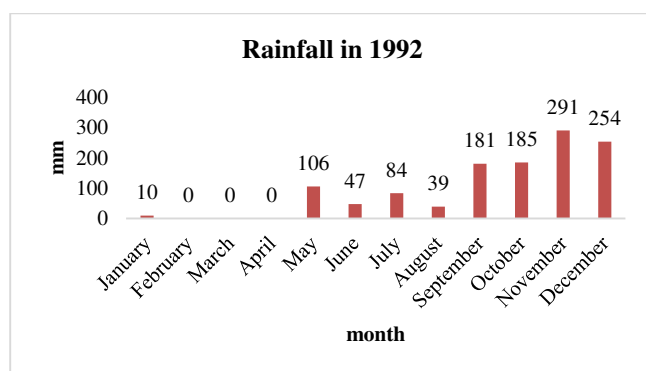


Fig 4.3 Rainfall in 1992

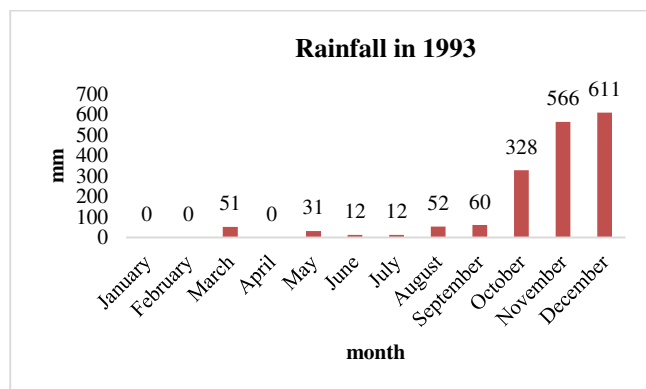


Fig 4.4 Rainfall in 1993

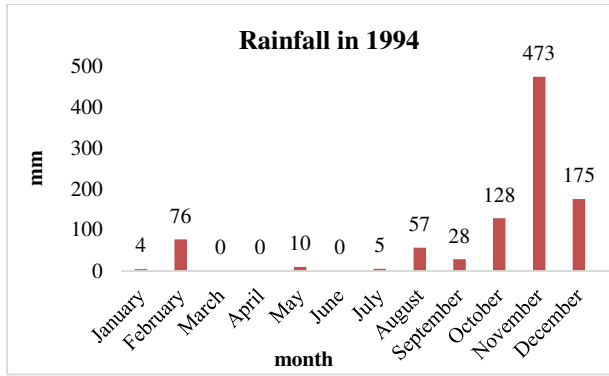


Fig 4.5 Rainfall in 1994

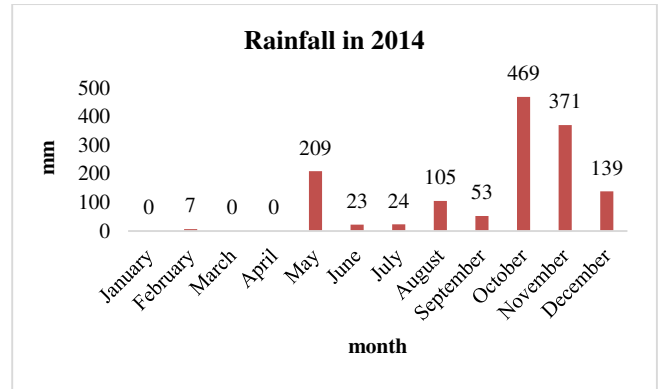


Fig 4.9 Rainfall in 2014

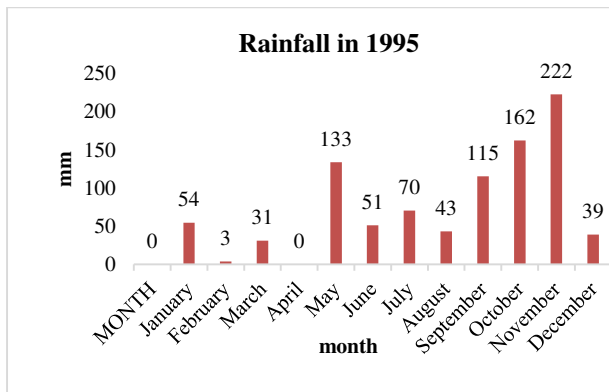


Fig 4.6 Rainfall in 1995

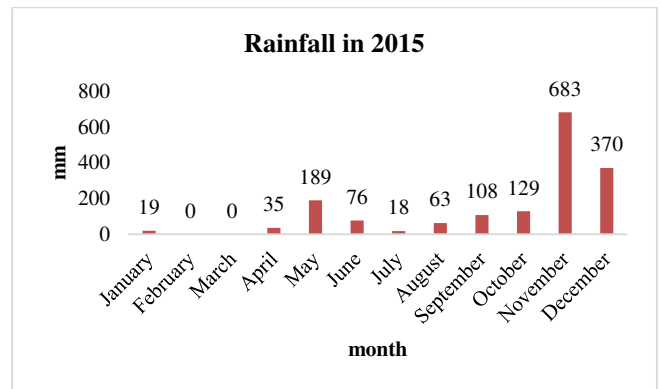


Fig 4.10 Rainfall in 2015

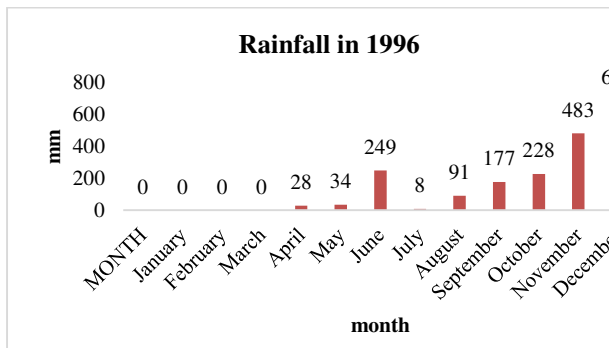


Fig 4.7 Rainfall in 1996

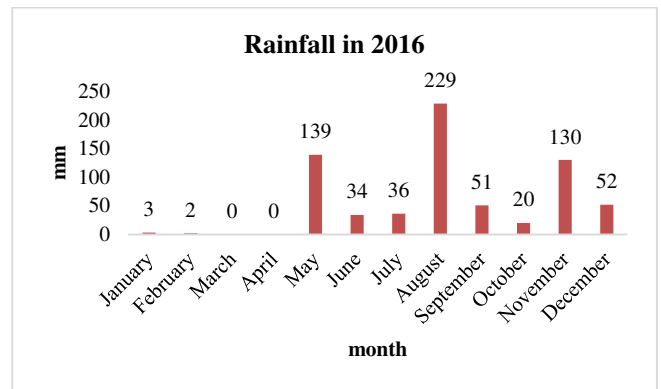


