iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** V **Month of publication:** May 2018

DOI: http://doi.org/10.22214/ijraset.2018.5094

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue V, May 2018- Available at www.ijraset.com

Delimiting the Flood Risk Zones in Cuddalore District, Tamil Nadu, India

P. Ravikumar[1], Dr. G. Baskaran[2]
[1]*Research Scholar,* [2]*Assistant Professor, Department of Geography, University of Madras, Chennai – 05*

Abstract: Using non-structural measures, or in other words harmonizing with flood is a new approach in flood damage mitigation. Flood hazard zonation is one of the subsets and could be applied as a proper tool in flood basin management so that in normal condition is a guideline for construction of structures and infrastructures and in flooding condition could set the evacuation routes and safe sites. In this paper, the manner of providing the flood hazard zones is presented and applied in Cuddalore district of Tamilnadu. Since, Cuddalore is located on coastal region it is almost flat and prone to water stagnation. The Combined approach of hydrology and geomorphology was employed to identify the condition of flood and delimit the flood risk zones using the data of high rain fall years 2005, 2008 and 2010. The weighted sum analysis has been used to identify the flood risk zones.
Keywords: Hazard, Risk, Hydrology, Stagnation and Weighted Overlay Analysis

I. INTRODUCTION

Floods are the most devastating natural hazard affecting the social and economic aspects of population **(Hewitt and Burton, 1971**) and claiming more lives than any other natural phenomenon. The frequency with which flood occurs is increasing in many regions of the world with no restriction to the boundary, climate and geo-political zones. Flooding is normally severe in flood plains which are regions of a valley floor located in either side of a river channel that is full of sediments deposited by the river that flows through the surface of land. Flood plains along big rivers are one of the most productive and valuable environments on the surface of the earth that provide abundant ecosystems and human services **(Harun, 2009**).

II. STUDY AREA

The district has an area of 3,564 km². It is bounded on the north by Villupuram District, on the east by the Bay of Bengal, on the south by Nagapatinam District, and on the west by Perambalur District. The district is drained by Gadilam and Pennaiyar rivers in the north, Vellar and Kollidam River (Coleroon) in south. The district contributes to the production of cashew nut and jack fruit. In the year 2015 Flood, Cuddalore district was among those most severely affected by the flooding. Six of the districts' 13 blocks suffered extensive damage during the floods in November. Continuous heavy rainfall from 1st December again flooded the Cuddalore municipality and the district, shifting more than 10,000 people. Rainfall continued till 9th December. Inspite of the efforts of the state government and several individuals trying to send rescue teams and relief materials to the affected areas, it never reached most of the victims as they still lacked basic amenities because of improper distribution. This created a general uproar resulting in looting of relief lorries. Large swaths of Cuddalore city and the district remained flooded as of 10th December, with a large number of residents stranded by floodwaters and over 600 Sq kms of farmland flooded, Inspite of evacuating more than 30,000 people to relief camps.

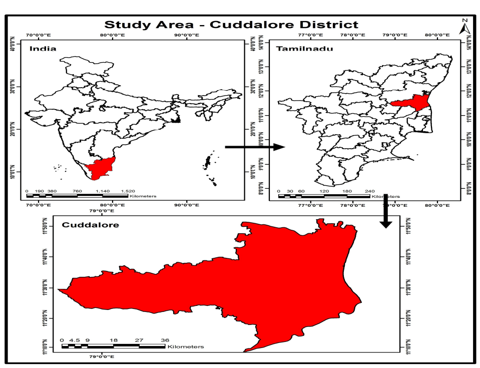

Figure 1: Study Area – Cuddalore District

III. AIMS AND OBJECTIVES

The main aim of this paper is delimiting the flood risk zones in Cuddalore District for higher annual rainfall periods of 2005, 2008 and 2010.

A. *Objectives*

1) To identify the factors influencing the floods in cuddalore district.
2) To delineate the Flood Risk Zones in cuddalore district.

