Disaster Management Plan for Nanded City by Using Geographical Information System

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Abstract: This paper is an attempt to prepare disaster management plan for Nanded city (MH) India. **Objectives:** The objective of the research is to time wise service area calculation for fire station and ambulance. Preparation of buffer zone maps for flood prone area. Generation of facility zone for police stations. **Methods:** The random distortions were corrected using well distributed ground control points occurring in raw data. To achieve plan metric accuracy, the remote sensing scene was rectified with respect to SOI maps on 1:50,000 scale. Then the subset of image has been taken according to the boundary of the study area. The digital classification technique has been used for the extraction of the land use and land cover information from the imagery. **Results:** Using GIS for Preparing Disaster management plan for Nanded city. **Conclusions:** It is found that major population having areas are of Nanded city i.e. Anand Nagar, Sahayog Nagar, Ambedkar Nagar, Manyar Galli, Bramhapuri, Umar Colony, Bilal Nagar, Labor Colony, Jaibhim Nagar, Shiv Nagar, Jangamwadi, Hanuman gad, Mandhai, Ram Rahim Nagar, Sidhnathpuri, Ambekar Nagar and Shobha Nagar. This growth is subsequently found in same area of Nanded city that make problem in feature for disaster management.
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1. Introduction

India is the most flood affected nation in the world after Bangladesh. It accounts for one fifth of global deaths due to floods and on average 30 million people are evacuated every year. Unprecedented floods takes place every year in one or the other state of the country. (Khanna 2005) Geographic Information Systems (GIS) is a technology that can gather, store, analyze, manage, manipulate, map, and display information on a geographical location. GIS technology is a combination of computer-based tools, data, people, and methods that work together to perform tasks related to spatial data (Brenda and Lerner, 2009). Geographic Information Systems (GIS) are a powerful set of computer-based tools used to collect, store, manipulate, analyze and display spatially referenced information (Burrough and McDonnell 1998). They transform data into knowledge and present this knowledge in various formats for the purpose of supporting decisions. GIS are usually portrayed as knowledge-based and free from bias, but in fact GIS is a socially constructed technology (Warren 1995). GIS (Geographic Information Systems and Science) have always shared many of the foundational ethea (plural of ethos) of Web 2.0 (Kamel and Wheeler 2007). Indians have been enthusiastically and rapidly adopting GIS and remote sensing technology over the past 15 years. In this adoption, technical expertise in the geomatics fields has tended to be concentrated in scientific research centers, and the related initiatives and programs have been top-town and data centric (Walsham and Sahay 1999; Geogiadou et al. 2005; Singh 2005).

On an average 4,888 people are killed and 59 million get affected annually from various types of disasters (International Federation of Red Cross and Red Crescent Societies, 1994). The government is hoping to find new uses for public information in the areas of criminal justice, health and education, and is opening up gigabytes of information for this purpose from a variety of sources like mapping information from Britain's Ordnance Survey, medical information from the NHS (National Health Service), and neighborhood statistics from the Office for National Statistics. (Maged et al. 2008) Recent developments in GIS have led to significant improvements in its capability for decision making processes in land allocation and environmental management, among which Multi-Criteria Evaluation (MCE) is one of the most important procedures (Janssen and Rietveld 1990, Burrough et al. 1992, Jankowski 1995). However, changes in land cover and in the way people use the land have become recognized over the last 15 years as important global environmental changes in their own right (Turner, 2002). In 1997, a fire broke out in Bridhadeswara temple, killing 40 (including 31 women and 5 children) and left 85 injured.

They are used to support decision-making in a wide variety of contexts, including spatial planning and

environmental management.

There is an urgent need to prepare disaster management plan by using recent techniques like Geographic information systems. The present paper aims to identify the vulnerable part of Nanded city.

