

DISASTER MANAGEMENT PREPAREDNESS IN EMERGENCIES AND RURAL TECHNOLOGY

LECTURE NOTES

Prepared, Designed & Authored by

Dr. Ullash Kumar Rout
Associate Professor



School of Electrical Sciences
Odisha University of Technology and Research (OUTR), Bhubaneswar

Dr. Rajesh Kumar Behera
Professor & HOD



Department of Mechanical Engineering
Krupajal Engineering College (KEC), Bhubaneswar

Dr. Birajendu Prasad Samal
Principal & Professor



Department of Mechanical Engineering
Mahavir Institute of Engineering and Technology (MIET), Bhubaneswar

Dr. U. K. Rout. Dr. R. K. Behera & Dr. B. P. Samal

SYLLABUS (Add-On Course)**AOC 01: Disaster Management Preparedness
in Emergencies and Rural Technology****MODULE - I (10 LECTURES)****Prevention and Mitigation:**

Identify and assess potential hazards in a given area. Implement measures to prevent or minimize the impact of disasters, such as building codes, land-use planning, and environmental conservation.

Preparedness:

Develop and implement emergency plans and procedures. Conduct drills and training exercises for emergency responders and the community. Establish early warning systems to provide timely alerts.

Response:

Activate emergency response teams and resources. Provide immediate assistance to those affected. Coordinate rescue and relief operations. Establish communication systems for information dissemination.

Recovery:

Restore essential services and infrastructure. Support the physical and emotional well-being of affected individuals. Rebuild communities and promote long-term resilience. Evaluate the response and recovery efforts for continuous improvement.

International Cooperation:

Collaborate with other countries and international organizations to share resources, expertise, and best practices. Participate in regional and global initiatives for disaster risk reduction.

Community Engagement:

Involve local communities in planning and decision-making processes. Educate the public on disaster risks and preparedness.

Foster community resilience through training and capacity building.

Technology and Innovation:

Utilize advanced technologies for early warning, monitoring, and response. Incorporate data analytics and artificial intelligence for risk assessment and decision-making.

Legislation and Policy:

Develop and enforce laws and policies related to disaster management. Ensure that regulations support risk reduction, preparedness, and recovery efforts.

Training and Capacity Building:

Train emergency responders and community members in disaster response and recovery. Build the capacity of local organizations to effectively manage disasters.

Public Awareness and Education:

Promote awareness of disaster risks and preparedness measures. Conduct educational programs in schools, workplaces, and communities.

MODULE - II (10 LECTURES)

Disaster Information System, Megha Satellite, Role of Various Agencies in Disaster Mitigation- National level and State levels. Disaster Response: Disaster Medicine, Rehabilitation, Reconstruction and Recovery Techniques.

MODULE - III (10 LECTURES)**1. Agricultural Technology:**

- **Precision Farming:** Use of technology such as GPS, sensors, and data analytics to optimize farming practices, improve crop yields, and reduce resource usage.
- **Farm Mechanization:** Introduction of modern machinery and equipment to increase efficiency in planting, harvesting, and post-harvest processing.
- **ICT in Agriculture:** Information and Communication Technology (ICT) tools for weather forecasting, market information, and agricultural extension services.

2. Renewable Energy Solutions:

- **Solar Power:** Implementing solar technologies for electricity generation, especially in areas with limited access to the power grid.
- **Biomass Energy:** Utilizing organic waste for energy production, including biogas and biomass-based power generation.

3. **Water Management:**
 - **Smart Irrigation Systems:** Using sensors and automated systems to optimize water usage in agriculture.
 - **Water Purification Technologies:** Implementing technologies for safe drinking water and water sanitation in rural areas.
4. **Telecommunications and Connectivity:**
 - **Mobile Technology:** Leveraging mobile phones for communication, banking, and access to information.
 - **Internet Connectivity:** Expanding broadband and internet access in rural areas to bridge the digital divide and enable e-learning, telemedicine, and e-commerce.
5. **Healthcare Technology:**
 - **Telemedicine:** Providing remote healthcare services through technology, especially beneficial in areas with limited access to medical facilities.
 - **Health Information Systems:** Implementing electronic health records and data management systems to improve healthcare delivery.
6. **Education Technology:**
 - **E-Learning Platforms:** Using online platforms and educational technology to enhance learning opportunities in rural schools.
 - **Digital Literacy Programs:** Providing training and resources to enhance digital literacy skills in rural communities.
7. **Financial Inclusion:**
 - **Mobile Banking:** Offering financial services through mobile technology to empower rural communities economically.
 - **Digital Payment Systems:** Facilitating cashless transactions to improve financial accessibility.
8. **Infrastructure Development:**
 - **Rural Road Connectivity:** Employing technology in the planning and construction of rural roads to improve transportation.
 - **Smart Grids:** Implementing intelligent electrical grids for efficient energy distribution.
9. **Disaster Management:**
 - **Early Warning Systems:** Using technology to provide timely alerts and information during natural disasters.
10. **GIS and Remote Sensing:** Mapping and monitoring tools for effective disaster risk reduction and response.

BOOKS

[1] TEXT BOOK OF DISASTER MANAGEMENT by A.K. Shrivastava.

[2] Disaster Management by M. M. SULPHEY

[3] An Introduction To Disaster Management Natural Disasters And Man Made Hazards by S VAIDYANATHAN

[4] Rural Technology Development and Delivery by S Chigullapalli

Digital Learning Resources:

<https://www.scientificpubonline.com/bookdetail/text-book-disaster-management/9789389412451/0>

Disaster Management Preparedness in Emergencies and Rural Technology

LECTURE NOTES

Module-I, II & III

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Module - I

INTRODUCTION

Disasters take a toll on human lives and property resulting in losses in several ways to people and the country as a whole. The primary reason for the loss of lives is poor communication and delay in help arriving at the disaster scene. To save more lives, relief and salvage operations need to be activated in response to the disaster as soon as possible. The government, NGOs and several local agencies play critical roles in the effective management in terms of rehabilitation of the affected population. It is important to formulate risk reduction plans and implement them effectively.

India has been traditionally vulnerable to natural disasters due to its unique geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides are frequent phenomena. Disaster management occupies an important place in this country's policy framework because, it is primarily the poor and the underprivileged who are the worst affected by these calamities/disasters.

UNIT OBJECTIVES

After going through this unit, you will be able to:

- Analyse disaster preparedness with special reference to India
- Discuss disaster mitigation and prevention
- Explain disaster information system
- Understand the role of various agencies in disaster mitigation at the national and state levels

DISASTERPREPAREDNESS

One of the main objectives of development programs in many developing countries of the world for the past several decades has been poverty reduction. Over the years, the definition of poverty has shifted from calculating people's income to taking a more holistic view of their overall well-being. Enhanced access to public health facilities, increased life expectancy and gender equity has become the essential pointers of success of the poverty reduction programs. This has led to increased stress on better integration of poverty reduction programs with other sectoral issues like environmental management, gender development and public health. However, the instances of systematic long-term integration of poverty reduction programs within disaster management have been very few. Development efforts have focused on helping the poor in dealing with the various risks they face on a daily basis, such as in employment, health care, transport, education, water and sanitation.

Traditionally, the development agenda did not include disaster. When carefully laid development plans are drastically interrupted by disasters, the international community relied on organizations such as the United Nations and the Red Cross to step in with relief services. When the emergency work is over, reconstruction efforts are initiated to get the country back on the development track. Most poverty reduction programs leave a lot to be desired in terms of integration with disaster management.

Dr. U. K. Rout, Dr. R. K. Behera & Dr. B. P. Samal

Paradigm Shifts—From Relief and Response to Disaster Risk

The paradigm shift in poverty reduction programs, from income poverty to human poverty, has almost been matched in the disaster management sector. Disasters are no longer seen as extreme events, created entirely by natural forces, but also as manifestations of unresolved problems of development.

Disaster management practices have evolved from a largely top-down relief and response approach to a more inter sectoral risk management approach. In current risk management approaches, there is scope for addressing the issues of risk reduction for the poor. Till a few decades ago, disasters were viewed as one-off events and responded to by the governments relief agencies without taking into consideration the social and economic implications and causes of these events. However, nowadays, by following an improved understanding of the natural processes that underlie hazardous events, a more technocratic paradigm has emerged i.e., the only way to deal with disasters was by public policy application of geophysical and engineering knowledge. Disasters were regarded as exceptional events, not related to the ongoing social and developmental processes. Gradually this attitude changed towards preparedness measures, such as:

- Stockpiling of relief goods
- Preparedness plans
- Growing role for domestic and international relief agencies

Such measures, also known as 'contingency planning' approaches, not only improved the efficiency of relief agencies, but also did a lot in terms of the appropriateness and effectiveness of the relief work done.

From the 1960s to the 1990s, although there was no clear indication that the frequency of extreme hazard events had increased; it was observed later that there was a huge increase in human and material losses from disaster events. This showed that the increase in disasters and their consequences was due to increased vulnerability of people all over the world, possibly as a result of development due to human action. This increase in vulnerability showed variations across regions, nations, provinces, cities, communities, socio-economic classes, castes and even gender.

For example, when an earthquake of magnitude 6.4 occurred in San Fernando, California in 1971 only 58 deaths were reported out of over seven million people. Two years later, a similar earthquake, registering a magnitude of 6.2 on the Richter scale, in Managua, reduced the center of the city to rubble and killed over 6,000 people. Similar patterns can be seen in other recent disasters.

For realization that people's vulnerability is a primary factor in affecting the impact of disasters, emphasis moved to using 'vulnerability analysis' as a disaster management tool. Recently, there has been the emergence of a wide-ranging approach known as disaster risk management.

Disasters are no longer viewed as extreme events created entirely by natural forces but as unresolved problems of development. It is a known fact that risks of any type—physical, social,

begun to influence the way disaster management programs are now being planned and financed. There are initiatives aimed at reducing social and economic vulnerability and investing in long-term mitigation activities. Unfortunately such initiatives are poorly funded and trivial in comparison to the money spent by donors and development banks on humanitarian assistance, relief and on post-disaster reconstruction. An additional weakness is that these initiatives are primarily undertaken in the formal sector of the economy, while the poor and the most vulnerable sections of the society are neglected. As Maskrey (1999, p. 86) points out, 'in the year or so between the occurrence of a disaster and approved national reconstruction plans, many vulnerable communities revert to coping with risk, often in the same or worse conditions than before the disaster actually struck'. There is more need than ever to address the issues of risk reduction for the poor. As is the case in mainstream development, there is not only the need to focus on good governance, but also on accountability and bottom-up approach.

The new and innovative approaches to decrease disasters and poverty share several common features such as the following:

- Approaches developed must be more people-centric
- Development of a multi sectoral approach in planning and decision-making
- Ever-increasing importance of improving ways and means to access resources
- Overall involvement and contribution to the development process

Despite the common elements, the poverty and disaster reduction efforts have developed as parallel processes rather than as integral processes probably due to a lack of thorough understanding of their linkage and the benefits deriving from this.

Poverty and vulnerability

While the poor are often the most affected by a disaster, it is naïve to assume that there is a direct and absolute association between poverty and vulnerability. Poverty which refers to the lack of access to resources and income opportunities is one of the several dimensions of vulnerability.

While discussing the association between poverty and vulnerability, Blakie et al. (1994) point out that, 'vulnerability is a combination of characteristics of a person or group, expressed in relation to hazard exposure which derives from the social and economic conditions of the individual, family, or community concerned. High levels of vulnerability imply a grave outcome in hazard events, but are a complex descriptive measure of people's lack or need. Vulnerability is a relative and specific term, always implying a vulnerability to a particular hazard.' In addition to economic dimension, other aspects of social positioning such as class, ethnicity, community structure, community decision-making processes and political issues, are key factors for establishing the poor people's vulnerability. A poor community although economically vulnerable, may have social, cultural and political capacities to deal and survive disasters. This was evident in the rare and isolated tribes of the Andaman and Nicobar islands who though economically weak, were able to save themselves from the deadly tsunami that hit South Asian countries in December 2004.

Risk reduction strategies for the poor should aim at decreasing the economic susceptibility

communities, the physical, social and political risks are also identified and managed.

Another aspect of vulnerability of the poor (which is commonly ignored) is that it is generally local in nature. Disaster statistics collected and aggregated at provincial and national levels are unable to detect the miseries of the poor and the most vulnerable. Impact assessments are able to identify only the formal and well-defined sectors of the economy.

Gradually, now there is clarity that the nature of vulnerability of the poor is complex and diverse. Hence, reducing the vulnerability and risk to the poor will require multidimensional approaches and innovative institutional arrangements.

Integrating poverty reduction programs with disaster

There have been relatively few examples of systematic integration of poverty reduction and disaster reduction programs. This section provides three approaches that have evolved over the last several years.

- First, is the livelihood framework developed in the context of bilateral development aid?
- Second, is the community-based disaster management evolved in the disaster management sector?
- Third, are the detailed and exact financial instruments to deal with risk transfer, encouraged by multilateral agencies?

An integrated approach using all the three perspectives is best to address disaster preparedness and management.

Recognizing the vulnerability context of the poor within the development framework

In the last few years, a more holistic framework to assess the sustainability of livelihood strategies adopted by poor people has emerged. The five elements to analyze the sustainability of livelihood approach are as follows:

- Vulnerability context of poor people
- Assets such as human, social, physical, natural and financial capital
- The economic structures such as government, private sector as well as administrative guidelines and processes such as laws, institutions
- Livelihood strategies
- Livelihood outcomes

This approach encompasses the dynamic and complex nature of people's vulnerability. The vulnerability context also includes the external environment comprising of trends (population trends, resource trends), shocks (natural hazards, disease outbreak) and seasonality (market prices, employment opportunities).

This framework does not consider the vulnerability context in isolation, but links it with transforming structures and processes. Practical application of such a framework means that it not only describes the different aspects of people's vulnerability but also points to social, political and economic structures and processes, transformations that facilitate in the

Disasters adversely affect the livelihoods of poor people by damaging their means of earning (destruction of the factory, loss of land due to erosion in flooding, destruction of the shop) and/or tools (loss of drought animals, plowing tools). Mainstream disaster management responses frequently neglect the rehabilitation of people's means of livelihood. Families, who lose their means of livelihood during a disaster, find their recovery from adverse effects becoming more unlikely and their vulnerability to future disasters is increased accordingly. It is also assumed that if people have better sources of livelihoods and higher incomes, they will spend more on disaster risk management to save their property because, due to higher incomes, they have funds to spend for this purpose. However, in case they do not have savings, spending on disaster management becomes the lowest priority in contrast to the chronic issues of survival. Diversity in the source of livelihoods is vital for boosting the people's capacity to cope and recover. If a family, for example, has two different sources of income, a tract of land and a shop, the family still has the shop if it loses a drought animal or a crop. The family will obviously be in a better position than a family that has only one tract of land and loses the standing crop.

The government should make extra efforts to strengthen and diversify the means of livelihood of people who are living in disaster prone areas. This would be a big help in reducing the risk factor of an actual disaster. Initiatives of this kind have been taken by The Asian Disaster Preparedness Center (ADPC) in many South Asian countries in collaboration with other partner agencies.

Community-based disaster management (CBDM)

Sometimes it becomes difficult for top government officials to correctly gauge the kind of disaster relief that would be effective in a certain region and as a result, the approaches they devise prove largely wasteful. Studies reveal that it is better to involve communities themselves in disaster risk reduction planning because they are much better aware of ground realities and exactly what kind of relief is required during a disaster. Besides this, it has been noted that rather than planning for only major disasters, small and medium-sized disasters should also be taken seriously and their relief measures planned. The community-based approach was widely appreciated by the general public because they could share their concerns and make decisions pertaining to their own well-being.

How does the community-based disaster management (CBDM) approach work?

The basic objective of CBDM is to provide people with resources to cope with hazards and in the process, reduce their vulnerabilities. In order to make people aware of disaster management and ultimately reduce disaster risk, a careful study of a community's susceptibility to hazards and of their specific vulnerabilities and capacities is carried out. From the study emerges information that is employed in creating disaster management activities, projects and programs for the community. Since all citizens of a community are closely involved in the process, they are able to voice actual needs and apprehensions and how these can be best fulfilled using available resources. The process becomes more rational and grounded in reality in this way. The involved citizens discuss process as well as the content of the disaster management program. Awareness that the community gains in this process in turn leads to a progression towards safer conditions, security of livelihood and sustainable development.

Experts believe that there is a difference between community participation and community

involvement. While community participation means that the community is wholly responsible for all stages of a program, including planning and implementation, community involvement is

a 'less than ideal' scenario where the community is expected to participate in an existing program formulated by someone else. CBDM implementation indicates the following key features:

Implementation of CBDM points to the following essential features:

- The focus is on long-term and short-term disaster management that must be followed by the local community.
- The primary content of disaster management activities revolve around reducing vulnerable conditions and the root causes of vulnerability. The primary strategy of vulnerability reduction is to increase a community's capacities, resources and coping strategies.
- Disasters are viewed as unmanaged development risks and unresolved problems of the development process.
- CBDM should lead to a general improvement of the quality of life of the majority of poor people and of the natural environment.
- CBDM contributes to people's empowerment—to possess physical safety; to have more access and control of resources; to participate in decision-making that affects their lives; to enjoy the benefits of a healthy environment.
- Community as a key resource in disaster risk reduction.
- The community is the key factor as well as the primary beneficiary of disaster risk reduction. Within the community, prior attention is given to the conditions of the most vulnerable as well as to their mobilization in disaster risk reduction.
- The community participates in the whole process of disaster risk management from situational analysis to planning to implementation.
- Application of multi-sectoral and multidisciplinary approaches.
- CBDM brings together the massive community stakeholders for disaster risk reduction to expand its resource base. The local community level links up with the intermediate and national and even international level to address the complexity of vulnerability issues.
- A wide range of approaches to disaster risk reduction are employed.
- CBDM as an involving and dynamic framework. Lessons learnt from practice continue to build into the theory of CBDM. The sharing of experiences, methodologies and tools by communities and CBDM practitioners continues to enrich practice.

Before implementing CBDM it is important to know who in the community should be involved. The most vulnerable are the primary actors in a community. The focus should be at the household level. As all individuals, houses, organizations and services stand a chance of being affected, they should all be involved. But before working on disaster risk reduction, differing perceptions, interests, and methodologies have to be recognized and a broad consensus on targets, strategies and methodologies have to be reached. To enrich the community's involvement in risk reduction, it is important to first assess the risk with the help of the community. There are specific tools and methods that can make the process of community risk assessment most effective.

There are a number of strategies for community based risk reduction:

- **Enabling self-insurance**

- *Improving existing occupations to enhance or continue current production and income levels:* Some techniques include irrigation (expansion, improvement in water management), soil fertility improvement, draft animal dispersal, and livestock and

seed dispersal. These techniques are most useful for refugees returning to lands they had abandoned after a disaster, for farmers who cultivate lands, and in for

- those cases where irrigation systems are in the condition to be restored after typhoons, earthquakes, and floods. The benefit of this technique is that food shortage is overall reduced by a large percentage.
- *Enabling people to cope better with risks:* As per this strategy, crops grown are diversified and more disaster-resistant crops are grown along with the regular crops and even if the regular crop is destroyed, the alternate one can be used for sustenance.
- *Enhanced social support structures, and better storage facilities for the harvested crops:* With the use of this technique, every household will have larger reserves of food at their homes or within the community as a whole and the problem of food shortage will be mitigated.
- Performing season-based disaster management activities: Many disasters, like floods are usually seasonal and therefore predictable. Some effective cyclical methods that can be used every season include planting disaster-resistant crops, reinforcing storage facilities, maintaining seedbanks, and mobilizing resources.
- **Promoting long-term investments**
 - There should be contingency resources in every community, including forest reserves, trees planted around the house, a village pharmacy, trained village health workers, spread of literacy for awareness sake. All these methods require sustained investment and implementation
 - Mitigate long-term vulnerability of the people by better land use and management planning in the community.

