Journal of Environment and Earth Science
ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online)
Vol.6, No.4, 2016

Technology in Disaster Management and Disaster Risk Reduction: A Review of Applications

V. Rathore
School of Engineering and Technology, Jagran Lakecity University- Bhopal-02

Abstract

India has been traditionally vulnerable to natural disasters on account of its unique geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been a recurrent phenomena. Despite the fact that we cannot prevent an earthquake or a typhoon from occurring, or a volcano from erupting, we can apply the scientific knowledge and technical knowledge to Disaster risk reduction. Supervision of disaster risks and disaster events is heavily dependent on scientific knowledge and evidence - based technique. Coping with hazards whether natural or attributable to human activity is one of the greatest challenges of the applications of science and technology. In the present paper review on various technologies helps in disaster risk reduction is presented. A detailed information including functionality, working and applications of DBMS, RDBMS, MIS, DSS, Geographic information systems and remote sensing have been presented in the paper.

Key Words: Risk Reduction, DBMS, DSS, MIS, GIS, Remote Sensing

1. INTRODUCTION

The role of technology in disaster can be predictable in such a way that it minimizes the hazard and helps in reduction of vulnerability. Progress in the science and technology of natural hazards and related coping mechanisms has made it possible over the past years to introduce significant changes in the integrated approach to the problematic of natural disasters. Science and technology help us to understand the mechanism of natural hazards of atmospherically, geological, hydrological, and biological origins and to analyze the transformation of these hazards into disasters. The scientific and technological disciplines, which are involved, include basic and engineering sciences, natural, social and human sciences. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought. In the decade 1990-2000, an average of about 4344 people lost their lives and about 30 million people were pretentious by disasters every year. Even as substantial scientific and material progress is made, the loss of lives and property due to disasters has not decreased. In fact, the human toll and economic losses have mounted. It was in this background that the United Nations General Assembly, in 1989, declared the decade 1990-2000 as the International Decade for Natural Disaster Reduction with the objective to reduce loss of lives and property and restrict socio-economic damage through concerted international action, especially in developing countries [1]. Over the last three decades, scientific knowledge of the intensity and distribution in time and space of natural hazards and the technological means of confronting them have expanded greatly. The dramatic advances in the understanding of the causes and parameters of natural phenomena and in the techniques for resisting their forces were presented, in the mid-80s, by Dr Frank Press, a lead scientist, as the rationale which made propitious the launching of the international decade devoted to reduce significantly the consequences of natural hazards.The International Strategy for Disaster Reduction is the successor of the Decade and provides a framework for each nation to fully utilize existing knowledge on the lithosphere, atmosphere, and biosphere and the know-how on disaster protection gained in prior years, and to build effectively and creatively upon past accomplishments so as to meet the projected needs for safer communities.

The wide spectrum of technologies used in all four phases of disaster management preparedness, mitigation, response and recovery are remote sensing, Geographical Information System, Global Positioning System (GPS), Satellite navigation system, Satellite communication, Amateur and community radio, television and radio broadcasting, Telephone and fax, Cellular phones, video Conferencing Networking Technologies, Internet, e-mail; On-line management databases, disaster information systems and networks, Robotics [2]. The application of all these technologies in disaster management are: Setting up disaster early warning system, Quick processing and analysis of disaster system. Applications also include Database construction; Information integration and analysis, Disaster mapping and scenario simulation; Hazard assessment and monitoring; disaster trend forecasting; Vulnerability assessment; Emergency response - decision support; Planning of disaster response, reduction, and relief ; Logistics preparation for disaster relief; Search and rescue teams. Warnings of

violent storms and of volcanic eruptions hours and days ahead have saved many lives and prevented significant property losses. Modern technologies encompass developments that reduce the exposure to natural hazard of the physical and built environment and other elements of socio-economic life. Owing to progress in design and construction engineering, earthquake-resistant structures, including high-rise buildings, critical lifelines and industrial facilities, are technically feasible and have become a reality.

2. Types Of Technologies In Disaster Risk Reduction

The application of technologies are more vital and need to be more creative in the disaster "P" phase of prevention (mitigation) and preparedness than in the disaster "R" phases – response and recovery.

