Forecasting Water Levels in Chennai India

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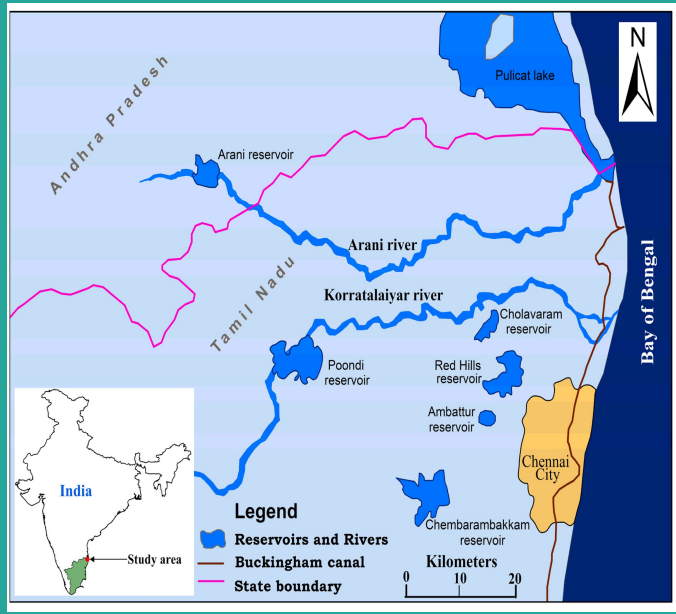
By Asher Lewis

75% of People Don’t have Access to Clean water

Crisis struck in Chennai,India on June 19, 2019 when the water ran out.



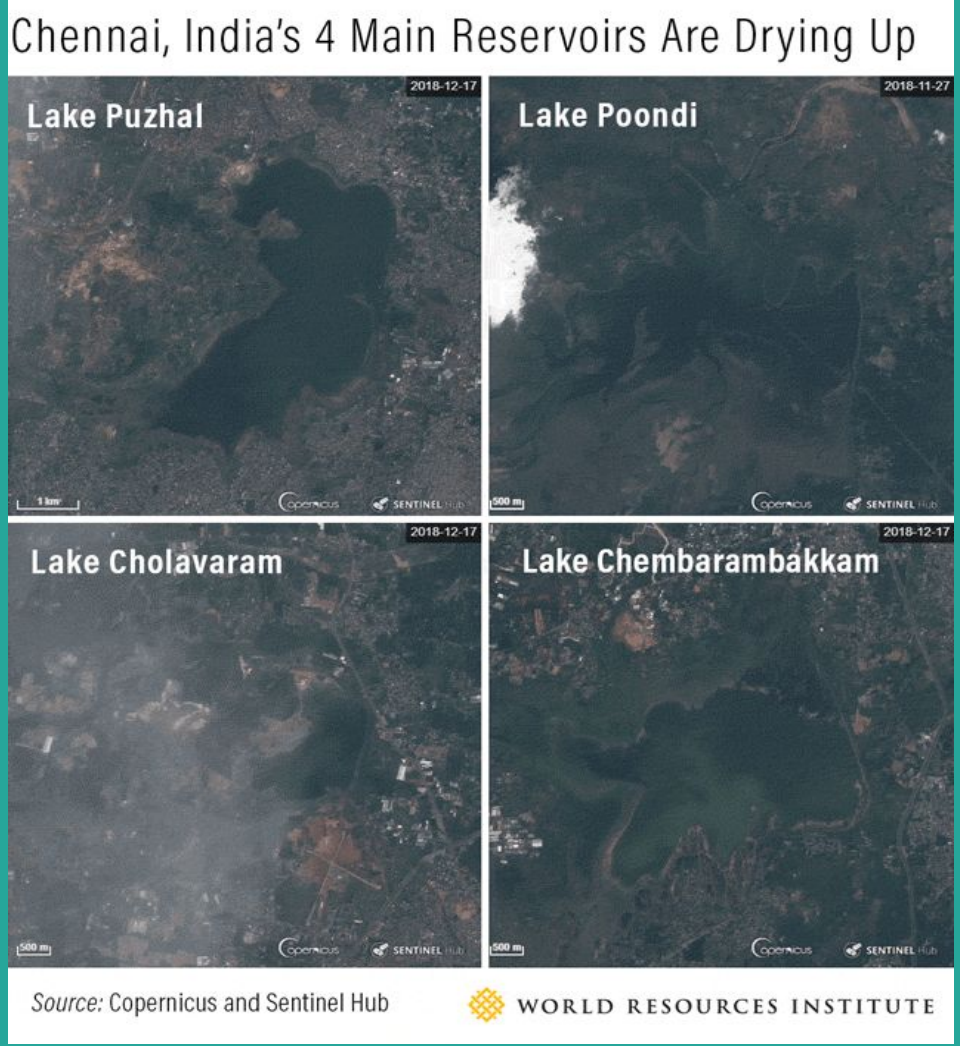
Our Problem Statement:

To forecast the average monthly water level for the four main water reservoirs.

