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Reason Behind Southern India (Tamilnadu) Catastrophic Flood: Natural or Manmade

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Abstract

Water is very vital source for all living beings, without water there is no life possible on the earth. But its mismanagement creates havoc problems such as catastrophic flood and drought. Scarcity of water created drought in many part of world and excess of water created flood. In this study an attempt was made to find out the reason behind the catastrophic flood of Tamilnadu that creates havoc problem in the month of October, November and December 2015. Tropical Rainfall Measuring Mission (TRMM) daily, monthly and annual rainfall data were used to study the average precipitation, its climatology and pattern. This study has been performed to determine the extent of severity in the flood affected districts of Tamil Nadu much as Chennai and other surroundng region. In this article we have also studied the impact of flood in terms of property dammage and life loss that happens in large scale.

Keywords:

Water Mismanagement;
Catastrophic Flood;
Drought;
TRMM;
Precipitation.

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1. Introduction

Water is very vital source for all living beings, without water there is no life possible on the earth. But if it's mismanagement, downpore/heavy rainfall or no rainfall then creates havoc problems such as catastrophic flood and drought. Scarcity of water created drought in many part of world and excess of water created flood. We can define the flood as an overflow process of water that submerges land which is usually dries (Metrology Glossary, 2000). Flooding cause due to overflow of water from water bodies, such as a river or lake, in which the water breaks levees that's why some of that water escaping its usual boundaries because of siltation (Encarta dictionary,

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2009). The overflow of water may occur due to an accumulation of rainwater on saturated ground or due to inadequate drainage facility or encroachment or due to sedimentation in the bottom of water bodies. So, what is the reason behind Chennai catastrophic flood? Is it man made or the climate change impact? The BBC is reported that more than 180 have died in the floods in within 3 to 4 days. According to media till 4thDecember at least 165 people have lost their lives as heavy rains resulted in floods in Tamil Nadu. Chennai has been badly affected by floods in Tamilnadu, in Chennai only more than 100 people have been killed. According to mentioned literature this havoc has been caused due to a depression in the Bay of Bengal coast near Tamil Nadu. The deadliest and heaviest rainfall in over a century in the part of southern india caused massive flooding across Tamil Nadu. This incident (natural cum manmade) driving thousands from their homes, shutting auto factories and paralysing the airport in capital Chennai. To determine the extent of severity in the flood affected districts in Tamil Nadu, Chennai and other surroundng region this study has been performed. Agriculture damage is also reported in large scale in district like Cuddalore, Nagapattinam, Ariyalur and Perambalur. Intense and long lasting rain are more common to river flood. Media channels reported that total 450 persons have lost their life and loss of property and animal being is also massive but the ground reality was more than this.

TN gets rain from NE mansoon between October to December every year. But now deviation is seems in rainfall pattern in this region. Many climatologists see this event as an impact of climate change and IMD has declared that 2015 rainfall in TN break the record of last 100 year. Climatologist and hydrologist says that due to creation of large depression area in Bay of Bengal and creation of heavy low pressure area in this region mainly in TN and Andhra Pradesh this catastrophic flood has had happened but they also not denied about the irregular planning, settlement and unadwantage construction of the building. They seem that unwanted anthropogenic activities such as building contruction, irregular planning etc. also responsible region of coming of flood. We have studied the last 17 year TRMM rainfall data, and also studied some data collected from Indian Metrological Department (IMD), therainfall is shown major deviation from the normal trend.

The catastrophic flooding in part of southern India, particular in Chennai called well planned city has raised several questions over its urban planning. The doubt was created on the role of the state government towards implementing policies to prevent unplanned constructions and preservation of the wetlands with other water bodies. Researcher, development expert and scientist were feeling and thought that the illegal structures over the years and poor urban planning are among the key reasons behind the havoc flooding, which claimed more than 500 lives and left thousands homeless. According to some news sources (media) total loss of cattle reported so far is 2,766, India flooding worst in 100 years, heaviest rainfall in more than 100 years devastates Indian state. According to survey of the government, the reason of the disappearance of more than 300 water bodies were the near by 1.5 lakh illegal structures that came out around Chennai that led to improper drainage system in the city. So now there is need to unite the environmentalist, urban planners, NGO and govt. agencies to take proper action regarding the mentainance and conservation of all waterbodies, to control illegal construction, mining and

deforestation and for proper manaitanace of all drainage system, only these precautionary measures can save the cities and lives from such catastrophic accidents.