2. Materials & Methods

2. 1 Study Area

This study was carried out in Nanded city located within co-ordinates of latitudes between 18°.15' and 19°.55' North latitude and 77°.7' to 78°.15' east longitudes. The total area under the Nanded Waghala City Municipal Corporation jurisdiction is 51.76 sq. km. Nanded city is situated on the bank of Godavari River. Nanded city is divided in two parts i.e. Old Nanded 20.62 sq. km. North of the Godavari river (on the left bank) and New Nanded 31.14 sq. km. Comprising of Waghala and six other newly merged villages and CIDCO area, South of the Godavari river (on the right Bank). The population of Nanded city, as per 2001 census was 438397 persons. It is growing up to 550564 persons in 2011. The municipal area of Nanded City comprises 73 wards.

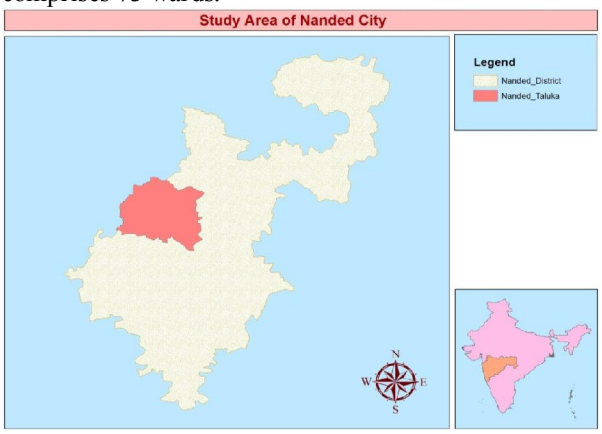

Figure: 1 showing study areas map of Nanded Taluka.

2.2 Methodology

The random distortions were corrected using well distributed ground control points occurring in raw data. To achieve plan metric accuracy, the remote sensing scene was rectified with respect to SOI maps on 1:50,000 scale. The GCP's in the scene such as railroad intersections, corners of water reservoirs, bunds, etc. were identified on the image as well as on the reference map. Third order model was constructed and finally registration of image was carried out with nearest neighborhood resampling taking map as reference and one map registration was achieved.

Then the subset of image has been taken according to the boundary of the study area. The digital classification technique has been used for the extraction of the land use and land cover information from the imagery. Eleven different land use and land cover classes have been identified in the area under study. Table shows the information about the extent of land use/land cover classes in the study area. Here, Spatial Adjustment technique is being used to remove that gap by retaining its geographic feature, describe as below:

