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Flood Level Simulation Modeling And Vulnerability Of Slums Along Musiriver, Hyderabad

Dr. S.Venkateshwarlu*, Prof.Vijayabhole**
** Department of Geography&Geoinformatics, Osmania University, Hyderabad*
*** Professor, Emeritus, Department of Geography&Geoinformatics, Osmania University, Hyderabad*
Corresponding Author: Dr. S.Venkateshwarlu

ABSTRACT: *Hyderabad is one of the fastest growing metropolitan city of the India and an emerging mega city. The mega city of Hyderabad is the sixth largest Urban Agglomeration in India (2011).Extreme rainfall events triggered by climate change are responsible for unprecedented concentration of rainfall. As the frequency of extreme precipitation events in greater Hyderabad are increasing, so is the risk of flooding. The need of the hour is to identify and map the flood risk or vulnerability zones in order to understand, where there is need to build capacity to cope up with the problem of flooding . There, the need of the hour is to tackle the challenges of urban flooding in a more appropriate and scientific manner . To make the city flood resilient, application of geospatial technological tools and hydrological models are very useful as Decision Support Systems (DSS). Flood risk zonation map is essential for flood preparedness, early warning system, mitigation and decision making. Vulnerability is an important component of risk, as it determines whether or not, exposure to a hazard that may eventually results into a disaster. With rapid urbanization and population explosion coupled with climate change, the problem of urbanflooding isbecoming increasingly catastrophic in nature.*

KEY WORDS*: Extreme rainfall, flooding, Simulation Modeling, DEM and GIS*

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I INTRODUCTION

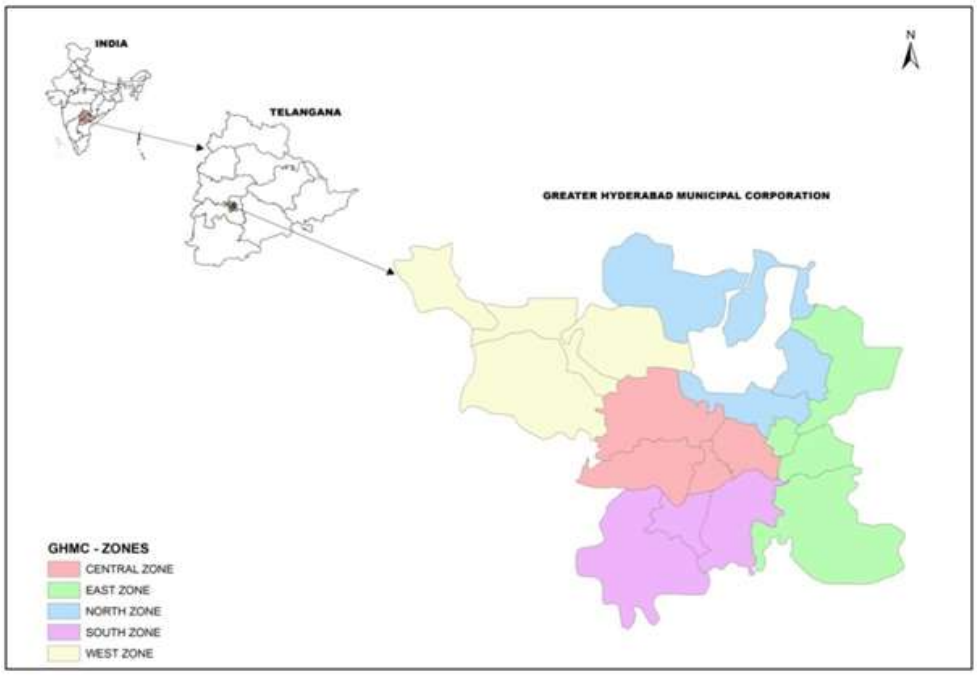
Extreme rainfall events triggered by climate change areresponsible forunprecedented concentrationof rainfall. Asthe frequency of extreme precipitation events in greater Hyderabad are increasing, so is the risk of flooding. The need of the hour is to identify and map the flood risk or vulnerability zones in order to understand, where there is need to build capacity to cope up with the problem of flooding . There, the need of the hour is to tackle the challenges of urban flooding in a more appropriate and scientific manner . To make the city flood resilient,application of geospatial technological tools and hydrological models are very useful as Decision Support Systems (DSS). Flood risk zonation map is essential forflood preparedness, early warning system, mitigation and decision making.Vulnerability is an important component of risk, as it determines whether or not, exposure to a hazard that may eventually results into adisaster. With rapid urbanization and population explosion coupled with climate change, the problem of urban flooding is becoming increasingly catastrophic in nature.