Data showed that the reservoirs were at 1% of there capacity

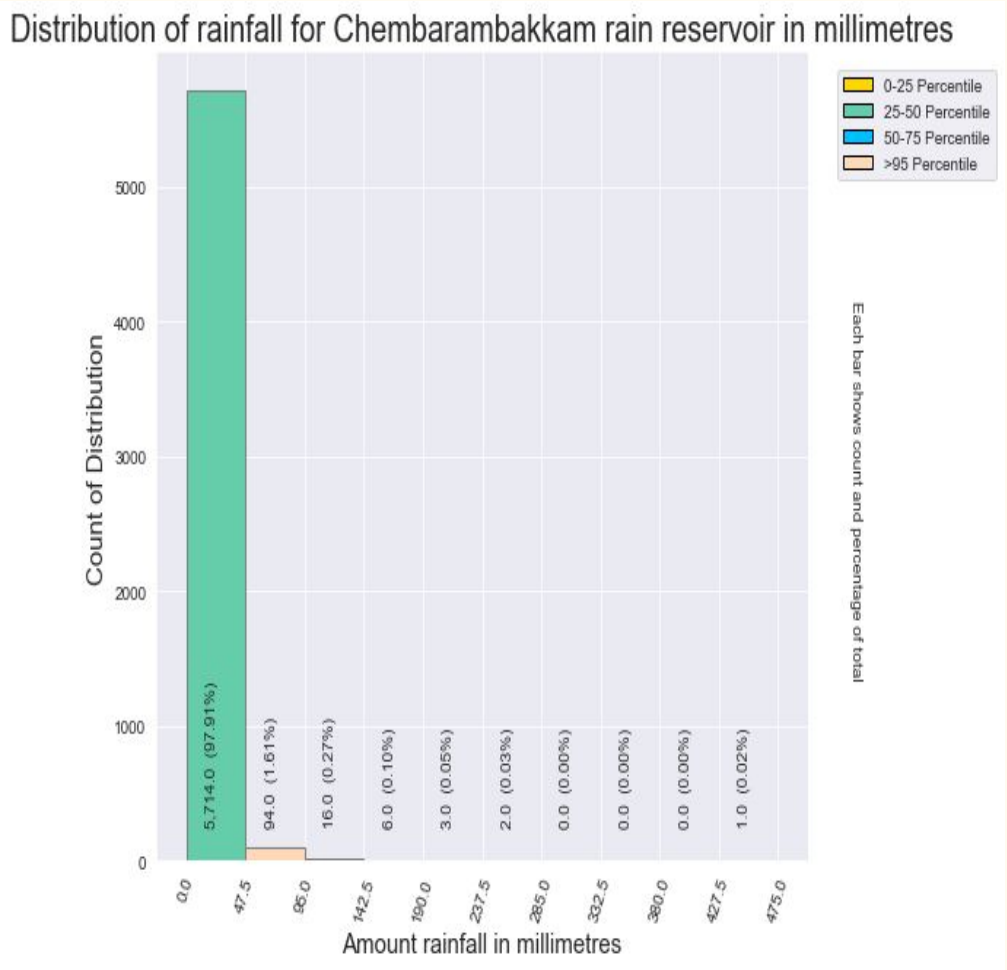
- Redhills-3,300 Mcft
- Poondi - 2573 Mcft
- Chembarambakkam- 3,645 Mcft
- Choveram - 1081 Mcft

A combination of lower than performing monsoons and bad water management led to this crisis.

