
Hydroinformatics Assignment 1

Presentation

Team Number - 5

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Dataset

Datasets are multidimensional of dimensions 121x121x768.

We take spatial resolution of 0.25x0.25.

Now for latitude we have the two extremes of 6.5N to 38.5N. Thus the total dimensions needed is $(38.5-6.5)/0.25 = 129$. Similarly for longitude we have extremes at 66.5 E to 100 E. Thus total dimensions needed is $(100-66.5)/0.25 = 135$. However we only take 121 dimensions. We have data for 64 years (1951-2014) sampled monthly. Thus the third dimensions is $12 \times 64 = 768$.

Dataset

1. PET_India.mat

It contains information about Potential Evapotranspiration. It is the potential evaporation from soils plus transpiration by plants.

2. rain_India.mat

It contains information about rainfall or Precipitation across various regions.

Problem Statements

- 1) To classify water-energy limited zones of India.
- 2) To study the variability of the landscape's (India) aridity
- 3) To study the variability of water security of India
 - a) Spatial variability
 - b) Temporal variability

Problem Explanation

- Water and energy limited zones
 - ◆ $P < PET \Rightarrow$ Water Limited
 - ◆ $P > PET \Rightarrow$ Energy Limited
- Aridity
 - ◆ The ratio of PET/P is known as aridity. Based on its value regions can be classified into four categories.
- Spatial variability
 - ◆ Analyze change in water security and aridity across different regions of India.
- Temporal variability
 - ◆ Analyze yearly change in water security and aridity across India.

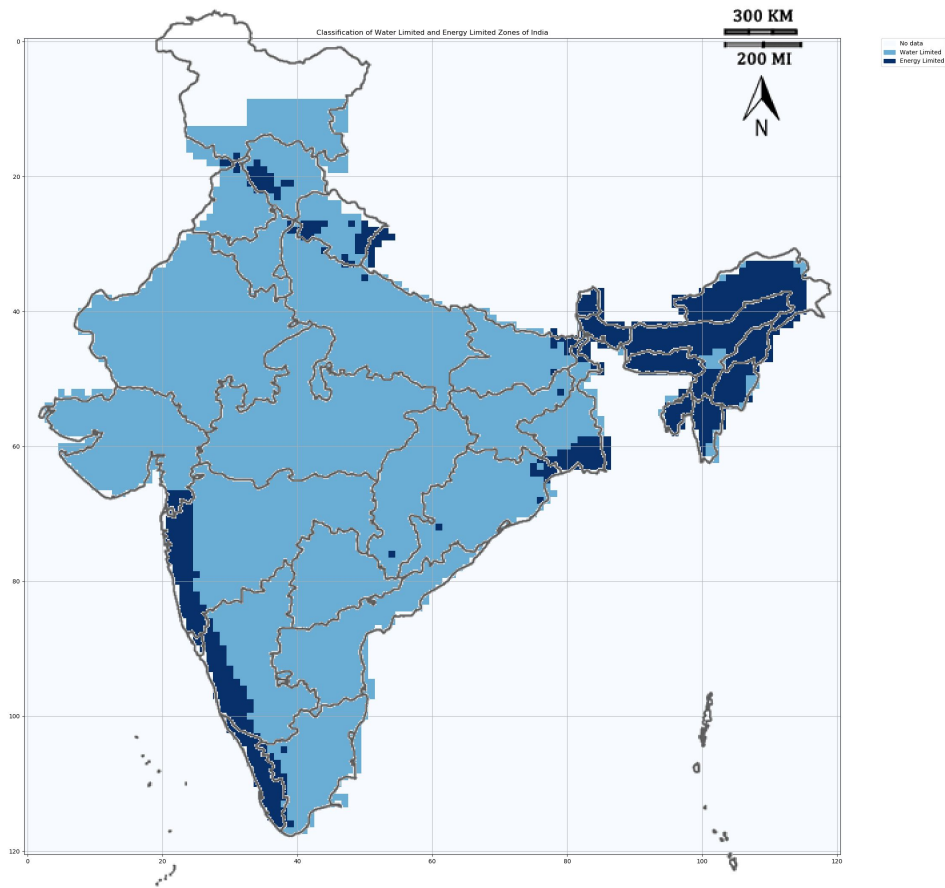
Our Approach

- 1) To classify water-energy limited zones of India.