II STUDY AREA

Hyderabad is one of the fastest growing metropolitan city of the India and an emerging mega city. The mega city of Hyderabad is the sixth largest Urban Agglomeration in India (2011). Hyderabad is located at $17^0.36^{'}$ north latitude and $78^0.47^{'}$ east longitude. The relative relief within the city varies between 456 meters in Hyderabad south to 672 meters in Banjarahills in the north -western part of the city. The contour level falls gradually from west to east creating almost a trough near Musiriver. The city of Hyderabad was established in the year 1591 on the southern bank of Musi river, a tributary of Krishna river. River Musi divides Hyderabad city into Hyderabad north, the new city and Hyderabad south the old historical city. (Fig.1) River Musi has experienced disastrous flood in the year 1908. Due to rapid pace of urbanization, the areas along Musi river and its bed is encroached by large number of informal settlements and slums. Earlier Hyderabad was known for its historical monuments like Charminar and Golconda . Today due to rapid pace of urbanization, turned this feudal city of Hyderabad to "Cyberabad" due to its emergence as rapidly developing hub of Information Technology (IT) and other related sectors.

Fig.1

LOCATION OF GREATER HYDERABAD MUNICIPAL CORPORATION



Source:Greater Hyderabad Municipal Corporation

III OBJECTIVES:

I. Flood level Simulation Modeling along Musiriver.

II. To map slums vulnerable to urban flooding along Musiriver.

IV METHODOLOGY AND DATA BASE:

The data related to slums is obtained from Greater Hyderabad Muncipal Corporation (GHMC). The slums located alongMusi river are plotted using GPS. Shuttle Radar Topographic Missin

(SRTM) DEM is used for Floodlevel Simulation. Arc GIS 10.1 version is used in the flow Accumulation and flood inundation mapping. Overlay, a tool of analysis in Arc GIS is used to identify the vulnerability of slums to various flood levels. Slums falling in different flood levels is identified.

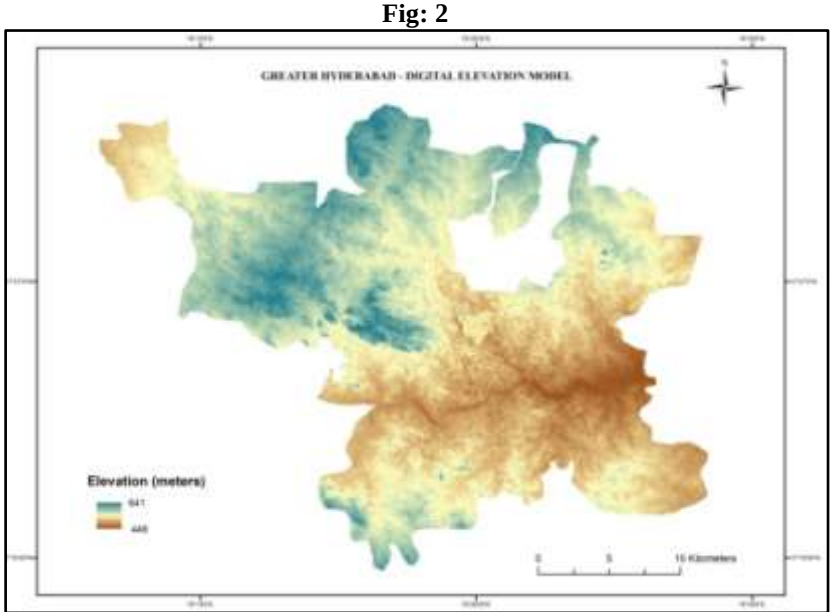
V DISCUSSION AND RESULTS

flood level simulation and slums vulnerable to flooding along musi river:

In flood simulation mapping a series of layers representing inundation at different water levels is used . Flood simulation modelling is a quick and cost effective method of altering habitations during floods .This method is useful in anticipating the areas to be affected in flood situation. Simulation of flood inundation area through hydrological modelling is a best approach. It requires fine resolution DEM and real time hydrological data. This method can be of great help for urban planners and decision makers in times of flood events.