2.1 Database Management System (DBMS): is a computer based system that is used to store, manipulate and retrieve data. In any DBMS, there are three types of data models used to store and retrieve (recover) data namely hierarchical, network and relational models. While the words store and retrieve associated with DBMS are well understood, the word Manipulation of data means (a) adding new data (b) deleting unwanted data and (c) modifying the data DBMS supports a data access and manipulation language. The most widely used data access language for RDBMS (relational database management systems) is SQL (Structured Query Language). DBMS Software, Microsoft Access, Microsoft SQL, Oracle, My SQL, Open Office Base, IBM DB2. Features/Functions of DBMS are Support for large amount of data, Data sharing, concurrency and locking, Data Security, Data Integrity, Data Recovery, Support for Languages. Des Inventor and **GSTL Tsunami Alert System.** Application of DBMS include: It is the base for other systems like MIS, DSS, GIS etc and can be used for creating Disaster Information Software. It can be used for setting up Disaster Information Network. It is essential to send out warning to all people in a vulnerable region. It can provide information on disaster professionals in a particular nation/region. It can be useful for proper accounting of calamity funds in a particular area:

2.2 Management Information System: MIS would have to cater to the following types of information: **Planning Information -** Certain standard norms and specifications are used in planning of any activity. **Control Information -** Reporting the status of an activity through a feedback mechanism is called the Controlling Information. **Knowledge Information -** A collection of information through the library records and the research studies to build up a knowledge base as an information is known as Knowledge Information. **Organization Information -** When the information is used by everybody in the organization, it is called Organization Information. **Functional/ Operational Information -** When the information is used in the operation of a business it is called Functional/Operational Information. **Database Information -** When the information has multiple use and application, it is called as database information. Applications of MIS in Disaster Management includes, to establish a Decision Support Systems and Disaster Information Network. It is used for hazard mapping and vulnerability assessment. It can be a very vital component in disaster preparedness plan. The Vulnerability Atlas contains the following information for each State and Union Territory of India (1) Seismic hazard map (2) cyclone and wind hazard map (3) flood prone area map (4) housing stock vulnerability table for each district.

2.3 Decision Support System: Decision Support System can be defined as an integration of computer hardware, software and methodology that is designed to complement the cognitive thinking of human beings in their decision making. It should be understood that DSS supports in the process of decision making and does not always give a decision itself. DSS is an application of Hebert Simon model of decision making which marks three phases namely i) Intelligence ii) Design and iii) Choice. The DSS has its applications on the all four phases namely mitigation, preparedness, response and recovery. In mitigation stages (1) safety analysis of a particular hazard (2) probability of occurrences with adverse effect (3) cost and time constraints analysis and (4) Alternatives Analysis. In preparedness phase, it can be utilized for (1) inventory analysis of emergency resources (2) Local Jurisdictions and Legal Provisions analysis (3) cost and schedule dimensions of preparedness policy and (4) scenario generation for emergency training. In the response stage it can be used for alert procedures, Damage Reporting Assessment, Evacuation Requirements Analysis, Imminent danger conditions and mobilization of resources. In the recovery phase, it can be utilized for Vulnerability Analysis for the immediate future (2) what if Analysis of budgetary provisions (3) Task Priority Analysis and (4) Safety Analysis.

2.3 Geographical Information System

Geographic Information System is a computer based system comprising hardware, software, data, people and methodology that combine to provide answers to queries of a geographical nature as and when required. GIS may be considering as the evolution of maps and Global Positioning System is a satellite based system that gives accurate location information anywhere on earth. It can be useful for risk assessment in a particular area. GPS can be useful for emergency response to locate dangerous points and to find shortest route for the responders using network analysis. It can be very useful for search and rescue operations in short term emergency response when coupled with GPS and Remote Sensing. GPS can be useful for live GPS tracking and GIS tools of emergency resources. It can be used for finding evacuation routes and choosing emergency operation centers. It is used to organize damage information and evaluation of sites for reconstruction and used to forecast and simulate disaster occurrences with reference to hazards in particular areas

2.4 Remote Sensing

Remote sensing is the science of acquiring information about the Earth's surface without actually being in contact with it. This is done by sensing and recording reflected or emitted energy and processing, analyzing, and applying that information and involves the following seven elements: i) Energy Source or Illumination ii) Radiation and the Atmosphere iii) Interaction with the Target iv) Recording of Energy by the Sensor v) Transmission, Reception, and Processing vi) Interpretation and Analysis vii) Application

3 Conclusion

The importance of scientific technologies can be understood by as mentioned review. Although earthquake prediction is still not possible, considerable options exist today to make accurate forecasts and to give warnings of several impending hazard events. In this vein, scientists will have to share with policy-makers and others, the responsibility for scientifically sound risk assessment and management. 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.

4 References:

[1] National Disaster Management Division/MHA/GOI/28/06/2004

[2] Pardeep Sahni Madhavi malalgoda and ariyabandu “Disaster risk reduction in south asia”, PHI