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Disaster Management and Assorted Perspectives with Need to Use Laser Physics

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Abstract

India is vulnerable to natural and manmade disasters. All disasters are spatial in nature. GIS techniques act as a decision support tool. Decision making can possible by analysis of different GIS layers. Currently socio-economic and geo-spatial data is useful for management and planning of disasters as well as tackling of disastrous condition. Various departments and agencies who are stakeholders using GIS in the disaster management process. GIS, RS & GPS is useful in disaster management applications & for decision making. Evolution of computer technology and availability of hardware is helpful for rapid expansion of GIS in both disaster research and practice.

Keywords: Disaster Management, Laser Physics, Laser Clustering

Introduction

A disaster is an event or series of events that leads to sudden disruption of normal life, causing severe damage to life and property to an extent, that available social and economic

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protection mechanism are inadequate to cope. Disasters could be, natural (geological, hydro-meteorological and biological) or induced by human processes (environmental degradation and technological hazards).

While we cannot prevent an earthquake or a hurricane from occurring, or a volcano from erupting, we can apply the scientific knowledge and technical know-how to issue early warnings on volcanoes and cyclones and organize proper community response to such warnings.

Science and technology help us to understand the mechanism of natural hazards of atmospherical, geological, hydrological, and biological origins which are made up of an orderly system of facts that have been learned from study, experiments, and observations of floods, severe storms, earthquakes, landslides, volcanic eruptions and tsunamis, and their impacts on humankind and his works. The scientific and technological disciplines which are involved include basic and engineering sciences, natural, social and human sciences. They relate to the hazard environment (i.e., hydrology, geology, geophysics, seismology, volcanology, meteorology, and biology), to the built environment (i.e., engineering, architecture, and materials), and to the policy environment (i.e., sociology, humanities, political sciences, and management science).

Application of technology in disaster management

Though it is not possible to completely avoid the natural disasters, but the sufferings can be minimized by creating proper awareness of the likely disasters and its impact by developing a suitable warning system, disaster preparedness and management of disasters through application of information technology tools.

There are mainly applications we can use to manage disasters:

GIS and remote sensing

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GIS provides a tool for effective and efficient storage and manipulation of remotely sensed data and other spatial and non-spatial data types for both scientific management and policy oriented information. This can be used to facilitate measurement, mapping, monitoring and modeling of variety of data types related to natural phenomenon.

The specific GIS application in the field of Risk Assessment are:- Hazard Mapping to show earthquake, landslides, floods or fire hazards. Theses map could be created for cities, districts or even for the entire country and Tropical Cyclone Threat Maps are used by meteorological departments to improve the quality of the tropical storm warning services and quickly communicate the risk to the people likely to get affected by the cyclone.

Remote sensing makes observation of any object from a distance Remote sensing comprises Aerial Remote Sensing which is the process of recording information, such as photographs and images from sensor on aircrafts and Satellite Remote Sensing which consists of several satellite remote sensing system which can be used to integrate natural hazard assessments into development planning studies. These are: Land sat, SPOT Satellite, Satellite Radar System, Advanced Very High Resolution Radio.

GIS can also be used in carrying out search and rescue operations in a more effective manner by identifying areas that are disasters prone and zoning them accordingly to risk magnitudes.

Internet

In the present era of electronic communication, the internet provides a useful platform for disaster mitigation communications. Launching of a well-defined website is a very cost-effective means of making an intra-national and international presence felt. It provides a new and potentially revolutionary option for the rapid, automatic, and global dissemination of disaster information. A number of individuals and groups, including several national meteorological services, are experimenting with the Internet for real-time dissemination of weather observation, forecasts, satellite and other data. In the most critical phase of natural

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disasters electronic communication have provided the most effective and in some instances perhaps the only means of communication with the outside world.

Warning and forecasting system

An advance system of forecasting, monitoring and issuing early warnings plays the most significant role in determining whether a natural hazard will assume disastrous proportions or not.