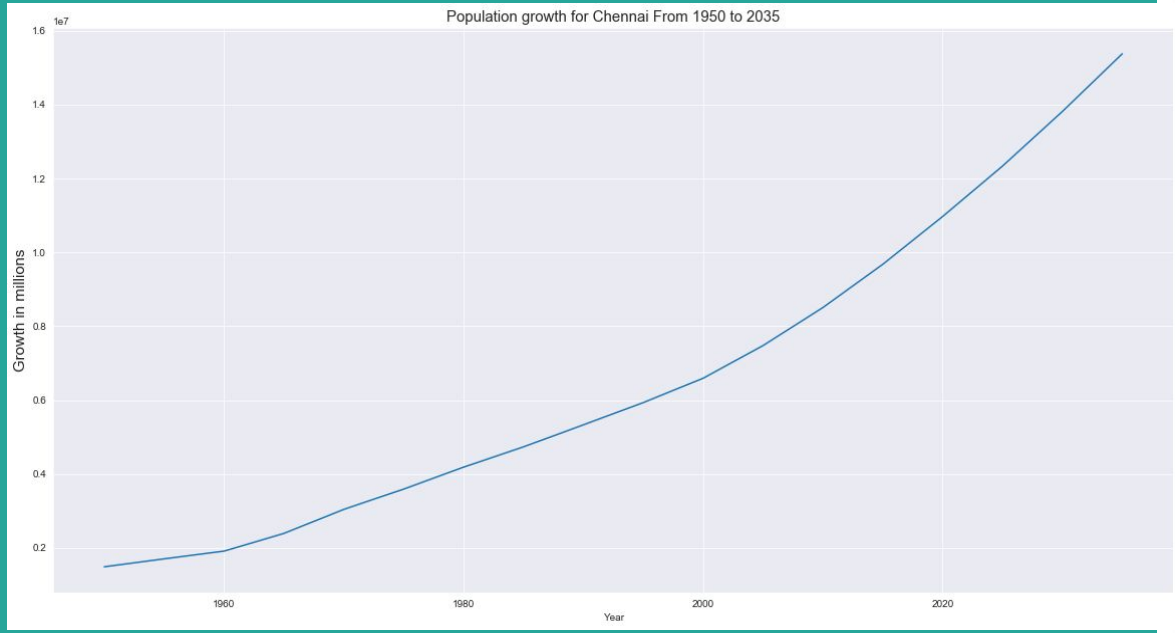


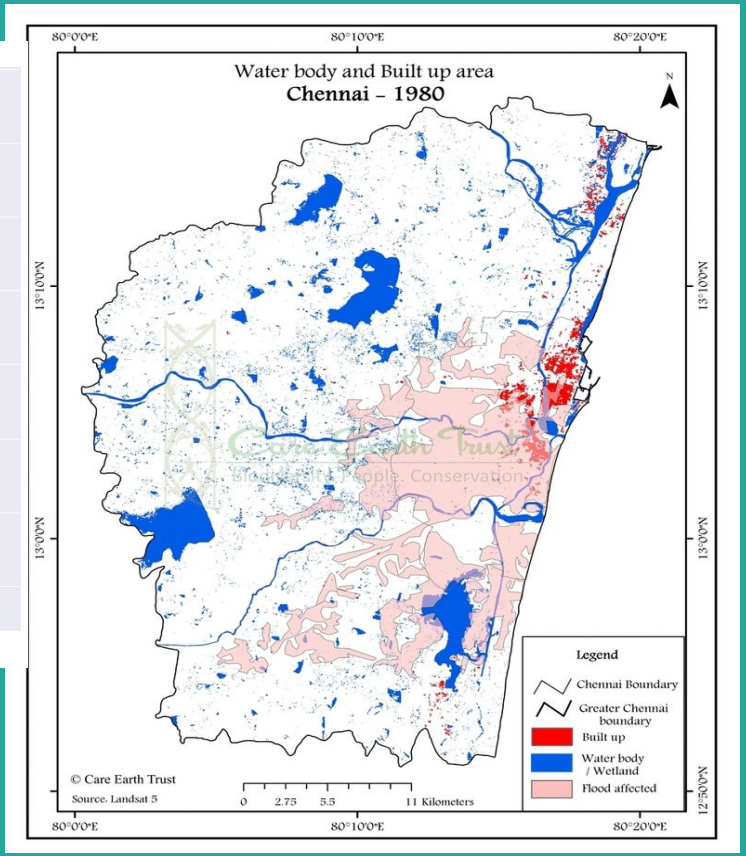
Monsoon

1. Part of what makes the city so sensitive to drought is the weather pattern.
2. Chennai gets an average of 54 days of rain.
3. The monsoon lasts from June to September and October-November



Population Growth





Factories and infrastructure built in the catchments of these reservoirs were unregulated.

Water levels on the day of the Crisis

The water level was less because of silt and a hot summer

Estimated need of 830 Million liters per day

Every drop counts

The CMWSSB has arranged 9,400 lorry trips a day by hiring 900 water lorries in the city

Storage position of city reservoirs

Lakes	Full storage capacity (in Mcft)	Storage as on June 16, 2019 (in Mcft)
Poondi	3,231	26
Cholavaram	1,081	0
Red Hills	3,300	0
Chembarambakkam	3,645	1
Sub total	**11,257**	**27**
Veeranam	1,465	569
Total	**12,722**	**596**

Sources of water supply

Water source	MLD
Desalination	180
Veeranam and NLC acquifer	180
Tamaraipakkam, Poondi & Minjur agricultural wells	95
CMWSSB borewells	35
Retteri Lake	10
Total	**500**

