Research Paper
Impact Factor: 3.853
Peer Reviewed, Listed & Indexed

IJBARR
E- ISSN -2347-856X
ISSN -2348-0653

APPLICATION OF INFORMATION TECHNOLOGY IN DISASTER MANAGEMENT

Dr. Navneet Kaur
Director (Computers)PSEB Mohali, Punjab.

Introduction

Disaster reduction makes humanitarian sense – because putting adequate warning and mitigation measures in place can save lives – and it makes economic sense as well because an ounce of prevention is usually worth a pound of cure. Disaster is a serious disruption of the functioning of society, posing a significant, widespread threat to human life, health, property and/or the environment, whether caused by accident, nature or human activity and whether developing suddenly or as a result of complex, long term processes.

Over the last four decades, scientific knowledge about natural hazards and the technological means of confronting them has expanded greatly. Yet despite the ample availability of knowledge and expertise, vulnerability is growing because of unsustainable development, climate change and extremes of weather increase the scope and cost of disasters. Ever larger populations are at risk, mostly in the developing countries. Disaster reduction therefore is an important part of the United Nations' Millennium Development Goals for abating poverty. Disaster reduction emphasizes the crucial role of human thought and action in the minimization of risk. This means that we need to educate people – in particular young people – about disasters and their far- reaching implications for the way we live.

To mitigate the risks stemming from natural hazards such as earthquakes, tsunamis, hurricanes, floods, windstorms, landslides, volcanic eruptions, droughts and wildfires, those at risk must be informed of dangers and the protective measures available, and well versed in the skills of prevention and resilience. In this way, there would be fewer deaths, fewer injuries and less destruction when such disasters strike. Communities will always have to face natural hazards. But hazards become disasters only when lives are lost and livelihoods swept away.

The destruction of forests and wetlands is harming the capacity of the environment to withstand hazards, and eliminating protections that nature has evolved over time. Climate change increases the risk of storms, drought and coastal flooding.

Definition

The term 'disaster' owes its origin to the French word 'disaster' which is a combination of two words 'dis' meaning bad and 'aster' meaning star. Thus, the term 'disaster' refers to 'bad or evil star'. In earlier day's disaster were considered to be an outcome or outburst of some unfavorable star[i].

A disaster may be defined as- "a serious disruption of the functioning of society, coursing widespread human, material and environment metal losses which exceeds the ability of the affected material to cope using its own resources"[ii]

The United Nations of Organization defines disaster as -"The occurrence of a sudden or major misfortune which disputes the basic fabric and normal functioning of a society. It is an event or a serious of events which gives rise to casualties and damage or loss of property, infrastructure essential service or means of livelihood on a scale that is beyond the normal capacity of the affected communities to cope with unaided"[iii].

Disaster is defined as "unforeseen and sudden event or situation that causes widespread damage, destruction and human suffering exceeding the ability of the affected community or society to cope with its own resources". The disaster can be natural or manmade. Disaster is a product of hazards like floods, cyclone, drought etc. coinciding with vulnerable communities, cities or villages. Without vulnerability or hazard there is no disaster[iv]. The hazard is defined as a phenomenon that poses a threat to community or system, which may cause disaster. The vulnerability is defined as ability of community or system to resist the forces of hazard Vulnerability components are physical vulnerability and socio-economic vulnerability. The relationship between disaster, hazard and vulnerability is represented as: Disaster Risk = Hazards x Vulnerability. The major categories of disasters are i) Hydro-meteorological disasters (cyclone, flood, drought), ii) Geological disasters (Earthquake, landslide, volcanoes) and iii) Technological disasters (Nuclear& chemical accidents)[v].

The report of High Powered Committee of the Government of India (October, 2001) defines Disaster as "an occurrence of a severity and magnitude that normally results in deaths, injuries and property damage and that cannot be managed through the routine procedures and resources of government. It usually develops suddenly and unexpectedly and requires immediate, coordinated and effective response by multiple government and private sector organizations to meet human needs and speedy recovery".[vi]

IJBARR
E- ISSN -2347-856X
ISSN -2348-0653

The Disaster Management Act 2005 defines disaster as "a catastrophe, mishap, calamity or grave occurrence affecting any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of property, or damage to, or degradation of environment, and is of such a nature magnitude as beyond the coping capacity of the community of the affected area"[vii].

Stages of Disaster Management

Pre-Disaster

Activities taken to reduce human and property losses caused by the hazard and ensure that these losses are also minimized when the disaster strikes. Risk reduction activities are taken under this stage and they are termed as mitigation and preparedness activities.

During Disaster

Activities taken to ensure that the need and provisions of victims are met and suffering is minimized. Activities taken under this stage are called as emergency activities.

Post-Disaster

The activities taken to achieve rapid and durable recovery do not reproduce the earlier vulnerable conditions. Activities taken under this stage are called as response and recovery activities[viii].

