

Impact of Land use Change on Climatic Conditions

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Abstract— *The changes in Land use have mostly occurred locally, regionally and globally over the last few decades and will carry on in the future as well. The increase in impervious surfaces has a major impact on rainfall and groundwater. The increase in urbanization results in changes in regular behavior of rainfall and also reduction in infiltration, which affects the groundwater recharge and storage. In the present study land use detection in Chennai city and its impact on rainfall changes and groundwater level have been carried out using the latest techniques of Remote Sensing and Geographical Information System.*

I. INTRODUCTION

Human activities have profound climate and environmental impacts. Climate change is predicted to lead to an intensification of the global hydrological cycle. Though increase in temperature and other factors serves as an key to climatic change, in today's scenario discussion is done to analyze the "Impact on climatic conditions by land use change"

II. STUDY AREA

Tamil Nadu State lies between Latitudes 8° 5' N and 13° 55' N and between Longitudes 76° 15' E and 80° 20' E. The State has a long eastern coast stretching for nearly 1000 km. The geographical area of the State is 1, 30,160 km², which is 4% of the geographical area of the country and holds 7% of the population of the country. Tamil Nadu has a tropical climate. The normal maximum and minimum temperatures (except in the hill areas) are 45⁰C and 18⁰C respectively. The State has four distinct seasons:

(i)	Southwest monsoon	June to September
(ii)	Northeast monsoon	October to December
(iii)	Winter season	January to February
(iv)	Summer season	March to May

Generally, sub-tropical climate prevails over the state. The temperature rises slowly to maximum in summer months up to May after which it drops slowly. The mean maximum temperature ranges from 28.2⁰C to 36.5⁰C and the mean minimum temperature from 17.3⁰C to 27.4⁰C. The average rainfall of the state is 953.4 mm. The principal rainy season commences from the month of June and extends up to the end of December. Rainfall during Southwest and Northeast monsoon seasons accounts for more than 75% of the total annual rainfall.

III. LAND USE PATTERN

The total Geographical area of the State is 1.30 crore ha. It has been classified according to different types of land use during 05-06 and presented in the table below:

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Category	05-06		04-05	
	Area	%	Area	%
1. Forest	2110703	16.2	2122069	16.3
2. Barren and uncultivable land	503255	3.9	509275	3.9
3. Land put to non-agricultural uses	2138679	16.4	2124564	16.3
4. Cultivable waste	368661	2.8	374026	2.9
5. Permanent pastures and other grazing lands	110309	0.8	113563	0.9
6. Misc. tree crops and groves not included in the net area sown	274351	2.1	290072	2.2
7. Current fallow	758840	5.8	691926	5.3
8. Other fallow lands	1518008	11.7	1704139	13.1
9. Net area sown	5243839	40.3	5097011	39.1
Geographical area	13026645	100.0	13026645	100.0
Area sown more than once	788879	6.0	792058	6.1
Gross area sown	6032718	46.3	5889069	45.2

Source: Department of Economics and Statistics, Chennai, Government of Tamil

IV. DATA COLLECTION

A. Topographic Maps

The study area is resulted from the mosaic of 9 topographic maps of Survey of India (SOD), viz., 57K/12, 57K/16, 57L/6, 57L/7, and 57L/11 at 1:50,000 scale. From these maps, information such as location of the villages, water bodies etc., are extracted and used as input data for database creation. These maps have also been used for georeferencing of the remotely sensed data.