Source: Data submitted by CMWSSB in the Madras High Court

Workflow

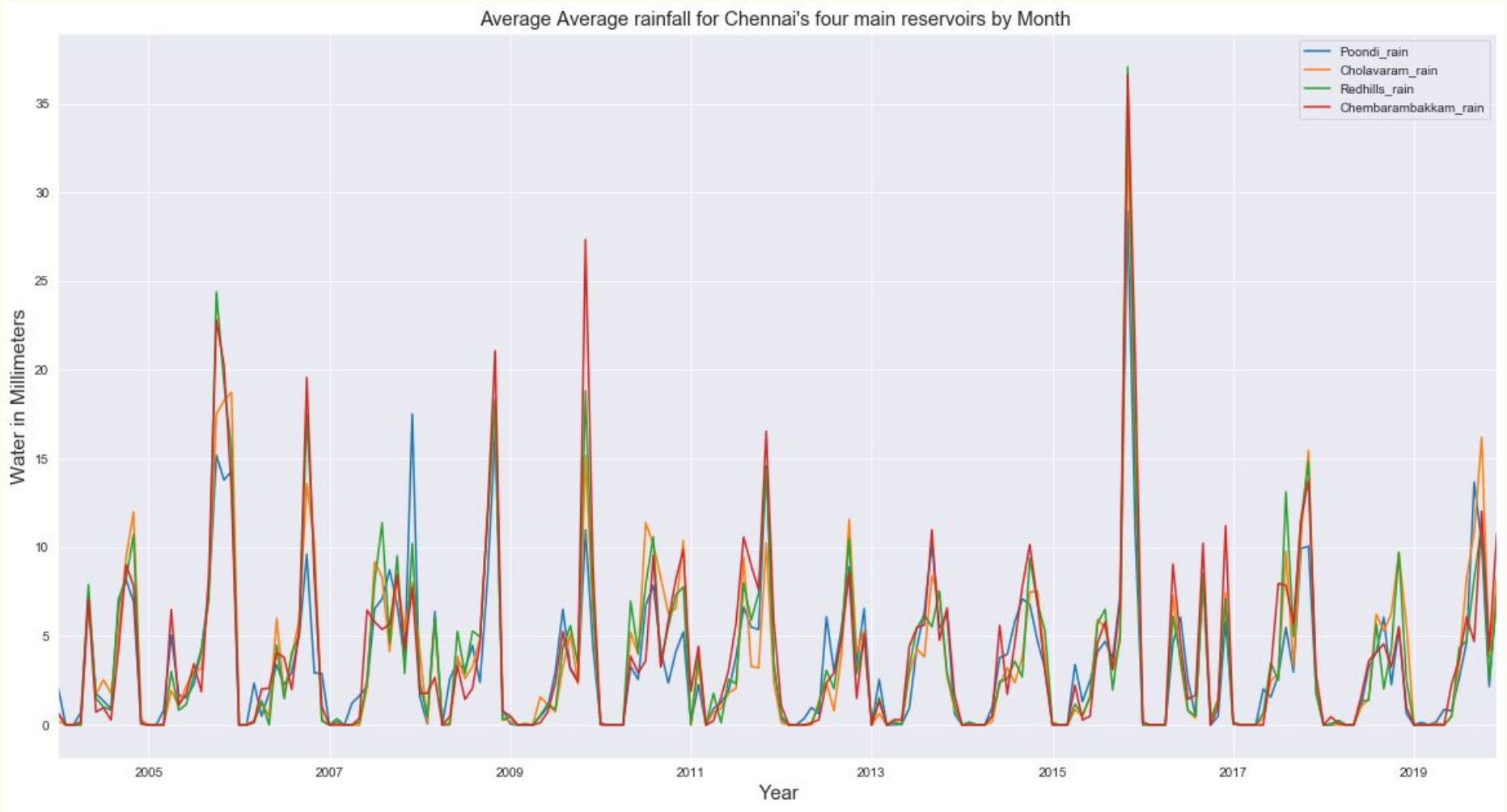
What we did.