Disaster Preparedness in India

The institutional and policy mechanisms in India for carrying out response, relief and rehabilitation have been well-established since Independence. These mechanisms have proved to be robust and effective as far as response, relief and rehabilitation are concerned. The changed policy/approach, however, mandates a priority to pre-disaster aspects of mitigation, prevention and preparedness and new institutional mechanisms are being put in place to address the policy change.

Mitigation, preparedness and response are multi-disciplinary functions involving a number of ministries/departments. Institutional mechanisms which would facilitate this inter-disciplinary approach are being put in place. It is proposed to create disaster management authorities, both at the national and state levels, with representatives from the relevant ministries/departments to bring about this coordinated and multi-disciplinary with experts covering a large number of branches. The National Emergency Management Authority is proposed to be constituted. The organization will be multi-disciplinary with experts covering a large number of branches. The National Emergency Management Authority is proposed as a combined Secretariat/Directorate structure—a structure which will be an integral part of the Government while, at the same time, retaining the flexibility of a filed organization. The authority will be headed by an officer of the rank of Secretary/Special Secretary to the Government in the Ministry of Home Affairs with representatives from the Ministries/Departments of Health, Water Resources, Environment & Forest, Agriculture, Railways, Atomic Energy, Defence, Chemicals, Science & Technology, Telecommunication, Urban Employment and Poverty Alleviation, Rural Development and Indian Meteorological Department as members. The authority would meet as often as required and review the status of warning systems, mitigation measure and disaster preparedness. When a disaster strikes, the authority will coordinate disaster management activities. The authority will be responsible for:

- Providing necessary support and assistance to state governments by way of resource data, macro-management of emergency response, specialized emergency response teams, sharing of disaster related data base.
- Coordinating/mandating government's policies for disaster reduction/mitigation
- Ensuring adequate preparedness at all levels
- Coordinating response to a disaster when it strikes
- Assisting the provincial government in coordinating post disaster relief and rehabilitation
- Coordinating resources of all national government department/agencies involved
- Monitor and introduce a culture of building requisite features of disaster mitigation in all development plans and programmes
- Any other issues of work which may be entrusted to it by the Government

The organization structure for disaster management in India has been illustrated in Figure 3.1

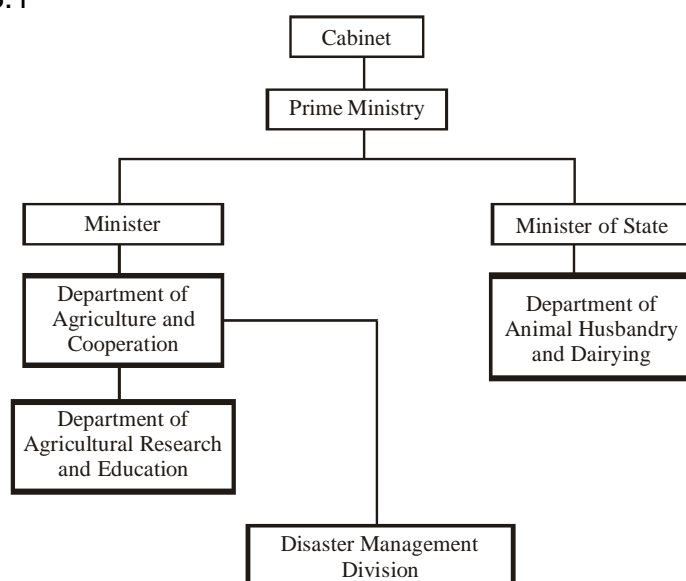


Fig. 3.1 Disaster Management Organizations in India

Source: <http://www.sristi.org/>

The Yokohama message emanating from the International Decade for Natural Disaster Reduction in May 1994 underlined the need for an emphatic shift in the strategy for disaster mitigation. It was stressed that disaster prevention, mitigation, preparedness and relief are four elements which contribute to and gain, from the implementation of the sustainable development policies. These elements along with environmental protection and sustainable development are closely inter-related and it was therefore, recommended that nations should incorporate them in their development plans and ensure efficient follow up measures at the community, sub-regional, regional, national and international levels. The Yokohama Strategy also emphasized that disaster prevention, mitigation and preparedness are better than disaster response in achieving the goals and objectives of vulnerability reduction. Disaster response alone is not sufficient as it yields only temporary results at a very high cost. Prevention and mitigation contribute to lasting improvement in safety and are essential to integrated disaster management.

DISASTER MITIGATION AND PREVENTION

The Government of India has adopted mitigation and prevention as essential components of

without mitigation being built into developmental process. Each state is supposed to prepare a plan scheme for disaster mitigation in accordance with the approach outlined in the plan. In brief, mitigation is being mainstreamed into developmental planning.

Financial arrangement: The Finance Commission makes recommendations with regard to devolution of funds between the Central Government and State Governments as also outlays for relief and rehabilitation. The earlier Finance Commissions were mandated to look at relief and rehabilitation. The Terms of Reference of the Twelfth Finance Commission have been changed and the Finance Commission has been mandated to look at the requirements for mitigation and prevention apart from its existing mandate of looking at relief and rehabilitation. A memorandum has been submitted to the Twelfth Finance Commission after consultation with the states. The memorandum proposes the creation of a disaster mitigation fund which will assist the states in taking mitigation measures like retrofitting of lifeline buildings, coastal shelter and belt plantation.

The Government of India have issued guidelines that where there is a shelf of projects, projects addressing mitigation will be given a priority. It has also been mandated that each project in a hazard prone area will have disaster prevention/mitigation as a term of reference and the project document has to reflect as to how the project addresses that term of reference.

Flood preparedness and response: In order to respond effectively to floods, Ministry of Home Affairs have initiated National Disaster Risk Management Programme in all the flood-prone states. Assistance is being provided to the states to draw up disaster management plans at the state, district, block/taluka and village levels. Awareness generation campaigns are implemented to sensitize all the stakeholders on the need for flood preparedness and mitigation measures. Elected representatives and officials are being trained in flood disaster management under the programme. Bihar, Orissa, West Bengal, Assam and Uttar Pradesh are among the 17 multi-hazard prone states where this programme is being implemented with assistance from UNDP, USAID and European Commission.

Earthquake risk mitigation: A comprehensive programme has been taken up for earthquake risk mitigation. Although, the BIS has laid down the standards for construction in the seismic zones, these were not being followed. The building construction in urban and suburban areas is regulated by the Town and Country Planning Acts and Building Regulations. In many cases, the building regulations do not incorporate the BIS codes. Even where they do, the lack of knowledge regarding seismically safe construction among the architects and engineers as well as lack of awareness regarding their vulnerability among the population led to most of the construction in the urban/sub-urban areas being without reference to BIS standards. In the rural areas, the bulk of the housing is non-engineered construction. The mode of construction in the rural areas has also changed from mud and thatch to brick and concrete construction, thereby increasing the vulnerability. The increasing population has led to settlements in vulnerable areas close to the river bed areas which are prone to liquefaction. The government have moved to address these issues.

drawing up a strategy and plan of action for mitigating the impact of earthquakes; providing advice and guidance to the states on various aspects of earthquake mitigation; developing/organizing the preparation of handbooks/pamphlets/type designs for earthquake resistant construction; working out systems for assisting the states in the seismically vulnerable zones to adopt/integrate appropriate Bureau of Indian Standards codes in their building by-laws; evolving systems for training of municipal engineers as also practicing architects and engineers in the private sector in the salient features of Bureau of Indian Standards codes and the amended by-laws; evolving a system of certification of architects/engineers for testing their knowledge of earthquake resistant construction; evolving systems for training of masons and carry out intensive awareness generation campaigns.

Review of building by-laws and their adoption: Most casualties during earthquakes are caused by the collapse of structures. Therefore, structural mitigation measures are the key to make a significant impact towards earthquake safety in our country. In view of this the states in earthquake prone zones have been requested to review, and if necessary, amend their building by-laws to incorporate the BIS seismic codes for construction in the concerned zones. Many states have initiated necessary action in this regard. An Expert Committee appointed by the Core Group on Earthquake Risk Mitigation has already submitted its report covering appropriate amendments to the existing Town & Country Planning Acts, Land Use Zoning Regulations, Development Control Regulations & Building by-laws, which could be used by the state governments and the local bodies thereunder to upgrade the existing legal instruments. The Model Building by-laws also cover the aspect of ensuring technical implementation of the safety aspects in all new constructions and upgrading the strength of existing structurally vulnerable constructions. To facilitate the review of existing building by-laws and adoption of the proposed amendments by the state governments and UT administrations, discussion workshops at regional level in the country are being organized. It is expected that all planning authorities and local bodies will soon have development control regulations and building byelaws which would include multi-hazard safety provisions.

Development and revision of codes: There are Bureau of Indian Standard (BIS) codes which are relevant for multi-hazard resistant design and construction. Some of the codes need to be updated. There are some areas for which codes do not exist. An action plan has been drawn up for revision of existing codes, development of new codes and documents/commentaries, and making these codes and documents available all over the country including online access to these codes. An apex committee consisting of representatives of Ministry of Consumer Affairs, BIS and MHA has been constituted to review the mechanism and process of development of codes relevant to earthquake risk mitigation and establish a protocol for revision by BIS.

3.3.1 Disaster Preparation

Preparation for a disaster can reduce losses, fear, and anxiety that it causes. One should be know how to treat basic medical problems. Regardless of the amount of warning offered, the safety precautions that one can take to reduce or prevent injury include:

- Personal safety
- Home and worksite preparation
- Community preparation

Prior preparation is the key to survival in a disaster or emergency. Structural and non-structural hazards during a disaster can be minimized if individuals, families, and worksites take steps to

Community Emergency Response Teams to respond quickly in the aftermath of a disaster.

DISASTER INFORMATION SYSTEM GIS

A GIS is defined as a system that is designed to gather, store, manipulate, analyse, manage and present all types of geographical data. The combination of GIS and geography has led to the emergence of a new approach, *geographic approach*, to problem solving. The *geographic approach* allows us to apply the geographical knowledge to the way we design, plan and change our world.

Through GIS we can map where and how things move over a period of time to get insight into how they behave. For example, a meteorologist might study the paths of hurricanes to predict where and when they might occur in the future. GIS helps us view, interpret, visualize and understand data in many ways. To see certain patterns or trends in the data, it can be converted into maps, globes, reports and charts. This data transformation helps us get answers to our questions easily.

GIS captures, interprets and transforms geographical data into graphical outcomes using advanced hardware and software technology. GIS can be used to map useful information such as: places with specific tourist attractions; high-income customers of a departmental store; availability of physicians per 1,000 people in a region to check adequacy of healthcare infrastructure; change in an area to anticipate future conditions and decide on a course of action.

Government agencies, businesses, scientists, researchers, environmental experts and natural resource groups all use GIS to predict the effects on or the reaction of the environment to the activities they wish to carry out. This helps them make their activities more environment-friendly.

Some major advantages of GIS are as follows:

- **Better decision making:** GIS is often used to assist in decision-making so as to be able to take fast and better decisions. For example, it helps select better routes during travel, find out where natural resources are available in abundance, locate and select a property with desired features and identify evacuation routes in case of a disaster.
- **Better communication:** GIS helps teams, troops, organizations to coordinate and communicate in a better manner. The collected data can be interpreted in a way so as to facilitate good communication among organizations or individuals for understanding situations in a better way.
- **Better record keeping:** Organizations keep a track record of the geographical changes that occur in and around an area, particularly those changes which take place because of their own activities. GIS facilitates better record keeping. It allows easy collection, organization, analysis, interpretation, storage and convenient access of data.
- **Predicting geographical events:** Apart from giving a detailed account of the current situation of geography, GIS also helps researchers predict the likely events in the near future. Such predictions prove quite useful in taking safeguards to minimize damage in case of potentially dangerous geographical changes.

GIS learning is now being integrated into a number of study courses to allow students to

Geoinformatics application users in India

- In healthcare sector, GIS is used for marketing, promotion, research and development
- The Central and state governments use GIS for development in economy, legislative reforms, administration registration of voters, emergency management
- In agriculture, it is used for analysis of production, pollution control and targeted agrarian production
- In environmental management, GIS is used in natural resource management, water quality, waste management, groundwater modeling, climate change
- Public safety units utilize GIS as a constitutional part of emergency response systems formulated for man-made and future disasters
- Forest department uses GIS for the mapping of flora and fauna and biodiversity

Remote Sensing

Acquiring information about a remote object or phenomenon, without making physical contact with the object is called remote sensing. Aerial sensor technologies are used to get information about remote objects on the earth surface or in the atmosphere and oceans. In these technologies, electromagnetic radiation, emitted from aircraft or satellites, is used to gather the required information. Remote sensing is used in combination with GIS to get images of the earth's geographical features. Remote sensing is of two types—active sensing and passive sensing.

- Passive sensors detect objects through natural radiation or energy that is emitted or reflected by the objects or surrounding areas. In other words, passive sensors can only be used to detect energy when the naturally occurring energy is available. The most common example of natural energy is the reflected sunlight. Therefore, passive sensing is possible only when the sun is illuminating the earth. Examples of passive remote sensors include film photography and radiometers. The biggest advantage of passive sensing is that it can be used in inaccessible areas. It is the lifeline of archaeological investigation, military observations and city planning.
- Contrary to passive sensors, active sensors provide their own energy for illuminating the objects to be investigated. An active sensor emits radiation which is directed toward the target object. The radiation reflected from the target is detected and measured by the sensor. Active sensors can obtain measurements anytime in day or night. Active sensors can be used to better control the way a target is illuminated. They can examine wavelengths that are not sufficiently provided by the sun, such as microwaves. However, active systems need to generate a fairly large amount of energy to adequately illuminate targets. RADAR and LiDAR are examples of active remote sensing where the time delay between the emission and return is measured, establishing the location, height, speed and direction of an object.

A camera can serve as an active sensor as well as passive sensor. On a sunny day, enough sunlight illuminates the targets and gets reflected towards the camera lens. The camera simply acts as a passive sensor and records the reflected radiation. On a cloudy day or inside a room, there is often not enough sunlight for the camera to record the targets adequately. So, it acts as an active sensor and uses its own energy source—a flash—to illuminate the targets and record the radiation reflected from them.

Remote sensing is a very useful tool of GIS. Without remote sensing, researchers would have to wait for long times for the planets and their satellites to align in a suitable formation so as to

needed. Remote sensing also works well to study the surface of the earth under water. The use of altimeters is common to see the shifts and changes in the seabed and how humans are responsible for those changes. Ocean waves are also studied through remote sensing to establish their normal cycle and detect any unpredicted changes in the same. This is particularly useful in predicting a tsunami.

Among other remote sensing applications is the use of radars for monitoring aircraft movements to control air traffic. It is also helpful in controlling satellites. Hyper spectral imaging is used to get large pixel images highlighting intricate details of the image object. This is commonly used in biology.

The results of remote sensing depend on the location of the platform on which the sensing device is installed, the location of the target object and the orientation of the two. Remote sensing allows researchers to pre-set the changes they wish to track and every time the target object undergoes those changes, the sensing device becomes active and automatically gathers the required information about the changes.

Table 3.1 Levels of Processing of Remote Sensing Data

Level	Description
0	Reconstructed, unprocessed instrument and payload data at full resolution, with any and all communications artifacts
1a	Reconstructed, unprocessed instrument data at full resolution, time-referenced, and annotated with ancillary information, including radiometric and geometric calibration coefficients and georeferencing parameters computed and appended but not applied to the Level 0 data
1b	Level 1a data that have been processed to sensor units; level 0 data is not recoverable from level 1b data.
2	Derived geophysical variables at the same resolution and location as Level 1 source data.
3	Variables mapped on uniform spacetime grid scales, usually with some completeness and consistency
5	Model output or results from analyses of lower level data

Source: <http://science.nasa.gov/earth-science/earth-science-data/data-processing-levels-for-eosdis-data-products/> Accessed on 5 June 2012

Table 3.1 depicts the data collected through remote sensing, which is processed at a number of levels.

Mapping of Disaster Prone Zones

Maps are images that depict different aspects of the earth's geography in two dimensions. Maps are quite useful in the context of disasters. Pre-disaster and post-disaster maps depict the potential changes and the actual changes, respectively, associated with a disaster, and the areas of these changes. Maps are designed according to latitudinal and longitudinal measures of concerned areas. However, maps are difficult to prepare and their assumed scale may also be difficult to adhere to in all conditions. It is for this reason that GIS technology is

by disasters. These atlases also specify the nature of disasters and their consequences.

Mapping of any kind is done following a four-step basic procedure. The first step of the mapping procedure is the collection of data. This data could be about situational, social, geographic, climatic and economic conditions prevailing in the area. In the second step, the collected data, particularly the one gathered through GIS, is verified with ground realities to ensure accuracy. After reference and matching, in the third step, the data is plotted as a map either on paper or on an electronic display device. In the fourth and last step, the required information is added to the map to facilitate its easy understanding and interpretation. These maps are very important for researchers for predicting any kind of disaster and hence prepare an area to face the disaster. The disaster warning maps can help in preventing large damage. Mapping is an integral part of urbanization planning. It is a great help in natural resource estimation.

Some types of mapping related to natural or manmade disasters are—mapping of seismic activity, mapping of industrial sector, mapping of floods and cyclones, mapping of volcanic eruptions and fires, mapping of earthquakes and landslides.

- **Mapping of seismic activity:** This is done after analysing the history of tectonic activities in the concerned area. The analysis of the data on tectonic activities reveals how these activities have substantially or marginally altered the area. The intensity of each activity is carefully analysed to understand its effect on the area. Presence of indicators like ridges or cracks is considered to be of critical importance. Seismic mapping has to be updated regularly after every minor or major tectonic activity to record any resultant changes. Seismic mapping is carried out on a regional scale because it affects a large area.
- **Mapping of industrial sector:** In case of industrial accidents, disaster mapping is done at the micro level, not at the regional level, because the effect of a disaster is not widespread. Industrial mapping takes into account factors such as industrial growth and development, equipment, processes and raw materials. The storage and transportation patterns in and around the industrial area are closely monitored. Any previous industrial accidents are also carefully studied. Once risk zones are identified, then the risk cause — air pollution, water pollution or noise pollution — is identified. Air pollution effects would be widespread while others are mostly localized.
- **Mapping of floods and cyclones:** The first step in this mapping is the collection of data regarding past floods and the extent of devastation caused by them. This mapping also needs to highlight the amount of rainfall in the past years apart from highlighting the points where natural water bodies after receiving rain water caused the heavy floods. The last two decades have seen great technological strides in the study of floods. Now, high-resolution satellite images are used to pinpoint the places where floods are most likely to occur and where embankments can be made to prevent floods. This mapping also helps in highlighting the areas which would be prone to soil erosion and taking steps to avert it.
- **Mapping of volcanic eruptions and fires:** Information is collected about the duration for

which a volcano remains dormant and the intensity of its eruption. Also, satellite imaging is used to track the flow of lava during a volcanic eruption and assess its reach in the

- surrounding areas. In case of fires, fire frequency and intensity through day and night are monitored in a number of areas to assess their susceptibility to fire disasters and decipher the causes of these disasters. Mapping of fires also suggests the ways to avoid fires and how to protect people in the vicinity of raging fires.
- **Mapping of earthquakes:** In this mapping, data on the earthquake history in an area is collected. The data on the epicentres of recurring earthquakes is also analysed and plotted on seismic maps to highlight the points of maximum seismic activity. Mapping of earthquakes also highlights how soil is shifted from a place and how buildings in the area have been modified to withstand earthquakes better. This mapping greatly helps in city planning and development and in formulating safety procedures against earthquakes.
- **Mapping of landslides:** The first step in this type of mapping is to identify areas with varying degrees of slopes and the stability or instability of slopes. The data obtained on these aspects is then compiled with aerial photographs and with the data about changes that might have occurred in land and soil composition in the past. The results from this exercise help in identifying landslide-prone areas and caution people not to build houses in such areas. This mapping also helps in assessing the feasibility of an area for construction of dams and canals and in taking appropriate steps to prevent landslides.