B. *Methodology*

S. No	Acquisition Date	Source	Resolution (m)	Path/Row
1	2005	Earth Explorer	30	142/52 & 143/52
2	2008	Earth Explorer	30	142/52& 143/52
3	2010	Earth Explorer	30	142/52& 143/52

Table 1: Data Source

Two types of data were used in this research. Satellite data Land sat 7 (path and Row 142/52) that acquired from the USGS GLOVIS website to prepare DEM, slope and soil maps. Secondary data rainfall was collected from meteorology department. The ground truth data was in the form of reference points collected using Geographical Positioning System (GPS) for the 2010 image analysis, used for image classification and overall accuracy assessment of the classification results. Data were pre processed in ERDAS imagine for geo-referencing, mosaicking and sub-setting of the image on the basis of Area of Interest (AOI). The rainfall distribution maps were prepared to identify the rainfall zones. Slope, soil and rainfall have been given weights to identify the flood risk zones using Arc GIS.

IV. RESULTS AND DISCUSSIONS

A. *Soil Distribution*

Cuddalore district has different varieties of soil (Figure a) in which Black soil is the dominant in the southern part of district. Red soil is well spread all over the district, while the sandy soil is in the northern part of it. Alluvial soil has been found along the streams and their mouths.

B. *Slope*

Most of the district has strong slope (Figure b) particularly north and middle part of the district as they have high lands. Very less area is levelled. Other regions have slopes that are very gentle, and moderate slope as their character.

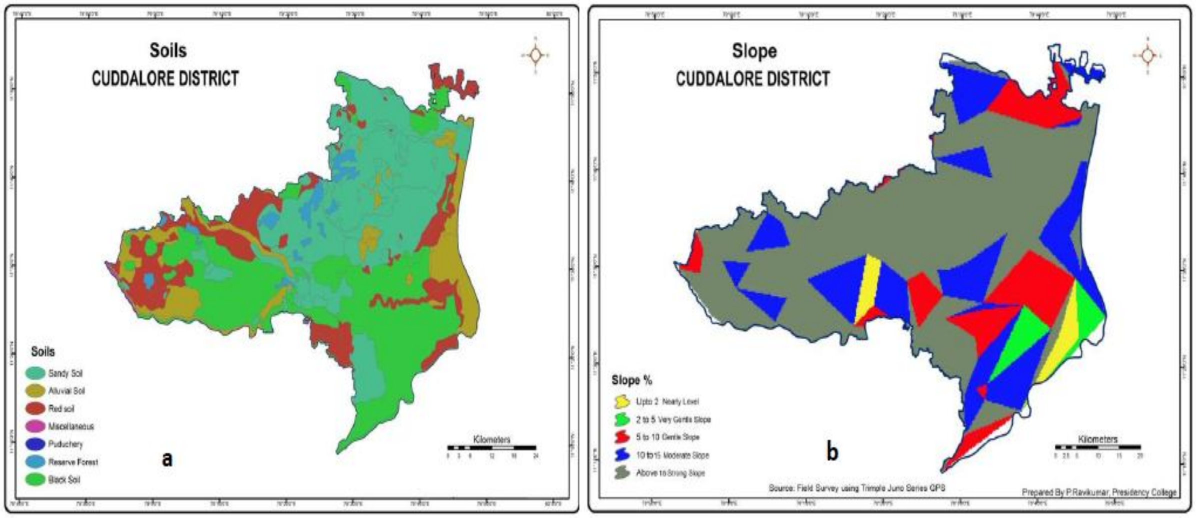

Figure 2: Cuddalore (a) Soils and (b) Slope

Cuddalore district receives maximum rainfall during the northeast monsoon between July and December. Almost all the places of the district except the western region has received more than 1000mm rain fall during north east monsoon during the period of 2005 and 2010. But the rainfall was significantly reduced in the western region during 2008.