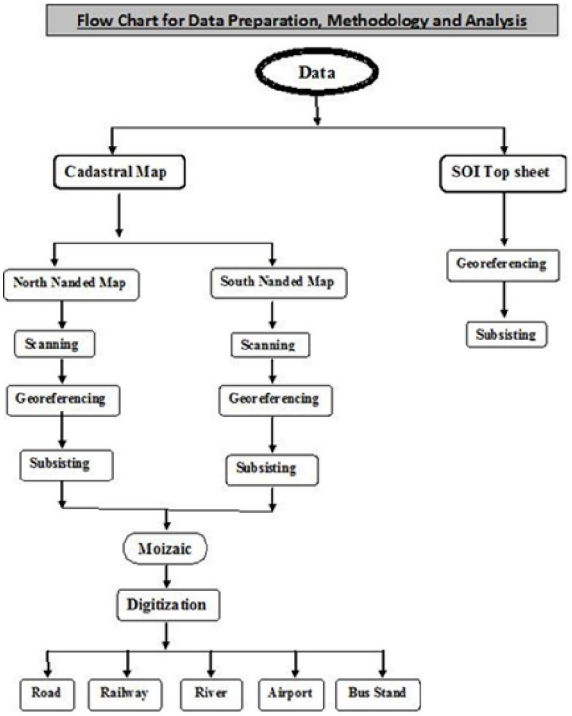

Figure: 2 Flow chart of data preparation methodology

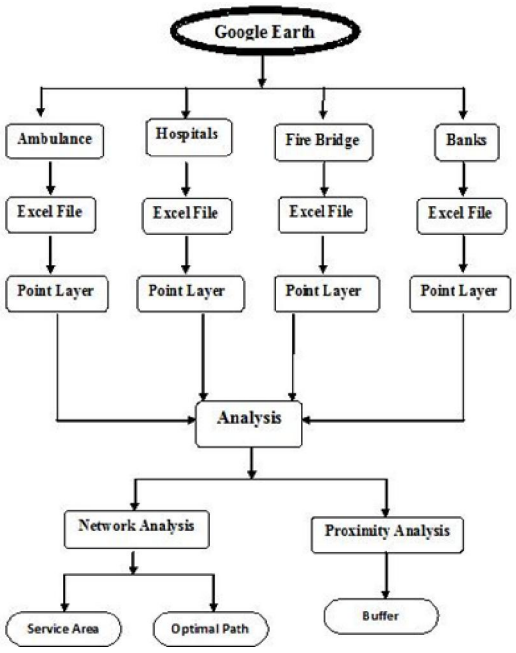

Figure: 3 Flow chart of data preparation methodology from Google earth & analysis.

3.3 Results and discussions

Flood vulnerable area is 40 million hectors and average area affected by floods annually is about 8 million hectors. Average yearly damage due to floods is about Rs. 9720 millions, effecting 32.03 million populations. On an average 1500 human lives are lost and nearly one lac (100,000) livestock die annually. 45 % of Assam's total area is prone to floods and major reason is river Brahmputra – the longest river that transverse through the state. It originates in Tibet in the North and its out flow is in Bay of Bengal in South. It flows through a total length of 918 km in India of which 720 km lies in Assam plains itself. (Khanna 2005) In such cases like Brahmputra flood GIS can help to prepare buffer zones of such rivers that can saves life of human beings as well as save from economic losses in that regions.

Dabwali fire tragedy in Haryana where about 400 children died during a school function. Tamil Nadu fire tragedies include the Saraswathi Vidyasala Higher Elementary school, Madurai (1964) where 35 children's died. (Khanna 2005) In such cases fire tragedy we can help to prepare buffer zones of fire bridge services for emergency in this region that can saves life of human beings as well as save from economic losses in this region. However, more applied possibilities such as GIS-based (disaster) management now becomes more and more widespread (e.g. Salvi et al., 1999, Venkatachary et al., 2001). City shows urban growth and its haphazard nature, which is obvious while traveling on the streets of Nanded. Areas are being converted for urban use without any systematic development plan and without a corresponding investment in infrastructure. As a result of it most of the population concentrated in the middle part of the Nanded Municipal Corporation area, most of the utilities founded in the same place. (Yannawar et. al. 2013)

Therefore it is prelude that the GIS techniques are the best tools to obtain accurate and reliable information on earth resources. Satellite imagery shows excellent facilities to study is useful for better understanding on regional scale to evolve the evolutionary history of the area. The present study shows the unplanned growth in city due to the more populous area and simultaneously poor urban planning and it requires to pay greater attention towards disaster management in Nanded city. Various maps were generated for the analysis in the GIS platform. Some of these maps are flood-affecting areas like buffers of city (Figures 10), city having road connectivity (Figure 5), hospital facility in flood affected areas (Figure 7), city fire bridge map (Figure 6), the city police station (Figure 8), city emergency services map (Figure 9) and (Figure 11) shows fire bridge service area.in the city. Out of 73 wards of city 12 wards in city are affected by Godavari River. With the help of above GIS generated map one can find out wards that are affected when floodwater of the Godavari River exceeds a particular level and this map also shows neighboring wards, which may be affected due to further rise in flood water.

4. Conclusion

Nanded comprises only one Fire Station so that the time required is 10-15 Minutes to reach to other end of study area and also single station requires covering more area in term of time and distance. Ambulance, Blood bank and Hospitals are well distributed throughout the study area, so that they provide good health facility.