IMD provides cyclone warnings from the Area Cyclone Warning Centers (ACWCs) It has developed the necessary infrastructure to originate and disseminate the cyclone warnings at appropriate levels. It has made operational a satellite based communication system called Cyclone Warning Dissemination System for direct dissemination of cyclone warnings to the cyclone prone coastal areas.

Seismological observations in the country are made through national network of 36 seismic stations operated by the IMD, which is the nodal agency.

These stations have collected data over long periods of time.

Flood forecasts and warnings are issued by the Central Water Commission (CWC) , Ministry of Water Resources. These are used for alerting the public and for taking appropriate measures by concerned administrative and state engineering agencies in the flood hazard mitigation. Information is gathered from the CWC's vast network of Forecasting Stations on various rivers in the country

It may be observed that advancement in Technology in the form of Internet, GIS, Remote Sensing, Satellite communication, etc. can help a great deal in planning and implementation of hazards reduction. For maximum benefit, new technologies for public communication should be made use and natural disaster mitigation messages should be conveyed through

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these measures. GIS can improve the quality and power of analysis of natural hazards assessments, guide development activities and assist planners in the selection of mitigation measures and in the implementation of emergency preparedness and response action. Remote Sensing, on the other hand, as a tool can very effectively contribute towards identification of hazardous areas; monitor the planet for its changes on a real time basis and give early warning to many impending disasters. Communication satellites have become vital for providing emergency communication and timely relief measures. Integration of space technology inputs into naturaldisaster monitoring and mitigation mechanisms is critical for hazard reduction. It is absolutelynecessary to create awareness amongst the public as well as decision makers for allocating resources for appropriate investments in information technology. Awareness and training in Information technology in a much greater measure is required to develop human resources, particularly in the developing countries, who are chronically suffer from natural disasters.

The disasters usually occur in the well-defined areas, even though the community does not know the coping mechanism for the disaster. The disaster mitigation programmes must be extensively taken up covering various aspects at national level to minimise the disaster damages. There should be a greater emphasis on development of new technologies in disaster mitigation. The disasterpreparedness and awareness is the only effective way of mitigating the impact of future disasters.

Therefore, without science and technology, and their blending with other disciplines, there can be no world safer from natural disasters. Thanks to science and technology, we already know much about natural hazards and about the ways and means to avoid or reduce many of their effects. Success in significantly reducing disasters is within our reach. Now is the time to act within the International Strategy for Disaster Reduction.

GIS is useful for hazard zone mapping and during emergency conditions mitigation of people can easily possible using this maps. GIS and RS much beneficial in mitigation strategies and

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preparedness plans. Real time geographic data can improve the allocation of resources for response. GIS technologies is much useful in modeling of disaster risks and human adaptations to hazards. It is also provides decision support system in disaster management.

Mitigation: Emergency is the discipline of dealing with and avoiding risks. It is a discipline that involves, steps taken to contain or reduce the effects of an anticipated or already occurred disastrous event.

Preparedness: It is how we change behavior to limit the impact of disaster events on people.

Response: An effective plan for public health and other personnel during a disaster would outline activities designed to minimize the effects of the catastrophe. These efforts can be summarized as closely situation analysis and response.

Disaster Recovery: The aim of the recovery phase is to restore the affected area to its previous state. Recovery efforts are concerned with issues and decisions that must be made after immediate needs are addressed.

Disaster Management is done by following steps:

1. Planning and Analysis
2. Situational Awareness
3. Data Management
4. Field Operations

Planning and Analysis:

GIS is the most complete information system for modeling, analyzing spatial data and displaying community vulnerability. When we identify hazard locations with critical infrastructure. Processed GIS Models can be useful for determination of event impact and

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necessary mitigation requirement. Preparedness is important when disastrous event occurs. On analysis of risk and hazards is beneficial in Emergency management program

Situational Awareness:

Disaster and emergency management in situational awareness is essential thing. GIS techniques plays vital role to provide locational information of the event, that is, where is the event happened and what happening exactly in real time. Also by linking people, processes spatial information situational awareness established. GIS map interface important in handling emergency condition.