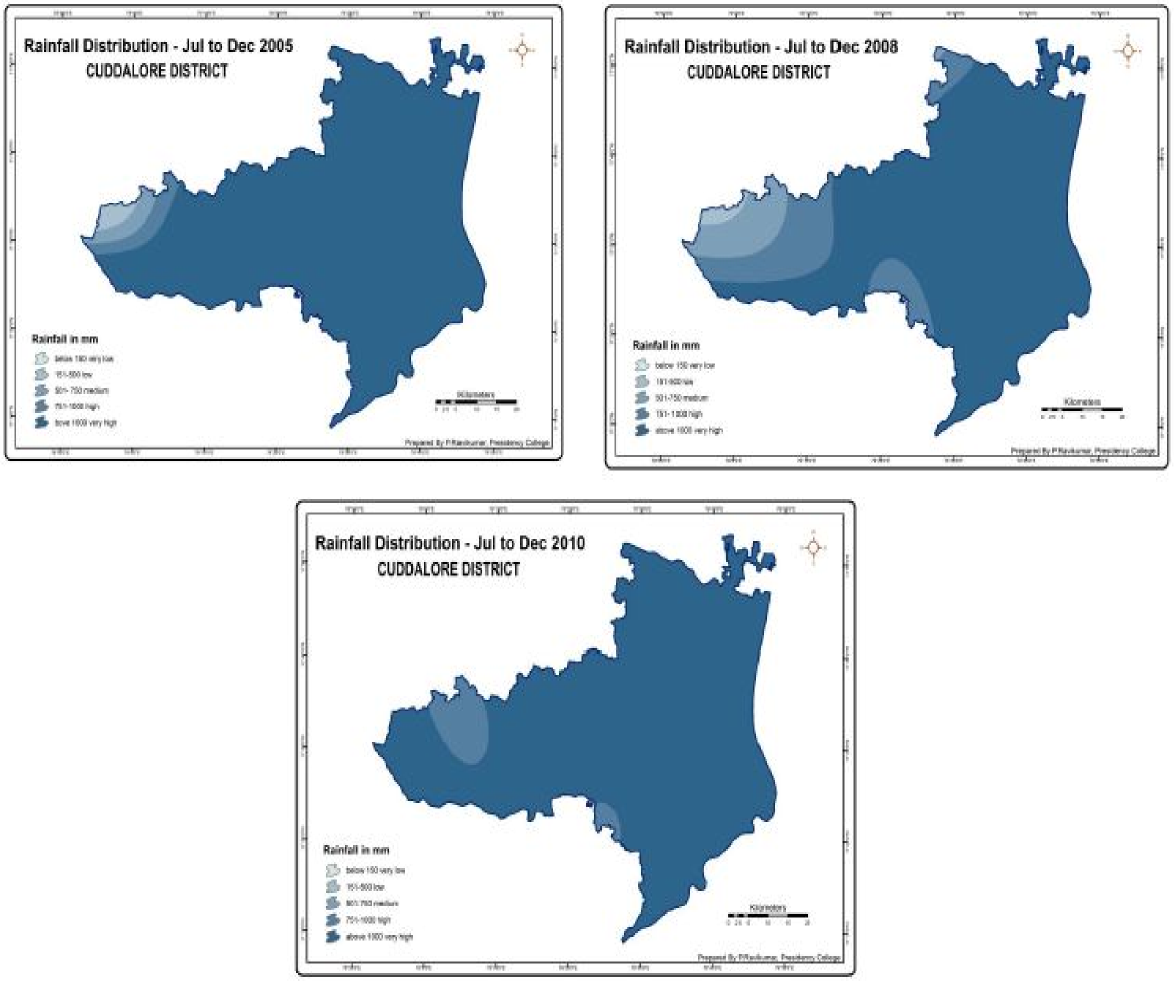

Figure 3: Cuddalore Rainfall Distribution

C. Weighted Overlay Analysis

Weightage has given to the elements of nature of water retaining capacity, degree of slope and amount of rainfall in the region to delimit the region of flood risk.