The costs imposed by floods on humans, societies and ecosystems can be subdivided into impact or damage costs (or simply losses) and subsequent risk reduction and adaptation costs (Meyer et al. 2013). Typically, impacts include loss of human lives, cultural heritage, ecosystem services and indirect effects (impacts on the flows of trade and finance that make up economies). However, economic activity may simply be displaced. These aspects are very important for developing consistent databases (Kron et al. 2012). Among the principal climate system factors that determine flood risk are the water containing capacity of the atmosphere (Koutsoyiannis 2012) and the characteristics of intense precipitation, including its amount and distribution in space and time as affected by large-scale circulation patterns (Zbigniew W. Kundzewicz et al. 2013). Study showed that nearly 5, 5500 hectares of swamp has been converted to IT corridor and only 10% of wetland remains so, there is urgent need to take a proper action to save our wetlands for survival of the biodiversity in the region. Almost 90% of the marshland was given to corporates, builders, garbage dump etc. and for other concrete establishments. The thing must be kept in mind that if human beings become obstacle in the way of nature then nature will destroy the every civilization in future.

2. Study Area and Data Set

The Study Area was located in the part of Southern India viz. Tamilnadu and Chennai. TRMM rainfall data (1999-2015) set and Indian Metrological Department (IMD) data were used to study the problem. The Climatic condition of Tamil Nadu generally tropical and features fairly hot temperatures over the year except during the monsoon seasons.

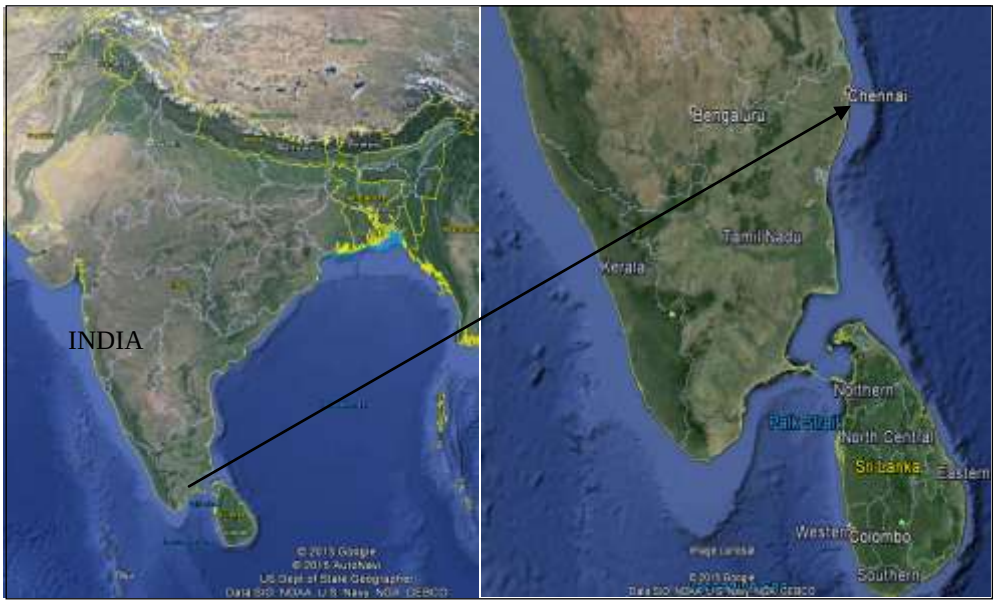


Figure 1: Map Indicates Most Flood Affected Area- Chennai, Tamilnadu, India

Mainly three distinct periods of rainfall occur in the state viz. advance rainfall, rainfall and NE mansoon. The advance rainfall and heavy rainfall was caused by mainly from the tropical cyclones emerging in the near by of the Andaman island during the retreat of monsoon (October–November)) and the North East monsoon during the months of October–December. The dominant NE monsoon winds emerging over the Mediterranean Sea from the western disturbances. The state has dry season mainly from February to early June. In TN the mostly flood affected areas was chennai and cuddalore.

3. Research Method

In the current study the daily, Monthly and annual TRMM data is used to study the amount, pattern and climatology of the precipitation in October, November and December month in the year 2015 and before to that. There are various anthropogenic drivers that affect to flood in terms of reduction and maximizing the flood risk (fig 2). So this study was performed by keeping these drivers viz. intensity, duration, amount and timing of rainfall etc. in mind.