It is impossible to think about doing the disaster mappings and make relevant disaster predictions without using remote sensing and GIS. Researchers need to use both these systems to make reasonable predictions about the disaster vulnerability of an area and suggest appropriate defences.

Generally, floodplain management studies have been extensive, expensive and cumbersome because most of the analysis performed 'by hand' using paper maps. Presently, latest technologies like GIS, GPS and remote sensing have enabled the floodplain managers to generate precise and latest floodplain maps with improved efficiency and speed at a practical cost. Precise floodplain maps form very sophisticated tools of floodplain management.

Digital maps contain multiple, potentially infinite information layers. Information is usually the most valuable resource after a disaster, so such maps possess the ability to save thousands of lives. These maps are a product of the GIS software and have already been used in Haiti, Japan and West Africa with great effect.

Emergency management personnel generally require comprehensive information regarding building layout, pipelines, sewer systems, electrical distribution. With the help of a GIS system, the concerned departments can share information through databases on computer-generated maps in one location only.

Three-dimensional models within a GIS are used to more realistically analyse the effect of the Earth's terrain. A GIS can present the Earth in three-dimensional, realistic perspective. Such views and animations present the information more effectively and to larger audiences in comparison to static, two-dimensional maps.

Advantages of Spatial Technology in Disaster Management

Spatial technology is an integrated hardware and software system which brings together GIS and remote sensing to use satellites for a number of uses. Spatial technology plays an important role in disaster management. Rather, it has become an integral part of disaster management. Through spatial technology, every step and stage of a disaster management plan can be modified and monitored to minimize the damage from a disaster.

The advantages of spatial technology in disaster management are—early warning, disaster magnitude estimation, communication, city planning, monitoring and mitigation, models and demonstrations.

- **Early warning:** Spatial technology allows scientists and researchers to critically study the patterns of the earth's atmosphere. Any changes in these patterns can be spotted easily in the images formed by using spatial technology. These changes are then used to track any disaster which might be becoming active to hit a particular area in future. Early detection of changes in the atmosphere patterns help researchers and administrators to make arrangements to escape the drastic effects of the speculated disaster.
- **Disaster magnitude estimation:** Looking through the changes occurring on the earth's surface or under the ocean bed, and combining them with the data about the history of disaster occurrence in the same area can help estimate the magnitude of a future disaster. An estimate of the disaster magnitude allows people to work for their protection individually and also lets the government make arrangements to protect the economy of an area from the drastic effects of a disaster.
- **Communication:** Spatial technology takes communication to a new level where information can flow more easily and more information can be sent quickly. This helps in alerting people about a disaster more quickly, thus taking precautionary steps well in time. This also enables the authorities to plan and take appropriate steps for the desired coordination during disaster recovery and rehabilitation.
- **City planning:** When planners and developers turn to spatial technology, they are able to understand the potential risks in an area where they wish to build a city. This helps them build the city in a way that would enable it to withstand the disasters that are most likely to occur. Taking preventive measures to keep a population protected against disasters is one of the basic steps in disaster management.
- **Monitoring and mitigation:** Spatial technology allows authorities to monitor an oncoming disaster while also planning mitigation strategies to relieve the stress that the economy would suffer from the same. Constant monitoring and study of relevant parameters helps analyse the extent of potential damage and assess the need for preventive measures.
- **Models and demonstrations:** The images and data generated through spatial technology can be used to produce models and demonstrations which would help the

authorities and people understand how the disaster would strike and how the environment and its elements would react to the same. These models help one to draw accurate inferences regarding the action and reaction after a disaster.

Tsunami

A tsunami warning system (TWS) is a system to detect tsunamis and issue warnings to prevent loss of life and property. It consists of two equally important components—a network of sensors to detect tsunamis and a communications infrastructure to issue timely alarms to permit evacuation of coastal areas. There are two distinct types of tsunami warning systems—international and regional. Both depend on the fact that, while tsunamis travel at between 500 and 1,000 km/h (around 0.14 and 0.28 km/s) in open water, earthquakes can be detected almost at once as seismic waves travel with a typical speed of 4 km/s (around 14,400 km/h). This gives time for a possible tsunami forecast to be made and warnings to be issued to threatened areas, if warranted. Unfortunately, until a reliable model is able to predict which earthquakes will produce significant tsunamis, this approach will produce many more false alarms than verified warnings. In the current operational paradigm, the seismic alerts are used to send out the watches and warnings. Then, data from observed sea level height (either shore-based tide gauges or DART buoys) are used to verify the existence of a tsunami.

Other systems have been proposed to augment the warning paradigm. For example, it has been suggested that the duration and frequency content of t-wave energy (which is earthquake energy trapped in the ocean SOFAR channel) is indicative of an earthquake's tsunami potential. The first rudimentary system to alert communities of an impending tsunami was attempted in Hawaii in the 1920s. More advanced systems were developed in the wake of the April 1, 1946 (caused by the 1946 Aleutian Islands earthquake) and May 23, 1960 (caused by the 1960 Valdivia earthquake) tsunamis which caused massive devastation in Hilo, Hawaii.

Source: (Wikipedia, http://en.wikipedia.org/wiki/Tsunami_warning_system) Earthquake

An earthquake warning system is a system of accelerometers, communication, computers, and alarms that is devised for regional notification of a substantial earthquake while it is in progress. This is not the same as earthquake prediction, which is currently incapable of producing actionable event warnings.

Time lag and wave projection

An earthquake is caused by the release of stored elastic strain energy during rapid sliding along a fault. The sliding will start at some location and progress away from this hypocenter in each direction along the fault surface. The speed of the progression of this fault tear is slower than and distinct from the speed of the resultant pressure and shear waves, with the pressure wave travelling faster than the shear wave. The pressure wave will generate an abrupt shock while the shear waves can generate a periodic motion (at about one cycle per second) that is the most destructive in its effect upon structures, particularly buildings that have a similar resonant period, typically buildings around eight floors in height. These waves will be strongest at the ends of the slippage, and may project destructive waves well beyond the fault failure. The intensity of such remote effects are highly dependent upon local soils conditions within the region and these effects are considered in constructing a computer model of the region that determines appropriate responses to specific events.

Configuration

Earthquake warning systems consist of arrays of seismic motion sensors arranged throughout a region. High speed communication systems and computers collect the sensor readings and the computers are programmed to detect the likely strength and progression of the seismic

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event. If a dangerous event is detected then alarms can be signalled through the region likely to be affected, allowing warnings before local ground motion of up to and beyond twenty seconds. While short, such warnings would be sufficient to allow many persons to move to

safer areas or to take shelter under substantial furnishings.

Transit safety

Such systems are currently implemented to determine appropriate real-time response to an event in determining train operator response for urban rail systems such as BART (Bay Area Rapid Transit). The appropriate response will be highly dependent upon the warning time, the local right-of-way conditions, and the current speed of the train.

BART: BART is a rapid transit system serving the San Francisco Bay Area. The heavy-rail public transit system connects San Francisco with cities in the East Bay and suburbs in northern San Mateo County. BART operates five lines on 104 miles (167 km) of track with 43 stations in four counties. With average weekday ridership of 346,504 passengers, BART is the fifth busiest heavy rail rapid transit system in the United States.

BART is operated by the San Francisco Bay Area Rapid Transit District, a special-purpose transit district that was formed in 1957 to cover San Francisco, Alameda County, and Contra Costa County. The name BART is an acronym and is pronounced as a word, not as individual letters. In some ways, BART is the successor to the Key System, which ran streetcars across the lower deck of the San Francisco–Oakland Bay Bridge until 1958.

BART has served as a highly successful rapid transit and commuter rail system, and it has provided a valuable alternative transportation route to highway transportation. Due to the success and the number of commuters depending upon the rail system, BART has been undergoing a vast modernization to improve the quality of the system and its ability to serve the public's transportation needs. These modernization moves have included overhauls of the stations, the purchase of new and refurbished rolling stock, and extensions to the area covered by the BART lines.

Deployment

Japan, Taiwan and Mexico have earthquake early-warning systems. The most advanced is Japan's Earthquake Early Warning system, which was put to practical use in 2006. Its scheme to warn the general public was installed on October 1, 2007. It was modeled partly on the Urgent Earthquake Detection and Alarm System (UrEDAS) of Japan Railways, which was designed to enable automatic braking of bullettrains.

Accelerometer

An accelerometer measures the proper acceleration it experiences relative to freefall. Single- and multi-axis models are available to detect magnitude and direction of the acceleration as a vector quantity, and can be used to sense orientation, vibration and shock. Micromachined accelerometers are increasingly present in portable electronic devices and video game controllers, to detect the orientation of the device or provide for game input.

An accelerometer measures the proper acceleration it experiences relative to freefall. This is equivalent to inertial acceleration minus the local gravitational acceleration, where inertial acceleration is understood as acceleration with respect to a Newtonian inertial reference frame,

As a consequence, quite counter-intuitively, an accelerometer at rest with respect to the Earth's surface will indicate 1 g upwards. To obtain the acceleration due to motion with respect to the earth, this 'gravity offset' should be subtracted. No such subtraction is necessary along horizontal directions. Conversely, the device's output will be zero during free fall, where the acceleration exactly follows gravity. This includes use in an earth orbiting spaceship, but not a (non-free) fall with air resistance, where drag forces reduce the acceleration until a terminal velocity is reached, at which point the device would once again indicate 1 g vertically upwards.

Earthquake prediction: An earthquake prediction is a prediction that an earthquake of a specific magnitude will occur in a particular place at a particular time (or ranges thereof). Despite considerable research efforts by seismologists, scientifically reproducible predictions cannot yet be made to a specific hour, day, or month but for well-understood faults, seismic hazard assessment maps can estimate the probability that an earthquake of a given size will affect a given location over a certain number of years.

Hence an earthquake has already begun, early warning devices can provide a few seconds' warning before major shaking arrives at a given location. This technology takes advantage of the different speeds of propagation of the various types of vibrations produced. Aftershocks are also likely after a major quake, and are commonly planned for in earthquake disaster response protocols. Experts do advise general earthquake preparedness, especially in areas known to experience frequent or large quakes, to prevent injury, death, and property damage if a quake occurs with or without warning.

Prediction techniques

In the effort to predict earthquakes, people have tried to associate an impending earthquake with such varied phenomena as seismicity patterns, electromagnetic fields (seismo-electromagnetics), ground movement, weather conditions and unusual clouds, radon or hydrogen gas content of soil or ground water, water level in wells, animal behaviour, and the phases of the moon.

Many pseudoscientific theories and predictions are made, which scientific practitioners find problematic. The natural randomness of earthquakes and frequent activity in certain areas can be used to make 'predictions' which may generate unwarranted credibility. These generally leave certain details unspecified, increasing the probability that the vague prediction criteria will be met, and ignore quakes that were not predicted. Rudolf Falb's 'lunisolar flood theory' is a typical example from the late 19th century.

Evaluation of prediction theories

Official earthquake prediction evaluation councils have been established in California (the California Earthquake Prediction Evaluation Council) and the federal government in the United States (the National Earthquake Prediction Evaluation Council), but have yet to endorse any method of predicting quakes as reliable.

Scientific evaluations of prediction claims look for the following elements in a claim:

- A specific location or area
- A specific span of time

- A specific magnitude range
- A specific probability of occurrence

Attribution to a plausible physical mechanism lends credibility, and suggests a means for future improvement. Reproducibility and statistical analysis are used to distinguish predictions which come true due to random chance (of which a certain number are expected) versus those that have more useful predictive capability, and to validate models of long-term probability. Such models are difficult to test or validate because large earthquakes are so rare, and because earthquake activity is naturally clustered in space and time. 'Predictions' which are made only after the fact are common but generally discounted.

Radon

Emission of radon as a quake precursor was studied in the 1970s and 1980s, with no reliable results. It is still under study at NASA as of 2009.

The VAN method

VAN is a method of earthquake prediction proposed by Professors Varotsos, Alexopoulos and Nomicos in the 1980s; it was named after the researchers' initials. The method is based on the detection of 'seismic electric signals' (SES) via a telemetric network of conductive metal rods inserted in the ground. The method stems from theoretical predictions by P. Varotsos, a solid-state physicist at the National and Capodistrian University of Athens. It is continually refined as to the manner of identifying SES from within the abundant electric noise the VAN sensors are picking up. Researchers have claimed to be able to predict earthquakes of magnitude larger than 5, within 100 km of epicentral location, within 0.7 units of magnitude and in a 2-hour to 11-day time window.

Foreshock predictions

Foreshocks are medium-sized earthquakes that precede major quakes.

An increase in foreshock activity (combined with purported indications like ground water levels and strange animal behaviour) enabled the successful evacuation a million people one day before the February 4, 1975 M7.3 Haicheng earthquake by the China State Seismological Bureau.

While 50 per cent of major earthquakes are preceded by foreshocks, only about 5-10 per cent of small earthquakes turn out to be foreshocks, leading to many false warnings.

Fractoluminescence

This was briefly considered a possible technique to predict earthquakes, but never gained widespread acceptance. It came into the public knowledge after the 1995 Kobe earthquake in Japan, when many victims reported that they had seen glimpses of red and blue light in the sky for about an hour prior to the earthquake. After these reports, studies were carried out at the Chugoku National Industrial Research Institute and they showed that when it is broken, silica emits red and blue light for about 100 milliseconds duration. The explanation for this was supposed to be that when there was stress within the rock, silicon-oxygen bonds were broken and unstable oxygen atoms and free bonds were released which appeared as blue

Satellite observations

Demeter microsatellite: The 'Detection of Electro-Magnetic Emissions Transmitted from Earthquake Regions' satellite was constructed by CNES. It has observed that there are strong correlations between certain types of low frequency electromagnetic activity and the highly seismically active zones on the Earth, and have shown a sharp signal in the ionospheric electron density and temperature near southern Japan seven days before a 7.1 magnitude took place there (on August 29 and September 5, 2004, respectively).

QuakeSat nanosatellite: QuakeSat is an earth observation nanosatellite based on 3 CubeSats. It collects extremely low frequency earthquake precursor signals from space. Its main instrument is a magnetometer set up in a 2 foot (0.6 m) telescoping boom.

The ESPERIA project: ESPERIA is an equatorial space mission, concerned with scoping out any tectonic and pre-seismic signals. Besides earthquake prediction, it is used for more general purposes like defining the near-Earth electromagnetic, plasma, and particle environment, and for monitoring perturbations and instabilities in the ionosphere-magnetosphere transition region. To study earthquake preparation processes and anthropogenic impacts in the Earth's surface, a phase 'A' study has been realized for the Italian Space Agency.

Flood Warning and Forecasting

Flood forecasting and flood warning are closely interlinked. However, they are different in the sense that flood forecasting involves estimating the channel flows or river levels at various places while flood warning involves making decision regarding which section of the population should be warned, or evacuated. The flood warning exercise is divided into two parts:

- Making the decision regarding whether the level of alert is to be raised or cancelled or changed to the flood warning service provider, since this also includes partner organizations that are activated during an emergency, such as medical teams.
- Making the decision regarding whether general public is to be issued flood warnings. Someone who is making this decision needs to take care of the following important factors:
 - How reliable are the available forecasts and whether there are likely to be changes with time.
 - How much time should the public be given to respond to the warning.
 - If there can be a delay between when the warning was initiated and when it was received by the public.
 - If the warning proves to be unnecessary or exaggerated, the efforts of respondents will be wasted and the general public will not take future warnings seriously.
 - If the warning is cancelled and then re-issued, this brings down the credibility of the flood warning agency and will lay waste the efforts made by the public and partner agencies.

A flood warning computer system will also contain sub-systems for:

- Flood forecasting

- Automatic alerts for internal personnel
- Regular monitoring of alert messages and received acknowledgements

Lecture Notes Means to divert received messages to others if no acknowledgement is received from original recipient. **Disaster Management Preparedness in Emergencies and Flood Technology**

Flood forecasting is the 'use of real-time precipitation and stream-flow data in rainfall-runoff and stream-flow routing models to forecast flow rates and water levels for periods ranging from a few hours to days ahead, depending on the size of the watershed or river basin.'

Flood forecasting uses forecasts of rain with the aim to extend the lead-time available. Advanced flood forecasting systems also take into account the effects of:

- Snowmelt
- Flood plains and washlands
- Flood defences like control-gates
- Effect of tides in the sea and sea-surges

In order to do this, forecasting models will have to include suitable snowmelt models, and the stream-flow models that are appropriate for simple applications would also require hydrodynamic models.

National Flood Warning Services

The nature of flood warning services in one country varies greatly from those in another country. Sometimes, a particular location may receive flood warnings from more than one source. The type of flood warning service available varies greatly from country to country, and a location may receive warnings from more than one service.

United Kingdom

In the UK, for instance, the Met Office would issue flood warnings if their forecasts indicate heavy rainfall but this warning may not be specific to an area and just a general warning, issues 6-24 hours before the incidence of rain. Such warnings are usually just a caution for the citizens. Besides this rainfall warning, when an area is likely to be flooded, specific agencies in various regions would issue short-term warnings—the Scottish Environment Protection Agency (covering Scotland) and the Environment Agency (covering England and Wales)—and perform the flood forecasting exercise, based on:

- Recent rainfall patterns
- Rainfall expected in the next 6 hours
- Existing and past river conditions

In the UK, flood warning service has evolved into being issued automatically by phone to those who are likely to be affected by the flood. Warnings are also issued by local radio stations and Internet pages. These pages will contain names of areas likely to be affected and the severity of the warnings:

- Environment Agency (EA) Flood Watch (live warnings) - England/Wales
- EA scheme description

United States

Disaster Management Preparedness in Emergencies and Rural Technology

In the US, the National Weather Service issues flood watches and warnings for large-scale, gradual river flooding. The watches are issued when there is likelihood of a flood within the

next 12–48 hours, and warnings are disseminated when there is likelihood of large-area flooding. Watches as well as warnings may be issued separately for counties or as per towns situated along a river. For rapid flooding from intense rainfall or dam failures, flash flood watches and warnings are disseminated.

In USA and Canada, issuing of flood warnings is made through Specific Area Message Encoding (SAME) code FLW, which is used in the US Emergency Alert System and NOAA Weatheradio network and in Canada's Weatheradio Canada network.

Australia

The Bureau of Meteorology provides a flood warning service for most major rivers in Australia. This service is provided with the cooperation of other government authorities, such as the State Emergency Service (S/TES) in each State/Territory, water agencies and local Councils. The Bureau delivers this service through Flood Warning Centres and Regional Forecasting Centres in Bureau Regional Offices in each State and the Northern Territory.

The Flood Warning Service provides different types of information that depends on the type of flooding and the flood risk. The range of information, which may vary between states and areas within a state, includes:

An alert, watch or advice of possible flooding, if flood producing rain is expected to happen in the near future. The general weather forecasts can also refer to flood producing rain.