Disaster Database

The international disaster database and statistics is maintained by EM-DAT and report published by EM-DAT in year 2005 revealed that 75 per cent of natural disasters are of hydro-meteorological type, followed by 16 per cent biological and 9 per cent geological[ix]. If individual disasters are considered, the frequency of occurrence is higher for floods, followed by cyclone and drought. Flood annually affects approximately 32 million people; the average annual loss is of the order of Rs. 1340 crores. The flood atlases of India prepared by Central Water Commission (CWC) and Natural Hazard Map of India prepared by National Atlas and Thematic Organization (NATMO) have identified following major flood prone areas.

An Ideal disaster management system needs to support activities related to preparedness, prediction, damage assessment and rehabilitation. India introduced Disaster Management Act in 2005 for enforcing the above-mentioned standard procedures and practices m event of disaster. India has adopted three-tier disaster response mechanism connecting centre, state and district level functionaries. There is also a network of knowledge institutions like National Institute of Disaster Management (NIDM/MHA), Disaster Support Centre (ISRO) mandated to provide the operational scientific and technological solutions towards disaster management including training and capacity building. National Disaster Management Authority (NDMA) is established as nodal agency for forming policies and guidelines Subsequently, State Disaster Management Authority (SDMA) and District Disaster Management Authority (DDMA) are established for disaster coordination and implementation of action plans. National Emergency Operations Centre (ERC) under Ministry of Home Affairs and State ERCs under state Departments are established and linked through VSAT (Very Small Aperture Terminal) based satellite communication network.

Ministry of Home Affair (MHA) is identified a nodal agency for flood, cyclone and tsunami disaster management at national level. Ministry of Earth Sciences, Ministry of Water Resources, Indian meteorological department, central water commissioner, department of space, National Informatics Center (NIC) etc. are providing necessary inputs for disaster forecasting, vulnerability mapping, hazard zonation and damage assessment.

Application of Information Technology in Disaster Management

Natural disasters and its effects can be minimized with the help of recent tools of information technology. GIS, remote sensing and Internet can of immense use. Following are the areas of disaster where recent techniques of electronic communication can be used[x].

Drought: advanced tools of information technology such as GIS, remote sensing can be used in drought area. It will help to plan for organizing relief work. It can be used to locate, assess, and monitor drought conditions of specific areas.

Flood: GIS, remote sensing can be used in flood area for mappings and monitoring flood areas, damage conditions and other flood effects. It can also be used to conduct post flood surveys. Flood forecast and warnings can be used to alert public and for taking appropriate actions .

Landslide: Electronic tools can be used to provide help concerning location, extent of slop area to be affected and trend of mass movement of the slop mass.

Earthquake: An earthquake (also known as a quake or tremor) is a violent movement of the rocks in the earth's crust. This creates seismic waves, waves of energy that travel through the Earth. GIS and remote sensing can be used for preparing hazards maps in order to assess the nature of risk.

Cyclone: A cyclone is a storm accompanied by high speed whistling and howling winds. It brings torrential rains. A cyclone causes heavy floods. It uproots electricity supply and telecommunication lines. Road and rail movements come to halt. Ships overturn Winds bends and plucks out trees and plants. Houses collapse. Bridges, dams and embankments suffer serious damages. There can be outbreak of diseases like Cholera, Jaundice or Viral fever[xi]. Advanced techniques like, GIS, remote sensing tools can be used to identify the vulnerable population with the single hazard component. These tools can be used to calculate state level population affected by different type of storms. But, calculating vulnerability by GIS with multiple hazards and coping capacity is not easy job for decision makers.

The economic cost of natural catastrophes and man-made disasters worldwide amounted to USD 370 billion in 2011, a huge increase over the previous year. The Japanese earthquake and tsunami alone cost the national economy at least USD 210 billion. Science and technology play an increasingly vital role in managing natural disasters. To this end, a growing number of OECD countries have recently established programmes or incentives to develop and deploy information and communication technologies (ICTs), geographic information systems, and remote sensing and satellite data[xii].

As climate change already is a reality, the risk needs to be managed through suitable adaptation policies. These include strengthening preparedness by further improving early warning systems for high impact weather events - to which EUMETSAT meteorological satellites provide key observational inputs - the introduction of coastal defenses and other protection infrastructure, as well as the revision of habitation planning. On the other hand, mitigation policies remain crucial to contain emissions and the magnitude of climate change in the long term.

UNESCO is strongly committed to the Hyogo Framework for Action 2005-2015, which was adopted at the 2005 Kobe World Conference on Disaster Reduction. The United Nations Decade of Education for Sustainable Development (2005-2014), which UNESCO is coordinating, is a second strategic instrument for reducing and mitigating disasters. To develop the required climate information services, the third World Climate Conference (WCC3, Geneva, 2009) established the Global Framework for Climate Services (GFCS). The GFCS is designed to improve the quality, quantity and availability of science-based climate information being developed by researchers and service providers and to bridge the gap between this information and the practical needs of end-users.