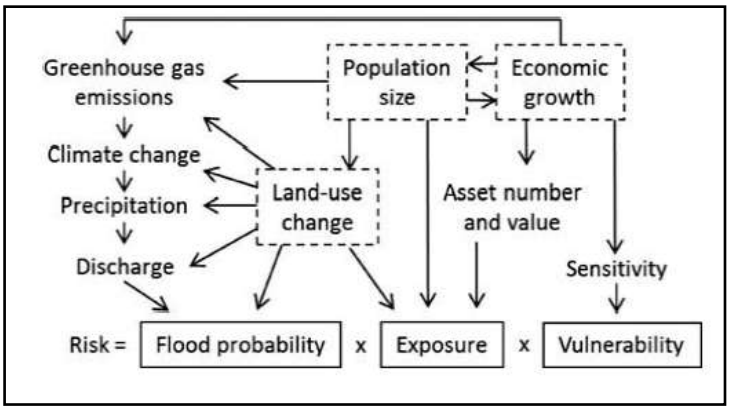


Figure 2: Anthropogenic drivers of changes in flood risk, After Bouwer (2013)

3. Results and Analysis

As noted by (Bates et al. 2008), floods are affected by various characteristics of the climatic system, most notably precipitation (intensity, duration, amount, timing and phase of rainfall or snow), but beside this temperature patterns also contributes. Beside above mentioned region the condition of drainage basin also affects to the flood. The condition such as pre-existing water levels in rivers, the soil character and status (permeability, soil moisture content and its vertical distribution), the rate of urbanization, and the presence of dikes, dams and reservoirs, river flooding may be concurrent (close to sea level) with storm surge or extreme tide events (Brakenridgeet al. 2013).