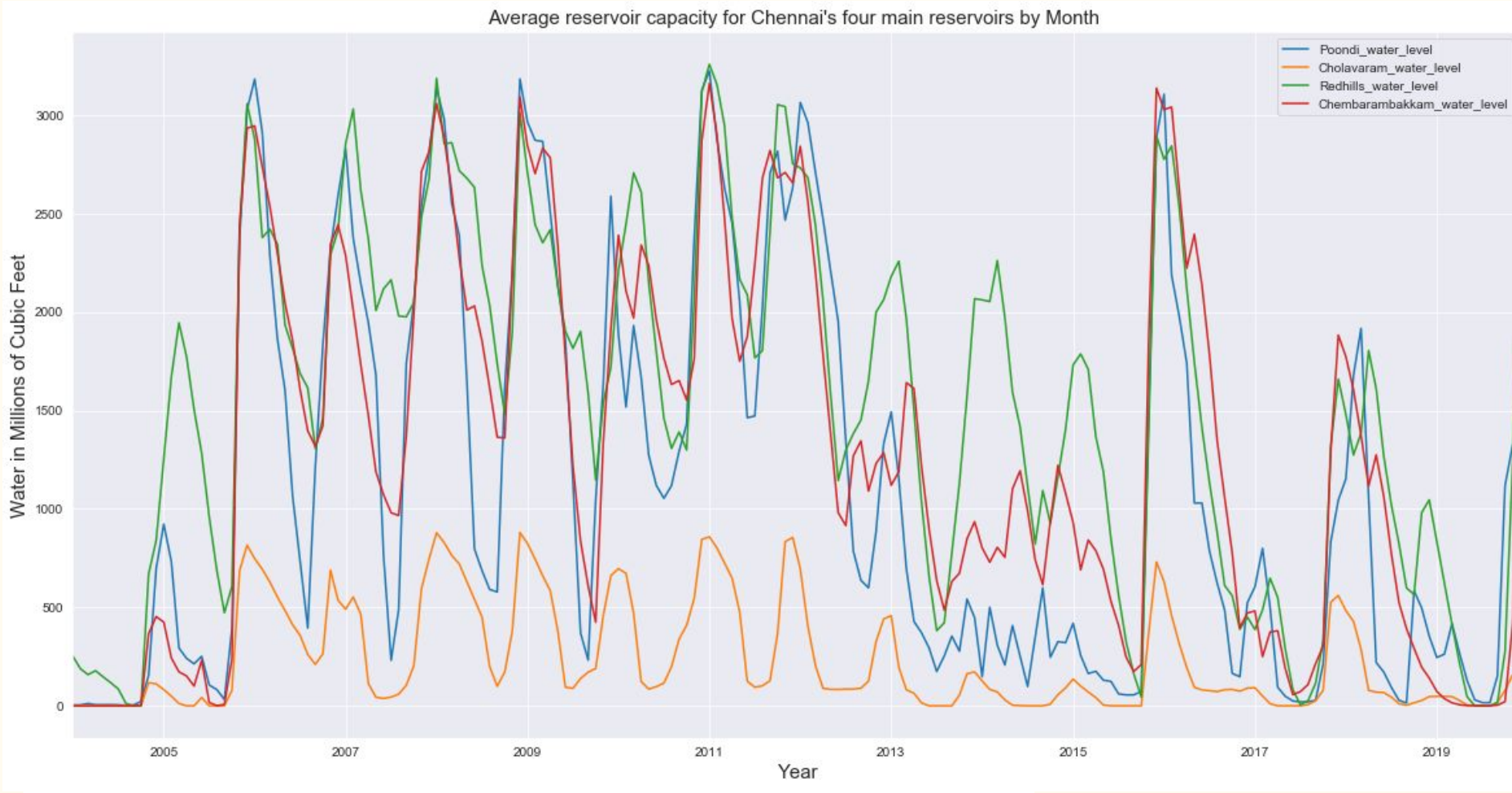
We first ordered are data and formatted it to make it suitable for our purposes

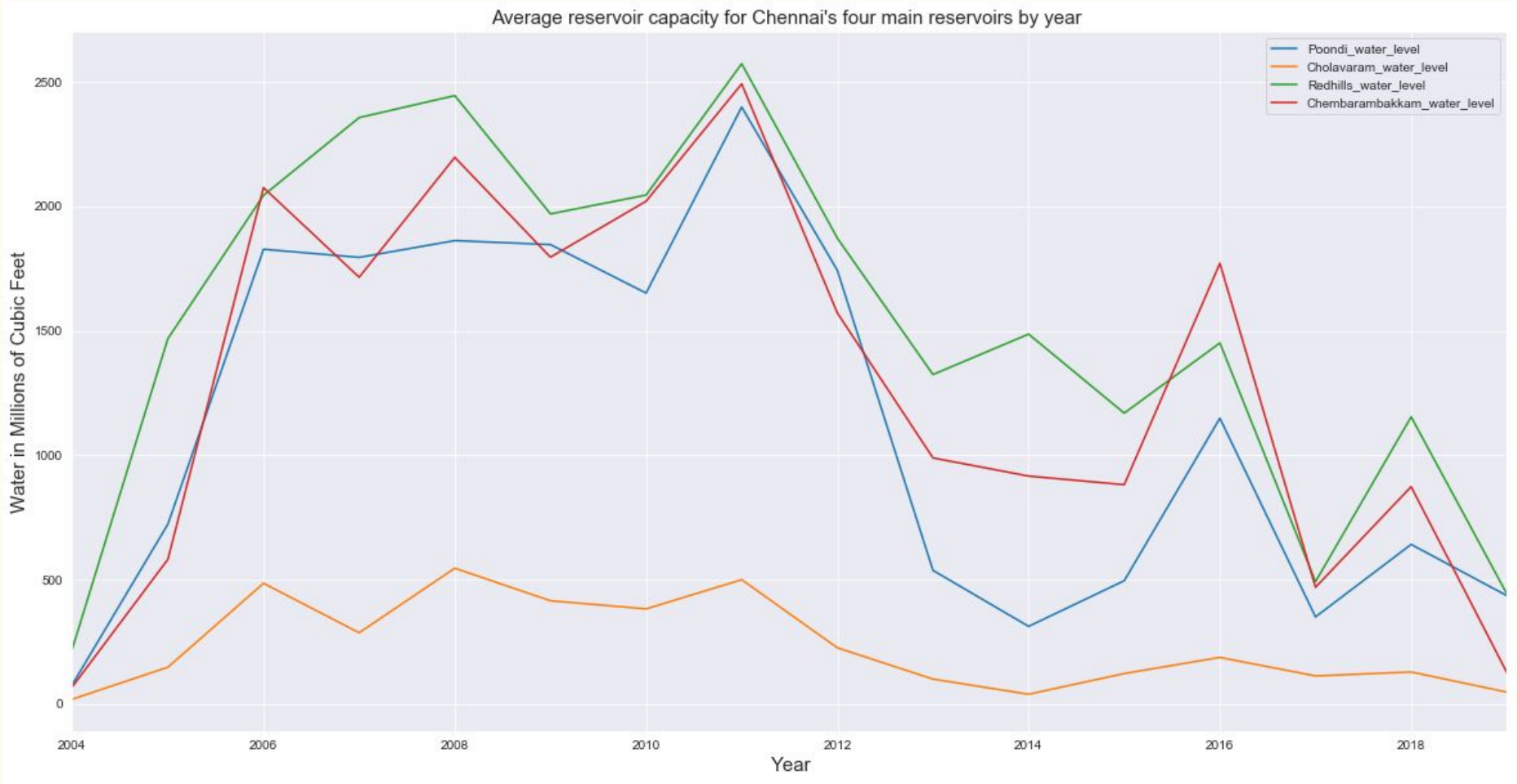
We then visualized it and tried to find some trends.