Fig 4.11 Rainfall in 2016

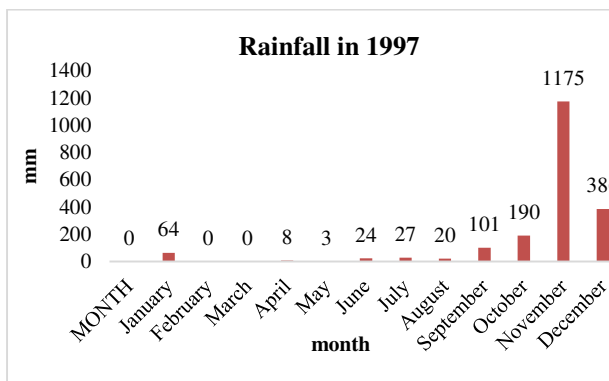


Fig 4.8 Rainfall in 1997

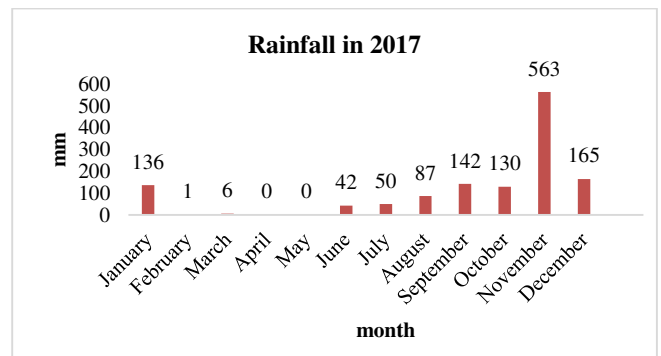


Fig 4.12 Rainfall in 2017

We consider the graphs for the years (1990 - 1997) and (2014 - 2017). In the year 1990 – 1997 the maximum rainfall during the year 1997 with the intensity of 2003.7mm. In the year 2014 – 2017 the minimum rainfall during the year 2016 with the intensity of 699.7mm. The details are taken from the Mayiladuthurai Taluk.