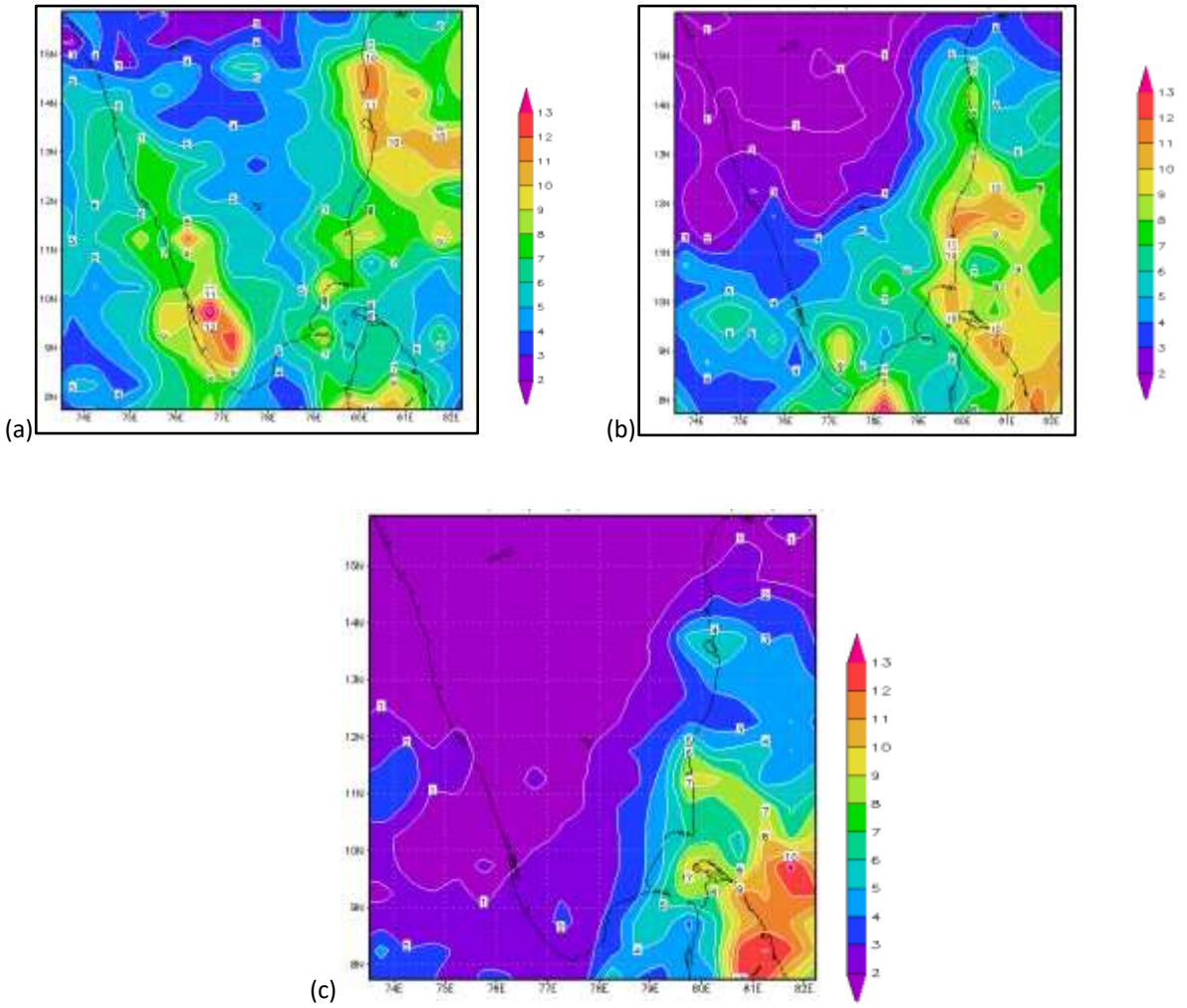


Figure 3: TRMM Composite Climatology (TCC) of the Southern region (a) October 2015 (b) November 2015 (c) December 2015 (mm/day)

Risk reduction activities can reduce the hazard and the potential loss by affecting exposure and vulnerability (fig.2). During study the reason behind Chennai flood we have studied the TRMM composite climatology of the southern Indian region of October, November and December month (fig. 3). The main aim to show the TCC is to define accurately the climatological surface rainfall in the region. We have also plotted the scatter time averaged graph of the southern region of October, November and December month (Fig.4). TCC and scatter plot depicts that the rainfall during this period is higher than earlier in respect to time and space.

