

SHORT NOTES

RECONSTRUCTION OF VOLUME AND SPREAD OF FLOOD WATER IN VELACHERY AREA THROUGH FIELD INVESTIGATION

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Abstract: Floods are uncontrollable natural event causing loss of life and damage to public property. The flood water has to be managed so that it can be used for many purposes. The extent of inundation and the depth of flooding can be estimated using remote sensing and GIS (Geographic Information System) techniques. This study intends to focus on the aspect of field investigation along with GIS to reconstruct a Flood event so as to estimate the flood volume and extent. Field investigation shows that Velachery area of Chennai city in India is subjected to severe flooding. This study is an attempt in reconstructing the flood event of December 03, 2005 through field investigation in Velachery area. Field of study has been restricted to the Velachery area.

Keywords: *flood, Remote sensing, GIS*

1.0 Introduction

Flood is an inevitable natural phenomenon occurring from time to time which not only damages natural resources and environment, but also causes the loss of lives, economy and health (Carroll, 2001). Flooding is observed when the discharge in the channels (natural/ artificial) is greater than the carrying capacity. Urbanization of watershed leads to decrease in infiltration or increase in runoff coefficient, increased peak flow, reduced time of concentration and hence for the same amount of rainfall, greater is the flooding. Nowadays the state of the art technology in the field of Geographic Information System (GIS) allows spatial analysis so as to generate the flood hazard modeling. With regard to flood studies, GIS is an important tool which enables data capture, input,

manipulation, transformation, visualization, combination, query, analysis, modeling and output (Bürger, 2008). Although several flood modeling techniques are available, this study focuses on first hand information from the flood affected people to analyze the flood situation. Thereby, the volume of flood water in the area is calculated from the high flood level obtained in the field along with the Digital Elevation Model created in GIS.

2.0 Objective

The objectives of the study are :

- To reconstruct the meteorological flood event of December 03, 2005 through field investigation.
- To calculate the volume of flood water and to estimate the water spread in Velachery area.

3.0 Study Area Description

Velachery is a fast-developing residential area in South West Chennai, a metropolitan city in Tamil Nadu, India. Velachery lies between latitude $12^{\circ} 58' 20''$ and longitude $80^{\circ} 13' 35''$. It is well-connected by roads and Metro railway network, MRTS (Mass Rapid Transit System).

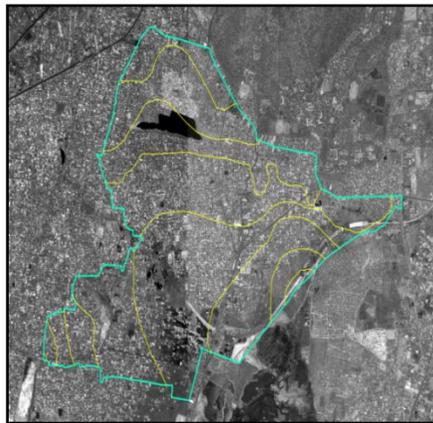


Figure 1: Studyarea (Velachery)

Most of the study area is built up and there are only few open lands. Due to rise in water table, water gets stagnated in this open land. For the purpose of field investigation, the study area was divided into grids. The grids were represented in 1:2000 scale. High resolution QUICKBIRD Imagery, 2006 is used for the analysis.