Source: *Survey Of India, Guindy , Chennai.*

B. Meteorological Data

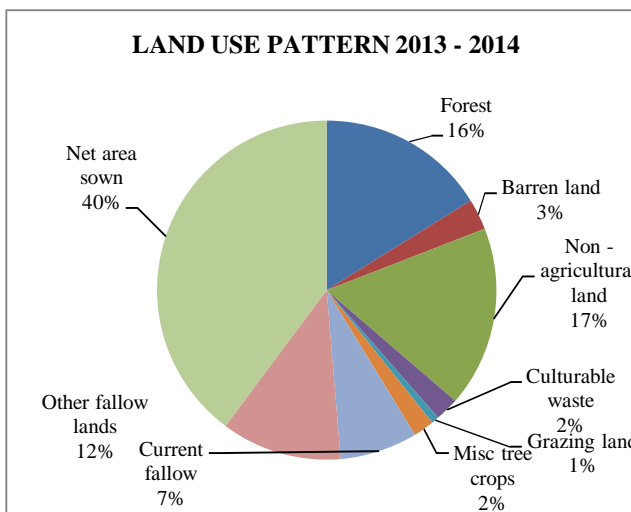
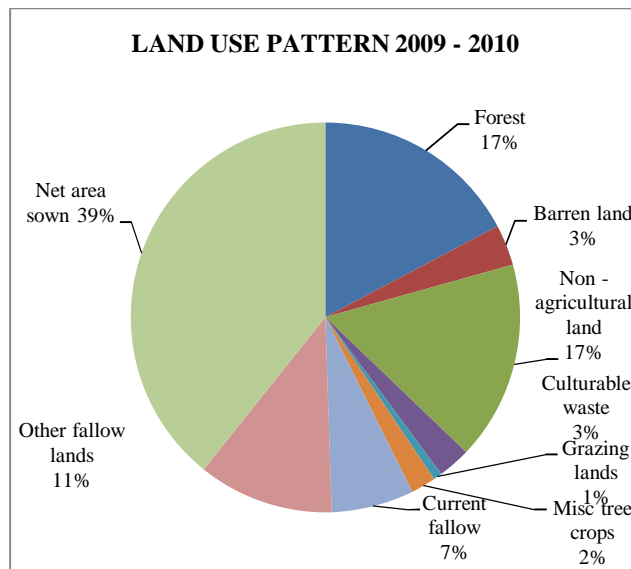
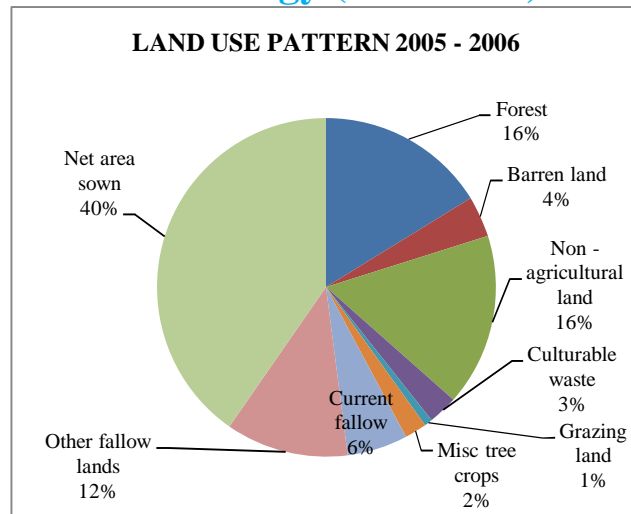
The Monthly rainfall data for Tamil Nadu were collected from the Regional Meteorological Department, Chennai for the period from 2005-2015.

Source: *Indian Meteorological Department, Chennai.*

V. RESULTS AND DISCUSSION

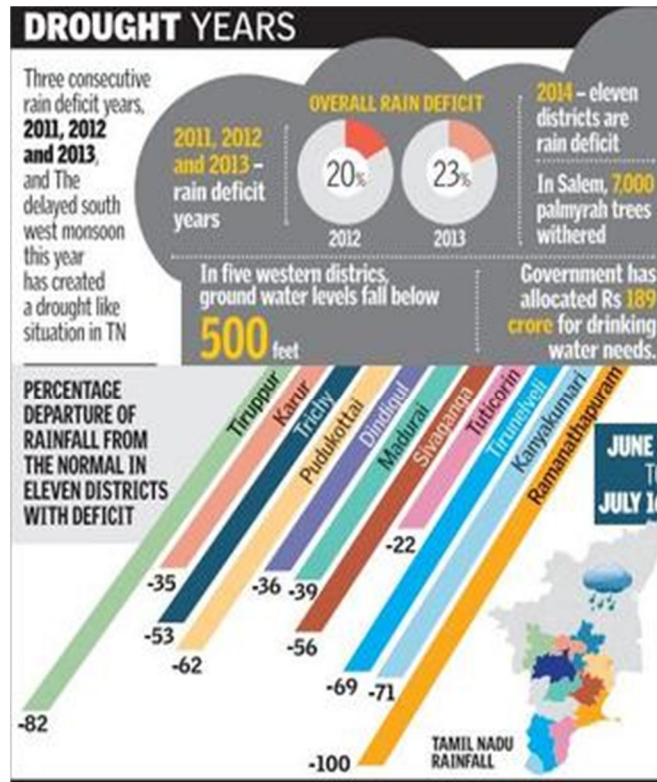
Using the data of Land use collected the following data are represented in form of pie charts