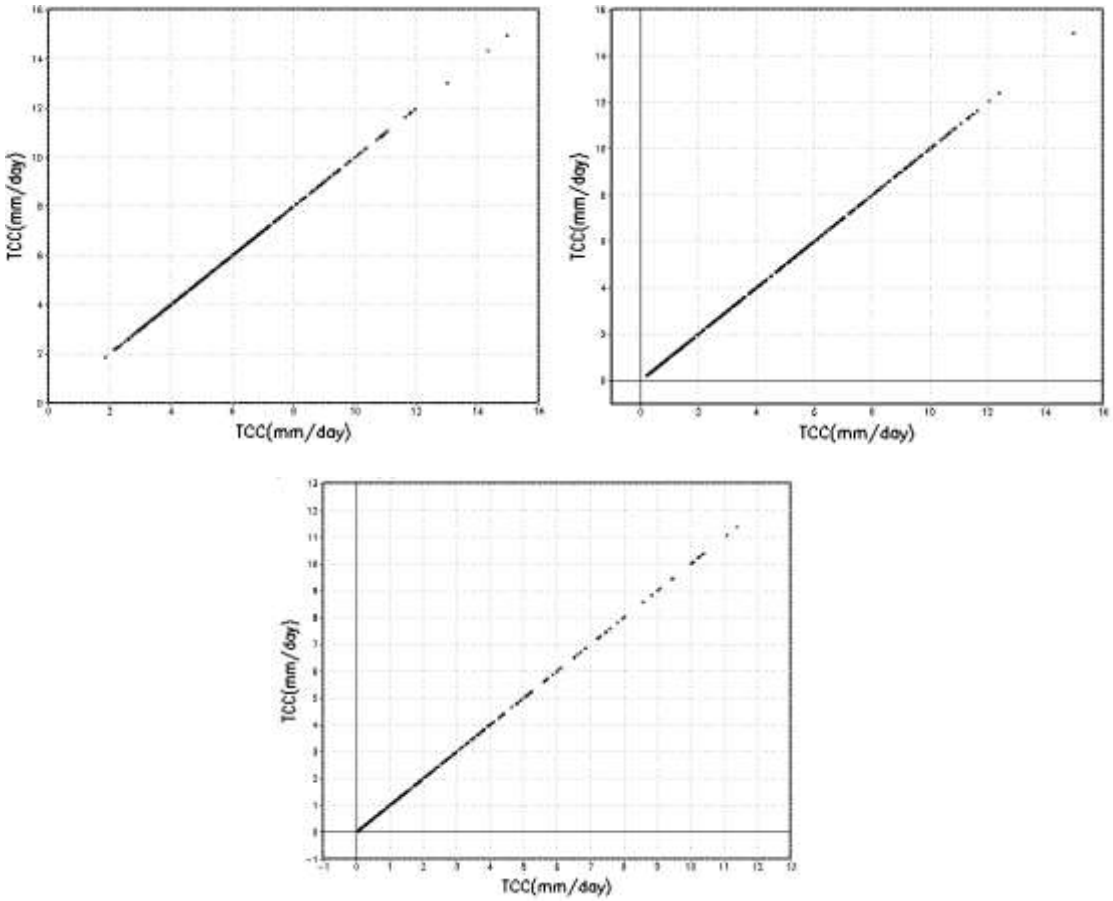
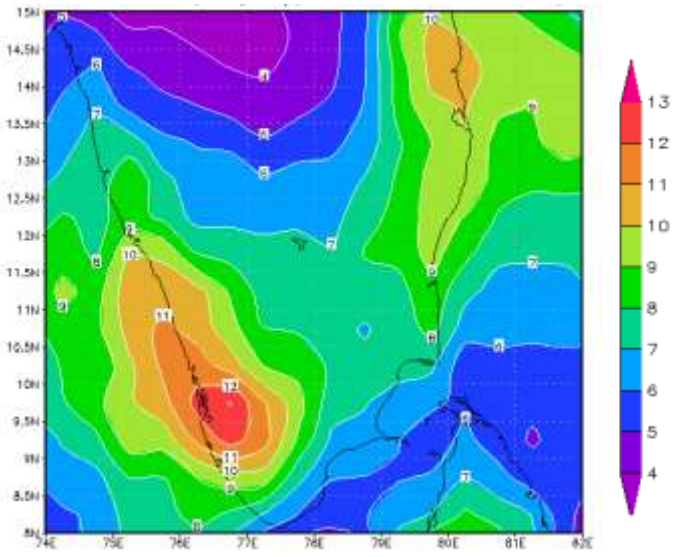
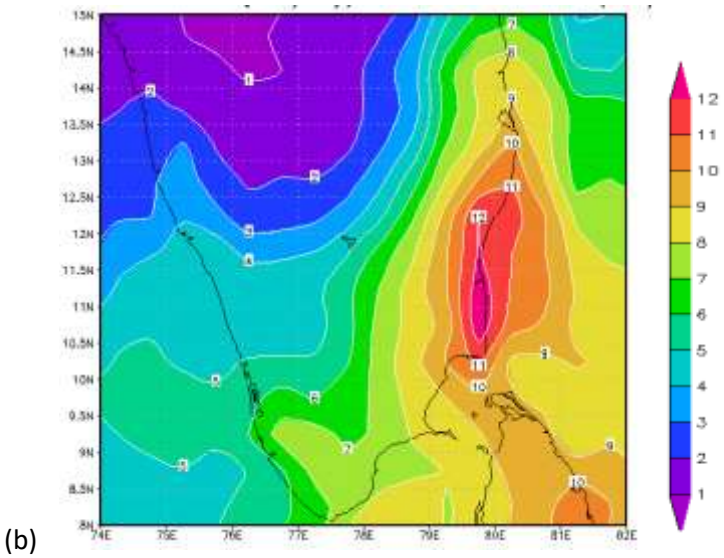


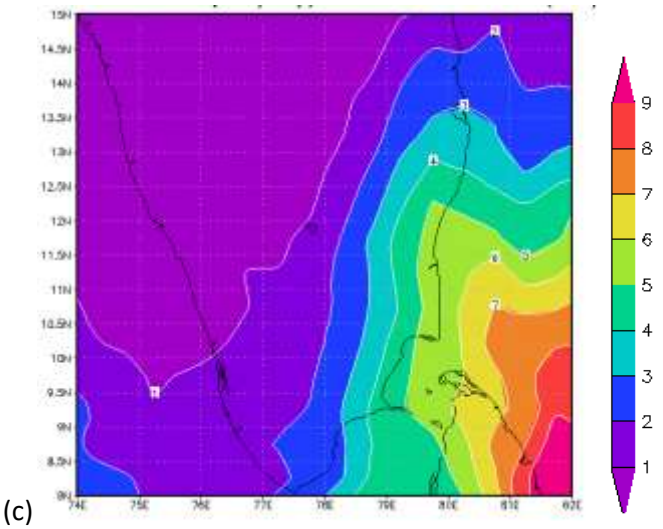
Figure 4: Scatter Plot, Time-Averaged (a) October (b) November (c) December (2015) mm/day



(a)



