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INFORMATION TECHNOLOGY FOR DISASTER MANAGEMENT

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ABSTRACT

Now in the age of technology it has been easier to manage the disasters both natural and men made. We can manage them by using the various features of information technology. IT is useful to prevent as well as recover them… It may be observed that advancement in Information Technology in the form of Internet, GIS, Remote Sensing, satellite communication, etc. can help a great deal in planning and implementation of hazards reduction measures. GIS can improve the quality and power of analysis of natural hazards assessments, guide development activities and assist planners in the selection of lessening 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 natural disaster monitoring and mitigation mechanisms is critical for hazard reduction. It is absolutely necessary to create awareness amongst the public as well as decision makers for allocating resources for appropriate investments in information technology. In this paper an attempt has been made to highlight the role of information technology in management of natural disasters in India

Key words

Disasters in India
Application of IT in Disaster Management
Warning and Forecasting System
Financial and Administrative Arrangements
Administrative Structure

INTRODUCTION

It is a well known fact that natural disasters strikes countries, both developed and developing, causing huge destruction and creating human sufferings and producing negative impacts on national economies. Due to various geo-climatic conditions prevalent in different parts of the globe, different types of natural disasters like floods, droughts, earthquakes, cyclones, landslides, volcanoes, etc. strikes according to the vulnerability of the area.
India is considered as the world's most disaster prone country. It has witnessed devastating natural disasters in recent past like droughts, floods, cyclones, earthquakes, landslides…

NATURAL DISASTERS IN INDIA

India is a large country and prone to a number of natural hazards. Among all the natural disasters that country faces, river floods are the most frequent and often devastating. The shortfall in the rainfall causes droughts or drought like stimuli in various parts of the country. The country has faced some severe earthquakes causing widespread damage to the life and property. India has a coastline of about 8000 km which is prone to very severe cyclonic formations in the Arabian Sea and Bay of Bengal. Another major problem faced by the country is in the form of landslides and avalanches.
With an increase in the perception towards spreading a culture of prevention in the disaster management scenario, considerable emphasis is now being placed on research and development activities in the area of information technology for disaster preparedness and prevention. This has

brought in a significant positive change even though the multitude and frequency of disasters in the country has increased.

APPLICATION OF INFORMATION 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. The changing trends have opened up a large number of scientific and technological resources and skills to reduce disaster risk.

There are mainly applications we can use to manage disasters:

1) GIS and Remote Sensing

2) Internet

GIS AND REMOTE SENSING

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 modelling 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 and without coming into actual contact. Remote sensing can gather data much faster than ground based observation, can cover large area at one time to give a synoptic view. 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. Some applications of GIS and Remote Sensing in various disasters are as follows:-

(A)DROUGHT

GIS and Remote Sensing can be used in drought relief management such as early warnings of drought conditions will help to plan out the strategies to organize relief work. Satellite data may be used to target potential ground water sites for taking up well-digging programmers. Satellite data provides valuable tools for evaluating areas subject to desertification. Film transparencies, photographs and digital data can be used for the purpose of locating, assessing and monitoring deterioration of natural conditions in a given area.

(B)EARTHQUAKE

GIS and Remote Sensing can be used for preparing seismic hazards maps in order to assess the exact nature of risks.

(C)FLOODS

Satellite data can be effectively used for mapping and monitoring the flood inundated areas, flood damage assessment, flood hazard zoning and post-flood survey of rivers configuration and protection works.

(D)LANDSLIDES

Landslide zonation map comprise a map demarcating the stretches or area of varying degree

of anticipated slope stability or instability. The map has an inbuilt element of forecasting and is hence of probabilistic nature. Depending upon the methodology adopted and the comprehensiveness of the input data used, a landslide hazard zonation map able to provide help concerning location,- extent of the slop area likely to be affected, and rate of mass movement of the slope mass.

(E)SEARCH AND RESCUE

GIS can 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 web site 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 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. The country have the following forecasting systems:

1 INDIAN METEOROLOGICAL DEPARTMENT (IMD)

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. IMD runs operationally a Limited-area Analysis and Forecast System (LAFS), based on an Optimal Interpretation (OI) analysis and a limited area Primitive Equation (PE) model, to provide numerical guidance.

2 NATIONAL REMOTE SENSING AGENCY(NRSA)

Long term drought proofing programmes on the natural resources of the district have been greatly helped by the use of satellite data obtained by NRSA. Satellite data can be used very effectively for mapping and monitoring the flood inundated areas, flood damage assessment, flood hazard zoning and past flood survey of river configuration and protection works.

3 SEISMOLOGICAL OBSERVATIONS

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.