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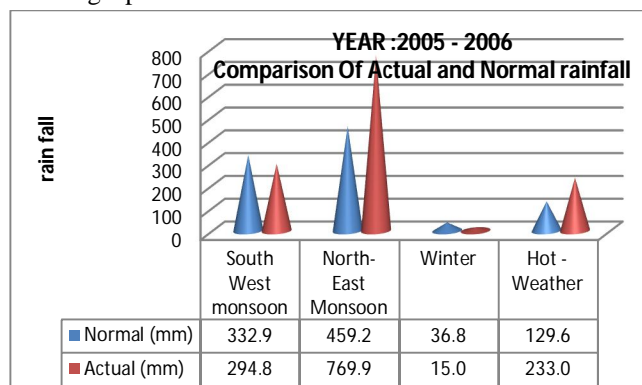
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Analyzing the above charts for the period 2005 – 2015, the land use pattern have changed Particularly , by comparing 2006 and 2009 LAND USE pattern , the area for forest have been increased by 1% where as the barren land or unused lands were reduced by 1%(from 4% to 1%). This shows the impact of urbanization. As days passes the vacant lands are being converted into Non – agricultural lands which may be used for various purpose .Also the net area sown for the period 2006 to 2010 have been decreased. The year 2011 , 2012 and 2013 are considered as rain-deficit years. This is due to delayed south-west monsoon .

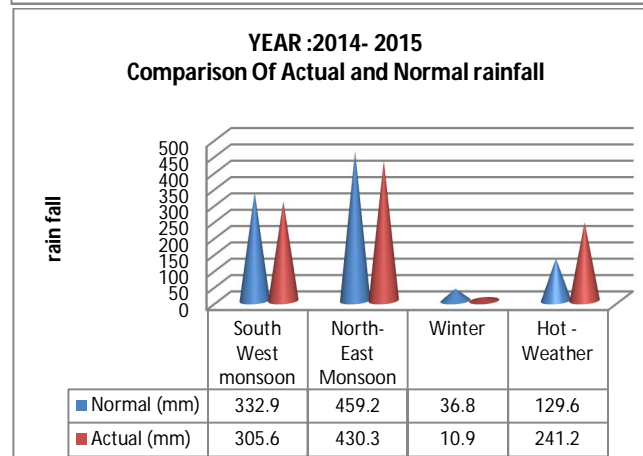
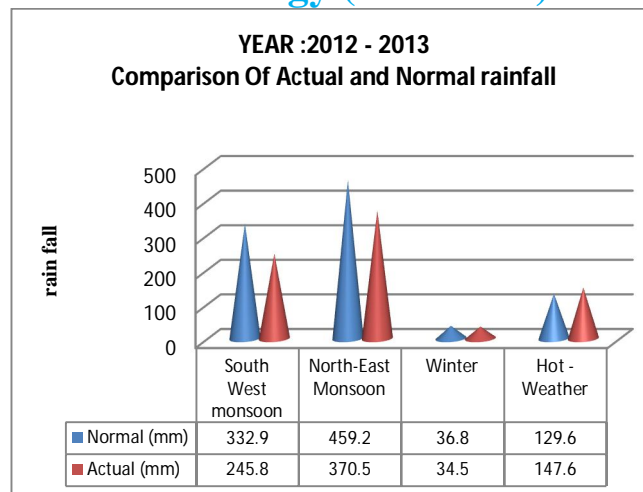


This is taken from “THE HINDU” date July 21, 2014. This shows the percentage departure of rainfall from the normal rainfall in eleven districts from June 1,2014 to June 16,2014.The normal annual rainfall of the state is about 945 mm (37.2 in) of which 48% is through the North East monsoon and 32% through the South West monsoon Comparing this with the actual rainfall of 2012 which is about 712 mm is 20% deficit. Likewise in the year of 2013 the actual rainfall is 23% deficit.