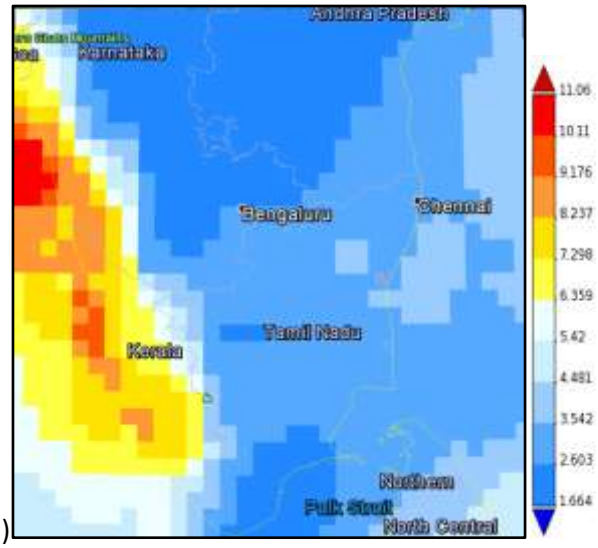
(b)



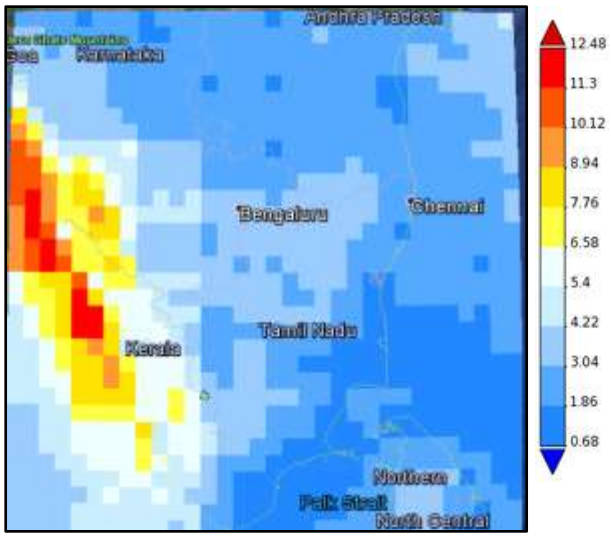
(c)

Figure 5: TRMM (3B43) map of the Southern Indian Region shows rainfall pattern in mm/day (a) October (b) November (c) December (2015)

(a)


Andhra Pradesh
Karnataka
Bengaluru
Chennai
Tamil Nadu
Kerala
Northern
North Central
11.06
10.11
9.176
8.237
7.298
6.359
5.42
4.481
3.542
2.603
1.664

(b)


Andhra Pradesh
Karnataka
Bengaluru
Chennai
Tamil Nadu
Kerala
Northern
North Central
12.48
11.3
10.12
8.94
7.76
6.58
5.4
4.22
3.04
1.86
0.68

(c)

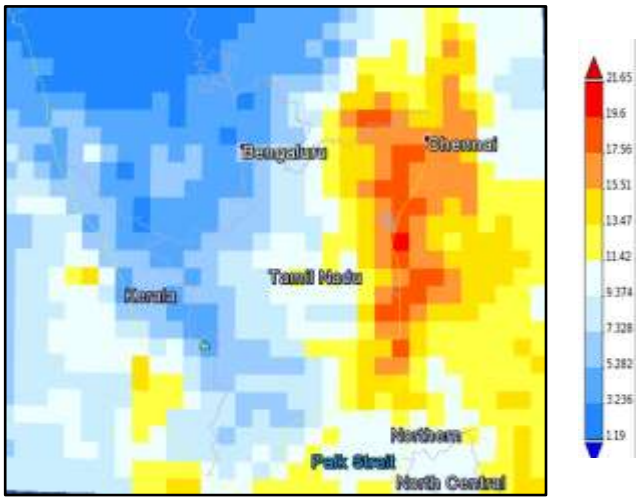
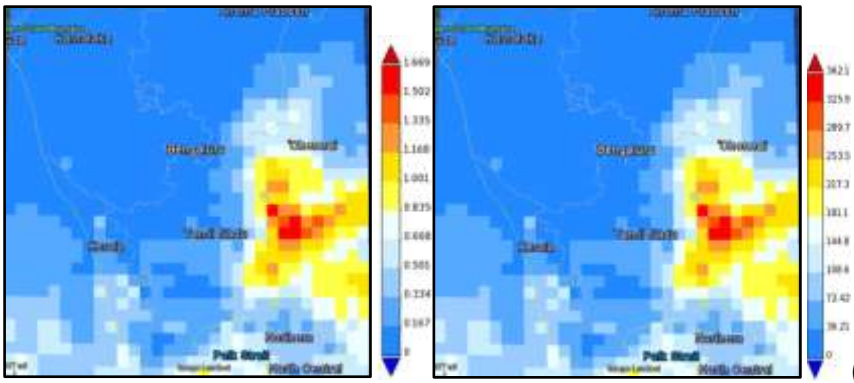