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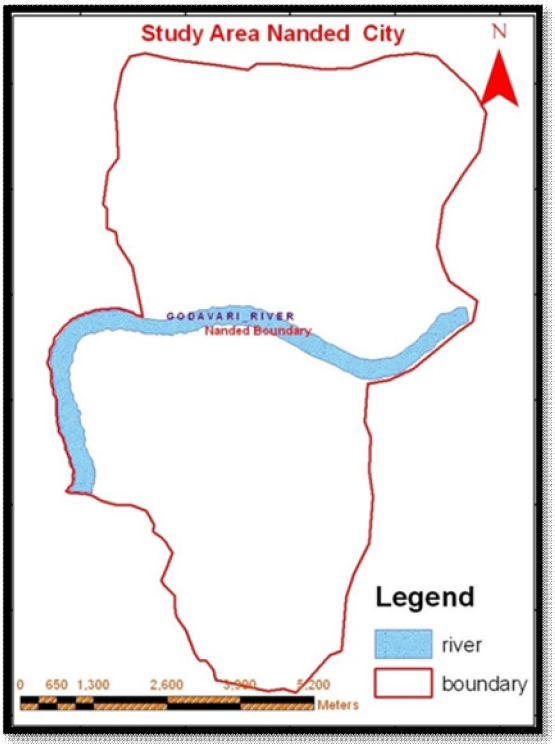

Figure 4: shows the study area of Nanded city.

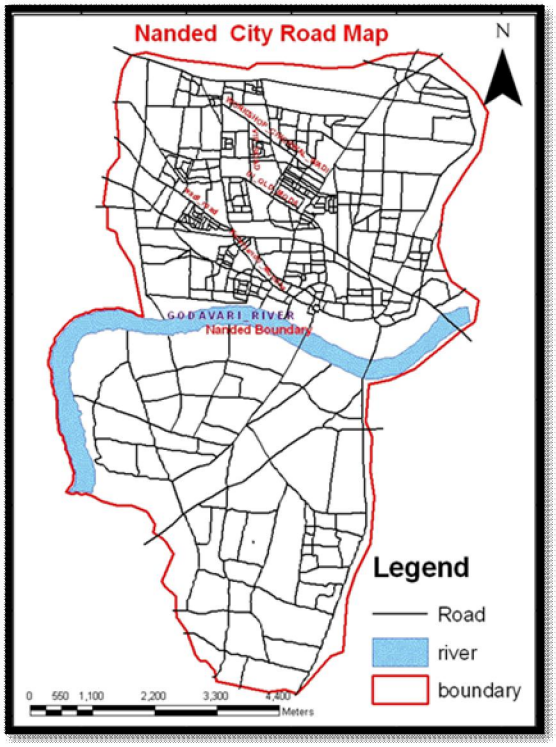

Figure 5: shows road map of Nanded city.

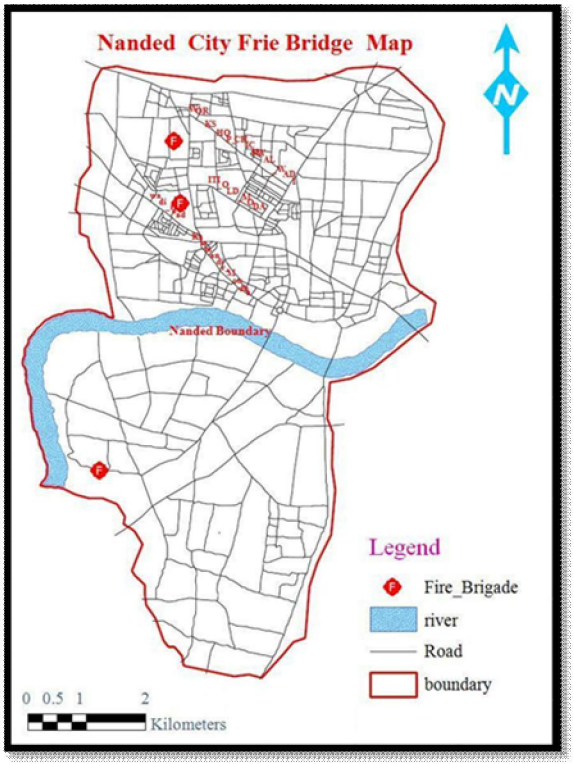

Figure 6: shows the city fire bridge map.