A generalised flood warning that flooding is occurring or is expected to occur in a particular region. No information on the severity of flooding or the particular location of the flooding is provided. These types of warnings are issued for areas where no specialized warnings systems have been installed. As part of its Severe Weather Warning Service, the Bureau also provides warnings for severe storm situations that may cause flash flooding. In some areas, the Bureau is working with local councils to install systems to provide improved warnings for flash flood situations.

Warnings of 'minor', 'moderate' or 'major' flooding in areas where the Bureau has installed specialized warning systems. In these areas, the flood warning message will identify the river valley, the locations expected to be flooded, the likely severity of the flooding and when it is likely to occur.

Predictions of the expected height of a river at a town or other important locations along a river, and the time that this height is expected to be reached. This type of warning is normally the most useful in that it allows local emergency authorities and people in the flood threatened area to more precisely determine the area and likely depth of the flooding. This type of

warning can only be provided where there are specialized flood warning systems and where flood forecasting models have been developed.

Tropical Cyclone and Hurricane Cyclone Warnings

Cyclone warnings are disseminated through a variety of communication media, such as, radio, television, print media, telephones, fax, telex, telegrams, police wireless network. A specially designed Cyclone Warning Dissemination System which works via the INSAT satellite provides area-specific service even when there is a failure of conventional communication channels. Warnings are issued for general public, fishermen, farmers and different categories of users such as central and state government officials responsible for disaster mitigation and relief, industrial and other establishments located in the coastal areas, railways, aviation, communications and power authorities.

North Atlantic systems

The US National Hurricane Center uses the following terminology for classifying storms etc. and which is also used as standard terminology for countries around the North Atlantic, the Caribbean basin, except Cuba as well as for the Pacific coasts of Mexico, Central America, southern California, and Hawaii.

Tropical storms

Prior to the 1987 Atlantic hurricane onset, tropical storm warnings were known as Gale Watches/Warnings, thus, no different from warnings for non-tropical storms.

Tropical storm watch

This kind of warning is issued in case of tropical storm conditions, including winds from 39 to 73 mph (35 to 64 knots, 63 to 117 km/h) threaten to cause damage to a particular coastal area within the next 36 hours. This warning is symbolized by a single square red flag.

Tropical storm warning

This kind of warning is issued in case of the same storm conditions as above are expected within the next 24 hours or less. This warning is symbolized by two square red flags.

Hurricanes

This type of warning is issued when a hurricane is expected to hit a specific area sometime during the next 36 hours. This watch is symbolized by a single square red flag with a black square in the middle.

Hurricane warning flags (USA): In USA, a hurricane warning is made when it is estimated that a hurricane with sustained winds of 74 mph (65 knots, 118 km/h) or higher would be hitting a particular coastal area within the next 24 hours. This warning is symbolized by two square red flags, each with a black square in the middle.

Dr. U. K. Rout, Dr. R. K. Behera & Dr. B. P. Samal

The hurricane warning remains valid even after wind speed has subsided below hurricane intensity but there is danger of **Danger of high water level or a combination of dangerously high water and extremely high waves.**

In case it is not possible to determine the intensity or track of a forecast cyclone (when a tropical storm is imminent of nearly hurricane intensity or it is on the edge of a track), a Tropical Storm Warning and a Hurricane Watch are issued at the same time along various portions of the coastline. These are indicated by two square red flags with a black square in the middle on only one of them.

Inland advisories: Such alerts are issued for areas lying away from the coastline but are likely to be affected by the tropical storm or hurricane force wind and/or rain conditions. Such advisories were first issued in 2005. All warnings come with Emergency Alert System event codes HWA and HWW, employed for high wind watches and warnings, despite their being under the same codes and standard tropical cyclone advisories. Earlier, standard High Wind Warnings and Watches were issued. These refer to tropical storm force or worse. For inland regions, watches and/or warnings are issued for tropical storm or hurricane intensity winds. Listed here are the older watches and warnings:

Inland tropical storm watch

This is issued for inland regions when there is prediction of sustained winds of 39 to 73 mph (62 to 117 km/h) associated with a tropical storm even if the actual occurrence, timing and location are still not known exactly.

Inland tropical storm warning

These are issued for inland counties when there is prediction of tropical storm conditions in the coastal areas within the next twelve hours or less.

Inland hurricane watch

Issued in anticipation of sustained winds of 74 mph (118 km/h) or greater associated with a hurricane in inland counties even if the actual occurrence, timing and location are not known exactly.

Inland hurricane warning

Such warnings are issued for inland counties when sustained hurricane intensity winds are forecast beyond the coastal areas within the next twelve hours or less.

Drought Warning System

A colour-coded early warning system is developed and proposed for drought management on the real-time reservoir operation. The system consists of three essential elements, namely, (1) drought watch, (2) water consumption measure, and (3) policy making. A new drought alert index is used to characterize the alert level of drought severity. For demonstration the drought

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warning procedures were effectively applied to a real-world two-parallel-reservoir region in northern Taiwan. The implementation of such a system proves that the decision support-like system can help the water authorities concerned take a timely action while confronting drought threats.

Megha-Tropiques Satellite

Megha-Tropiques is an Indo-French Joint Satellite Mission. The main objective of this mission is to understand the life cycle of convective systems that influence the tropical weather and climate and their role in associated energy and moisture budget of the atmosphere in tropical regions.

Megha-Tropiques will provide scientific data on the contribution of the water cycle to the tropical atmosphere, with information on water vapour in the atmosphere condensed water in clouds, evaporation, and precipitation. With its circular orbit inclined 20 degrees to the equator the Megha-Tropiques is a unique satellite for climate research that should aid scientists seeking to refine prediction models.

ROLE OF VARIOUS AGENCIES IN DISASTER MITIGATION:

NATIONAL LEVEL AND STATE LEVELS

The general role of states (or governments) can be enumerated as follows:

- To provide relief to the people for the loss incurred due to disaster and to expedite rehabilitation and reconstruction and to ensure that all sections of the population are covered by efforts of the government
- The government also needs to put in place some social and economic activities for quick restoration of the situation
- To make efforts to minimize the impact of disasters by adopting precautionary measures and mechanisms
- To analyze and study the reasons for the occurrence of disasters and to suggest the remedies to avoid or minimize the effects of such natural calamities
- To make the best use of the funds, grants, donations and assistance received from the central government and other foreign countries or from other institutions/individuals for prevention of such natural calamities or for reconstruction and rehabilitation; to obtain loans and make proper use of the obtained funds

Institutional arrangements

In countries with federal system of government, various roles are distributed among the central and state governments. State governments further delegate their responsibilities down to the district authorities, block level as well as the village level. In fact, the Panchayat Raj Institutions in India are vested with specific roles in many administrative and developmental activities. However, the subject of disaster management has not been specifically mentioned in any of the three lists in the 7th schedule of the Indian Constitution, where subjects under the central and state governments that come under both are specified. On the legal front, there is no enactment either of the central or of any state government to deal with the management of

disasters of various types in a comprehensive manner.

Lecture Notes

Disaster Management Preparedness in Emergencies and Rural Technology

As a response to the numerous natural as well as man-made disasters, the governments of almost all the world nations have put institutional arrangements in place. India, too, has an integrated administrative machinery for management of disasters at the national, state,

district and sub-district levels. The basic responsibility of undertaking rescue, relief and rehabilitation measures in the event of natural disasters, as at present, is that of the state governments concerned. The central government supplements the efforts of the states by providing financial and logistic support.

Central level

The level of response at the central government level is determined as per the current policy of relief expenditure fund and looking at factors like:

- Seriousness of the disaster
 - Required scale of the relief and rescue operation
 - Required central assistance as support for state-funded financial help and logistic support
- The Contingency Action Plan (CAP) lists the initiatives that need to be taken by different central ministries and public departments after a natural disaster has taken place. The Plan will contain the procedures and identify the focal points in the administration to enable immediate launch of relief and rescue operations.

The ministry of home affairs is the nodal ministry for coordination of relief and response and overall natural disaster management, and the department of agriculture and cooperation is the nodal ministry for drought management. Other ministries are assigned the responsibility of providing emergency support in case of disasters that fall in their purview.

The following decision-making and standing bodies are responsible for disaster management at the central level:

- Union Cabinet, headed by the Prime Minister
- Empowered Group of Ministers, headed by the Deputy Prime Minister
- National Crisis Management Committee (NCMC), under the chairmanship of the Cabinet Secretary
- Crisis Management Group (CMG): Under the chairmanship of the Central Relief Commissioner comprising senior officers from the various Ministries and other concerned departments which reviews contingency plans, measures required for dealing with a natural disaster, and co-ordinates the activities of the Central Ministries and the state governments in relation to disaster preparedness response and relief
- Technical organizations such as the Indian Meteorological Department (cyclone/earthquake), Central Water Commission (floods), Building Material and Technology Promotion Council (construction laws), Bureau of Indian Standards (norms), Defence Research & Development Organization (nuclear/biological), Directorate General Civil Defence provide specific technical support to coordination of disaster response and management functions

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- The setting up of a National Disaster Management Authority (NDMA) is being contemplated by the Ministry of Home Affairs as the proposed apex structure within the government for the purpose. Amongst other major organizational initiatives, it is proposed to:
 - Establish a specialised and earmarked response team for dealing with nuclear/biological/chemical disasters
 - Establish search and rescue teams in each state
 - Strengthen communication systems in the North-eastern region

Various agencies play various roles in disaster management-governments, NGOs, local agencies and the corporate sector. Some of these roles are overlapping. In addition, these agencies need to work in close cooperation with each other. In large countries like India, the government bodies function at many levels and through many different agencies. Therefore, coordination of their efforts is another challenge that needs to be met satisfactorily. Here, you will study about the roles of various agencies in disaster management.

State level

The responsibility to cope with natural disasters is essentially that of the state government. The role of the central government is supportive in terms of supplementation of physical and financial resources. The chief secretary of the state heads a state level committee which is in overall charge of the relief operations in the state and the relief commissioners who are in charge of the relief and rehabilitation measures in the wake of natural disasters in their states function under the overall direction and control of the state level committee. In many states, secretary, department of revenue, is also in-charge of relief. State governments usually have relief manuals and the districts have their contingency plan that is updated from time to time.

Table 3.2 Ministries Responsible for Disasters

Disasters	Nodal Ministry
Natural Disasters Management (Other than Drought Relief)	Ministry of Home Affairs
Drought Relief	Ministry of Agriculture
Air Accidents	Ministry of Civil Aviation
Railway Accidents	Ministry of Railways
Chemical Disasters	Ministry of Environment & Forests
Biological Disasters	Ministry of Health
Nuclear Disasters	Department of Atomic Energy

Role of Local Agencies

District and local level: As already discussed, the state governments are responsible for carrying out disaster management activities. However, the state governments get these activities carried out at the local level through district and local authorities. The district administration is the focal point for implementation of all governmental plans and activities. The actual day-to-day function of administering relief is the responsibility of the collector/district magistrate/deputy commissioner who exercises coordinating and supervising powers over all departments at the district level. Though it may not be a common phenomenon, there exists by and large in districts also a district level relief committee consisting of officials and non-officials.

The 73rd and 74th constitutional amendment have accorded the Panchayati Raj Institutions the status of 'Institutions of self-government'. The amendment has also laid down necessary guidelines for the structure of their composition, powers, functions, devolution of finances, regular holding of elections and reservation of seats for weaker sections including women. These local bodies can be effective instruments in tackling disasters through early warning system, relief distribution, providing shelter to the victims, and medical assistance.

Other local level agencies

Other than the national, state, district and local levels, there are various institutional stakeholders who are involved in disaster management at various levels in the country. These include the police and para-military forces, civil defence and home-guards, fire services, ex-servicemen, non-government organisations (NGOs), public and private sector enterprises, media and HAM operators (amateur radio operators), all of whom have important roles to play.

Armed forces

In India, the armed forces are called upon to intervene and take on specific tasks only when the situation goes beyond the control of civil administration. In practice, the armed forces are the core of the government's response capacity and tend to be the first responders of the central government in a major disaster. Due to their ability to organize action in adverse ground circumstances, speed of operational response and the resources and capabilities at their disposal, the armed forces have historically played a major role in emergency support functions such as communications, search and rescue operations, health and medical facilities, transportation, power, food and civil supplies, public works and engineering, especially in the immediate aftermath of disaster. Disaster management plans should incorporate the role expected of them so that the procedure for deploying them is smooth and quick.

International bodies

In the face of disasters, help usually pours in from various institutional and non-institutional agencies from within the nation as well as from outside. Foreign governments, especially the neighbours and other friendly nations are the first ones to offer aid. Many international bodies are vested with the responsibility to mitigate challenges posed by disasters. The Government of India is a member of various international organisations in the field of disaster response and relief. While, as a policy, no requests for assistance or appeals are made to the international community in the event of a disaster, assistance offered suo moto is accepted. Linkages exist with the following organizations:

- UN Office for Coordination of Humanitarian Affairs (UN OCHA), which has been made responsible by UN General Assembly mandate for all international disaster response
- United Nations Development Programme (UNDP), responsible for mitigation and prevention aspects of disaster management
- UN Disaster Assessment and Coordination (UNDAC) System

Community level initiatives

The goal of any disaster management initiative is to build a disaster resistant/resilient community equipped with safer living and sustainable livelihoods to serve its own development purposes. The community is also the first responder in any disaster situation, thereby emphasising the need for community level initiatives in managing disasters. To encourage such initiatives, the following are required:

- Creating awareness through disaster education and training and information dissemination are necessary steps for empowering the community to cope with disasters.
- Community based approach followed by most NGOs and Community Based Organisations (CBOs) should be incorporated in the disaster management system as an effective vehicle of community participation.
- Within a vulnerable community, there exist groups that are more vulnerable like women and children, aged and infirm and physically challenged people who need special care and attention especially during disaster situations. Efforts are required for identifying such vulnerable groups and providing special assistance in terms of evacuation, relief, aid and medical attention to them in disaster situations.

Management of disasters should therefore be an interface between a community effort to mitigate and prevent disasters as also an effort from the government machinery to buttress and support popular initiatives.

Role of NGOs

The past few decades have witnessed the growth (and proliferation) of numerous NGOs in various fields. Although many NGOs devote their attention to specific issues, most of these swing into action in the face of a disaster. There are NGOs devoted to disaster management, which conduct research, carry out rehabilitation and reconstruction work when immediate help is not required.

NGOs are autonomous non-governmental bodies operating mostly as non-profit organizations. In India, they are very large in number and widely scattered across the country. Therefore, a need was felt to coordinate and streamline the activities of the NGOs so as to have the optimal benefit from their efforts. For this purpose, the National NGO Task Force has been set up. The main objective of this task force is to promote Community Based Disaster Risk Management (CBDRM) in all spheres of disaster management.

Some of the guiding principles of the task force are as follows:

- The National NGO Task Force on disaster management will be guided by CBDRM.
- This will also be the national-level platform for coordinating the activities of both government organizations and non-governmental organizations (GO-NGOs) in the field of disaster management.

- The Task Force will facilitate and support the formation of similar task forces at state and district levels.

Objectives of the task force

The objectives of the task force are as follows:

- Mapping of NGOs at state and district levels
- Training and capacity building of various stakeholders
- Mainstreaming vulnerability reduction through CBDRM in civil society initiatives
- Assisting the transition from relief codes to Disaster Management codes through Policy and Guidelines
- Guidelines for GO-NGO collaboration
- Providing assistance in setting up NGO task forces at state and district levels
- Integrating CBDRM in development programmes
- Strengthening disaster preparedness, mitigation and effective response in state and districts
- Setting up working groups on specific themes to include broad-based participation of civil society organizations

Advisory/advocacy role

- Coordination with government and other stakeholders in the field of disaster management
- Information sharing, documentation and dissemination, knowledge sharing, networking and technical support
- Training and capacity building
- Helping INGOs/NGOs articulate their CBDRM policies

The task force has laid down several criteria for membership. Some of these criteria are as follows:

- A maximum of 20 members in the National Task Force
- The secretariat for the National NGO Task Force will be hosted at NDMA
- International, national, local NGOs and networks which are active at national, state and district level, undertaking disaster management initiatives in preparedness, capacity building, mitigation and response, including reconstruction programmes with potential for replication
- Organizations committed to CBDRM and having scope for wider dissemination and replication of CBDRM practices
- Organizations which have responded to a few major disasters
- Having the ability to dialogue and liaise with government and other stakeholders on disaster management and related policy issues
- Having demonstrated ability in training and capacity building

The list of institutions to be the members of the Task Force

- UNDP
- CARE, India
- OXFAM
- EFICOR
- SEEDS
- PGVS

- ABCD
- TNTRC
- RVC
- RedR India
- CARITAS
- World Vision
- Indian Red Cross Society
- BJS
- UNICEF
- MHA, GoI
- NIDM
- Ramakrishna Mission
- VANI
- SPHERE India

One of the most effective agencies during a disaster are the NGOs operating in the concerned area. These NGOs along with other local bodies (government assistance is desirable) can create community level initiative since community level initiatives are most effective.

Role of Corporate Agencies

Disasters are unforeseen events that cause great damage, destruction and human suffering. They require immediate, coordinated and effective response from multiple sources such as government, voluntary and corporate sector organizations. The corporate sector in India has played a valuable role in relief, recovery, rehabilitation and reconstruction.

An enhanced, expanded, well-defined and pro-active role is expected from corporates in all aspects of the disaster management cycle.

The NDMA recognizes the Indian corporate sector as one of the key stakeholders and envisages the involvement of this sector in awareness generation, disaster preparedness and mitigation planning through sensitization, training and co-opting of the corporate sector and their nodal bodies in planning process and response mechanism.

The corporate sector has the potential of assisting both the business community in protecting itself and the community at large in increasing its resilience to disasters.

Objectives for corporate sector's involvement in disaster management

- To identify the roles of various corporate entities in different areas of disaster management, including disaster preparedness, mitigation, emergency response (relief, rehabilitation, reconstruction) and recovery
- To explore the potential roles of trade associations for mobilizing the corporate sector in disaster management
- To explore the full potential of corporate social responsibility and public private partnership in disaster management in India for professionalizing various aspects of governance
- To set up a national corporate task force on disaster management
- The corporates in India are constantly committed to extending all necessary help toward-

- disaster management. Various corporate bodies coordinate their efforts. Meetings and follow-up meetings are called with other corporate associations such as FICCI, CII, ASSOCHAM and NASSCOM to discuss the modalities on public- private participation in disaster management, to explore the potential roles of trade associations in disaster management initiatives and to make strategies for setting up of a corporate task force for disaster management.

Role of the Armed Forces

India is a very vulnerable nation which is prone to multiple natural disasters owing to its unique topographic and climatic conditions. Considering its size and dimensions, it has various different climates and geographical types. The coastal states, especially the ones on the eastern coast and Gujarat are exposed to cyclones where 40 million hectares (eight per cent) of land mass is flood prone, 68 per cent faces drought threat, 55 per cent of the area is in seismic zones III and IV and falls under earthquakes-prone belt and sub-Himalayan region and Western Ghats are threatened by landslides. India is increasingly getting affected by man-made disasters related to industrialization, transportation, environmental degradation and terrorist attacks. There is no legal ratification either at the central or the state governments level to deal with such disasters as it is not specified under any of the three lists (central, state and concurrent) of Seventh Schedule of the Indian Constitution.

The government of India is well aware that there is an urgent need for better disaster response mechanism, but the overall trend has indicated that the level of preparation to handle such disasters by the centre as well as the states is very unbalanced and unorganized which requires considerable strengthening. The centre and a number of states have started gearing up for such disasters which are becoming common by the day. The nodal agency for coordination of relief, response and overall natural disaster management has been positioned under the Union ministry of home affairs to design strategies to overcome such disasters and their effects. Whenever any disaster occurs in India, the armed forces are requested to intervene and take control of the situation.