Data Management:

To achievement of preparedness, gathering of information and its advance data storing is important. In GIS, integration of information from other sources is possible. GIS solution is a standards-based. Accurate cataloging of GIS data provide useful information during emergency conditions.

Field Operations:

Field data is very important in GIS applications and Mobile GIS provides crucial information. Field teams captures information and sent back to user. So ground information useful for recognizing actual event conditions. Then new data can be sent to operation teams in field (where disaster occur), so they have the information possible for protecting lives and providing safety to people. Whether its response or recovery phase, Mobile GIS provides right information

Important objectives of GIS database generation are,

Disaster managers from different state, city, village level using GIS database for disaster planning.

- Preparedness and planning of disasters
- Forecasting and early warning of disastrous event

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- For relief management, rescue operations

GIS database with various themes is helpful to disaster managers in decision making process when catastrophic event occur.

GIS database include following information which is beneficial in disaster management.

1. Use of different satellite imageries (Remote Sensing data) ex. Quickbird, SPOT, IKONOS for GIS data creation.
2. Preparation of base map of different themes using satellite imageries.
3. Thematic maps such as hydro geomorphologic map, slope map, terrain map, and DEM generation in GIS. It is used for disaster planning.
4. Macro and micro level maps used for identifying vulnerability and threat condition
5. Identification of safe locations and zones for rehabilitation
6. Road and location maps used for finding alternate routes, shelters and locations
7. Planning of evacuation and operation
8. Management of Rehabilitation and post-disaster reconstruction.
9. Suitable locations identifying scientifically for construction of houses and shelters
10. No construction areas identified and rehabilitation of existing people can be done.
11. Hospitals and medical facilities identification for injured people.

GIS solutions for different hazards:

1. Earthquake

- GIS can be useful for monitoring historical sites of earthquake also to Response & data management for recovery.
- It's also useful for Impact assessment.

2. Flood

- Flood mapping from Macro level to Micro level.
- Flood Zone mapping.
- Detecting Potential Site of Flood in reference with rainfall

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- Elevation Mapping
- Preparing Response map in response to manage after flood situations

More than 700,000 people died as a result of disasters between the years 2005 and 2014. In 2017, the American Red Cross delivered more relief support than it had in the previous four years combined, responding to 242 significant disasters in the US alone.
Technological innovation is bringing digital solutions to sectors that have previously lacked access to technology, including the non-profit community. The rapid pace of this change suggests that one of technology's most meaningful benefits for society may lie in the humanitarian sector, which must reach large numbers of people, in remote and dangerous locations, to provide critical resources fast and efficiently.

From aerial robotics to big data analytics, technology presents the opportunity to expedite and magnify the impact of humanitarian relief efforts through greater efficiency and responsiveness; reaching more people, sooner, more cost-effectively, and saving more lives. For example:

Conclusion

Aerial robotics, including unmanned aerial vehicles (UAVs), aka drones, show tremendous potential to transform humanitarian aid. Using this technology, organizations can map terrain more effectively, assess damage in real time, increase situational awareness through high-resolution mapping and deliver items faster, cheaper and more efficiently. Lower in cost, lighter in weight (as little as three pounds) and quieter than helicopters or planes, with pre-programmed routes that enable them to fly in life-threatening conditions, these "digital responders" provide access to otherwise unreachable areas. In addition, infrared cameras and advanced listening systems enable UAVs to uncover survivors from rubble or among flames and live-stream night footage, increasing the success of critical rescue efforts. For example, global non-profit WeRobotics' programme, AidRobotics, identifies local humanitarian needs and incubates robotics solutions via regional Flying Labs. Following extensive flooding in

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2017, its Peru Flying Labs formed the Mision PIURA multistakeholder consortium to create high-resolution aerial images of more than 7,000 hectares (nearly 17,300 acres) in just three days. These maps provided humanitarian agencies with a detailed understanding of the region including infrastructure damage, locations of stranded communities, safe areas for resettlement, and efficient routes for aid delivery. Digital elevation models enabled the government to continually monitor water level changes throughout the region.

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