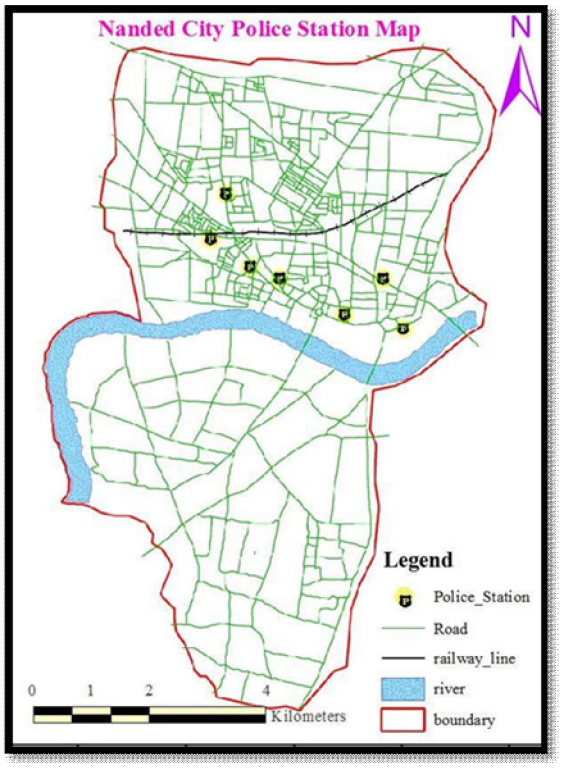

Figure 8: shows the city police station map.

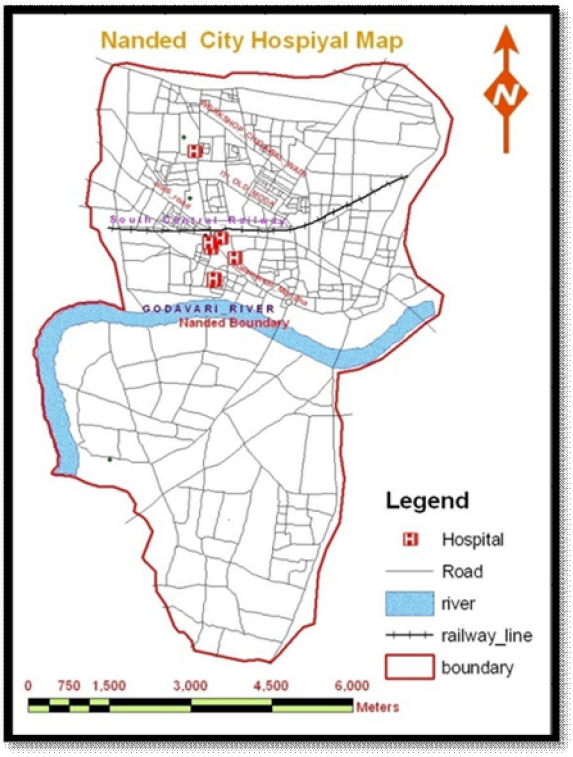

Figure 7: shows Nanded city hospital map.