Bengaluru
Chennai
Tamil Nadu
Kerala
Northern
North Central
21.65
19.6
17.56
15.51
13.47
11.42
9.374
7.328
5.282
3.236
1.19

Figure 6: Time Averaged Map of Precipitation Rate Daily 0.25 degree mm/day (TRMM).
(a) 1999-12-31 to 2014-12-31 (b) 2014-12-31 to 2015-09-30 (c) 2015-09-30 to 2015-12-19

(a)  (b)

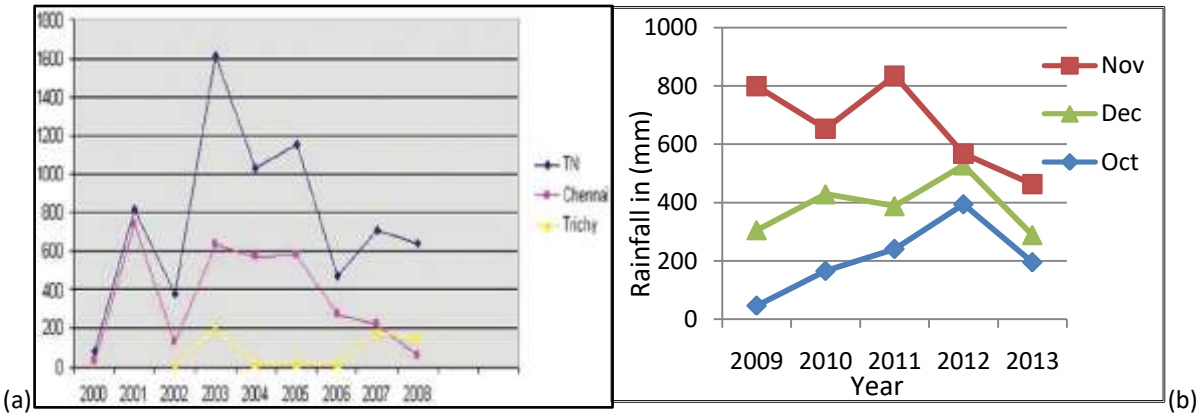
(a) 2015-10-31 to 2015-11-30 (b) 2015-11-30 to 2015-12-01

Figure 7(a): Time Averaged Map of Near Real Time Precipitation Rate 3 hourly 0.25 deg.mm/hr
(b): Time Averaged Map of Near Real Time Precipitation Rate Daily 0.25 deg. mm/day

Extremely heavy rainfall over south eastern part of India (Tamilnadu and Andhra Pradesh) caused deadly flooding in the middle of the month of November. Possible anthropogenic activities leading to increased flood risk include river regulation measures, intensified land used and forestry and emissions of greenhouse gases causing a change in global climate (Axel Bronstert, 2013). The 2013 calamity in Uttarakhand is considered as India's worst natural disaster since the December 2004 Indian Ocean tsunami. (C. S. Dubey et al., 2013) but this November 2015 flood in Tamilnadu and Pondichery has created havoc problem and loss of living beings and property. The flood water inundated the Tamilnadu and Pondichery region almost 2 week. Tamilnadu government is had declared it national calamity. 1218.6 mm is the amount of rainfall Chennai city has received so far in November (as on November 30, 2015 at 8:30 am IST) 10 days is all it took for Chennai to cross its monthly rainfall average for November 345 mm of rain recorded by Chennai in 24 hours on December 1 (http://www.skymetweather.com).

Weather experts indicated towards the seasonal NE monsoon as a responsible reason for the flooding in the city of six million, but might be El Nino of this year that warming to the eastern Pacific Ocean can have far reaching climate effects with heavy rains, poor urban planning and a callous administration behind Chennai floods. Studies showed that the dam level has reached 56 feet height and likely to full upto brim in a couple of days, after a gap of 17 years. The normal rainfall for November was at 407.4 mm.