A binary classification approach was considered for the value of P-PET over the complete space (excluding areas where P-PET = 0, as that indicates missing data/ areas outside India)

$P - PET > 0$ ➡ Energy Limited Zones

$P - PET < 0$ ➡ Water Limited Zones



RESULTS

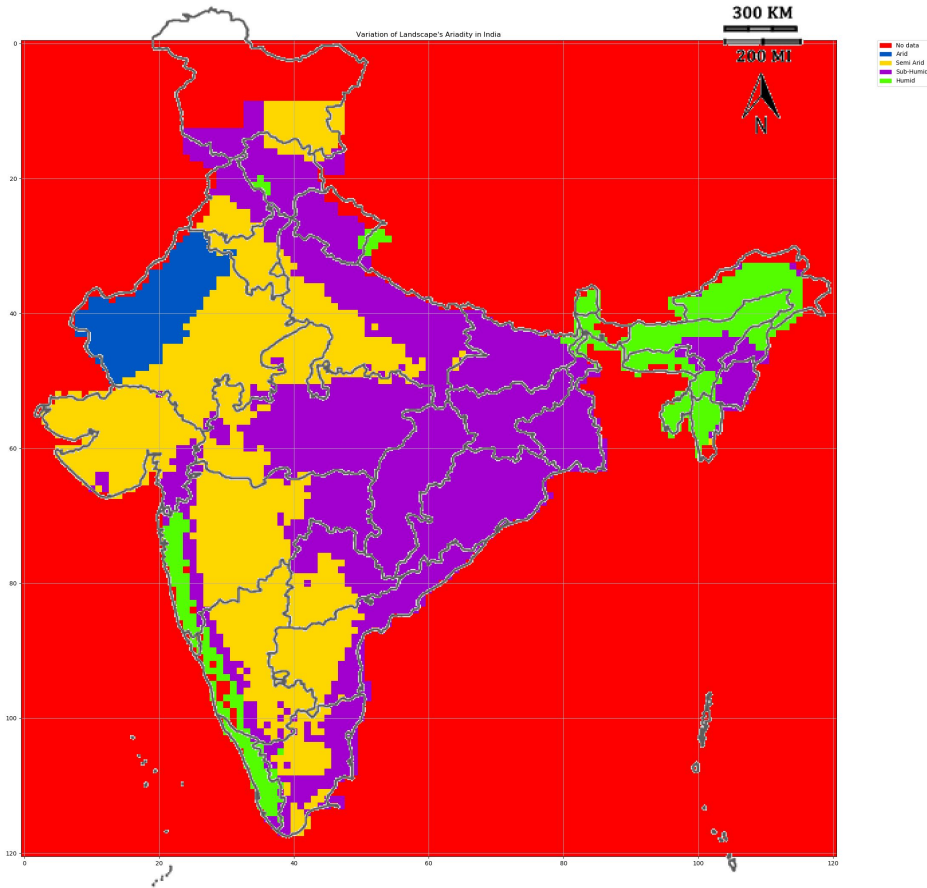
Our Approach

2) To study the variability of the landscape's (India) aridity

The ratio of PET/P was taken over in the complete space excluding the points for which data was not available.