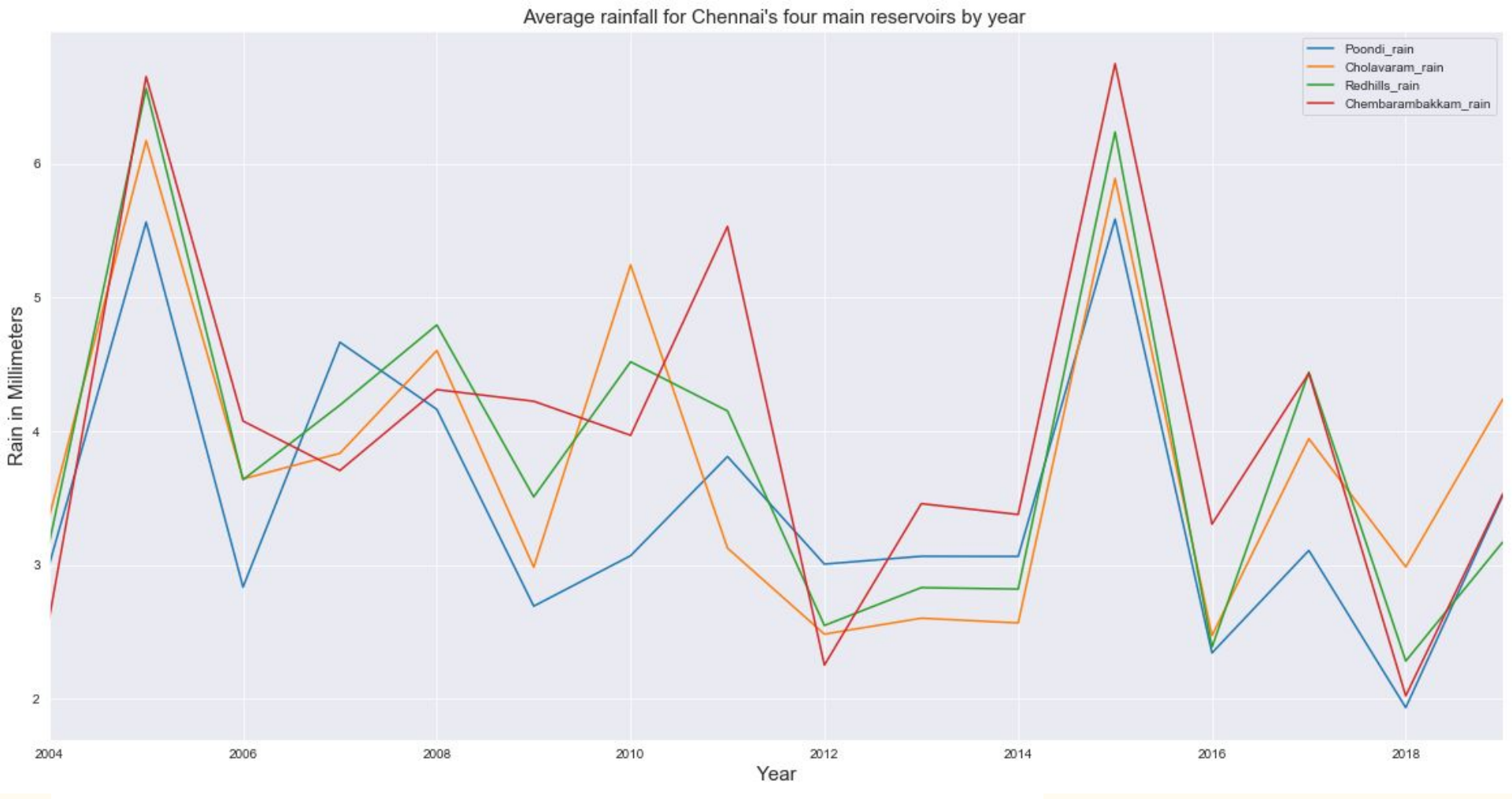
We run several models on the individual reservoirs data to forecast the water level in the reservoirs.

