

Environmental Planning for Disaster Management by using GIS-An Overview

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Abstract—Geographical Information System (GIS) with its inherent capabilities of handling spatial and non-spatial datasets, topographic analysis tools and generation of real time models will play crucial role in almost all phases of emergency management activities right from the preventive measures to disaster recovery processes. The disaster might not have the discrimination between urban and rural community, it will cause destruction in both the communities. But managing the disasters in the rural areas is much more complex than the urban areas. The reasons include unpreparedness, non-availability of required data sets, connectivity issues, unawareness and low intellectual response for the emergency etc. With consideration of these drawbacks in the rural community the disaster management activities will be dealt with more caution to minimize the affects of such natural calamities. This paper focuses on how the disaster can be managed through the understanding of the disaster phenomenon, using of GIS as tool in different phases of the disaster management and building up the awareness and required source data with specific reference to the rural context.

Index Terms— Customized GIS, Disaster Management, Decision Support System , Rescue management system.

I. INTRODUCTION

Emergency management may be defined as the discipline and profession of applying technology, science, planning and management to deal with adverse events that can injure or kill large numbers of people, do extensive damage to property, and disrupt community life. The man learnt a lot from these incidents and trying to face such challenges using the sophisticated technology. Any typical disaster management activity will have broadly six phases in its cycle. The cycle starts from the disaster prediction, prevention, preparedness, disaster mitigation, emergency management & Rescue, and ends with disaster recovery and rehabilitation. Predicting, preparedness and mitigation will be the part of pre-disaster management, while rest of the phases are the part of post-disaster management activities.

In the pre-disaster management cycle the various authorities, organizations and departments of governments will involve in the study and analysis of the natural formations and the periodical changes in the eco-systems in order to understand and predict the susceptibility of any such occurrences. In the initial stages broadly they

identifies the suspect zones for different types of the disasters. Then they will proceed for the detailed study of these zones in order to find out the root cause of such occurrences.

Remedial measures if any will be explored and will do experiments to reduce the impact. Formulation of preventive measures to control or at least to reduce the impact will be done by making the awareness in the respective authorities. These phases might not be possible for all types of disasters but definitely will play crucial role in frequent occurring disasters like floods and cyclones. The study of the changing course of the rivers and its tributaries in addition to the continuous monitoring of rainfall data and weather forecast will be helpful in managing such disasters. The study of the historic changes in the disaster prone areas will help a lot in understanding the phenomenon behind the disaster which will play crucial role in formulating the strategies in the disaster management activities.

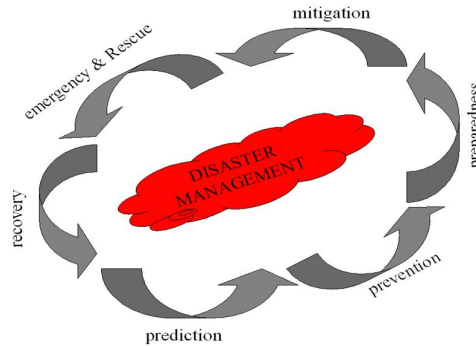


Fig.1 Critical Phases in Disaster Management

The disaster mitigation is the combination of real time strategies and action plans that deals with reducing impacts on human suffering and property damage. This phase will continuous even after the occurrence of the disaster. Huge planning through the good amount of dynamic and real time analysis and actions with respect to the changing situations will require in this phase.

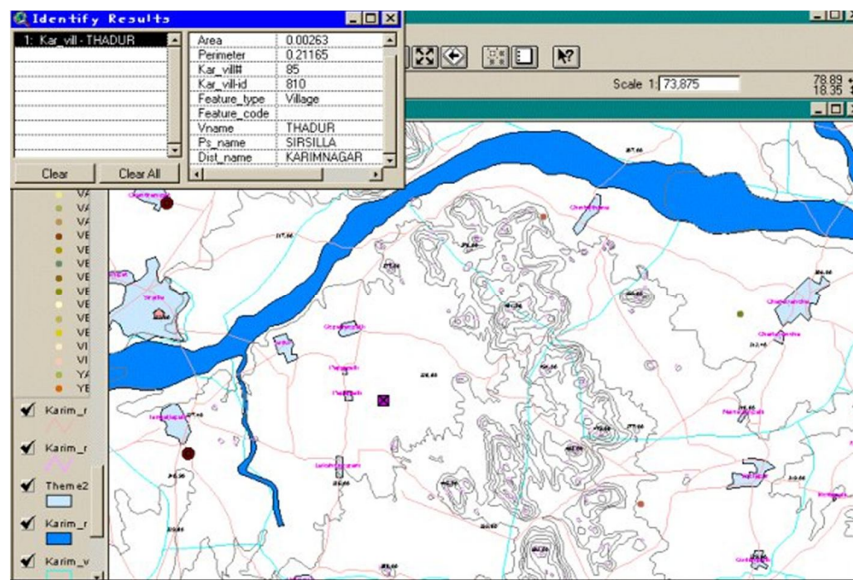
The post disaster activities comprises the emergency management like moving the people to safe locations, rescue of the suffering people, provision for shelter and supply of food and medical assistance through proper mobilisation of the available resources and time to time analysis of the situation, changing the strategy and re-requirement analysis and procuring the short comings in the resources are the prime challenging tasks of this phase. However this is the very crucial stage in the disaster management and requires enormous support from the real time dependable data sources.