Arid	➡	$5 \leq x < 12$
Semi arid	➡	$2 \leq x < 5$
Sub humid	➡	$0.75 \leq x < 2$
Humid	➡	$0.375 \leq x < 0.75$

(where $x = \text{PET}/P$)



RESULTS

Our Approach

3) To study the variability of water security of India

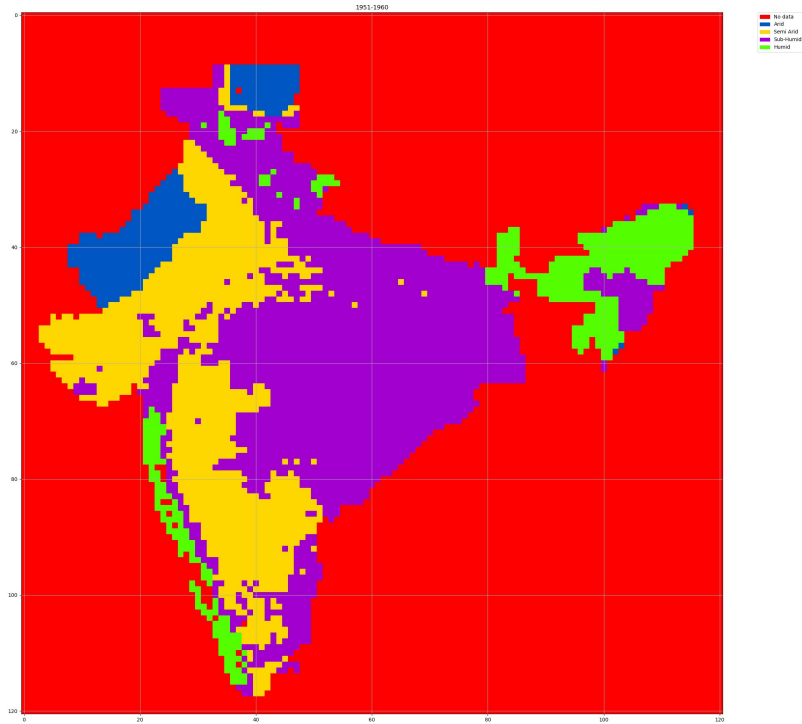
A) Spatial variability

In this part, we have calculated P-PET & P/PET and classified them into various categories according to their values and studied their variation across different regions of India.

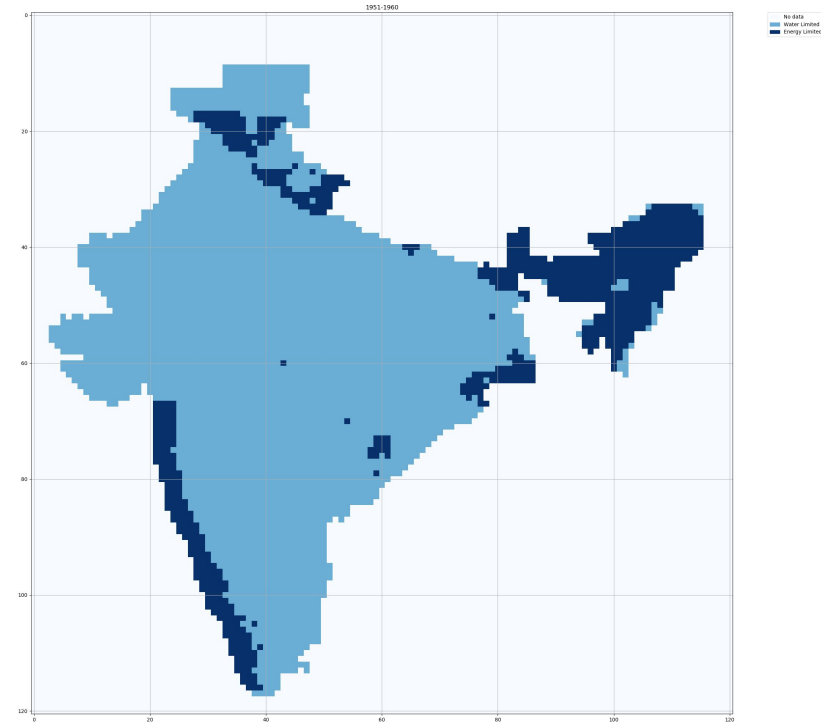
We have also mapped variations in various zones of India across decades to study spatial variability across time.