4.1.2 Comparison (1990-2017)

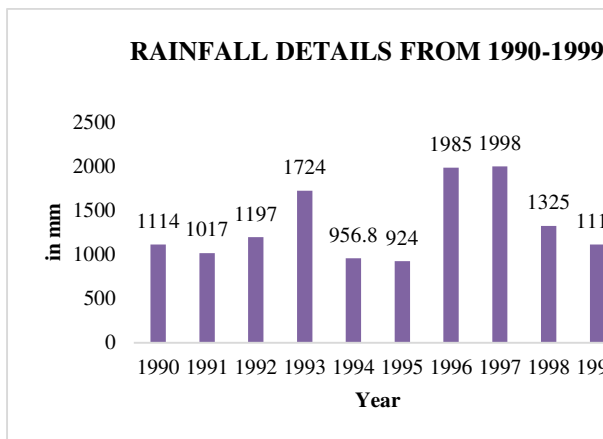


Fig 4.13 Rainfall Details from 1990 - 1999

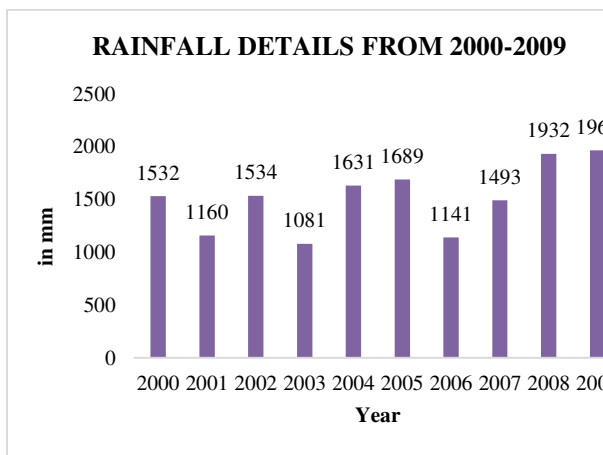


Fig 4.14 Rainfall Details from 2000 - 2009

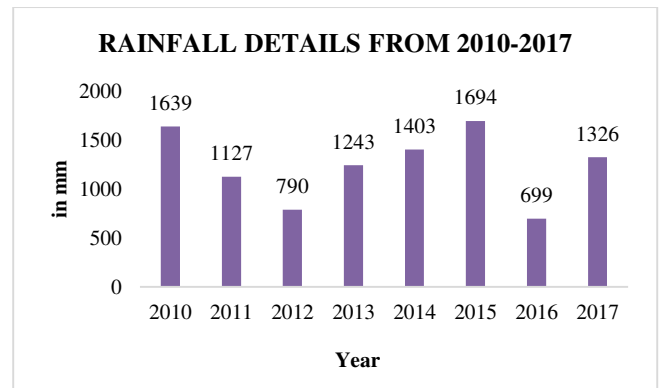


Fig 4.15 Rainfall Details from 2010 – 2017

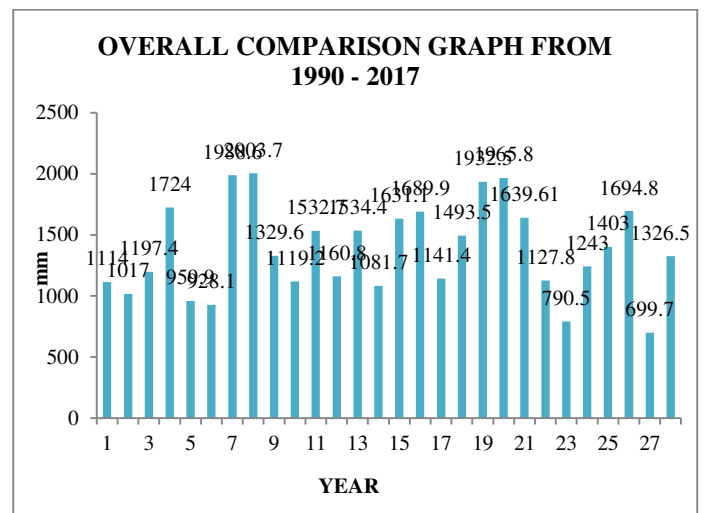


Fig 4.16 Overall Comparison Graph from 2010-2017

4.2 Cyclone details – from 2005 to 2017

Year	Cyclone name	Cyclone formed	Cyclone dissipated	Damages	Death toll	Areas affected
2005	Fanoos	December 6	December 10	Crops	-	Tamilnadu
2008	Nisha	November 25	November 29	\$800 million	204	Srilanka, Tamilnadu
2010	Jal	November 1	November 12	\$1.73 billion	118	Malaysia, Thailand, India,
2011	Thane	December 25	December 31	\$235 million	92	Tamilnadu, Pondicherry, Cuddalore
2013	Nilam	October 28	November 1	\$56.7 million	75	Srilanka, Tamilnadu, Andhra Pradesh
2016	Vardah	December 6	December 13	\$5.87 billion	38	South India, Malaysia, Srilanka.
2017	Ockhi	November 29	December 6	>\$5.07 billion	309	Tamilnadu, Kerala, Lakshadweep.

Table 4.2 Cyclone Details

**5. INSTRUMENT IMPLEMENTATION PROCESS IN OUR INSTITUTION**

The steps to be followed in the installation process:

1. Preliminary survey and Site clearance
2. Then, levelling should be done by taking temporary benchmark.
3. The plain cement concrete is laid.
4. It was supported by brickwork.
5. Finally, the whole instrument setup to be implemented.



Fig 5.1: Rain gauge instrument for our institution



Fig 5.2: Proposed site for our institution



Fig 5.3: Site Excavation for Proceeding our Installation Work



Fig 5.4: PCC Work



Fig 5.5 Basement using concrete cubes



Fig 5.6 Rain gauge setup in our college

## 6. CONCLUSION

In this study of rainfall in the Mayiladuthurai Taluk for past 28 years is carefully studied and the charts are prepared, based on the intensity of rainfall. With reference to the collected data and

charts the maximum rainfall in the year of 1997 with the intensity of 2003.7mm and the minimum rainfall in the year of 2016 with the intensity of 699.7mm. Then a Standard rain gauge is implemented in our institution as per IS code. The knowledge gained from this project will help us to take up similar projects with courage and confidence in future course of actions.

## 7. RECOMMENDATIONS

In our institution, the standard rain gauge will convert as recording type of rain gauge, or any other advanced type for measuring rainfall.

## 8. REFERENCE

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