4 WARNING SYSTEM FOR DROUGHT

The National Agricultural Drought Assessment and Management System (NADAMS) has been developed by the Department of Space for the Department of Agriculture and Cooperation, and is primarily based on monitoring of vegetation status through National Oceanic and Atmospheric Administration (NOAA) Advanced Very High Resolution (AVHR) data. The drought assessment is based on a comparative evaluation of satellite observed green vegetation cover (both area and greenness) of a district in any specific time period,

with that of any similar period in previous years.

5 Flood Forecasting

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.

6 CYCLONE TRACKING

Information on cyclone warnings is furnished on a real-time basis to the control room set up in the Ministry of Agriculture, Government of India. High-power Cyclone Detection Radars (CDRs) that are installed along the coastal belt of India have proved to be a very useful tool to the cyclone warning work. These radars can locate and track approaching Tropical Cyclones within a range of 400 km. Satellite imagery received from weather satellite is extensively used in detecting the development and movement of Tropical Cyclones over oceanic regions, particularly when they are beyond the range of the coastal radars. The existing mode of dissemination of cyclone warnings to various government officials is through high priority telegrams, telephones, telex and fax.

FINANCIAL ARRANGEMENTS FOR NATURAL DISASTER IN INDIA

Natural Disasters are huge economic burdens on developing economies such as India. Every year huge amount of resources are mobilised for rescue, relief and rehabilitation works following natural disaster occurrences. The Central Government plays a major role as far as mobilisation of financial resources are concerned. A scheme called Calamity Relief Fund (CRF) has been constituted for each state with contribution from the Central and State Government to undertake relief and rehabilitation measures .This enable the states to manage and provide for calamity relief on their own by drawing upon the resources available with a fund constituted for that purpose separately for each state. In addition to CRF, a National Fund for Calamity Relief (NFCR) has been created to deal with hazards of rare severity managed by a National Calamity Relief Committee (NCRC). The State Governments are required to submit memoranda for this purpose giving details of damage and destruction and the cost of relief and rehabilitation. On receipt of these memoranda, the Government of India decides on an individual basis whether a Central Team is required to be deputed to assess the situation.

ADMINISTRATIVE STRUCTURE OF DISASTER MANAGEMENT IN INDIA

The Department of Agriculture and Cooperation (DAC) in the Ministry of Agriculture, Government of India, is the nodal department for all matters concerning natural disasters relief at the Centre. The National Contingency Action Plan (CAP) facilitates launching of relief and rescue operations without delay. There are various committees at the national level for disaster management such as Cabinet Committee for effective implementation of relief measures in the wake of natural calamity; National Crisis Management Committee at the national level headed by the Cabinet Secretary who is in charge of various types of disasters and supporting ministries as members; Crisis Management Group reviews various measures required for dealing with a natural disaster, and coordinates activities of the Central ministries and the State Governments pertaining to disaster preparedness and relief and obtains information from nodal officers on measures relating to the above. Figure 1 shows the Interaction Pattern in the Government.

The State Governments are autonomous in organising relief operations in the event of natural disaster and a long-term preparedness / rehabilitation measures. The State Governments efforts are supplemented by Central Government.

There is a State Crisis Management Group (SCMC) under the Chairmanship of Chief Secretary/Relief Commissioner to take into consideration the infrastructure and guidance received, from time to time, from Government of India and formulate action plans for dealing with different natural disasters.There is a State Level Control Room set up whenever a disaster situation develops.

States are further divided into districts, each headed by the District Collector (also known as the District Magistrate or Deputy Commissioner), who is the focal point at the district level for directing, supervising and monitoring relief measures for disaster and for preparation of district level plans. The Collector exercises coordinating and supervisory powers over functionaries of all the departments at the District level. The relief measures are reviewed by the District Relief Committee consisting of official and no-official members, including local legislators and members of parliament. In the wake of Natural disasters, a Control Room is set up in the District for day-to-day monitoring of the rescue and relief operations on a continuing basis.

The Collector/Deputy Commissioner maintains close liaison with the Central Government authorities in the districts, namely, Army, Air Force an Navy, Ministry of Water Resources, etc., who supplement the effort of the District Administration in the rescue and relief operation.They also co-ordinates all voluntary efforts by mobilising the non-government organisations capable of working in such situations.

The armed forces of the country have played a vital role during disaster emergencies providing prompt relief to the victims even in the most inaccessible and remote areas of the country. The organisational strength of the armed forces with their disciplined and systematised approach, and with their skills in technical and human resource management make them indispensable for such emergency situations. India having a federal structure the integrated disaster management mechanism exists within the government framework.

CONCLUSION

It may be observed that advancement in Information 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 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 natural disaster monitoring and mitigation mechanisms is critical for hazard reduction. It is absolutely necessary 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 grater 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 disaster

preparedness and awareness is the only effective way of mitigating the impact of future disasters.

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