RESULTS

PET/P

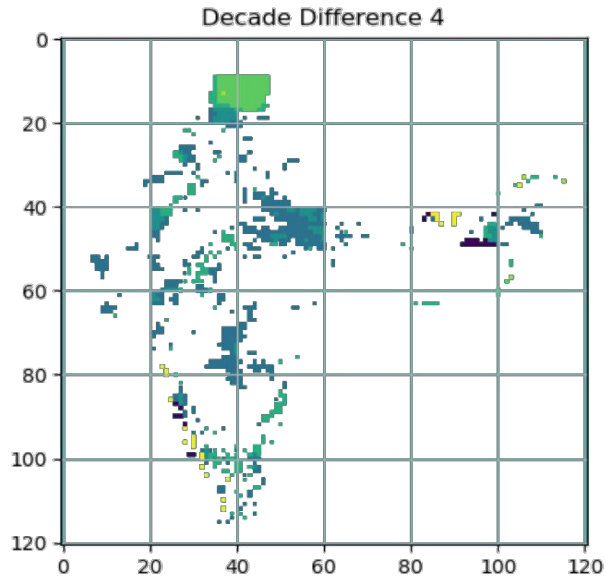


P-PET

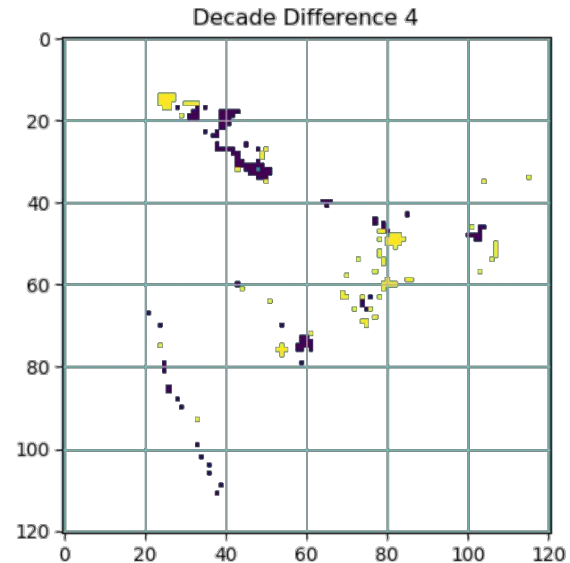


RESULTS

PET/P
Difference for 1991-2000 & 1981-1990



P-PET
Difference for 1991-2000 & 1981-1990



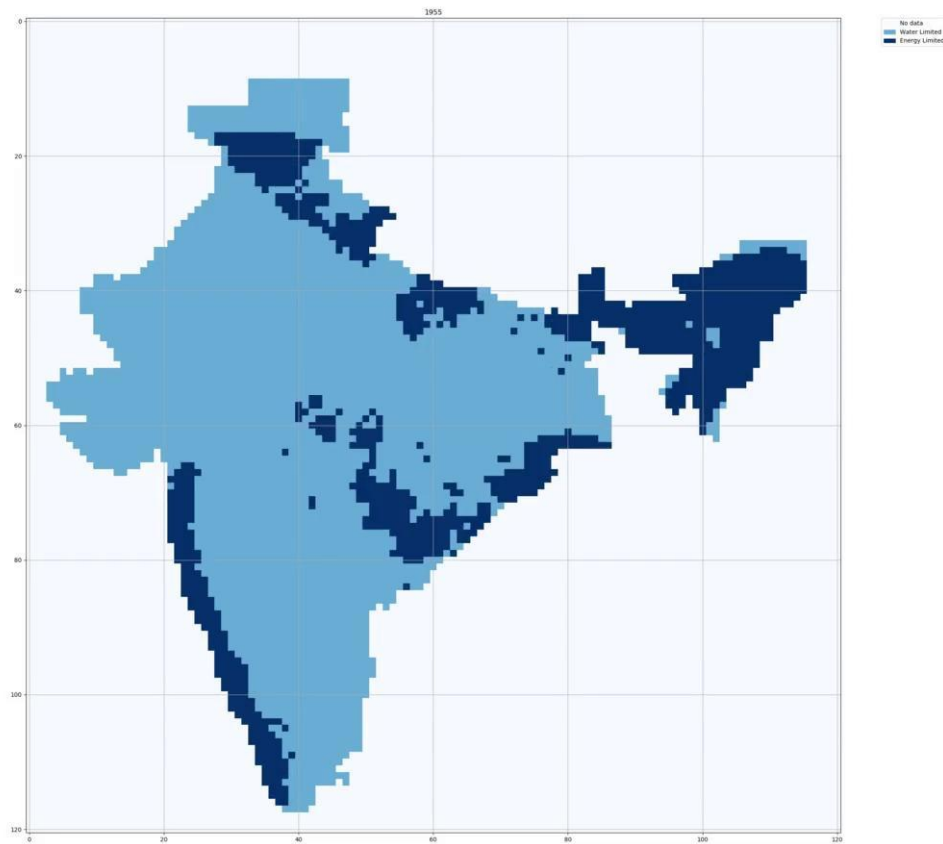
Our Approach

3) To study the variability of water security of India

B) Temporal variability

We have analysed P-PET difference and P/PET ratio for each year and studied the changes over time by creating a video.