Since the Indian civil administration is not adequately equipped for undertaking such urgent disaster response activities, they rely on the support given by the armed forces. On the other hand, Indian armed forces are one of the most technologically developed, dedicated and modernized armed forces in the world, adequately equipped with the necessary technical competence, man power and material resources undertakes rescue and relief operations of any disasters. An instance can be stated when the tsunami that occurred in December 2004 where the Indian Army, Navy and the Air Force coordinated by the Integrated Defence Staff (IDS) efficiently executed the relief, rescue and evacuation assignments under Operation Sea Wave, and also extended aid to Sri Lanka and Maldives under Operation Rainbow and Operation Castor at the request of their respective governments for assistance. A few other such instances where the defence showed its presence was the Kashmir earthquake of 2005, the cyclone in Bangladesh on 15 November 2007, the fire breakout at Burrabazar in Kolkata on 12 January 2008 or the recent serial blasts at Bangalore and Ahmedabad in July 2008, the role played by the Indian armed forces is commendable.

The primary role being to defend the nation against any external forces the Indian armed forces are inevitably involved in securing the country from diverse unconventional fronts. They are always ready to execute any kind of operation related to any kind of disaster-affected areas and the daring and skill required to be able to work under adverse ground and climatic conditions. This continual performance in quick rescue and response action after disasters has been outstanding and with the ever increasing frequency of disasters in the South-Asian region, they continue to play a major role in the coming years.

In spite of the disaster rescue and relief responsibilities, there is need for decisive modus operandi for operational coordination between the civil administration and the armed forces. The armed forces' instant response depends on the information made available by the state administration, where any delay in information would cause loss of precious time to relieve the situation. In regard to this quick response the state should appreciate the immediate organizing and course of action in which the armed forces function. The armed forces' professional ethics are autonomous in character and do not encourage civil interference. As disaster management plan should incorporate the role of the armed forces so that the procedure for deploying them is well-organized, and there is an interface personnel correlation between the state government and the armed forces for immediate effective delivery of relief to the affected victim.

The armed forces has trained resources locations with rehearsals to:

- Carry out search and rescue operations to save the injured and the disposal of the deceased victims to prevent spread of epidemics
- Mapping of vulnerable areas and escape routes
- Building mechanisms of early warning, educating the public in safety measures are added components to the police functioning

When such natural calamities such as floods and drought occur they are addressed by the already existing number of plan schemes under which a lot is planned and can be done. The state governments need to implement and make full use of the existing plan schemes and prioritize the implementation of such schemes which would help in overcoming the hard hit situation left behind by the disaster. In certain cases when the damage is colossal, they even imply possible diversion of the funds from other schemes to those schemes which are implemented to ease such situations and provide immediate relief. In such crisis situations there may also be need for certain re-appropriations/reallocations among the different departments.

When the Indian armed forces are called upon to control the situation, they come with the basic requirements of the people in such situations. In practice, the armed forces are the main government's response capacity and are generally the first rescue team in situations of such severe crisis. Because of their ability to organize action in adverse ground circumstances with speed and efficiency, the Armed Forces play a major role in emergency support functions such as communications, search and rescue operations, health and medical facilities, transportation, power, food and civil supplies, public works and engineering.

specially in the immediate aftermath of disaster. Disaster management plans should incorporate the role expected of them so that the procedure for deploying them is smooth and quick as displayed by the armed forces.

Although we have very efficient and swift acting armed forces for our rescue, there are some areas of concern that need to be worked upon, streamlined and require improvement urgently. They are:

- Integrated planning for disasters which also includes the intervention and roles of the armed forces formations into disaster management planning at all levels starting from the district level right up to the Central Government.
- Setting up of a permanent modernized well equipped national command centre or operations room, with advanced communications and data links to all state capitals. The national command centre or operations room needs to be operated on a 24-hour basis by professionals for instant response and resource integration. There needs to be a properly equipped operations room at the state level as well.
- A quick action team composed of experienced professionals, from both military and civilian backgrounds drawn from Central and state government staff to respond immediately and be present at the locations when a disaster strikes. This team needs to be organized and run professionally on the same basis as the United Nations Disaster Assessment and Coordination (UNDAC) teams.
- A set of urban search and rescue capacity at all levels, by establishing a fully equipped Search and Rescue team as a part of every fire department unit in all state capitals, with sufficiently trained staff and modern equipment such as thermal imagers, acoustic detection devices. This is of immediate relevance since a major weakness exposed in the Gujarat earthquake was a lack of specialized urban search and rescue capability in India.
- The media policy should be well geared to handle the growing real time television reporting which generates enormous political pressures on the government to respond rapidly and efficiently. This needs attention as it displays the immediate action taken in case of such diverse situations.
- An interface with a better understanding of the international system for disaster response and putting the required systems in place for dealing with international assistance such as customs, immigration, foreign policy implications. A closer weave is required between the Ministry of External Affairs and the relevant international agencies concerned with disaster response.
- The standard procedures for dealing with domestic humanitarian and relief assistance from non-government sources need to be formulated. The procedures need to be laid out to avoid confusion and ensure the best resource utilization being offered, just as it happens in the case of international assistance.
- Modern unified legislation for disaster management. Keeping in mind the current division of responsibilities between the state and Central government, central and concurrent lists, there is a need to create a body of legislation dealing with response to natural disasters and other emergencies, clearly delineating responsibilities and powers of each entity and specifying what powers and actions would need to be

- triggered on declaration of a disaster by the Government of India or a state government. This legislation also needs to incorporate the current legislation dealing with emergencies caused by chemicals that need to be dealt by the Ministry of Environment so that all emergencies are dealt with under one law. The legislation should include clear definitions of what constitutes a disaster at a national level.

Role of Government Agencies

Each department and government agency involved in disaster management and mitigation will do the following:

- Designate a nodal officer for emergency response who will act as the contact person for that department/agency
- Ensure establishment of fail-safe two-way communication with the state, district and other emergency control rooms and within the organization
- Emphasis on communication systems used regularly during LO with more focus on the use of VHF's with automatic repeaters, mobile phones with publicized numbers, HF radio sets. It should be remembered that SAT phones fail during prolonged emergencies and electric failure if the phones cannot be recharged.
- Work under the overall supervision of the SRC/the district Collectors during emergencies. Let us look at the way in which various agencies manage disasters:

1. Agriculture Prevention activities

- Awareness generation regarding various plant diseases, alternate cropping practices in disaster-prone areas, crop insurance, provision of credit facilities, proper storage of seeds
- Hazard area mapping (identification of areas endemic to pest infections, drought, flood, and other hazards)
- Develop database village-wise, crop-wise, irrigation source wise, insurance details, credit facilities
- Regular monitoring at block level; the distribution and variation in rainfall. Prepare the farmers and department officers to adopt contingency measures and take up appropriate course of action corresponding to the different emerging conditions
- Detail response manuals to be drawn up for advising the farmers for different types of disasters, e.g., rain failure in July or September and development of a dynamic response plan taking into account weekly rainfall patterns
- Develop IEC materials to advise the farming communities on cropping practices and precautionary measures to be undertaken during various disasters
- Improving irrigation facilities, watershed management, soil conservation and other soil, water and fertility management measures keeping in mind the local agro-climatic conditions and the proneness of the area to specific hazards
- Promotion of alternative crop species and cropping patterns keeping in mind the vulnerability of areas to specific hazards
- Surveillance for pests and crop diseases and encourage early reporting

- Encourage promotion of agro service outlets/enterprise for common facilities, seed and agro input store and crop insurance

Preparedness activities

- Review and update precautionary measures and procedures and especially ascertain that adequate stock of seeds and other agro inputs are available in areas prone to natural calamities
- Review the proper functioning of rain gauge stations, have stock for immediate replacement of broken/non-functioning gadgets/equipments, record on a daily basis rainfall data, evaluate the variation from the average rainfall and match it with the rainfall needs of existing crops to ensure early prediction of droughts

Response activities

- Management of control activities following crop damage, pest infestation and crop disease to minimize losses
- Collection, laboratory testing and analysis of viruses to ensure their control and eradication
- Pre-positioning of seeds and other agro inputs in strategic points so that stocks are readily available to replace damage caused by natural calamities
- Rapid assessment of the extent of damage to soil, crop, plantation, irrigation systems, drainage, embankment, other water bodies and storage facilities and the requirements to salvage, re-plant, or to compensate and report the same for ensuring early supply of seeds and other agro inputs necessary for re-initiating agricultural activities where crops have been damaged
- Establishment of public information centres with appropriate and modern means of communication, to assist farmers in providing information regarding insurance, compensation, repair of agro equipments and restarting of agricultural activities at the earliest

Recovery activities

- Arrange for early payment of compensation and crop insurance dues
- Facilitate provision of seeds and other agro inputs
- Promotion of drought and flood-tolerant seed varieties
- Review with the community, the identified vulnerabilities and risks for crops, specific species, areas, which are vulnerable to repetitive floods, droughts, other natural hazards, water logging, increase in salinity, pest attacks and draw up alternative cropping plans to minimize impacts to various risks
- Facilitate sanctioning of soft loans for farm implements
- Establishment of a larger network of soil and water testing laboratories
- Establishment of pests and disease monitoring system
- Training in alternative cropping techniques, mixed cropping and other agricultural practices which will minimize crop losses during future disasters

2. Water Supplies and Sanitation (Public Health Engineering and Rural Water Supply and Sanitation)

Prevention activities

- Provision of safe water to all habitats
- Clearance of drains and sewerage systems, particularly in the urban areas

Preparedness activities

- Prior arrangement of water tankers and other means of distribution and storage of water
- Prior arrangement of stand-by generators
- Adequate prior arrangements to provide water and halogen tablets at identified sites to be used as relief camps or in areas with high probability to be affected by natural calamities
- Raising of tube-well platforms, improvement in sanitation structures and other infrastructural measures to ensure least damages during future disasters
- Riser pipes to be given to villagers

Response activities

- Disinfections and continuous monitoring of water bodies
- Ensuring provision of water to hospitals and other vital installations
- Provision to acquire tankers and establish other temporary means of distributing water on an emergency basis
- Arrangement and distribution of emergency tool kits for equipments required for dismantling and assembling tube wells
- Carrying out emergency repairs of damaged water supply systems
- Disinfection of hand pumps to be done by the communities through prior awareness activities and supply of inputs

Recovery activities

- Strengthening of infrastructure
- Review and documentation
- Sharing of experiences and lessons learnt
- Training to staff
- Development of checklists and contingency plans

3. Police Prevention activities

- Keep the force in general and the ODRAF in particular fighting fit for search, rescue, evacuation and other emergency operations at all times through regular drills
- Procurement and deployment of modern emergency equipments while modernizing existing infrastructure and equipments for disaster response along with regular training and drills for effective handling of these equipments
- Focus on better training and equipments for ODRAF for all types of disasters, e.g. diving equipments
- Rotation of members of ODRAF so that the force remains fighting fit
- Ensure that all communication equipments including wireless are regularly functioning and deployment of extra wireless units in vulnerable pockets
- Ensure interchangeability of VHF communication sets of police and OSDMA supplied units, if required.
- Keeping close contact with the District Administration and Emergency Officer
- Superintendent of Police be made Vice Chairperson of District Natural Calamity Committee
- Involvement of the local army units in response planning activities and during the preparation of the annual contingency plans to ensure logistics and other support to armed forces during emergencies

Response plan

- Security arrangements for relief materials in transit and in camps
- Senior police officers to be deployed in control rooms at State and district levels during L 1 level deployment onwards
- Deploy personnel to guard vulnerable embankments and at other risk points
- Arrangement for the safety
- Coordinate search, rescue and evacuation operations in coordination with the administration
- Emergency traffic management

- Maintenance of law and order in the affected areas
- Assist administration in taking necessary action against hoarders, black marketers

4. Civil Defence

Prevention activities

- Organize training programmes on first-aid, search, rescue and evacuation
- Preparation and implementation of first aid, search and rescue service plans for major public events in the state
- Remain fit and prepared through regular drills and exercises at all times

Response activities

- Act as support agency for provision of first aid, search and rescue services to other emergency service agencies and the public
 - Act as support agency for movement of relief
 - Triage of casualties and provision of first aid and treatment
 - Work in co-ordination with medical assistance team
 - Help the police for traffic management and law and order

5. Fire services Prevention activities

- Development/enforcement of relevant legislations and regulations to enhance adoption of fire safety measures
- Modernization of fire-fighting equipments and strengthening infrastructure
- Identification of pockets, industry which are highly susceptible to fire accidents or areas, events which might lead to fires, building collapse and educate people to adopt safety measures. Conduct training and drills to ensure higher level of prevention and preparedness
- Building awareness in use of various fire protection and preventive systems
- Training the communities to handle fire emergencies more effectively
- VHF network for fire services linked with revenue and police networks
- Training of masons and engineers in fire proof techniques
- Making clearance of building plans by fire services mandatory

Response activities

- Rescue of persons trapped in burning, collapsed or damaged buildings, damaged vehicles, including motor vehicles, trains and aircrafts, industries, boilers and pressure vessels, trenches and tunnels
- Control of fires and minimizing damages due to explosions
- Control of other dangerous or hazardous situations such as oil, gas and hazardous materials spill
- Protection of property and the environment from fire damage
- Support to other agencies in the response to emergencies
- Investigation into the causes of fire and assist in damage assessment

6. Civil supplies Preventive activities

- Construction and maintenance of storage godowns at strategic locations
- Stockpiling of food and essential commodities in anticipation of disaster

- Take appropriate preservative methods to ensure that food and other relief stock are not damaged during storage, especially precautions against moisture, rodents and fungus infestation

Response activities

- Management of procurement
- Management of material movement
- Inventory management

Recovery activities

- Conversion of stored, unutilized relief stocks automatically into other schemes like Food for Work. Wherever, it is not done leading to damage of stock, it should be viewed seriously

7. Works/Rural development departments Prevention activities

- Keep a list of earth moving and clearing vehicles/equipments (available with government departments, PSUs, and private contractors) and formulate a plan to mobilize those at the earliest
- Inspection and emergency repair of roads/bridges, public utilities and buildings

Response activities

- Clearing of roads and establishing connectivity. Restore roads, bridges and where necessary make alternate arrangements to open the roads to traffic at the earliest
- Mobilization of community assistance for clearing blocked roads
- Facilitate movement of heavy vehicles carrying equipments and materials
- Identification and notification of alternative routes to strategic locations
- Filling of ditches, disposal of debris, and cutting of uprooted trees along the road
- Arrangement of emergency tool kit for every section at the divisional levels for activities like clearance (power saws), debris clearance (fork lifter) and other tools for repair and maintenance of all disaster response equipments

Recovery activities

- Strengthening and restoration of infrastructure with an objective to eliminate the factor(s) which caused the damage
- Review and documentation
- Sharing of experiences and lessons learnt
- Training to staff
- Development of checklists and contingency plans

8. Energy Prevention activities

- Identification of materials/tool kits required for emergency response
- Ensure and educate on the minimum safety standards to be adopted for electrical installation and equipments and organize training of electricians accordingly
- Develop and administer regulations to ensure safety of electrical accessories and electrical installations
- Train and have a contingency plan to ensure early electricity supply to essential services during emergencies and restoration of electric supply at an early date
- Develop and administer code of practice for power line clearance to avoid electrocution due to broken/fallen wires
- Strengthen high-tension cable towers to withstand high wind speed, flooding and

- earthquake, modernize electric installation, strengthen electric distribution system to ensure minimum damages during natural calamities
- Conduct public/industry awareness campaigns to prevent electric accidents during normal times and during and after a natural disaster

Response activities

- Disconnect electricity after receipt of warning
- Attend sites of electrical accidents and assist in undertaking damage assessment
- Stand-by arrangements to ensure temporary electricity supply
- Prior planning and necessary arrangements for tapping private power plants like those belonging to ICCL, NALCO, RSP during emergencies to ensure uninterrupted power supply to the Secretariat, SRC, OSDMA, Police Headquarters, All India Radio, Doordarshan, hospitals, medical colleges, Collectorate Control Rooms and other vital emergency response agencies
- Inspection and repair of high tension lines /substations/transformers/poles
- Ensure the public and other agencies are safeguarded from any hazards, which may have occurred because of damage to electricity distribution systems
- Restore electricity to the affected area as quickly as possible
- Replace/restore of damaged poles/salvaging of conductors and insulators

9. Aster resources department Prevention activities

- Assess preparedness level
- Annual assessment of danger levels and wide publicity of those levels
- Identify flood prone rivers and areas and activate flood monitoring mechanisms
- Provide water level gauge at critical points along the rivers, dams and tanks
- Identify and maintain of materials/tool kits required for emergency response
- Stock-pile of sand bags and other necessary items for breach closure at the Panchayat level

Response activities

- Monitoring flood situation
- Dissemination of flood warning
- Ensure accurate dissemination of warning messages naming GPs and Tehsils with details of flow and likely damage
- Monitoring and protection of irrigation infrastructures
- Inspection of bunds of dams, irrigation channels, bridges, culverts, control gates and overflow channels
- Inspection and repair of pumps, generator, motor equipments, station buildings
- Community mobilization in breach closure

Recovery activities

- Strengthening of infrastructure and human resources
- Review and documentation
- Sharing of experiences and lessons learnt
- Training of staff
- Development of checklists and contingency plans

10. Fisheries Prevention activities

- Registration of boats and fishermen
- Building community awareness on weather phenomena and warning system especially on Do's and Don'ts on receipt of weather related warnings
- Assist in providing life saving items like life jackets, hand radios
- Certifying the usability of all boats and notifying their carrying capacities
- Capacity building of traditional fishermen and improvisation of traditional boats which can be used during emergencies
- Train up young fishermen in search & rescue operation and hire their services during emergency

Response activities

- Ensure warning dissemination to fishing communities living in vulnerable pockets Responsible for mobilizing boats during emergencies and for payment of wages to boatmen hired during emergencies
- Support in mobilization and additional deployment of boats during emergencies
- Assess the losses of fisheries and aquaculture assets and the needs of persons and communities affected by emergency

Recovery activities

- Provide compensations and advice to affected individuals, community
- Plan for rehabilitation in the long run of the fisherfolk including resettlement, insurance, better boats, nets, etc., improved communication system as a part of the communication hub for warning dissemination, especially for marine fishermen and fishing communities residing in high-risk areas

11. Forest department Prevention activities

- Promotion of shelter belt plantation
- Publishing for public knowledge details of forest cover, use of land under the forest department, the rate of depletion and its causes
- Keep saws (both power and manual) in working conditions
- Provision of seedling to the community and encouraging plantation activities, promoting nurseries for providing seedlings in case of destruction of trees during natural disasters

12. Transport department Prevention activities

- Listing of vehicles which can be used for emergency operation
- Safety accreditation, enforcement and compliance
- Ensuring vehicles follow accepted safety standards
- Build awareness on road safety and traffic rules through awareness campaign, use of different IEC strategies and training to school children
- Ensure proper enforcement of safety regulations response activities
- Requisition vehicles, trucks, and other means of transport to help in the emergency operations
- Participate in post impact assessment of emergency situation

- Support in search, rescue and first aid
- Failure to cooperate and misappropriation of relief materials to invite disqualification from the post

Recovery activities

- Provision of personal support services e.g. counselling
- Repair/restoration of infrastructure e.g. roads, bridges, public amenities
- Supporting the GPs in development of storage and in playing a key role and in the coordination of management and distribution of relief and rehabilitation materials
- Panchayat Samity and GP members to be trained to act as an effective interface between the community, NGOs, and other developmental organizations
- Provide training so that the elected representatives can act as effective supportive agencies for reconstruction and recovery activities