- We added the rain as a feature to one of our models.


Average Average rainfall for Chennai's four main reservoirs by Month
Poondi_rain
Cholavaram_rain
Redhills_rain
Chembarambakkam_rain
Water in Millimeters
0
5
10
15
20
25
30
35
2005
2007
2009
2011
2013
2015
2017
2019
Year


Average reservoir capacity for Chennai's four main reservoirs by Month
Poondi_water_level
Cholavaram_water_level
Redhills_water_level
Chembarambakkam_water_level
Water in Millions of Cubic Feet
0
500
1000
1500
2000
2500
3000
2005
2007
2009
2011
2013
2015
2017
2019
Year


Average reservoir capacity for Chennai's four main reservoirs by year
Poondi_water_level
Cholavaram_water_level
Redhills_water_level
Chembarambakkam_water_level
Water in Millions of Cubic Feet
0
500
1000
1500
2000
2500
2004
2006
2008
2010
2012
2014
2016
2018
Year


Average rainfall for Chennai's four main reservoirs by year
Poondi_rain
Cholavaram_rain
Redhills_rain
Chembarambakkam_rain
Rain in Millimeters
2
3
4
5
6
2004
2006
2008
2010
2012
2014
2016
2018
Year

What we learned.

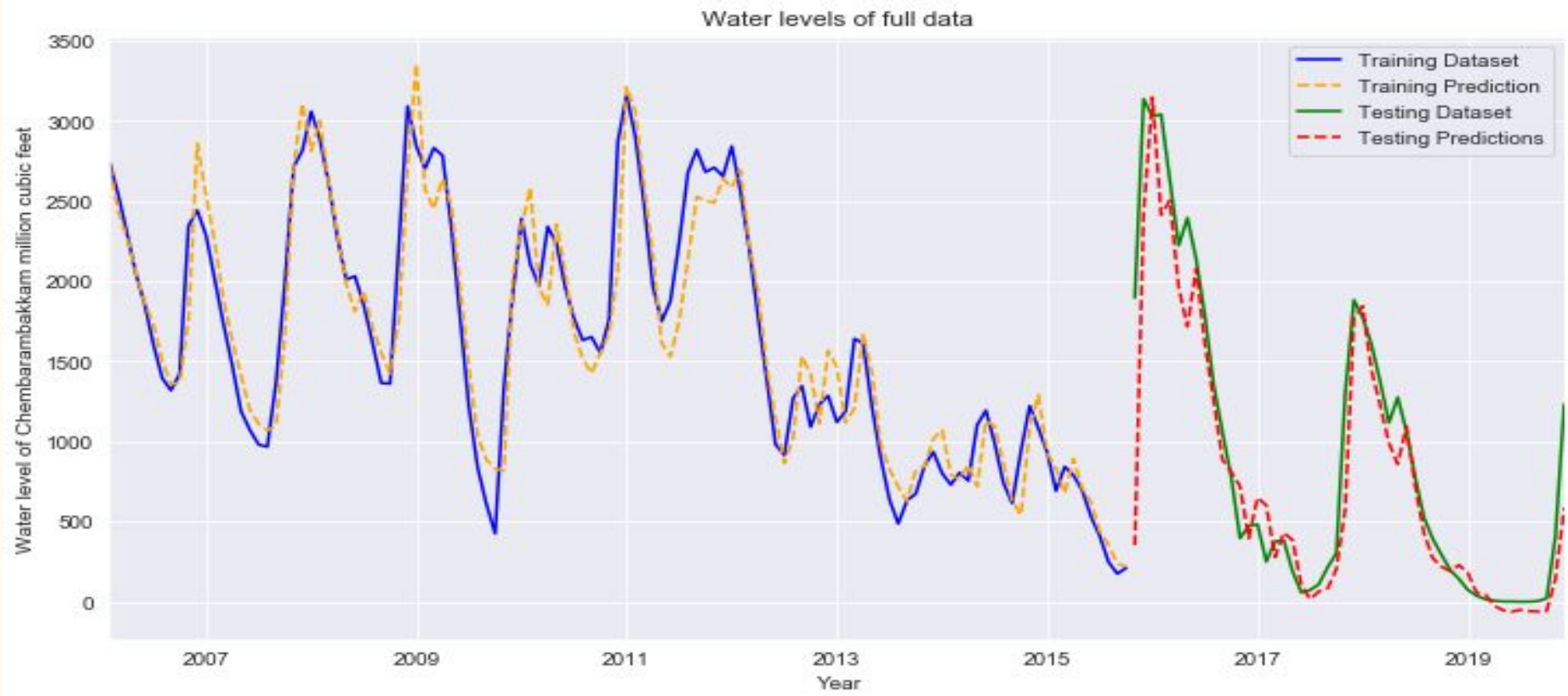
We could see that that is series of ups and downs when the reservoir loses water and then gains water usually in October December