To assess vulnerability of slums to flood along Musi river,Digital Elevation Model (DEM) is used. The Digital Elevation Model (DEM) is obtained from Space Shuttle Radar Topographic Mission (SRTM) down loaded from the USGS website. The minimum elevation along the Musiriver is 463 meters and maximum is 635 meters.

Fig: 2



Source: Shuttle Radar Topography Mission (SRTM) Imagery, 2013

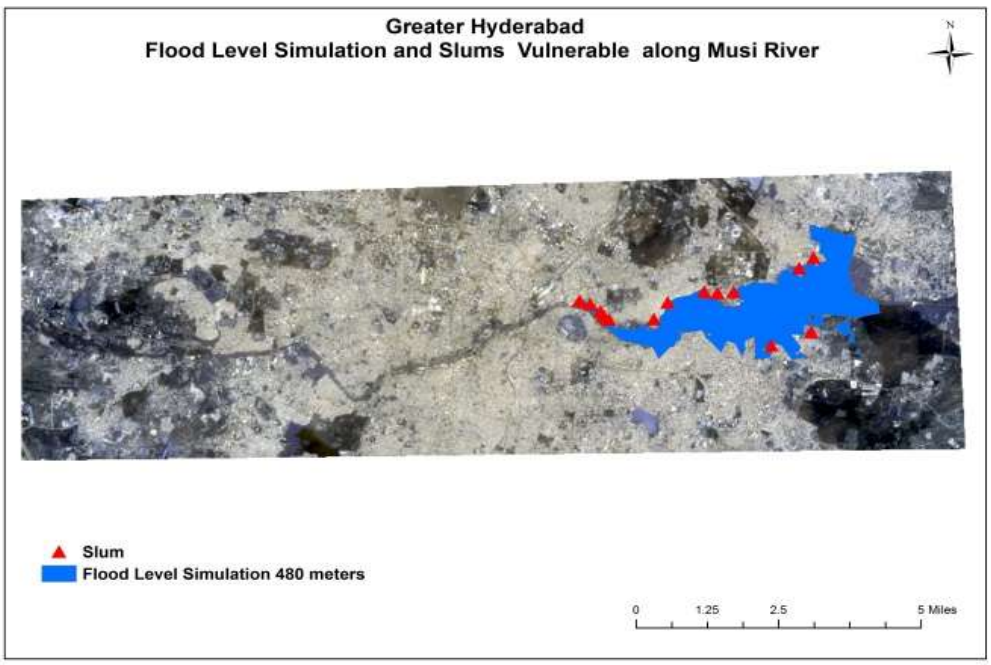
Table: 1

FLOOD LEVEL SIMULATION - SLUM VULNERABILITY TO FLOODS ALONG MUSI RIVER

Elevation (meters)	No. of Slums	Area (Sq.km)
480	14	11. **6**59
481	23	12.83
482	23	14.06
483	32	15.3
484	38	16.68
485	38	17.9
490	82	27.42
Total	250	155.78