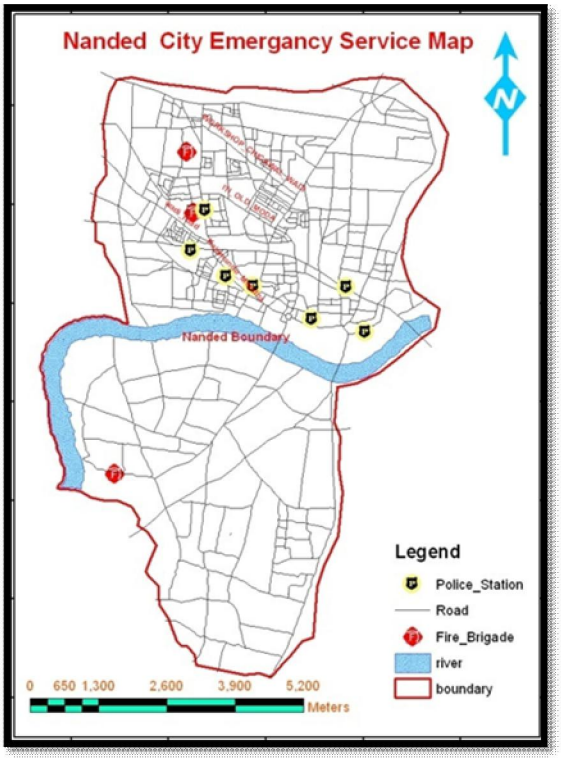

Figure 9: shows city emergency services map.

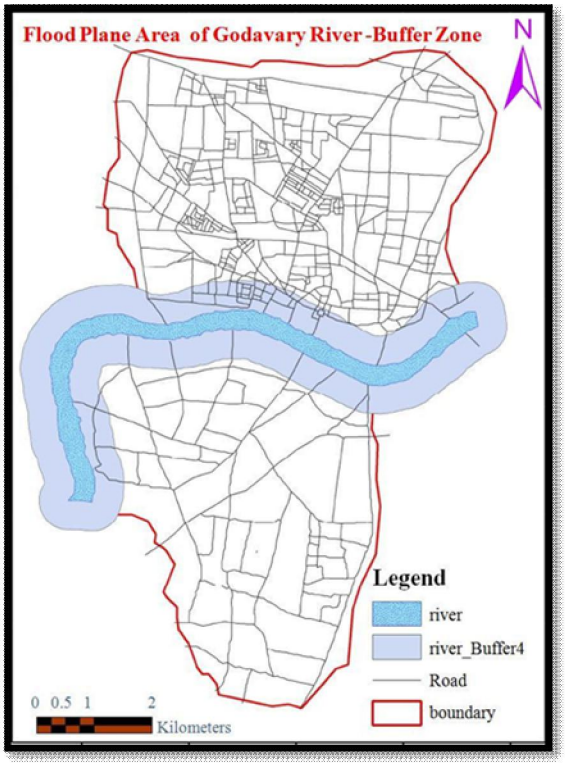

Figure 10: shows buffer zone of Godavari Rivers.

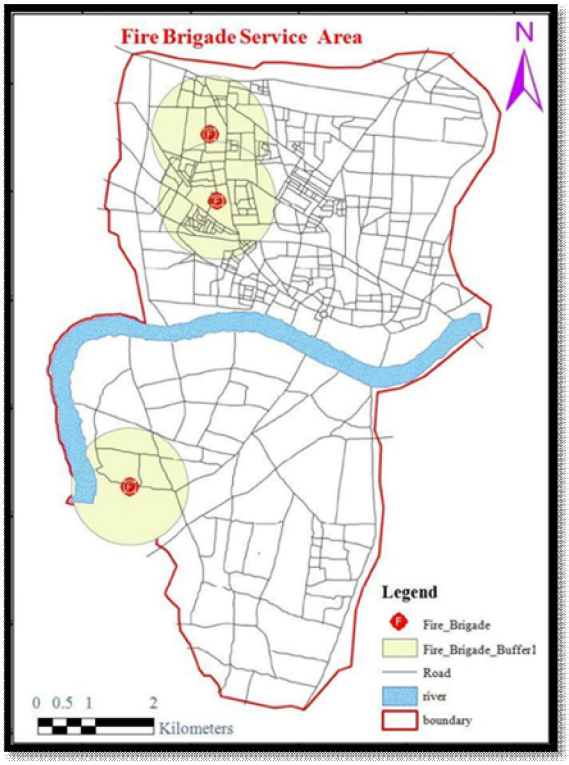

Figure 11: shows fire bridge service area.

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