Very little rain led to low reservoirs levels in 2019

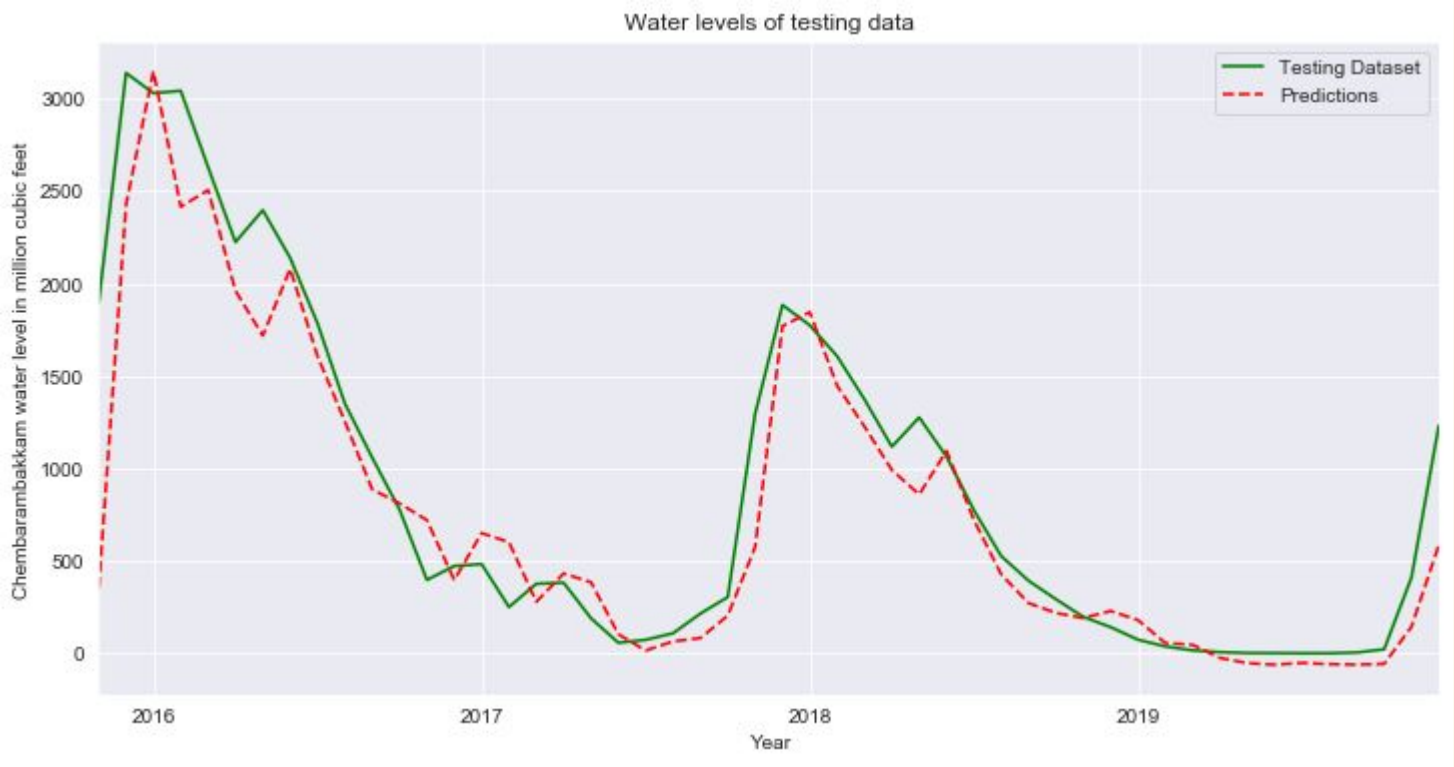
Leading up to 2019

- Spike in 2015 due to record flooding
- There is are some rains the city gets in June, July August and September
- Major rainfall normally happens October and November due to North east Monsoon
- The amount of rainfall in 2018 was the least in the data set

Forecasting the Monthly Average of Chembs



Looking at the Testing data.



Conclusion:

We can say that our model fit to the data pretty well.

Little rainfall leads to low reservoirs levels.

Human development plays a very important part in water scarcity.

The water that falls into during the monsoon needs to be contained better possibly by building more reservoirs.

The city should get more data on how water is consumed.

Water at the end of 2019 will help the city in the short term

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