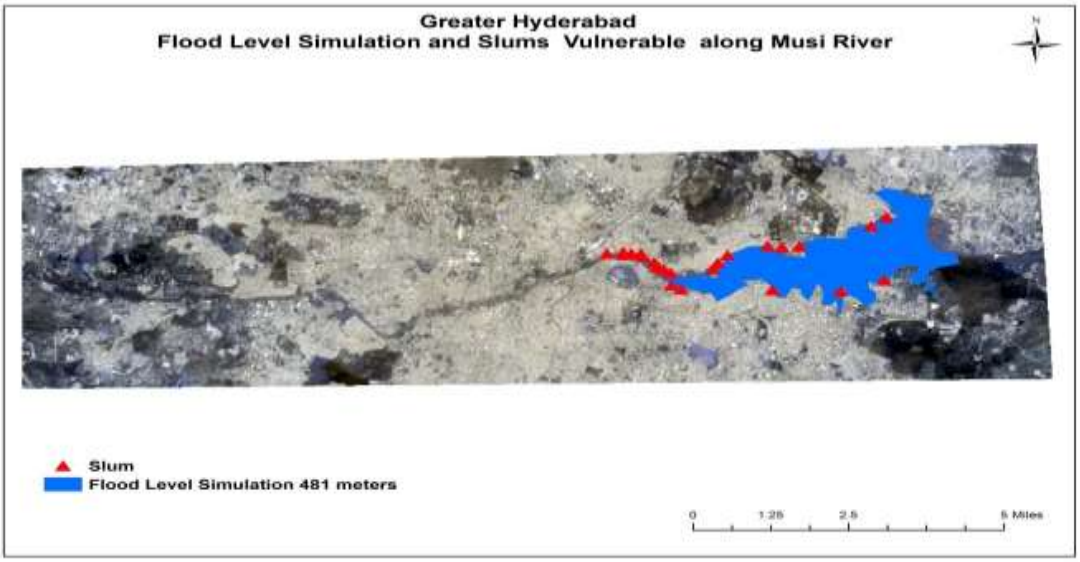
Source: GHMC and fig 2

Fig: 3



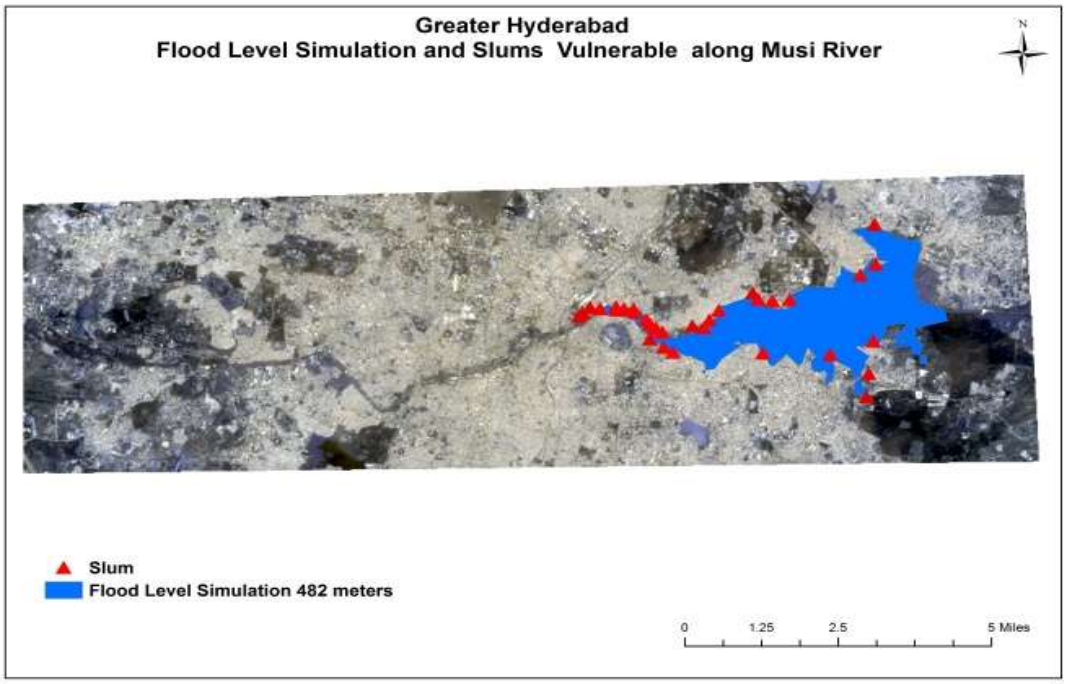
Source: GHMC and fig 2

Fig: 4



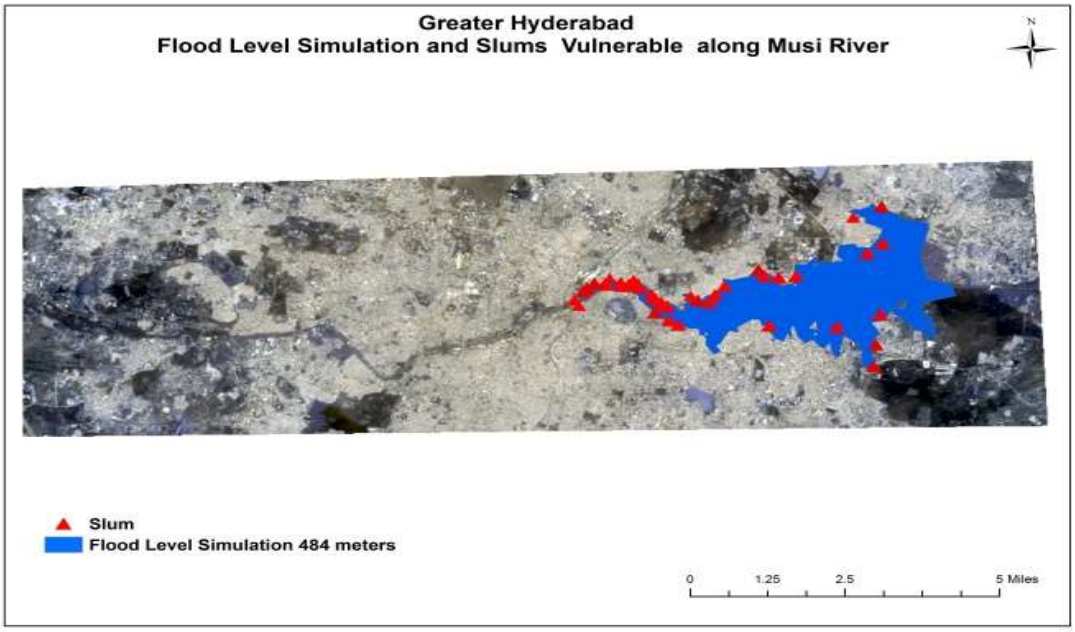
Source: GHMC and fig 2

Fig: 5



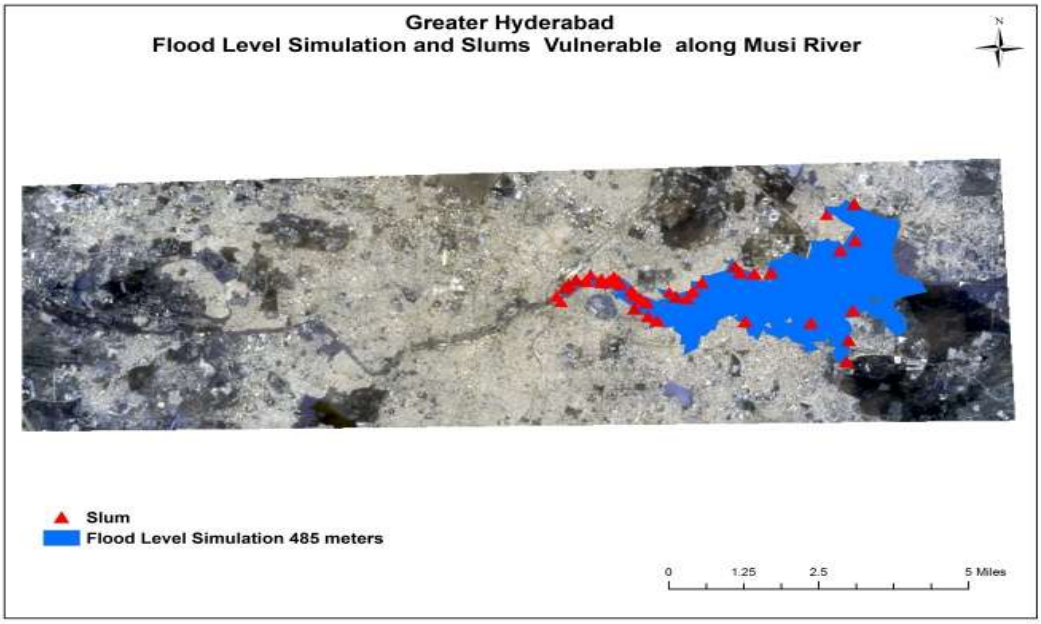
Source: GHMC and fig 2

Fig: 6



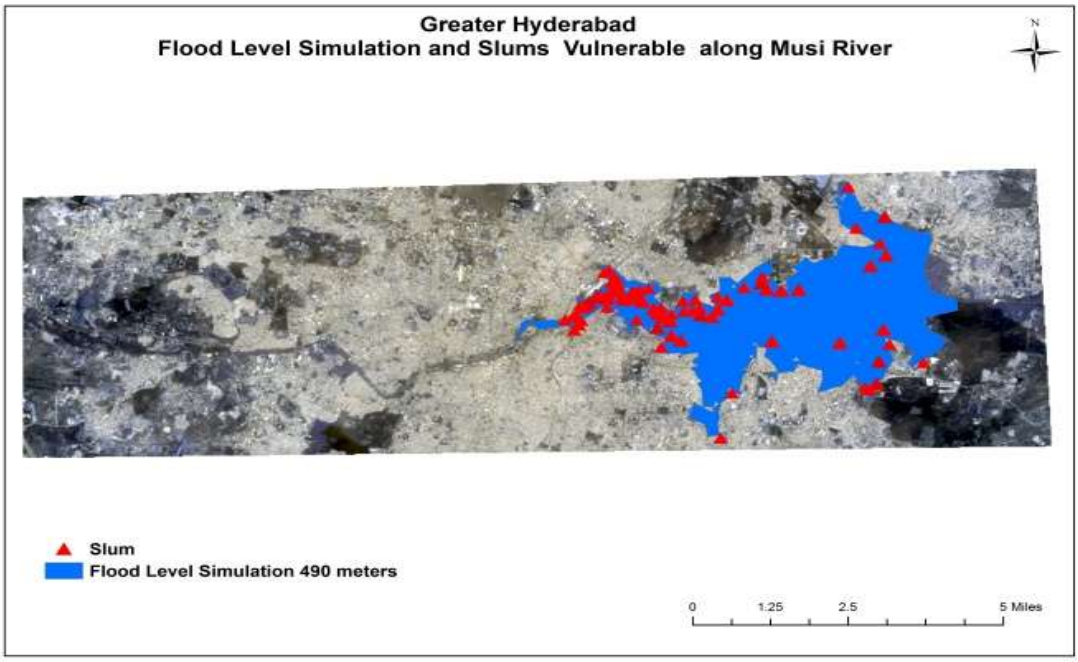
Source: GHMC and fig 2

Fig: 7



Source: GHMC and fig 2

Fig: 8



Source: GHMC and fig 2

Flood simulation is done at an interval of one meter elevation level along Musiriver. The likelihood of areas to be submerged during flooding along Musiriver varies between 0.35 km to 0.67 KM along Musi river, if the flood level simulated ranges between 480 to 490 meters elevation. The simulation of flood water level reveals that, when the flood level reaches 480 meters , along the Musi river , nearly 14 slums covering an area of 11.59 sq.km will be inundated . The maximum number of slums will be inundated,when the flood level rises to 490 meters along Musi river banks . Large number of slums are likely to be submerged, if the flood water rises to 490 meters . The total number of slums likely to be submerged is 250, when the level of flood water rises 10 meters along the Musiriver i.e. between 480- 490 meters.

VI CONCLUSION

For flood modeling, DEMand GIS provided basic input which proved to be very useful.Flood level simulation analysis can be of great use as a Decision Support System (DSS) specially in evacuating and rehabilitation of slums vulnerable to floods.

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