Using the rainfall data the comparative graphs “Season Wise” is drawn:



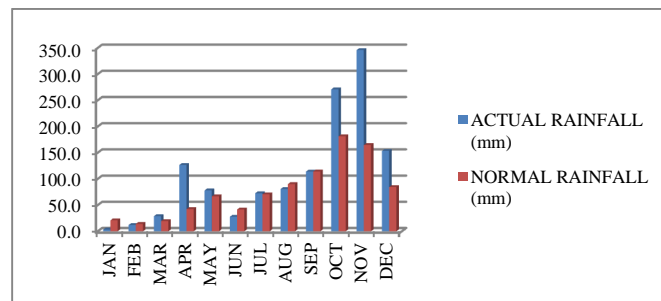
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The graph drawn above is the illustration of actual and normal rainfall in different seasons for the year 2005-2006, 2012-2013 and 2014-2015. During South West Monsoon the actual rainfall is always lesser than the normal rainfall. But in the year 2005 the difference was 38 mm but the same in the year 2006 varies by 87mm. Therefore it is noticed that the rainfall during the South West Monsoon is becoming less with respect to time (in year's). During North East Monsoon, in the year 2005, the actual rainfall was recorded as 770mm which is 59% greater than the normal rainfall. But the same in 2012 was 19% less than the normal rainfall In the Hot-Weather season the actual rainfall is more than the normal rainfall in all years except in the years of 2007, 2009 and 2011.

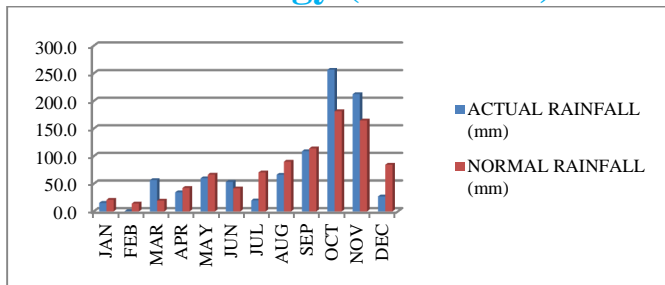
COMPARISON OF ACTUAL AND NORMAL RAINFALL- MONTH WISE – YEARLY GRAPHS:

YEAR: 2005

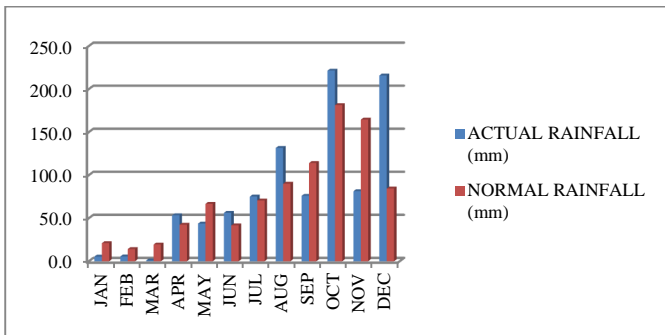


YEAR: 2006

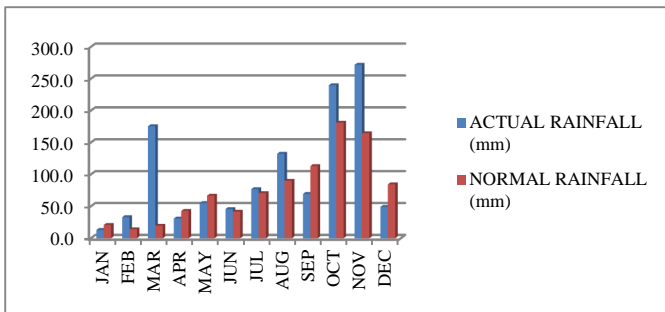
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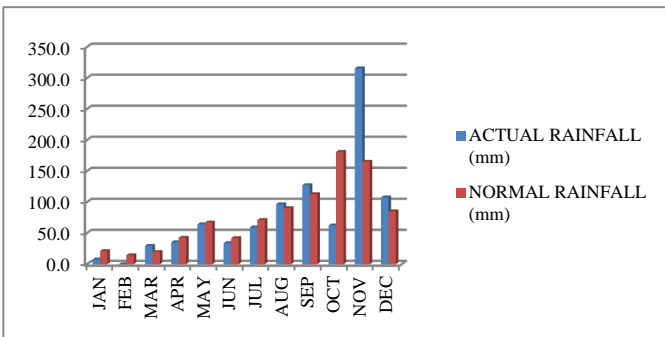
YEAR: 2007