RESULTS



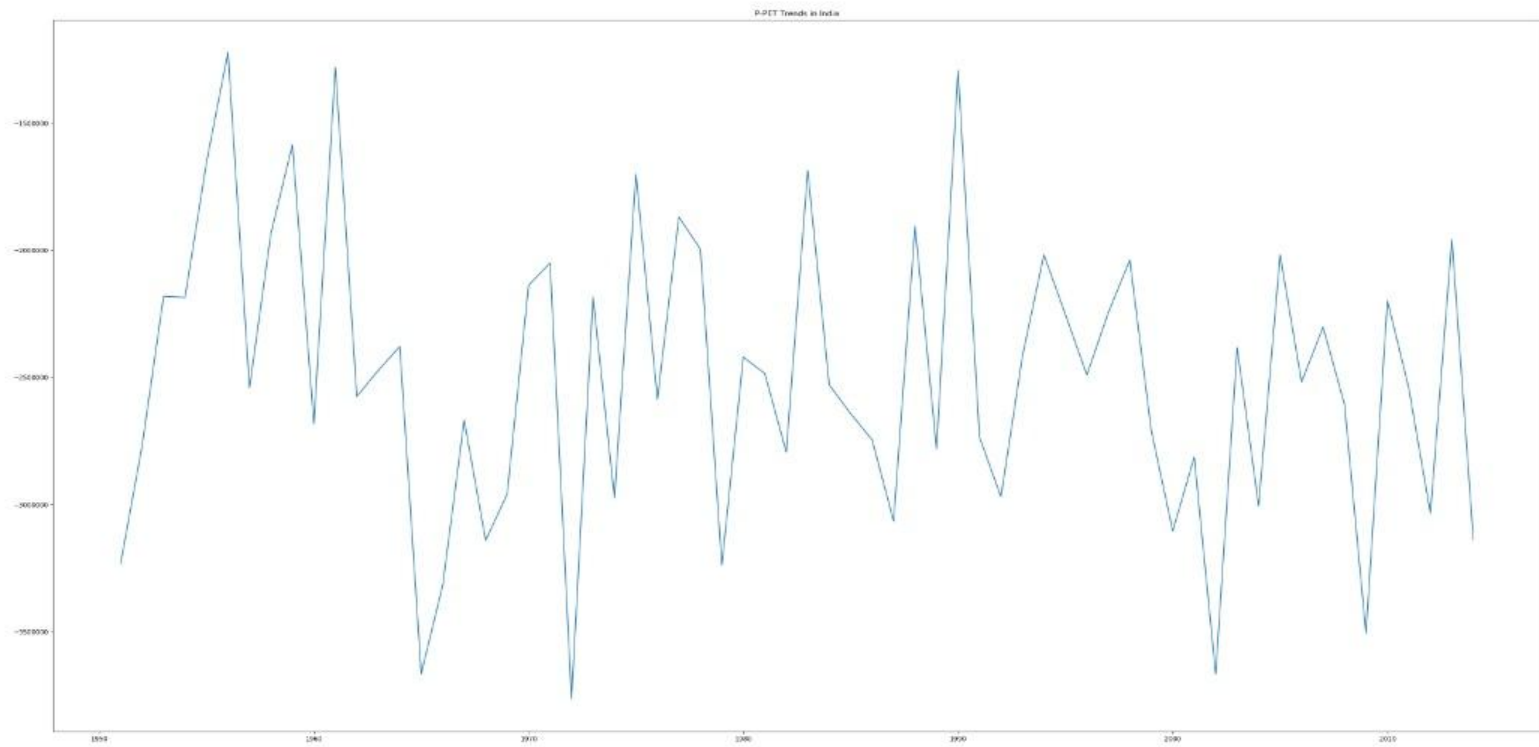
RESULTS

Algorithms Used

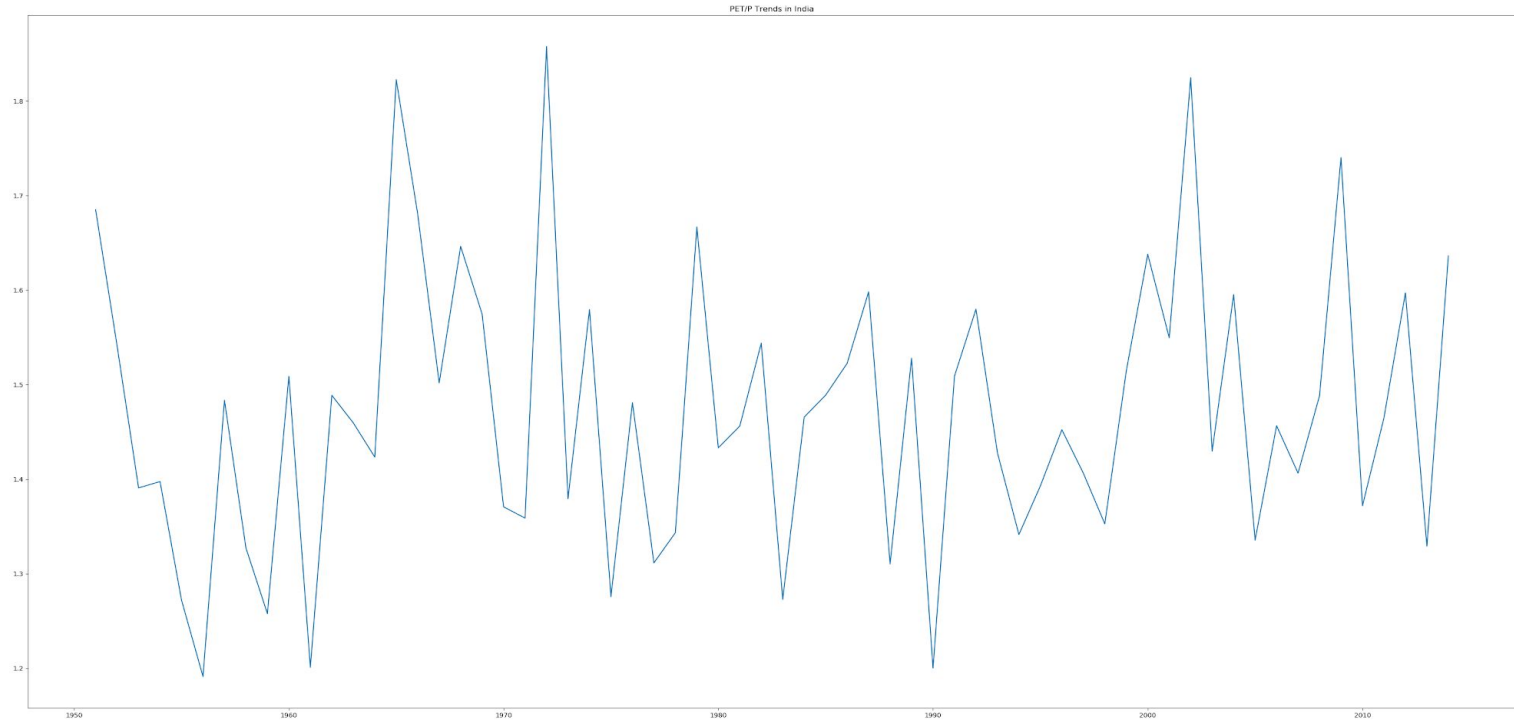
No particular algorithms were required. Just basic knowledge of hydroinformatics was used to generate the results.