13. Panchayatiraj Preventive activities

- Develop prevention/mitigation strategies for risk reduction at community level
- Training of elected representatives on various aspects of disaster management
- President, Zilla Parishad to be made member of District Natural Calamity Committee
- Public awareness on various aspects of disaster management
- Organize mock drills
- Promote and support community-based disaster management plans
- Support strengthening response mechanisms at the GP level (e.g., better communication, local storage, search & rescue equipments)
- Clean drainage channels, organize through community participation trimming of branches before cyclone season
- Ensure alternative routes/means of communication for movement of relief materials and personnel to marooned areas or areas likely to be marooned
- Assist all the government departments to plan and prioritize prevention and preparedness activities while ensuring active community participation

Response activities

- Train the GP members and support for timely and appropriate delivery of warning to the community
- Clearance of blocked drains and roads, including tree removal in the villages
- Construct alternative temporary roads to restore communication to the villages
- PRIs to be a part of the damage survey and relief distribution teams to ensure popular participation
- Operationalize emergency relief centres and emergency shelter
- Sanitation, drinking water and medical aid arrangements
- IEC activities for greater awareness regarding the role of trees and forests for protection during emergencies and also to minimize environmental impact which results owing to deforestation like climate change, soil erosion
- Increasing involvement of the community and NGOs in plantation, protection and other forest protection, rejuvenation and restoration activities
- Plan for reducing the incidence, and minimize the impact of forest fire

- Assist in road clearance
- Provision of tree cutting equipment
- Provision of building materials such as bamboos etc. for construction of shelters

Recovery activities

- Take up plantation to make good the damage caused to tree cover
- Information and Public Relations Department

Prevention activities

- Creation of public awareness regarding various types of disasters through media campaigns
- Dissemination of information to public and others concerned regarding do's and don'ts of various disasters.
- Regular liaisoning with the media

Response activities

- Setting up of a control room to provide authentic information to public regarding impending emergencies
- Daily press briefings at fixed times at state and district levels to provide official version (during LO also)
- Media report and feedback to field officials on a daily basis from L1 onwards
- Keep the public informed about the latest of the emergency situation (area affected, lives lost)
- Keep the public informed about various post-disaster assistances and recovery programme

Role of Media in Disaster Management

Disasters can be both natural and man-made. But the root causes of some of the seemingly natural disasters may also be certain human activities carried on in utter disregard of their consequences to the nature. Such natural disasters are therefore preventable. Since all man-made disasters and some of the so-called natural disasters are preventable, the media can educate and forewarn the people about the consequences of their dangerous actions and operations. More and in-depth education on the subject becomes necessary where the human activities and the natural calamities they lead to, are separated by a period of time. In

such cases, though the causal connection is direct, since the consequences occur at a distant point of time, people fail to appreciate the link between the two and continue to indulge in their depredations on nature, digging in turn sometimes slowly, sometimes fast, a grave for humanity.

The floods, droughts and water famine situations are many times directly traceable to the human activity, while drainage mismanagement and air and water-pollution, environmental destruction and global warming are all clearly on account of the man's misdeeds. Some excavations and destruction of forests are responsible for landslides and mudflows, while according to experts some earthquakes are caused by the construction of the large dams and by impounding large quantities of water in them. The dam failures, dam bursts, mine fires, epidemics, food poisoning, chemical and industrial disasters, nuclear disasters and all accident-

Dr. U. K. Rout, Dr. R. K. Behera & Dr. B. P. Samal

related disasters are undoubtedly the handiwork of man.

The impending occurrence of some natural disasters whether induced by human actions or otherwise, can now be known sufficiently in advance, thanks to the advances in science and technology. The media, by communicating the information to the people and the concerned authorities sufficiently in advance, can enable them to take the necessary steps to prevent and minimize the losses of lives and property.

While the disaster is on, the media can also play the role of relaying the measures that are being taken and monitoring them, cautioning the affected or to be affected people about the Dos and Don'ts, of scotching rumours and preventing panic and confusion, of establishing contacts, of identifying the needy spots and focusing attention on them, and generally by assisting the authorities, voluntary organizations and volunteers in reaching, informing and assuring the affected ones of the assistance and the measures taken, for their relief. During the onslaught of the disaster, what is of utmost importance is to keep the morale of the people high, to create self-confidence in them, to prevent panic and to maintain order by assuring and making available the necessary help readily and quickly. The media can help in many ways in ensuring these conditions.

The rescue, relief and rehabilitation measures need an integrated and co-coordinated approach and for that purpose all agencies, government and non-government, have to pool their resources together for efficient, expedient and effective work on all fronts. The collection of material resources and the enlisting of man-power are as much important as their efficient utilization. The depiction of devastation and of human misery through the media many times by itself acts as an appeal to the people to come forward to render help in various ways. In addition, the specific appeal made for relief through the columns and the time-slots of the media, brings in sizeable aid in the requisite form. At the same time, it becomes necessary to keep a watch and report on some anti-social elements who try to take advantage of such situations.

Some disasters like floods, cyclones and droughts have become a periodic feature of our national life. The vulnerable spots and the sections of the populace also stand identified over the years. Almost always, the worst sufferers are the weaker sections of the society. They are unable to shift from these places, because there lie their sources of livelihood and all that they have in life to preserve and protect. They constitute a vast section of our society, and in normal conditions they contribute in sizeable proportion to our national wealth. Yet, except in the times of disaster, they are rarely remembered and the measures for the permanent solution of their plight are hardly ever discussed in the media. The media can also focus its attention on this problem.

Not insignificant is the contribution the media can make in countering the damaging, exaggerated and negative reporting and propaganda in the foreign media on the occurrence of the disasters. This country has witnessed such phenomena in the past. A prompt presentation of the real state of affairs by our media including the news-agencies, and the correction of the misrepresentations by them will go a long way in dispelling the wrong impressions created abroad which may otherwise have adverse effects on the administration, the economy and the polity of the country.

On some occasions in the past the media fulfilled its duties in full measure while on other occasions it was found wanting. However, if the media has to discharge its role properly on such occasions, it is also necessary to have a complete cooperation between it and all governmental and non-governmental agencies. The extent of the co-ordination and co-operation between them determines the nature, the degree and the scale of the preparation to prevent and meet the disasters.

People across the globe are more disaster-conscious today than they ever were, thanks to the media. Countries that have a large geographical extent, house a large population, have a vast coastal strip and many mountainous areas and rivers, are more vulnerable to disasters. Prevention is better than cure and prevention can only happen through education and information dissemination. The role of the media in educating the population and providing information is of immense importance.

It is not just now that the media has come into prominence. Even in the past, Mahatma Gandhi made use of the media, that is, newspapers, to convey the methods of preventing plague. He wrote in the *Amrit Bazar Patrika*, about the techniques of preventing plague with the aim of educating the masses. Not only did he appeal to the people to adopt clean habits and ensure hygiene, he requested the educated groups to spread the word about the importance of hygiene and sanitation. His writings, popularized by the media, encouraged people to collect and dispose off garbage and use the pictures of Gods and Goddesses to prevent people from throwing garbage in public places.

When a calamity strikes, it is the responsibility of the media to motivate people to act collectively. A well-established print media in combination with television and radio can play a significant role in generating mass action during disasters. The media today has at its disposal all the tools and instruments for educating the public and enabling them to discharge their duties as well-informed and responsible citizens.

Media can help in many ways when disaster strikes. It can:

- Make people aware of mitigation efforts
- Guide them to utilize funds properly
- Act as an interface between the government and the people
- Help reduce panic
- Direct people on where essential services are available
- Provide counselling
- Help prevent corruption in the distribution of relief material
- Facilitate two-way communication between the provider of assistance and the affected

In times of a disaster or in any emergency, for that matter, it is very important for the government to maintain good relations with the media. It is important to give reporters information that is timely and accurate. It is also important to allow them access to emergency zones up to a certain limit. This helps them realize that honest efforts are being made to tackle emergency and prevents them from becoming adversarial.

The media can be informed through press releases or press conferences. Nowadays, information is also posted on websites. A press release should be used only when the

urgency is not immediate. Otherwise, in fast-moving situations, where the site is swarming with reports and the crowd is getting difficult to handle, it makes more sense to arrange a press conference on the spot.

The information that is conveyed to the population through the media should have the following characteristics:

- It should be clear in stating what the people should expect in the situation and what they are expected to do.
- It should take into account the effect the news would have on the people.
- It should be based on the predicted response of the population.
- It should be able to provide guidance to the people.
- It should be based on valuable inputs from media experts.
- It should have the public good in mind

There is a need for journalists to be more proactive in reporting on drought or disaster risk-related issues.

- Journalists need to be given regular training on preparing for disasters and for improving their understanding of the scope of the disaster, its hazards and the relevant key terms.
- The journalists should work closely with the policy makers so that positive stories are broadcast or printed. This, in turn, ensures that some kind of change is brought about and appropriate solutions can be offered to the disaster-prone areas.
- Journalists should be held accountable for what they report and the reactions their reports trigger.
- The advocacy stories that are broadcast or printed should target the ministries so that speedy action takes place.
- Workshops should be arranged for journalists so that they become proactive while reporting from the sites of disaster.
- There should be an exclusive team of editors working online to post the reports/stories, sent by journalists in the field, on to the website.
- Journalists should maintain a database of disaster-prone areas so that the impacts of hazards can be monitored.
- News agencies and magazines should announce contests and awards for disaster stories that are well-researched. This will ensure that the reports are genuine.

Dimensions of communication situations

The media can support or hinder the disaster management activities of the government and relief agencies. Before trying to understand the importance of the media in controlling and mitigating disaster, one must first take a look at the three aspects of communication situations as follows:

- Audience
- Stage
- Level of effect
 - It is very important to understand the audience what the media is addressing. During a disaster, there are clearly two distinct parts of the population. One part which is actually affected by the disaster and the other which is not.

- What is communicated should also take into account the stage of the situation. Before the disaster occurs, the media can communicate to the public, the ways in which disasters should be averted and managed. This information should help prepare the population. During a disaster, the media should give warning message; educate people on how best to handle the disaster if it occurs; and also provide reassurance. After the disaster, once again, the media should be able to provide the sources of help, information and medical aid. It should be able to counsel the affected and help them get over the trauma. At this stage, the media should also analyse the situation, help investigate what went wrong and ensure that some lesson is learnt from the disaster.
- The degree to which an individual or the population collectively is affected should be assessed by the media. They should also be able to tell how an individual can contribute to the relief work and how people collectively can not only help manage the situation but also educate others.

Hurdles in working with the media

Although we all know how important a role media can play in managing disasters, it is a fact that the media is not always easy to approach.

- The media may not find a situation as worthy of attention as it may be made out to be by the sources.
- The message may not be put across by the media in the right tone. There is always a chance for distortion.
- The media may not always succeed in painting a trustworthy or credible picture
- try to interfere where their presence is least required or even unwanted/harmful.
- Instead of being sympathetic, they may choose to be critical and distant.
- At times, they may communicate contradictory risk estimates.
- They may give more importance to sensationalism instead of concentrating on giving serious information.
- Most journalists work with the aim of keeping a critical eye on those wielding power.

Reducing the losses of life and property caused by natural hazards is a compelling objective now receiving worldwide attention. It is now being increasingly believed that the knowledge and technology base potentially applicable to the mitigation of natural hazards has grown so dramatically that it would be possible, through a concerted cooperative international effort, to save many lives and reduce human suffering, dislocation, and economic losses simply by better information, communication and awareness. Timely mass media communication about impending disasters can lead to appropriate individual and community action, which is the key to implementing effective prevention strategies including evacuation and survival of people. Such communications can educate, warn, inform, and empower people to take practical steps to protect themselves from natural hazards.

role of media, both print and electronic, in informing the people and the authorities during emergencies thus, becomes critical, especially the ways in which media can play a vital role in public awareness and preparedness through educating the public about disasters; warning of hazards; gathering and transmitting information about affected areas; alerting government officials; helping relief organizations and the public towards specific needs; and even in facilitating discussions about disaster preparedness and response. During any emergency,

people seek up-to-date, reliable and detailed information.

The main principle of information provision, therefore, should be an ethical one and so, during an emergency, the media should be sensitive to the needs of the public in affected areas and should avoid misinforming and broadcasting unconfirmed reports that may lead to despair and panic. Therefore, correct and reliable information disseminated through the media is an important instrument for balancing the possible effects of incorrect, misleading or even willfully distorted information. Reliable and timely information provided through the media can help people overcome any kind of fear and fatalism during and after an emergency. Indeed, the availability of reliable and timely information and knowledge about an event and the resulting needs help to improve solidarity and also creates an atmosphere conducive to collective response for sharing the humanitarian challenges created by disasters. Media today has arguably penetrated every household in the world, in one form or another. Journalists pride themselves in reporting objectively on global events and regard an independent media as one of the pillars of democratic society.

Mass media have certain characteristics that make them powerful instrument of disaster communication as they provide quick and easy access to large number of people located at different places; they highlight the problems and difficulties faced by the people affected by the disasters; they mobilize public opinion for humanitarian assistance. On the other hand, sources dealing with the media know that media can also prove to be difficult channels of communication. There is no direct control over the content and form of information transmitted and sometimes there are competing and even conflicting information which may always be very congenial for mobilizing support for concerted action. Contrary to popular perceptions journalists may not always be independent but may act as 'gate keepers, interpreters and commentators' representing larger business interests of the media owners. A closer examination of the global media illustrates that it is not one homogeneous entity pursuing a uniform method in disseminating their views. On the contrary, there are a small number of large factions which compete with one another to increase their respective audiences and commercial gains. Media ethics, therefore, become an important aspect of media reporting during any disaster event. It assists media workers in determining what is right and choosing the best from several alternatives. Ethics should set guidelines, rules, norms, codes and principles to lead journalists and other media workers to make moral decisions.

DISASTER RESPONSE

Responding to a natural disaster is the most important phase of a disaster management plan. Many a times, a quick response to a disaster can mean the difference between life and death for the victims of the disaster. Responding to a disaster does not only mean the mobilization of first responders to a disaster site, it also entails responding to the effects of disasters that are not immediately known, for example, the psychological impact of the disaster on the victims.

India has a long history of responding to natural disasters and rendering relief in an organized fashion in times of drought and famine. State governments have antiquated relief codes which deal with the general principles of administration of relief. Although huge progress has been made in recent times in updating these codes, much more needs to be done. Relief starts with the responsibility of the government for combating distress, defining the scope of objective of such measures, and so on. India, with a vast agrarian economy, had in the past focused on distress relief mainly related to agricultural activities. Preparedness included collection of statistical data on the rainfall, weather conditions, crop pattern activities relating to management of cattle. The relief work focused on departmental work and village work for

generation of employment during drought. With the changing pattern of disaster and with the introduction of technology, material and new financial terms into disaster management, several modifications have been incorporated in the administrative measures for relief work.

UNIT OBJECTIVES

After going through this unit, you will be able to:

- Describe how disaster response plans are formulated
- Understand disaster medicine and explain disaster site management
- Discuss rehabilitation, reconstruction and recovery programs

DISASTER RESPONSE AND RECOVERY

The response phase of disaster management encompasses the mobilization of necessary emergency services and first responders to the disaster site. This entails mobilizing the first responders, i.e., firefighters, police and medical crews. When such a response is conducted with military precision, it is termed Disaster Relief Operation (DRO). The first responders can be supported by a number of secondary emergency services, such as specialist rescue teams. If a disaster response plan has been prepared and rehearsed earlier, it allows proper coordination of rescue and relief operations. Quick and efficient relief operations are extremely important since research has found that depending upon the nature of injury and weather conditions, as well as the availability of water and food, a victim of a disaster is likely to die within 72 hours after the occurrence of a disaster.

The response phase of an emergency may commence with search and rescue, but in all cases the focus quickly turns to fulfilling the basic humanitarian needs of the affected population. This assistance may be provided by national or international agencies and organizations. Effective coordination of disaster assistance is often crucial, particularly when many organizations respond and local emergency management agency capacity has been exceeded by the demand or diminished by the disaster itself.

On a personal level, the response can take the shape either of a shelter in place or an evacuation. In a shelter-in-place scenario, a family would be prepared to fend for themselves in their home for many days without any help from outside. In an evacuation, a family leaves the area by automobile or other mode of transportation, taking with them the maximum amount of supplies they can carry, possibly including a tent for shelter. If mechanical transportation is not available, evacuation on foot would ideally include carrying at least three days of supplies and rain-tight bedding, a tarpaulin and a bedroll of blankets being the minimum.

Institutional Arrangements for Disaster Response

Institutional arrangements for disaster response constitute the heart of any disaster management system. There is no dearth of personnel, both civilian and military, experienced in handling situations arising out of natural disasters. However, there certainly is a pressing need for improvement and strengthening of existing institutional arrangements and systems in this regard to make the initial response to a disaster more effective and professional. Most of the resources and expertise needed already exist with the government. What needs to be streamlined is how they should be integrated, trained and deployed. Some of the areas where improvement is urgently needed are:

- Integrated planning for disasters including the integration of relevant Armed Forces formations into disaster management planning at all levels from district to state and Central Government.
- Setting up of a modern, permanent national command centre or operations room with redundant communications and data links to all state capitals. The national command centre or operations room needs to be manned on a 24-hour basis by professionals to cater for instant integrated response. There needs to be a properly equipped operations room at the state level as well.
- Establishment of a national stand by, quick reaction team composed of experienced professionals, both military and civilian, drawn from central and state government staff to respond immediately by flying in a matter of hours an experienced response team to the locations when a disaster strikes. This team can be organized and run professionally on the same lines as the United Nations Disaster Assessment and Coordination (UNDAC) teams.
- Creation of urban search and rescue capacity at all levels, by establishing a fully equipped Search and Rescue unit, as part of the fire service in all state capitals, with trained staff and modern equipment such as thermal imagers, and acoustic detection devices. This is of immediate relevance since a major weakness exposed in the Gujarat earthquake was a lack of specialized urban search and rescue capability in India.
- Media policy geared to handling the growing phenomenon of real time television reporting, which generates enormous political pressures on a government to respond rapidly and efficiently. This needs attention since the effect is going to increase not decrease in future.
- Closer interface with and better understanding of the international system for disaster response and putting in place systems for dealing with international assistance once it comes in e.g., customs, immigration, foreign policy implications and so on. A greater appreciation is needed of the speed and automation of modern international response to a natural disaster. Closer interaction is required between the ministry of external affairs and the relevant international agencies concerned with disaster response.
- Standard procedures for dealing with domestic humanitarian and relief assistance from non- government sources. Procedures and systems need to be set out to avoid
- confusion and ensure best utilization of the assistance being offered, just as in the case of systems for international assistance.
- Modern unified legislation for disaster management. In view of the current division of responsibilities between the state and central government into state, central and concurrent lists, there is a need to create a body of legislation dealing with response to natural disasters and other emergencies, clearly delineating responsibilities and powers of each entity and specifying what powers or actions would need to be triggered on declaration of a disaster by the government of India or a state government. This legislation should also incorporate the current legislation dealing with chemical emergencies that has been created by the ministry of environment so that all emergencies are dealt with under one law. The legislation should include clear definitions of what constitutes a disaster at a national level.

Response and Recovery

Usually the first response to a disaster comes from the local government body. Such efforts are spearheaded by the district authority. Some of the local agencies that spring into action immediately are municipalities, gram panchayats, block authorities and district administration. In a catastrophic disaster, aid and assistance from the central government is mobilized.