Weightage	Soils	Slope	Rainfall
1	Sandy soil	More than 15deg	Less than 150mm
2	Alluvial soil	10 to 15 deg	150mm to 500mm
3	Red soil	5 to 10 deg	501mm to 750mm
4	Black soil	2 to 5 deg	751mm to 1000mm
5	-------	Less than 2 deg	Above 1001mm

Table 2: Weightage

D. Flood Risk Zones

This analysis reveals that southern part of the Cuddalore district is highly prone to flood while western part of the district is the least prone to flood. The regions of flood risk are not showing drastic change for the years of 2005, 2008 and 2010. But quantitatively the areas of flood risk show significant changes.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue V, May 2018- Available at www.ijraset.com

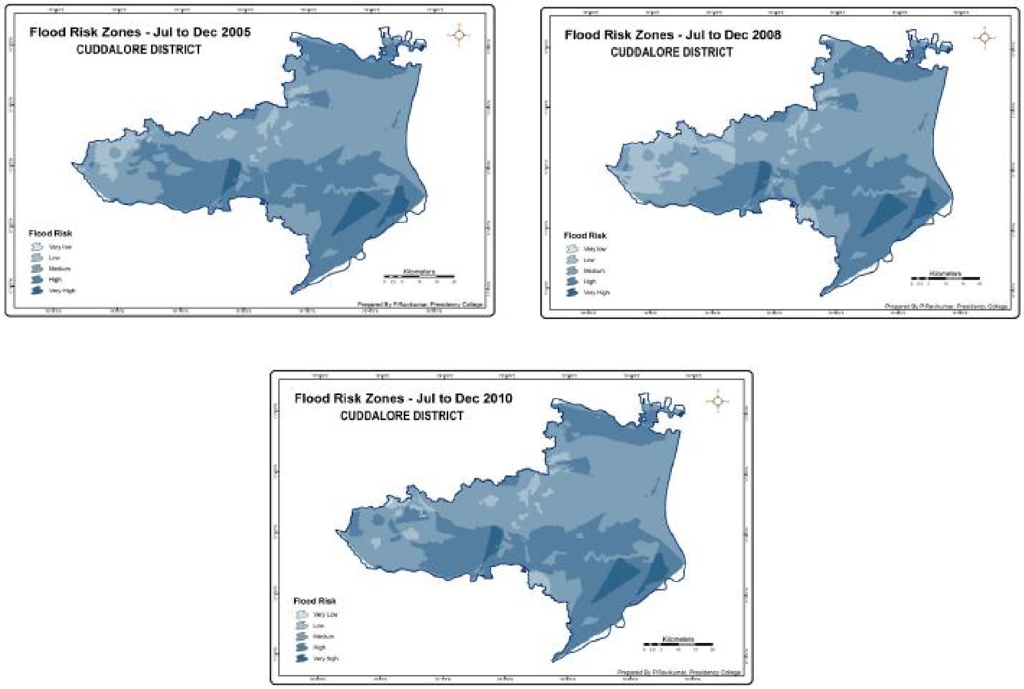

Figure 4: Cuddalore Flood Risk Zone

E. Area of Flood risk Zones-Cuddalore district

Flood risk Zones/year In sq.km	2005	2008	2010
Very Low	2.5	97.1	2.8
Low	167.3	500.6	549.8
Medium	1899.4	1659.3	1559.6
High	1488.4	1296.9	1429
Very High	138.8	142.5	155.2