Extra Analysis

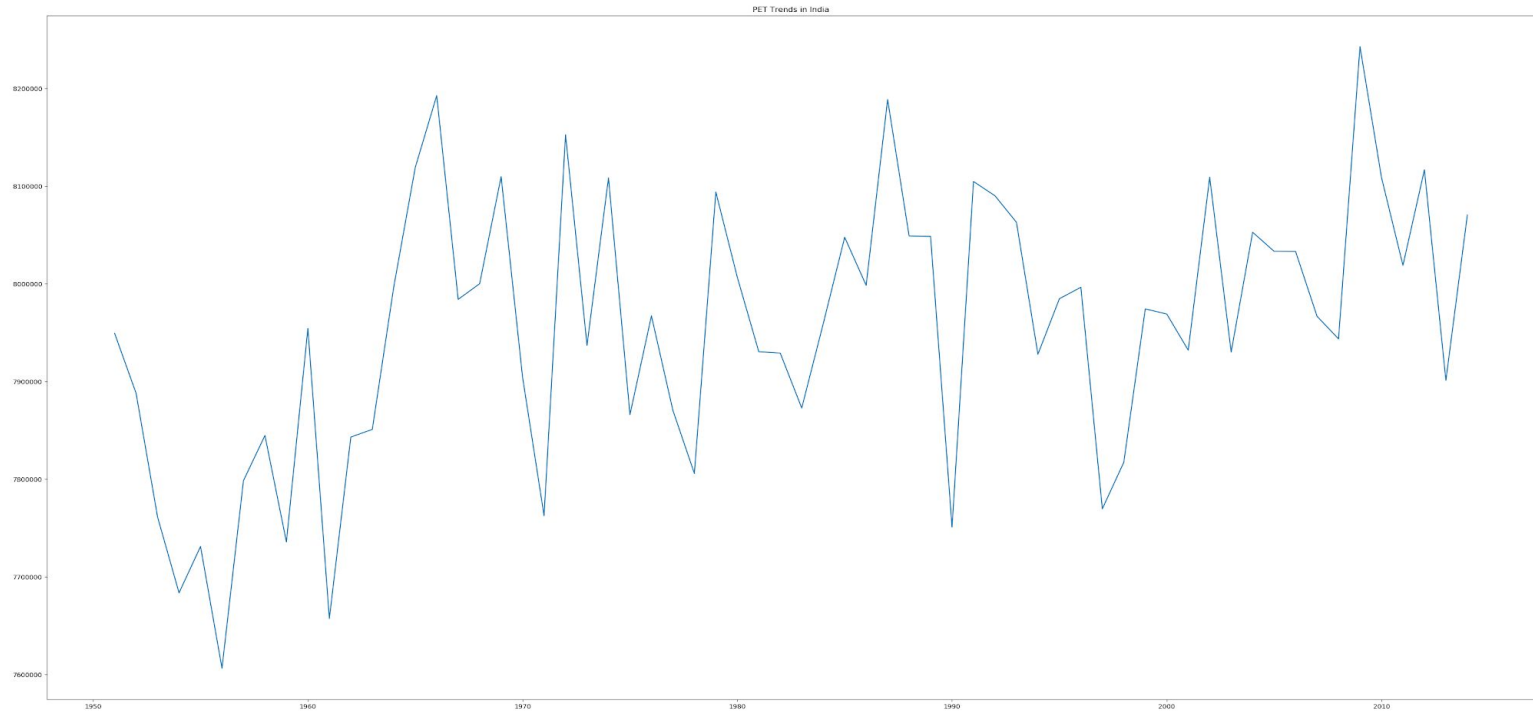
We plotted the time series of P-PET , PET/P , P and PET values to look for any particular trend in the dataset.