Here, it would be interesting to learn about the response and recovery mechanisms formulated by the governments in the United States of America. In the United States, the Department of Homeland Security's Federal Emergency Management Agency (FEMA) is vested with the responsibility for search and rescue, electrical power, food, water, shelter and other basic human needs. It is the long-term recovery phase of disaster which places the most severe financial strain on a local or state government. Damage to public facilities and infrastructure, often not insured, can overwhelm even a large city. In the United States, a request from a state's governor for a major disaster could mean an infusion of federal funds, but the governor must also commit significant state funds and resources for recovery efforts.

A major disaster could result from a hurricane, earthquake, flood, tornado or major fire which the U.S. President determines warrants supplemental federal aid. The event must be clearly of the magnitude that makes it impossible for local or state governments to handle alone. If declared, funding comes from the President's Disaster Relief Fund, which is managed by FEMA, and disaster aid programs of other participating federal agencies. A presidential major disaster declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, and designed to help disaster victims, businesses and public entities.

An emergency declaration is more limited in scope and without the long-term federal recovery programs of a major disaster declaration. Generally, federal assistance and funding are provided to meet a specific emergency need or to help prevent a major disaster from occurring.

A major disaster declaration in the United States usually follows these steps:

- Local government responds, supplemented by neighbouring communities and volunteer agencies. If overwhelmed, turn to the state for assistance
- The state responds with state resources, such as the National Guard and state agencies
- Damage assessment by local, state, federal, and volunteer organizations determines losses and recovery needs
- A major disaster declaration is requested by the governor, based on the damage assessment, and an agreement to commit state funds and resources to the long-term recovery
- FEMA evaluates the request and recommends action to the White House based on the disaster, the local community and the state's ability to recover
- The President approves the request or FEMA informs the governor it has been denied. This decision process could take a few hours or several weeks depending on the nature of the disaster

Models of Risk Assessment and Disaster Response

The standard mechanism for the assessment of disaster risk and disaster response in the United States is the Hazards U.S. Multi-Hazard (HAZUS-MH) model. A brief discussion of the model that is designed to deal with various disasters follows.

The Hazards U.S. Multi-Hazard (HAZUS-MH) is a nationally applicable standardized methodology that estimates potential losses from earthquakes, hurricane winds, and floods. HAZUS-MH was developed by FEMA under contract with the National Institute of Building Sciences (NIBS). HAZUS-MH uses state-of-the-art Geographic Information Systems (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of earthquakes, hurricane winds, and floods on populations. Estimating losses is essential to decision-making at all levels of government, providing a basis for developing mitigation plans and policies, emergency preparedness, and response and recovery planning.

Needs and Damage Assessment

The HAZUS-MH model estimates damage and loss to buildings, lifelines and essential facilities from scenario and probabilistic earthquakes, including:

- Ground shaking and ground failure
- Estimate of casualties
- Estimate of displaced households and shelter requirements
- Estimates the damage and loss of use of essential facilities
- Estimates the cost of repairing damaged buildings
- Estimates the quantity of debris
- Estimates the damage to buildings
- Estimates direct costs associated with loss of function (e.g., loss of business revenue)

HAZUS-MH displays the analysis both through GIS maps and tables. This forecasting capability enables users to carry out a wide range of analyses.

- Emergency managers can use HAZUS-MH to develop scenarios to drive exercises and support emergency operations plans
- State hazard mitigation officials can use information on costs and benefits of specific mitigation measures and to use analysis for risk assessments for state and local hazard mitigation plans
- Shelter managers can use estimates of displaced households and shelter requirements to scale mass care mission requirements
- Utility company representatives can use information on the locations and duration of potential utility outages in setting restoration priorities and committing necessary personnel and other resources

HAZUS Application for International Use

Since the early 1990s, when HAZUS development was initiated, there has been considerable interest within the international community in the application of the HAZUS loss estimation methodology and software application for international use. The National Institute for Building Sciences (NIBS) has led efforts on behalf of FEMA to evaluate steps that need to be taken to develop an internationally applicable version of HAZUS.

Recently, the earthquake risk assessment (ERA) of buildings using HAZUS was carried out in Dehradun, India. The HAZUS is one of the ERA tools developed in the United States, which assesses the earthquake loss for the built environment and population in urban areas. The applicability of HAZUS model for the assessment of earthquake risk of buildings in India. Samal

was analyzed. The HAZUS approach while being and in India faced many shortcomings.

The HAZUS model uses various classifications of civil structures as well as infrastructure for assessing earthquake losses. The up-to-date building inventory is always necessary to assess the loss for pre and post earthquake events. The method of making building inventories is well described in this model. There is a need to study the criteria of building classification and building inventory used in this model for assessing risk for buildings under Indian conditions.

Disaster Response in India

India's size and geographical diversity makes disasters in India almost an annual occurrence. We face all kinds of threats from natural disasters. The effects of global warming and climate change have only exacerbated these threats.

Forecasting climate change is a pre-requisite for taking preparedness measures to respond to the disaster. This is the most important element of disaster management. The Ministry of Environment and Forest (MoEF), Ministry of Earth Sciences (MoES), Ministry of Science and Technology (MST), Ministry of Agriculture (MoA), Ministry of Water Resources (MWR), Ministry of Human Resource Development (MHRD), Ministry of Non-conventional Energy (MNES), Defence Research and Development Organization (DRDO), Ministry of Defence (MoD), Ministry of Health and Family Welfare (MoHFW), Indian Space Research Organization (ISRO) and Indian Meteorological Department (IMD) promote and undertake climate and climate change related research in the country.

The Government of India has designated various agencies as the nodal agencies for early warning of different natural hazards:

- Cyclone - Indian Meteorological Department
- Tsunami - Indian National Centre for Oceanic Information Services
- Floods - Central Water Commission
- Landslides - Geological Survey of India
- Avalanches - Snow and Avalanche Study Establishment
- Heat and Cold Waves - Indian Meteorological Department

Since India is facing natural disasters, especially flooding, on an annual basis, an annual Conference of Relief Commissioners, Secretaries, to the Department of Disaster Management of States and UTs is organized before the onset of south-west monsoon to review the status of preparedness for the ensuing monsoon and to discuss other disaster management related issues. The representatives of various central ministries, organizations rendering emergency support functions besides representatives of central para-military forces also participate in the conference.

Activation of Emergency Preparedness Plan

- **Issue of guidelines:** Necessary guidelines in the form of checklist for taking necessary preparatory measures are issued to the state for their guidance and appropriate action. Instructions are also issued for creating reserves of essential items required during rescue and relief phase. The checklist issued to a state includes: **Dr. R. K. Behera & Dr. B. P. Samal**

- Vulnerability assessment
 - Dissemination of warning
 - Emergency Response activities
 - Coordination
 - Rapid Damage Assessment
 - Maintenance of essential services
 - Stocking of essential commodities
 - Medicines
 - Drinking water
 - Shelter/camps
 - Pre-contract
 - Evacuation plan
 - Activating Control Rooms
 - Search and Rescue Team
 - Communication
 - Identification of Nodal Officer
 - Status of SDRF
 - Preparedness Drill
- **Trigger mechanism:** This mechanism has been developed to activate the disaster response system automatically after receiving warning signals of a disaster that is occurring or is likely to occur or on receipt of information about the incident. The responders are required to undertake activities as per the SOPs issued in respect of such disasters. There may be scenario where early warning signals could be available and there may happen a disaster without any early warning.

Crisis Management Plan (CMP) and Standard Operating Procedures (SOPs): In accordance with the National Crisis Management Plan 2003 of the Cabinet Secretariat, the Ministry of Home Affairs formulated its CMP 2004 and circulated it to all states and UTs. The CMP of MHA comprises of two parts; Part-I deals with aspects, which are common to all contingencies situations and Part-II about the individual Standard Operating Procedures (SOPs) for dealing with specific crisis situations. SOPs are preparedness plans that activate the procedure for response on receiving warnings of impending disaster.

The CMP of MHA is reviewed periodically. It was last reviewed in 2009 and was circulated to all Ministries and Departments of Central Government as well as states and UTs. State governments have also been advised to formulate similar kinds of CMPs and SOPs. The MHA has conducted a number of training workshops for states and UTs for assisting them in the formulation of SOPs.

Role and responsibility of central and state governments

You have already learned about the responsibilities of the state and central governments to prevent a natural calamity and what they do during a natural disaster in the previous unit. A brief discussion on their roles and responsibilities during the response phase is summarized

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below.

The Ministry of Home Affairs is the nodal Ministry for the management of natural disasters (other than drought, hailstorms and pest attacks, which are handled by Ministry of Agriculture) on behalf of the Government of India. The Disaster Management Division (DM Division) performs the function in the Ministry of Home Affairs. The Central and state governments are jointly responsible for undertaking relief, rehabilitation, preparedness, mitigation and response measures. The basic responsibility for undertaking these measures in the event of a disaster rests with the concerned state government.

The Central Government supplements the efforts of the state governments by providing logistic and financial support in case of natural calamities of severe nature. The logistic support includes the deployment of aircrafts and boats, specialist teams of Armed Forces, Central Paramilitary Forces and personnel of National Disaster Response Force (NDRF), arrangements for relief materials and essential commodities including medical stores, restoration of critical infrastructure facilities including communication network and such other assistance as may be required by the affected states to meet the situation effectively.

The DM Division of MHA closely monitors the disaster and disaster-like situations to facilitate strategic interventions in the form of logistic and financial support by the Government of India to augment the resources of the affected states and UTs to deal effectively with each disaster situation. For this purpose, a close liaison is made with the affected states on the one side and the concerned Central line Ministries such as the Ministry of Health, Ministry of Defence, Ministry of Civil Aviation, Ministry of Food and Civil Supplies, and so on, on the other.

Logistics Management, Coordination and Participation

Co-ordination at the central and the state level is achieved by way of various committees involving all departments that are working in disaster management.

The Cabinet Committee on Management of Natural Calamities is one of the agencies involved in coordination and communication between various agencies. It was constituted to:

- Oversee all aspects relating to management of natural calamities including assessment of the situation and identification of measures considered necessary to reduce its impact
- Examine and implement programmes for reducing the adverse impact of natural calamities
- Monitor and suggest long-term measures for prevention of such calamities in the future
- Formulate and recommend programmes for public awareness for building up society's resilience to natural calamities

The Committee is serviced by the Ministry of Home Affairs in all cases except in cases relating to Drought Management and Epidemics when it is serviced, as the case may be, by the Department of Agriculture and Cooperation and Department of Health and Family Welfare.

In the context of federal set-up of India, the responsibility to formulate the government's response to a natural calamity is essentially that of the concerned state government. However, the Central Government, with its resources, physical and financial, does provide the

needed help and assistance to buttress relief efforts in the wake of major natural disasters.

Most of the states have relief commissioners under the Department of Disaster Management, who are in charge of the relief measures in the wake of natural disasters. In the absence of the relief commissioner, the chief secretary or an officer nominated by him is in overall charge of the relief operations in the concerned state. At the state level, the state relief commissioner supervises and controls relief operations through collectors or deputy commissioners, who are the main functionaries to coordinate the relief operation at district level. The state governments are autonomous in organizing relief operations in the event of natural disasters and in developing the long-term rehabilitation measures. The state government's efforts are supplemented by Central Government based on the recommendations of the Finance Commission.

State Crisis Management Group (SCMG)

States in India also have a State Crisis Management Group (SCMG) under the chairmanship of chief secretary and the relief commissioner. This group comprises senior officers from the

Departments of Revenue/relief, Home, Civil Supplies, Power, Irrigation, Water Supply, Panchayat (local self government), Agriculture, Forests, Rural Development, Health, Planning, Public Works and Finance.

The SCMG is required to take into consideration the guidance received, from time to time, from the Government of India and formulate action plans for dealing with different natural disasters. It is also the duty of the relief commissioner of the state to establish an Emergency Operation Center (*Control Disaster Response Room*) at the state headquarters as soon as a disaster situation develops. Besides having all updated information on forecasting and warning of disaster, the EOC would also be the contact point for the various concerned agencies.

Role of District Administration

The district administration is the focal point for field level organizations. It is responsible for implementation of all government contingency plans. Considerable powers have therefore been vested the district collector to carry out operations in the shortest possible time.

The district administration in the country is required to prepare an advance contingency plan depending on the type of disaster that is likely to affect the district. District contingency plans follow a framework that is laid down nationally which comprises type of preparedness, the relief material required to be mobilized and the concerned departments that need to work together and provide an efficient feedback and monitoring system.

The district magistrate exercises coordinating and supervisory powers over functionaries of all the departments at the district level in the event of emergencies. During actual operations for disaster mitigation or relief, the powers of the collector are considerably enhanced, generally, by standing instructions or orders on the subject, or by specific government orders, if so required. Sometimes, the administrative culture of the state concerned permits, although informally, the collector to exercise higher powers in emergency situations and the decisions are later ratified by the competent authority.

Role of Sub-district Administration

A district is sub-divided into sub-divisions and Tehsils or Talukas. The head of a sub-division is called the Sub-Divisional Officer (SDO) while the head of a Tehsil is generally known as the Tehsildar (Talukdar or Mamlatdar in some states). Contact with the individual villages is through the village officer or patwari who has one or more villages in his charge. When a disaster is apprehended, the entire machinery of the District, including officers of technical and other departments, swings into action and maintains almost continuous contact with each village in the disaster threatened area. In the case of extensive disasters like drought, contact is maintained over a short cycle of a few days. The entire hierarchy right from the Central Government (the Department of Agriculture and Cooperation in the Ministry of Agriculture and Irrigation) to the district level is connected by means of a telecommunication system.

Communication

(I) **National Emergency Operation Centre (NEOC):** The National Emergency Operation Centre (NEOC) in the Ministry of Home Affairs functions 24X7 to monitor a disaster or disaster like situation. Based on the feedback received from National Forecasting Agencies viz Indian Meteorological Department, Central Water Commission, Snow and Avalanche Study Establishment advisories to the concerned states/UTs are issued from time to time for keeping watch on the developing situation and take necessary measures such as evacuation of the vulnerable persons, operation of relief camps, pre-positioning of essential commodities, and so on. During the south-west monsoon, daily situation reports (are prepared based on the feedback received from the affected states and concerned Central Ministries and organizations, and are sent to all concerned. During the calamities of severe nature, special situation reports are also prepared and issued to all concerned. NEOC also issue SMS alerts to the concerned officers in MHA, PMO and Cabinet Secretariat.

(II) **State Control Room:** There is a State Level control room set up whenever a disaster situation develops. The control room is responsible for:

- Transmitting information about the development of a crisis as a result of natural disaster on continued basis to the central relief commissioner
- Receiving instructions and communicating them to appropriate agencies for immediate action
- Collection and submission of information relating to implementation of relief measures to the Central Relief Commissioner
- Keeping the state level authorities apprised of the developments on a continuing basis

(III) **District Control Room:** Likewise 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, operationalising the contingency plan and keep close liaison with the state Headquarters, NGOs and other agencies dealing with disaster management and relief.

National Disaster Response Force (NDRF)

- **Task and role of NDRF:** The main task of the NDRF is to provide specialist response in case of disasters which broadly covers:
 - NBC disasters (Decontamination of the area and personnel)

- Removal of debris
 - Extrication of victims- live or dead
 - First medical response to victims
 - Extend moral support to victims
 - Assistance to civil authorities in distribution of relief material
 - Co-ordination with sister agencies
 - Capacity building
 - Providing assistance to foreign countries, if asked
- **Specialized equipment for NDRF Battalions:** The NDRF has been equipped with latest and state of the art equipments required for rescue and relief works. Equipments of around 310 types have been authorized to NDRF which broadly consist of Medical First Responder (MFR) Equipments, Collapsed Structure Search and Rescue (CSSR), water rescue, CBRN equipments, specialist vehicles, and so on.
 - **Other activities of NDRF:** NDRF is engaged in the following other activities beside search and rescue operations undertaken during emergency situation:
 - Conducting familiarization exercise in order to acquaint personnel with vulnerability of their area of responsibility to different disasters
 - Conducting mock exercises in coordination with other stake holders for well coordinated response during disasters
 - Conducting community awareness program for capacity building
 - Organizing demonstrations and exhibitions as part of community awareness
 - Undergoing different kinds of training in order to increase the skill and expertise of NDRF personnel
 - Training State Disaster Response Force (SDRF), community and NGO'S in disaster management
 - **Major Operational Achievements of NDRF:** In the previous years, NDRF has proved its efficacy with its commendable performance during various disasters including the drowning cases, building collapses, landslides, devastating floods and Cyclones. NDRF has saved 1, 41,257 human lives and retrieved 362 dead bodies of disaster victims in various response operations in the country.

Managing and Funding Relief and Recovery

In post independent India, financing relief expenditure has largely been arranged through the Finance Commission appointed under Article 280 of the Constitution. In the earlier phases, the role of the Commission was restricted to suggesting the pattern of financial assistance by the centre. Subsequently, the recommendations were enlarged to cover the 'scheme of financing relief expenditure'.

To understand the measures undertaken for relief in India, let us look at the type of relief offered by the Government of India in the event of a drought.

- **Relief employment:** The most important relief component is the generation of employment provision during the drought period. As soon as drought is declared, it is therefore, necessary for the state governments to immediately start relief employment programmes and provide work to those who need employment within a radius of five kilometers. Most state governments have their own food for work programme. The Government of India has started the National Rural Employment Guarantee Scheme (NREGS), providing 100 days of employment to one person per family on demand. Dr. P. Samal

scheme has been extended to the entire country. A large number of public works and watershed Programmes could be supported through the NREGS. These programmes together can create substantial employment to tide over the hardship and deprivation caused by drought.

- **Water resource management:** Water resource management in the drought affected areas is one of the most critical tasks of relief operations. It requires diverse measures such as augmentation of water supply, rationing of water use, and efficient utilization and management of water resources, in both urban and rural areas. Shortage of water is one of the earliest indicators of drought, affecting the entire society, rural and urban. Assessing the demand for water and its total availability in a specific region, therefore, is extremely important for meeting the needs of different user groups.
- **Food security:** Food security is one of the most important objectives of drought management. It is provided through food for work programmes, which are started by the state governments to provide relief employment. Wages on these relief employment works are paid in the form of food grains, on a full or partial basis. The National Rural Employment Guarantee Scheme (NREGS), extended to all the districts across the country, guarantees employment opportunities in the rural areas by providing work that taps labour intensive community assets. It assures manual work to one person per family for a maximum of 100 days in a year.
- **Relief through tax waivers and concessions:** The primary objective of tax waivers and concessions would be to help people meet their basic entitlements. The state government can take a conscious decision to provide a number of tax waivers and concessions when a drought is declared. These tax waivers and concessions should be decided on the basis of the entitlement needs of certain segments of the population and the fiscal implications of such a relief to the state government. Each state government may decide on tax waivers and concessions to the people affected by drought, depending on fiscal situation of the state and severity of the drought.

The preparedness and response phase in the disaster management cycle are critical in reducing the impact of disasters. The involvement of multi-various stakeholders, therefore, needs to ensure efficient inter-departmental coordination and need to constantly review and improve the systems in place. It has to be kept in mind to ensure that the focus on these two areas help in bringing a tangible improvement in handling the disasters.

DISASTER MEDICINE

Disaster medicine is a field of medical specialization that provides health care to disaster survivors and assists in medically related disaster preparation, disaster planning, disaster response and disaster recovery leadership throughout the life cycle of a disaster. Those who specialize in disaster medicine provide the leadership and technical know-how on managing medical relief in disaster areas. During disaster relief operations, those who specialize in disaster medicine become the link between and partner to the medical contingency planner, emergency management professional, incident command system, government and policymakers.