Chennai recorded 374 mm rainfall on the first day of December and the forecast for the week was announced with heavy rainfall.



(a) (b)

Figure 8: rainfall pattern (a) 2000-2008 (b) 2009-2013 (source: imd)

Figure 8 depicts the rain fall pattern in Tamilnadu from year 2000 to 2013, indicated that rainfall was in normal condition before year 2015. This havoc condition might be created due to illegal construction in the place of water bodies such as ponds, river bank, lakes, wetlands and chocking of drainage system. The approach to urban governance needs to change in Chennai and elsewhere region, this havoc flood condition creates doubt on the administration because mundane aspects of city administration like building and maintaining water, drainage and sewage systems, mass transport facilities, etc. are ignored as the conversation shifts to concepts like smart cities.

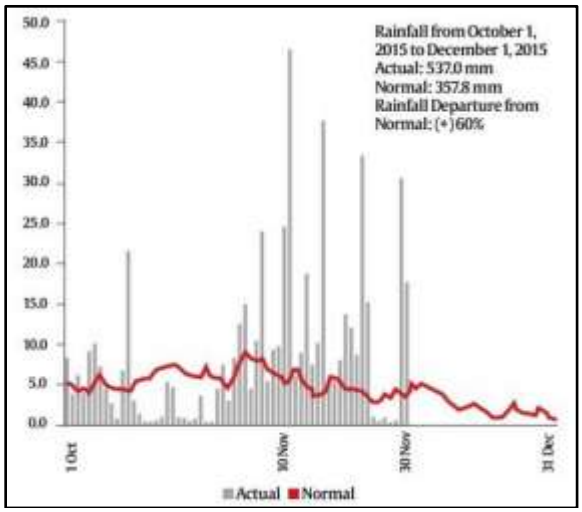


Figure 9: rainfall pattern

From October to December each year, a very large area of South India, receives up to 30 percent of its annual rainfall from the NE monsoon (or winter monsoon) including Tamil Nadu, the coastal regions of Andhra Pradesh and the union territory of Puducherry, Unlike during the regular monsoon, rainfall during the northeast monsoon is sporadic, but typically far exceeds the amount produced by the regular monsoon by up to 90 percent. This excessive rainfall can be exacerbated by an El Nino year, 2015 floods was the costliest natural disasters of the year. The flooding has been attributed to the El Nino phenomenon during the El Nino year of 2015 Chennai was officially declared a disaster area on the evening of 2 December. An oxygen supply was failed due to the interruption in

power, 18 patients died at the MIOT Hospital. On 4 December floodwaters gradually began to recede in Chennai, while 40 percent of the city's districts remained submerged.

Floods are a natural and inevitable event that's why we cannot always control them. Therefore, we must learn that how we can live with them with minimising risks to public health and safety, property and infrastructure. During the month of November, Chennai recorded a 1218.6 mm of rain (Skymet, 2015) that was the three times of its monthly rainfall. Figure 9 indicated the monthly rainfall pattern in November, October and December 2015.

4. Conclusion

Due to the heaviest rain recorded in almost 100 years in the month of Nov., Oct. and Dec. 2015 , the authorities were have no other options and they release about 30,000 cusecs water from the Chembarambakkam reservoir into the Adyar River in over two days that causes flood along river banks and submerged the neighbourhood area. Thid type event was also happend in the reservoirs like Poondi and Puzhal that flooded the Cooum River and flows through city. Other waterways too burst their banks and made lives of people miserable. The drainage system were found non functional and several channels became chocked due to dumping of garbage. It has also come in the light that the administrations were failed to ensure timely desilting of drainage system with a fact that there is no storm water drain network in suburbs like Tambaram, Sriperambudur and Ambattur. The city has 882 km of storm water drains but unfortunately no storm water drain in suburbs.

Wetlands plays very important role but over the years importance of wetlands were ignored and this is the reason, areas like Mudichur and Velachery were among worst affected because both the places are developed on wetlands on river basins. Due to the concretisation of wetland Velachery, a residential area and next to Pallikaranai marshland was flooded, this is the area, which gets flooded almost every year but this year it faced a massive havoc. Preserving wetlands are important as they help to reduce the impact of storm damage and flooding, but these are fast shrinking in the state. If such type of illegal activites is not prohibited timely then situation like 2015 will may rebirth in next upcoming year. So, this 2015 catastrophic flood is seems natural but it is due to the long term effect of illegal, unwanted and uncontrol anthropogenic activities.

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