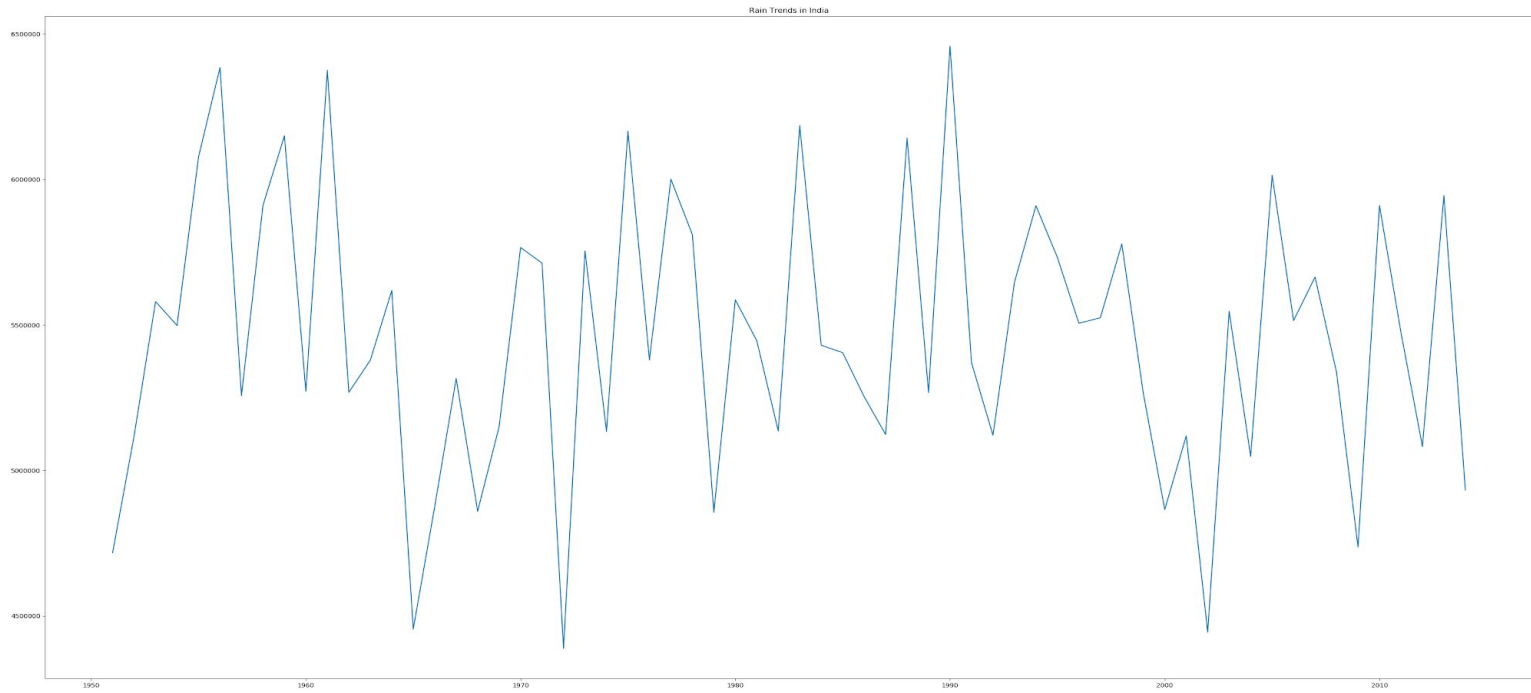
P-PET trends



PET/P trends



PET trends



P trends



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