4.0 Methodology

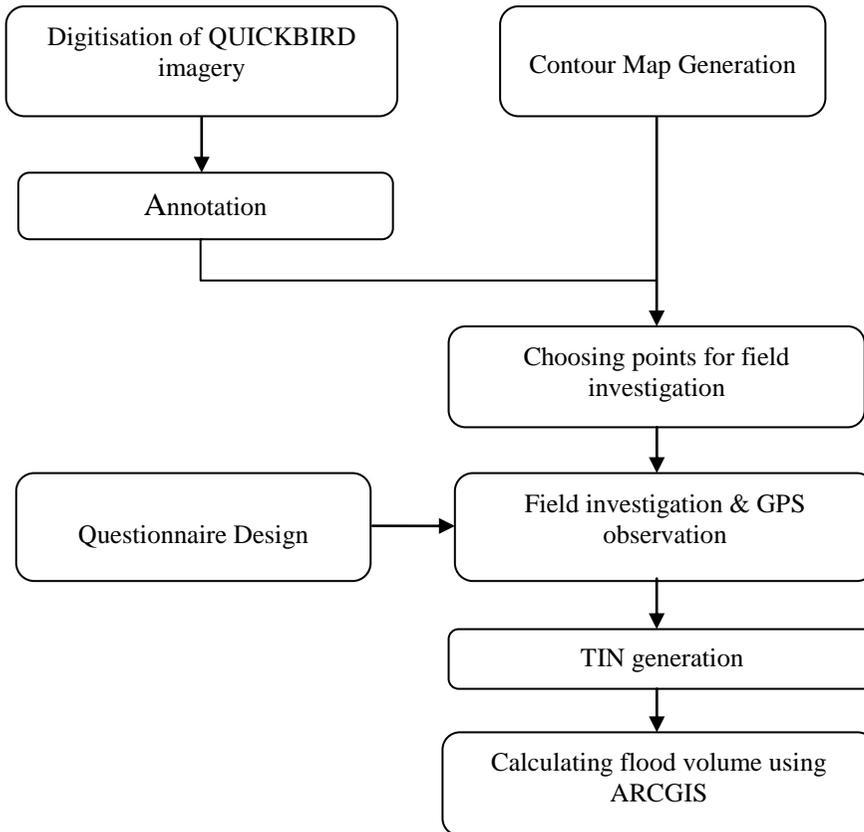


Figure 2: Methodology flow chart

5.0 Field Investigations

In this study, totally of about 36 points are chosen to cover the entire Velachery area. The points were chosen depending on the field enquiry regarding flooding and the map given by Corporation of Chennai. The QUICKBIRD imagery of scale 1: 2000 was taken and digitized. The Questionnaire was formulated in such a way it covers the information about the resident, flood event, description of field point and GPS coordinates observed on the ground. The residents are requested to explain the Flood event of December 03, 2005. He/She is asked to indicate the HFL (High Flood Level). This height is measured from the ground using a tape. The measured HFL is with respect to ground level. All other details are carefully filled in the questionnaire as stated by the resident. The HFL mark is correlated to establish its height from ground level. The GPS ordinates are imported to ArcGIS environment.

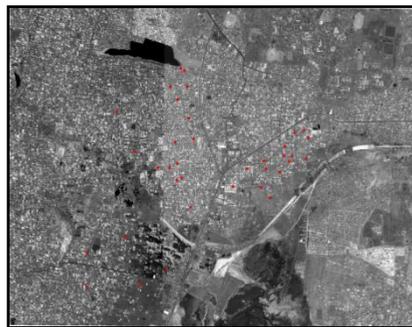


Figure 3: The field points investigated for reconstructing the flood event

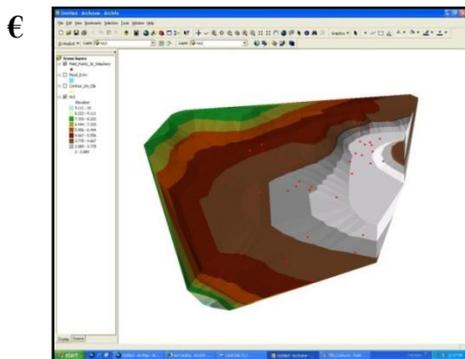


Figure 4: TIN generated for Velachery area

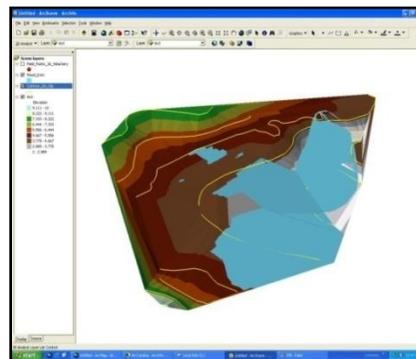


Figure 5: TIN showing Flood spread in Velachery area

A vector data model (TIN: Triangulated Irregular Network) was generated. Based on the information collected in the field, the extent of flood was identified and digitized. Attributes such as observed water level (HFL) are added. The area of the flood spread was calculated using the raster calculator. Then the volume of flood water was calculated. The flood area was visualized by overlaying both TIN and digitized water level.

6.0 Results and Discussion

The areas that are highly susceptible to floods are found out based on the flood extent and the volume calculation. In this study, the extreme flood events of December 03, 2005 are considered to calculate flood volume.

Total area of flood patches= 4224767.615 sq m
 Total volume of flood patches= 3484041 cu m

This model when used in combination with other GIS/Hydrological model provides the ability to assess the city wide flood damage impact. Thus, the average depth was found to be 80 cm.

FID	Shape	OB	Id	Name	Bl	Bl	Tal	St	Shape_Area
0	Polygon	0	0		0			0	1917864.70014
1	Polygon	0	0		0			0	820192.50634
2	Polygon	0	0		0			0	1337506.64064
3	Polygon	0	0		0			0	37056.903781
4	Polygon	0	0		0			0	2336.201999
5	Polygon	0	0		0			0	104577.553031
6	Polygon	0	0		0			0	5233.108702

Fig 6. Attribute table for flood volume calculation

7.0 Conclusion

The flood prone area cannot be defined by considering the contour information only, high flood levels observed on ground also need to be included. The limitations of this study are the water levels are determined by the information gathered from residents, which may be exaggerated. If ALTM (Airborne Laser

Terrain Mapping) data is used, a more accurate DEM can be generated for analysis. Places like Vijaya Nagar, Tansi Nagar and Baby Nagar are more susceptible to floods in Velachery area. There is only one exit point which connects the storm water drainage to Pallikaranai marsh. The entire channel is not sufficient to carry the flood water from Velachery. Thus Field surveys help to throw light on the real life situations and conditions providing reliable information for management of disasters such as floods.

References

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