The need for observations is formally addressed through the United Nations Framework Convention on Climate Change (UNFCCC), which has charged the Global Climate Observing System (GCOS) with the responsibility for defining requirements for observations relevant to climate change, both in-situ and space-based. GCOS works with partners to establish requirements and to ensure the sustained provision of reliable physical, chemical and biological observations and data records, building on relevant observing systems.

Countries such as Colombia, Italy, Japan, Mexico, Spain and the United States are vulnerable to earthquakes and are upgrading their seismic surveillance networks. Although earthquakes cannot be predicted and very few are preceded by clearly identifiable precursory events, the networks can facilitate emergency response (by giving the intensity and location of the tremors) and can provide early warning to tsunami-prone regions.

Following two major tsunamis in 2004 in the Indian Ocean and in 2011 in Japan, several regional and local warning system centers were set up. These centers are coordinated via UNESCO's Intergovernmental Oceanographic Commission, which set up regional co-ordination groups for the Caribbean and adjacent regions, the Indian, Pacific, the North-eastern Atlantic Oceans and the Mediterranean. In late 2011, 23 countries on the Indian Ocean rim participated in an ocean-wide tsunami exercise. At the same time, three regional tsunami service providers in Australia, India and Indonesia became operational, adding warning capacity for the Indian Ocean.

Considerable attention has been given in recent years worldwide to the potential of remote sensing satellite data for providing useful information and assistance in all phases of the disaster management cycle. Besides the currently expanding use of the international charter for major disasters, several countries and organisations (Argentina, Brazil, Canada, the People's Republic of China, France, Germany, India, Italy, Japan, Korea, Spain, the United States, the European Union are deploying satellite systems which offer a wide range of capabilities (all weather observations, high to very high resolution images, digital terrain models, land, ocean and ice monitoring, etc.) which are extremely useful in the preparation, assessment and

IJBARR
E- ISSN -2347-856X
ISSN -2348-0653

relief phases of disasters. International co-ordination of these resources is improving continuously. In this regard the Committee for Earth Observation Satellites (CEOS) created in 2011 a dedicated task force for better co-ordination of satellite observation in disaster risk management chaired by Italy.

Consolidation of the technical base by means of technology enrichment will also aid the nation well. Technology can play an significant role by means of GIS based observing and prediction systems as well as Internet based tools. The IDRN (India Disaster Response Network) is a nation-wide electronic inventory of essential and specialist supplies for disaster response, covering specialist apparatus, specialist manpower resources and critical materials. United Nations Development Programme (UNDP) has joined hands in this effort of Government of India and is implementing GoI-UNDP Disaster Risk Management (DRM) program in 169 most vulnerable districts of 17 states in India[xiii]. Last, but not the least; developing disaster relief interventions for quick response and minimizing damage post disaster including spectrometry kits, bio-aerosol detectors, radiation leak detectors etc. to name a few will ensure safety to both victims and disaster personnel.

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.

End Notes

[i] Training Manual (2012), "Capacity Building in Disaster Management for Government Officials and Representatives of Panchayati Raj Institutions & Urban Local Bodies at District Level", Initiative of National Disaster Management Authority and Indira Gandhi National Open University, New Delhi, p.32

[ii] R B Singh (2006), "Natural Hazards & Disaster Management (Vulnerability and Mitigation)", Rawat Publications, Jaipur, p.6

[iii] R.K Celly and T N Gupta (1999), Dimensions of Natural Disaster Management in India, In Shelter, Special Issue, World Disaster Reduction Day: A HUDCO, HSMI Publication, New Delhi, p.48

[iv] Charlotte Benson and Edward J Clay (2004), Understanding the Economic and Financial Impacts of Natural Disasters- Disaster Risk Management, Series No. 4, World Bank, p. 76

[v] Hector Sejenovich and Guillermo Cock Mendonza (2000), Economic Aspects of Floods: The case of Argentina-Disaster Risk Management Series No. 2, Managing Disaster Risk in Emerging economies, The World Bank, p.98

[vi] Anil Sinha, (2001), "Report of High Powered Committee on Disaster Management", Ministry of Agriculture and Cooperation, Govt. of India, NCDM, New Delhi, p.1

[vii] Government of India, Disaster Management Act (2005) Section (D), p.2

[viii] Ministry of Home Affairs, Government of India (2004), Hazards, Disasters and your community, A primer for Parliamentarians, National Disaster Management Division, New Delhi, p.7

[ix] C. Venkatesan (2012), Social Development Perspectives, Issues and Dimensions for India, Global Research Publications New Delhi, p.34

[x] Sanjib K. Sahu (2008), Information Technology for Disaster Management: Need of the Hour, Proceeding of 2nd National Conference, INDIACom-2008

[xi] Ashok K. Dutt (2008), Encyclopedia of Global Warming and Climate Change, Volume 2, A Sage Reference Publication, New Delhi, Pp. 533-534

[xii] OECD (2011), The Space Economy at a Glance 2011, OECD, Paris, p.48

[xiii] UNDP (2016), United Nations Development Programme Brochure No.143: 04