The disaster recovery phase is the stage where the normalisation of the activities and human life to the prevailing situation to nearest possible extent. The challenging tasks in this phase are the damage assessment in terms of loss of lives, structures and property and cultivation etc. The rehabilitation and recovery will be planned according to the damage assessment results.

II. GIS AS TOOL FOR DISASTER MANAGEMENT

The disasters are the part of the changing phenomenon of the nature. However, when the accident happens it costs the human life. This provoked the public to concern over safety. This is the right time to enhance the disaster management and rescue implementation operations with aid of sophisticated technology. The spatial and non-spatial databases of GIS will help in improving the standards of all phases of the disaster management life cycle.

The time and data availability are the critical elements in Disaster management and implementation. The right decision taken at the appropriate time from the valid sources helps implementing the plans efficiently. The major concerns in the disaster management and rescue planning involves detecting the location of a disaster and identifying the resource availability for rescue operations. In addition to this, the GIS database of the affected areas will enhance the speed and accuracy of planning and decision making activities during the disaster management.



The spatial data related to route mapping of the affected area and its surroundings helps in providing fast access to different safe locations i.e. for quick evacuation of the disaster prone areas. Whereas the non-spatial data of these areas gives the details of nearby government headquarters and their contact information, which minimizes the time factor in formulating the rescue strategy and smooth as well as fast alarming of the authorities concerned to improve the effectiveness of the rescue operations. The GIS always establishes dynamic link between these databases to improve the operating efficiency of the system. Hence the regular updation of the spatial and non-spatial database of all the geographical locations should be done, as it helps in decision making and effective rescue planning during the emergency conditions.

III. DISASTER MANAGEMENT & GIS APPROACH- RURAL PERSPECTIVE

The disaster management in the rural region is more complex. The history of the disasters in the developing countries like India reveals that the affected areas with greater magnitude are from the rural regions. Rehabilitation and recovery measures in the rural region are also pretty slow, due to many complex administrative factors involved in it.

The spatial events such as disasters adversely affecting the rural region as a result of range of factors like i) Non-availability of data sources, which is reducing the chances of prediction, ii) Preparedness is limited due to lack of resources iii) The low response time of the rescue and recovery teams due to the accessibility issues. iv) Lack of awareness to react to the emergencies. The remedial measures mentioned here would definitely improve the scenario to little extent:

- The detailed mapping of the neighbourhood can be done with the involvement of the schools, colleges, other academic institutions and government organisations that can provide necessary information for strategy panning in the emergency management.
- The committees can be formed with in the communities to monitor the various hazards with in the vicinity and also to take the lead to guide in emergencies.
- The accessibility and connectivity to the areas under risk for different kinds of disasters, can be improved by giving the priority in developmental projects like PMRY, Pradan Mantri Sadak Yojna etc.
- The awareness in the people of the disaster prone areas is critical as they are going to face the first impact of the disaster. Their response will greatly improve the success of the disaster management activities. The awareness can be improved through the counselling and interactions with them, for their understanding of DOs and DON'Ts at the time of such incidents.

IV. CONCLUSION

Disasters are the spatial events resulting catastrophic in their toll of human life. The disaster management activities require lot of data both spatial and non-spatial data sets for effective success, which can be possible by GIS. GIS is essential in effective preparedness, communication, and as a training tool for disaster management. The limitations and the shortcomings in the rural areas with reference to the disaster management will be considered to improve the speedy recovery from such destructive events.

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