YEAR: 2008

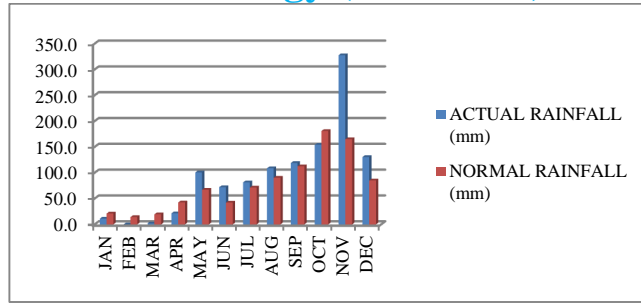


YEAR: 2009

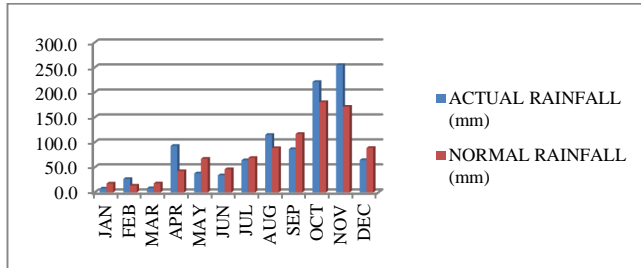


YEAR: 2010

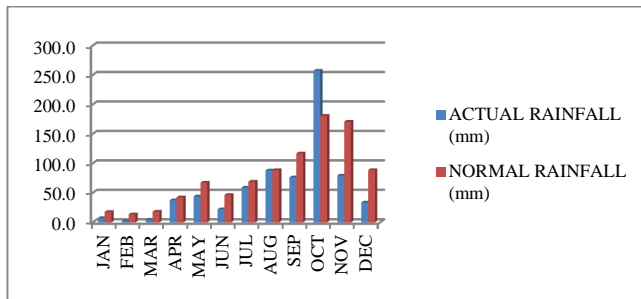
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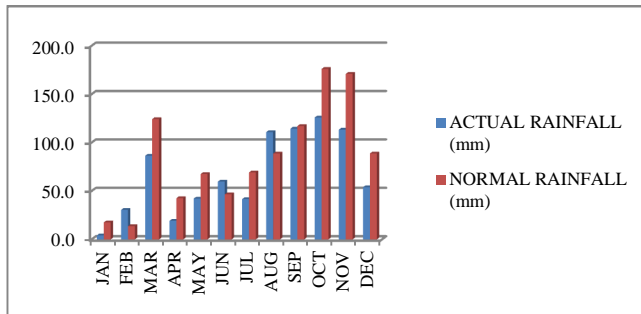
YEAR: 2011



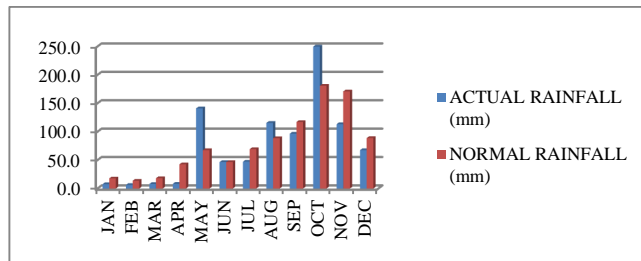
YEAR: 2012



YEAR: 2013

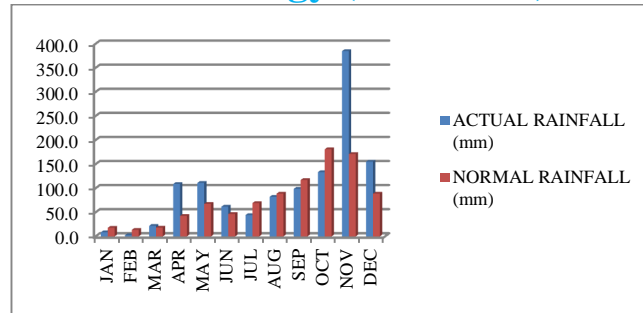


YEAR: 2014



YEAR: 2015

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Actual rainfall is being scarce in the months of March and April, except rainfall in the year 2013. During the year 2005-2008, the actual rainfall during August to November was more when compared to normal rainfall. But as years ago, the rainfall during the above months is reducing gradually such that the amount of rainfall (mm) is less than the normal amount of rainfall (mm) in Tamil Nadu. This stands as a point to understand the climatic changes due to the impact of land use and other factors.

VI. CONCLUSION

When consolidating the Land Use data and the rainfall data, the agricultural activities are less in the year 2009-2012 where the rainfall was less, considered as one of the reasons for the decrease of agricultural activities. The reason for decrease in the rainfall is due to conversion of vacant land into Non-agricultural land for various human needs such as live hood, constructing industries, expanding roads etc. If the same prevails then there will be a drastic change in the climatic conditions and all the seasons of rainfall will change, which in turn affects the cropping period time and finally leads to change of all traditional practices with respect to climate.

VII. ACKNOWLEDGMENT

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