Table 3: FRZ Area

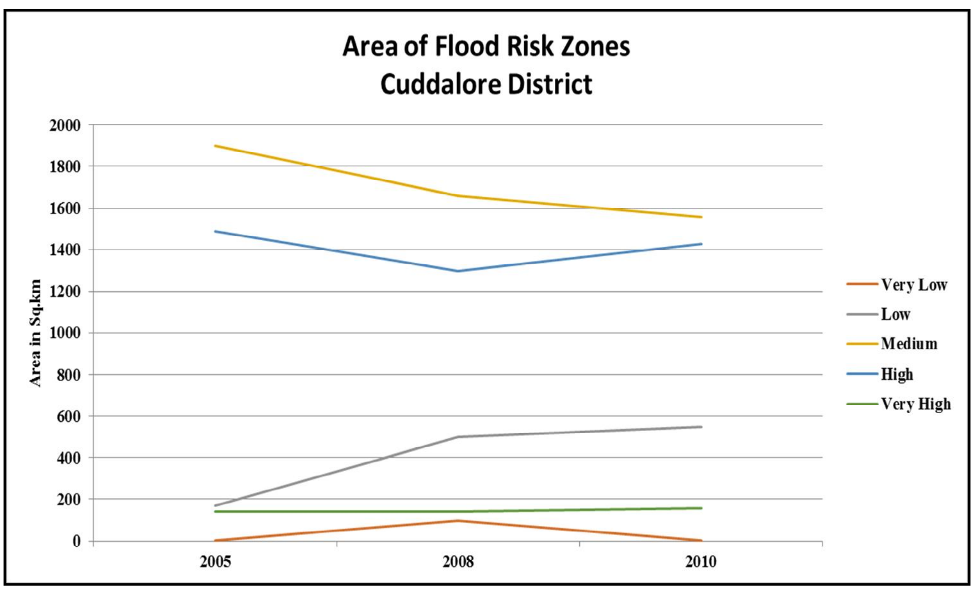

Figure 5: Cuddalore FRZ Area

V. CONCLUSION

The quantitative analysis shows that as the rainfall reduces in 2008 the flood risk zone area also reduces. The very low, low, medium and high are not significantly changed, but the very high flood risk region significantly increased between 2005 to 2010. This is an alarming increase. So these regions must be given importance in the disaster management to reduce the flood risk in the future if the rainfall increases.

REFERENCES

[1] Abate S. (2011), “Evaluating the land use and land cover dynamics in Borena Woreda of South Wollo highlands, Ethiopia”, Journal of Sustainable Development in Africa 13: 95-102.
[2] Alphan, H., 2003. Land use changes and urbanization in Adana, Turkey, Land degradation and Development, 14, pp 575-586.
[3] Coppin P.,et.al (2004), “Digital change detection methods in ecosystem monitoring: a review”, International Journal of Remote Sensing 25: 1569-1585.
[4] Chow, V. T.,et.al. (1988)."Applied Hydrology". McGraw-Hill, 511-523 p.
[5] DeFries, R. S.,et.al (2004), “Ecosystems and Land Use Change”, American Geophysical Union, Washington, DC.pp 14-16
[6] Federal Emergency Management Agency. (2003). ‘Guidelines and Specifications for Flood Hazard Mapping Partners, Guidance for Alluvial Fan Flooding Analysis and Mapping’, 20-35p.
[7] Flood and Overflow Technical Group (2006), “Principals and Fundamentals of Flood Hazard Map Preparation in Japan”, 4-31 p.
[8] Hardy, Ernest E., Belcher, Donald J., and Phillips, Elmer S., 1971, “Land use classification with simulated satellite photography: Dept of Agriculture, USA, Econ. Research Service”, Agricultural Information Bulletin., 340-351 p.
[9] Harikrishna Karanam., et al., “Land use/land cover patterns around Kolleru Lake, Andhra Pradesh, India- Using RS and GIS techniques”, International Journal of Remote Sensing & Geoscience, Volume 2, Issue 2, 2013. pp 1-5.
[10] Lambin E F, Geist H J (2001), “Global land-use and land-cover change: what have we learned so far”, Global Change Newsletter 46: pp12-23.
[11] Verburg, P.h., at el., 2000, “GIS-based modelling of human environment interactions for natural resources management: Applications in Asia. In Proceedings of the 4th International Conference on Integrating GIS and Environmental Modelling (GIS/EM4): Problems, Prospects and Research Needs”, Canada 2000, pp 1-10.