Among all types of medical specialization, disaster medical specialists are unique in the sense that they only operate during emergency situations and not every day. Specialists of disaster

management also engage in modifying disaster relief and recovery policies.

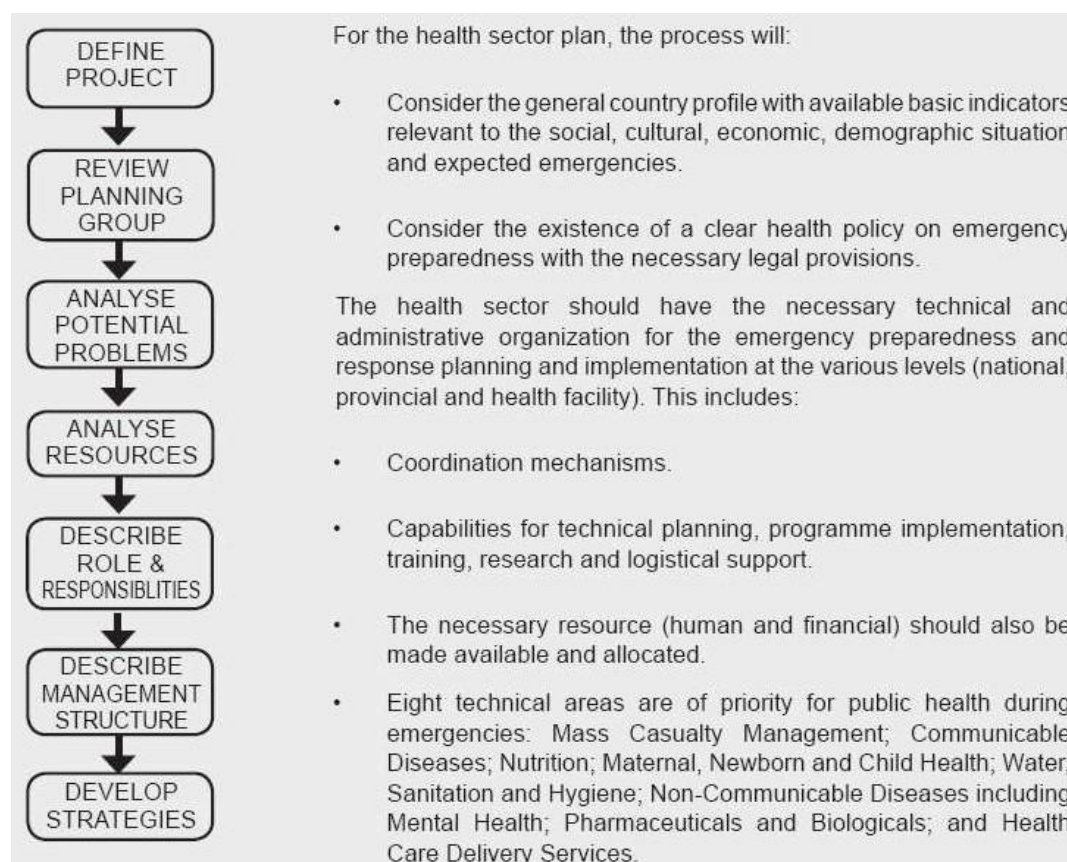
Although the usage of the term 'disaster medicine' first began during the Second World War, it was only in the 1980s that the term began to appear in medical journals and the mainstream press. By the 1990s, the term had entered government consciousness. In 2006, Elsevier, the largest publisher of medical textbooks in the world, published the textbook *Disaster Medicine*, further confirming disaster medicine as a genuine area of study with a definable core curriculum.

Medical preparedness plan

A medical preparedness plan is a set of procedures and policies necessary to maximize the ability to prevent, respond to, and recover from major disaster events, including efforts that result in the capability to render an appropriate public health and medical response that will mitigate the effects of illness and injury, limit morbidity and mortality to the maximum extent possible, and sustain societal, economic, and political infrastructure. Effective response to a disaster requires a clear understanding of the medical preparedness plan by the medical personnel responsible for medical relief. Such an understanding can only be inculcated through effective training. Training includes drills and exercises for hospital personnel and emergency

response teams with their respective equipment. Medical preparedness plans must be periodically updated and refined keeping in mind the new techniques and strategies of disaster management that appear in the medical literature.

The flowchart below provides the steps that need to be undertaken to prepare a medical preparedness plan.



Role of information and communication technology in health response

The importance of information technology (IT) in support of disaster medical response and provides a framework for the use of IT in response to natural disasters or terrorist activities cannot be overemphasized. Effective use of technology can literally mean the difference between life and death for the victims of a disaster.

The appropriate use of information technology enhances the effectiveness of the disaster response system, thereby safeguarding the population and the community infrastructure. In India, this entails connecting all state and district capitals with satellite communications that remain unharmed in the event of a disaster and connecting hospitals that have some disaster medical response capabilities with wireless local area networks (LANs). Along with the use of wireless LAN, other important disaster medical response capabilities include personal digital assistants, tablets and handheld personal computers. All of these are extremely handy technological tools that increase the effectiveness of a disaster medical response team.

4.3.1 Disaster Site Management

Disasters bring with them great devastation, ruining not only lives and property but also all patterns of social interactions and consistency. Recovering from a disaster is not an easy task as it involves more than burying the dead, taking care of those who have suffered injuries and again engage in the building of new structures. One has also to recover from a disaster in every aspect; mentally, physically, emotionally and socially. without former caution. Often, they should bring their own resources to the disaster site. Even before starting the consultation, the psychiatric consultant sent into a disaster area must create his or her team. The composition of the team depends on several factors including the type of disaster, availability of trained personnel, and the resources available. Ideally, the team should be composed of people from different areas of expertise, i.e, psychologists, psychiatric nurses, mental health professionals, social workers, psychiatrists and so on. If the team is composed of people who are not locals, it is critical for specialists from the disaster area to be also included since it allows the entry into the community as well as continuity of care.

Disaster sites can appear to be considerably calm shortly after the incident, despite the circumstances when destruction and loss have been intense. Individuals feel chaos around them and can experience a feeling of being cut off and a pervasive sense of unreality immediately after being hit by a disaster. During this time, rest and respite can act as relief factors. The initial disaster medicine interventions following a disaster must focus on the establishment of safety, provision of food and water, and protection from the environment. Fears of loss and separation should be addressed by establishing reliable communications and casualty identification and notification procedures.

The opening task of the team is to get an understanding of the nature and scope of disaster and establish for collaboration. Any integration into the disaster area must be done smoothly since victims of the disaster may view the team as outsiders who are interfering. One way to integrate is to liaise with local medical practitioners. Liaison with primary care providers and disaster workers is critical for effective intervention. The team itself should be knowledgeable about the area, its resources, culture and customs. Coordination with

government mental health agencies is also a must.

The people who are part of the team may also go through stress, since they are working in an extremely difficult environment. The leader of the team should be aware of the pitfalls of the members of the team falling victim to stress. It may cause impediments to the functioning of the team. Therefore, the leader of the team must ensure that all team members get proper rest and respite from their activities. Although one must be committed to the job at hand, extremely long working hours should be avoided since it may result in exposing oneself to psychological and physical trauma. The type of behaviour that suggests over dedication at a disaster site includes skipping meals, working well beyond the end of the shift, ignoring physical and emotional limits, and so on. The leader of the team must ensure that the wellbeing of the team remains intact; he or she must not hesitate in asking a member to take rest, but it should be done in a way that does not make the member feel devalued.

Disaster site management in India

The institutional and policy mechanisms in India for carrying out response, relief and rehabilitation in disaster hit areas have been well-established. These mechanisms have proved to be robust and effective as far as response, relief and rehabilitation are concerned. The changed policy/approach, however, mandates a priority to pre-disaster aspects of mitigation, prevention and preparedness. Thus, new institutional mechanisms have recently been put in place to address the policy change. The new institutional mechanisms include the creation of disaster management authorities, both at the national and the state level, which are responsible for disaster site management. These institutions are full of representatives from relevant ministries/departments to bring about a coordinated and multi-disciplinary response with experts covering a large number of branches. The National Emergency Management Authority is one such institution. The authority is headed by an officer of the rank of Secretary/ Special Secretary to the Government in the Ministry of Home Affairs with representatives from the Ministries/ Departments of Health, Water Resources, Environment and Forest, Agriculture, Railways, Atomic Energy, Defence, Chemicals, Science and Technology, Telecommunication, Urban Employment and Poverty alleviation, Rural Development and Indian Meteorological Department as members.

When a disaster strikes, the Authority coordinates disaster management activities. These include:

- Providing necessary support and assistance to state governments by way of resource data, macro-management of emergency response, specialized emergency response teams, sharing of disaster related data base
- Coordinating/mandating government's policies for disaster reduction/mitigation
- Ensuring adequate preparedness at all levels
- Coordinating response to a disaster when it strikes
- Assisting the provincial government in coordinating post-disaster relief and rehabilitation
- Coordinating resources of all national government department/agencies involved
- Monitor and introduce a culture of building requisite features of disaster mitigation in all development plans and programmes
- Any other issues of work, which may be entrusted to it by the government

Logistics management

The increase in the intensity and magnitude of disasters in recent times has forced disaster management policy makers to think of ways to improve the logistics during a relief and rehabilitation response. The logistical response to the Asian tsunami in December 2004 revealed the fragility and inadequacy of the logistics processes in disaster management. The disaster that earthquake and tsunami left in its path spanned 14 countries and millions of victims required coordination among the hundreds of government agencies, NGOs, military forces, and international relief organizations in rescue operations and moving relief materials. The complexity of the situation increased because of insufficient capacity of organizations to provide relief and aid. All these factors led to an inadequate response to the disaster, at least for the first few weeks. The failures of the relief operations during the tsunami forced the international community to review its priorities such as strengthening professional staffing and supporting strategic partnerships and local available expertise and also clarify at the outset who is to coordinate disaster response and recovery. It also required a re-look at the management of logistics during a relief operation.

Logistics management means prioritization, transport planning, reception and distribution of emergency supplies by the agency responsible for coordinating a relief effort during a disaster response. Logistics is a bridge that allows the transition between emergency and development programmes, and links the entire supply chain. This link cannot be ignored by the actors of this particular supply chain because by establishing a long-term process logistics will ensure local development and sustainability.

Logistics management is a key component of any disaster reduction effort. Planning for disasters is both necessary and practical, since it is generally possible to foresee the types of disasters that may affect a given location and the needs that such disasters will be likely to engender. Logistics preparedness must be based on the vulnerability and resource assessment. The assessment of needs during a disaster allows relief organizations to stockpile provisions in advance. The logistics stock preparedness is essential in covering the initial needs in the immediate aftermath of any disaster. The improvement of logistics management in disaster management in India was seen during the evacuation efforts for Cyclone

Phailin in 2013. Not only were the state agencies and the NDMA able to evacuate over a million people from the coastlines to cyclone shelters, but these shelters were extremely well-stocked, with adequate food, water and medical supplies. The efforts of the agencies were praised by all, including international agencies, and were largely responsible for the low casualty during the storm.

4.3.2 Medical and Health Response to Different Disasters

Hurricane Katrina in August of 2005 swept through the southern and eastern coasts of the United States, leaving 1,833 dead and causing more than \$100 billion worth of damage across multiple American states. In Japan in 2011, a massive 9.0 earthquake and resulting tsunami killed over 16,000 people and caused over \$235 billion worth of damage. In 1985, a volcano near the town of Armero, Colombia, erupted. The ensuing mudslides result in the deaths of over 25,000 people. Such types of natural disasters, whether they be tsunamis, floods, earthquakes, kill hundreds of thousands of people every decade. Studies have shown that over 15 to 20 per cent of people who have been victims of natural disasters suffer from post-

traumatic stress disorder. However, it has only been in the last decade or so that mental health professionals have become actively involved in the relief and recovery operations after a disaster event. Prior to that, recovery and relief only meant reconstruction and providing emergency medical relief.

The area of rehabilitation is still grappling with issues related to people having chronic disorders after trauma. Almost the entire body of literature related to disaster related trauma comes from the field of social work and psychology. However, it is of vital importance for the field of post-disaster rehabilitation to be aware of chronic PTSD. This is because disabilities and mental health issues among the victims of natural disasters have become very common. Moreover, heart attacks and other physical injuries arising out of disasters can lead to permanent disability which requires assistance in order for the victim to recover.

Stress after trauma often has a detrimental effect on a person's social life as well as his vocation. The most significant deficit that is associated with post traumatic stress is dealing with stressors that remind one of the disaster event. Victims of PTSD must be referred to government or private health services so that they get proper treatment.

The reason why victims of natural disasters fall victim to post traumatic stress is because natural disasters represent a crisis that causes significant and sudden change in an individual. That sudden change can be anything, from losing one's home to losing a loved one, and so on. According to the authors Murphy and Laube, such sudden changes lead to feeling of insecurity and vulnerability in the loss of privacy and treasured possessions.

Individuals are suddenly thrown into situations where they have to find temporary shelter, food and must reside in very poor conditions. This can cause a sense of dislocation and shock. The loss of home can extend to loss of community and employment, with concomitant loss of support and income.

Death and injury and often follows natural disasters make an impression upon the minds of victims. This often results in guilt for not doing enough to save other. Victims of natural disaster often also go through phases of denial and anger. Denial is associated with those victims who have lost loved ones in a tragedy. Their sudden loss leads to disorientation and victims not being able to cope with loss. Anger of the victims is generally directed towards officials who could not prevent the tragedy, or with relief and recovery personnel who may not arrive fast enough to save people. Anger could also be directed against insurance companies for not paying a claim. Studies by specialists have shown that those who are exposed to a natural disaster face anxiety reactions within five hours from the natural disaster event. This anxiety manifests itself in anxiety related sleep disturbances, fear, startle reactions, and so on. Some victims also abuse substances to cope with the situation. Studies from around the world have shown that drug abuse among victims of disasters is common.

One expected outcome for victims as a result of natural disasters is depression. Grieving is only natural, whether it is grieving for a loved one, for the loss of the home, for the destruction of the community, and so on. This grieving often leads to depression. According to the authors Cohen and Ahearn (1980), bereavement syndrome has five forms. These are:

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- The first is inhibited grief, in which intense denial is the main characteristic.
- The second form is anger that leads to victims lashing out.
- The third form is the feeling of extreme guilt which leads to self-blame.
- The fifth form is depressive illness, in which the person has social isolation, loss of energy, hopelessness, and even suicidal tendencies.

Significant symptomatology of victims of natural disasters is shown as defense and specific signs. They are shown in the table below:

Table 4.1 Defense and Specific Signs

Defense	Specific Signs
Shock	Confusion and psychological numbing
Fear and Anxiety	<ul style="list-style-type: none"> • Sleep disturbance (e.g. nightmares, insomnia) • Substance abuse • Uncontrollable and distressing images of event • Increased absenteeism at work • Loss of ability for intimacy • Loss of interest in interpersonal relations • Hyperalertness, scanning, hypervigilance, ticks • Desire not to be left alone • Hyperreactivity to particular cues, (e.g. storms) • Physical changes: increased blood pressure, arthritis, ulcers, chest pains, headaches. • Problems in performance at school, home, or work • Loss of sense of security
Denial	<ul style="list-style-type: none"> • Containment of feelings • Unwillingness to talk about event • Cheerful or audacious reaction to trauma
Mourning and Depression	<ul style="list-style-type: none"> • Frequent and endless gravesite visits • Crying at the reminder of loved ones • Social isolation • Loss of energy • Hopelessness • Suicidal ideation • Memory or concentration problems
Guilt and Shame	<ul style="list-style-type: none"> • Depressed moods • Extreme guilty preoccupation
Retaliation	<ul style="list-style-type: none"> • Lawsuits and other acting out episodes • Temper tantrums and argumentative style

Clinical casualty management

More and more people are affected by disasters, whether natural or man-made, every single day. Such situations put a strain on existing health infrastructure and also slow the process of sustainable human development. Many lives can be saved if communities are better prepared to deal with emergency situations and states are capable enough to respond to situations. Post-disaster, many victims also suffer from mental and physical disabilities straining the

already over burdened health system and diverting resources from other essential programmes. Much of these effects can be divided if one is properly prepared. Studies have shown that preparedness at the community level is essential for mitigating the adverse effects of disasters. For this reason, clinical casualty management stresses capacity building at the level of the community. Empowering communities to develop plans requires strong involvement of the health sector, both locally and nationally.

Although the shortfalls faced during emergency situations are understood by everyone, most countries of the world still have not addressed the issue in a comprehensive way. Many nations do not have a Mass Casualty Management Plans which forces local communities to initially fend for themselves while facing a disaster.

Guidelines for mass casualty management

The World Health Organization (WHO) has framed some guidelines for the formulation of mass casualty management plans. These are as follows:

Clear lines of responsibility: Roles must be clearly defined in the plans and policies so that there is no confusion about who is in charge during the different stages of the response

Scalability: Although some activities would be common for all types of mass casualty incidents, preparations for emergency events must look into issues related to scalability and upsurge in demands for health services.

Whole-of-health: Along with preparing for mass scale injury and death, other health services like providing clean drinking water and sanitation must also be planned.

Knowledge-based: Since pretty much every single mass casualty event that can be imagined has already taken place, it would be useful to use the body of knowledge and data available to prepare plans.

Coordination: Any response to a mass casualty incident can only succeed if there is proper coordination between the different agencies at the local, state and national level.

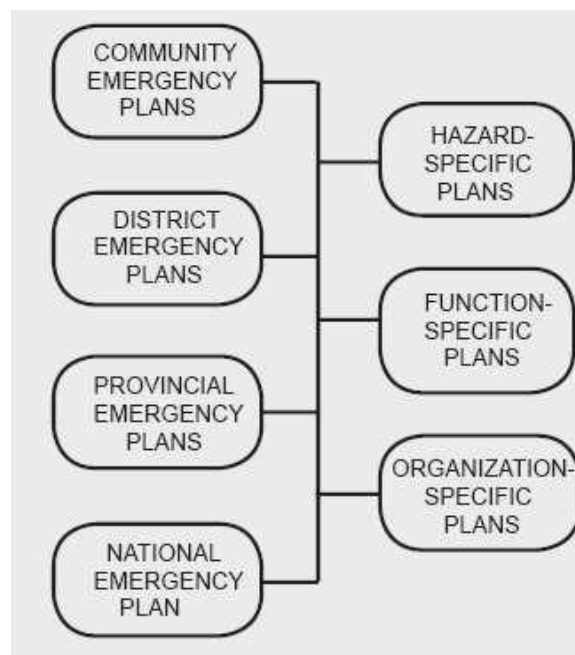


Fig. 4.1 Context of Emergency Plans (Source: WHO)

Any mass casualty management plan should be based on a tiered approach based on the above WHO approved guidelines. Such an approach recognizes that although a national approach to policy and management of mass casualty incidents is necessary, the preparedness of local health services will be the decisive element in the success or failure of the plan.

A tier based approach suggests that the first response to any disaster must be at the local level with local health care personnel and relief agencies working to provide relief. When it seems that the situation is overwhelming, the next tier may be activated. This tier consists of activating plans of the state government and utilizing its resources. If the state is not capable of handling the disaster on its own, the third tier, the resources of the national government must be activated. Therefore, any management plan of mass casualty events must provide clear criteria regarding the 'triggers' for these escalations. The triggers should be agreed by all stakeholders, and tested in training drills and simulation exercises.

Epidemiological study of disasters

Epidemiology is that branch of medicine that deals with the incidence, distribution, and possible control of diseases and other factors relating to health. The use of epidemiology in disaster situations, whether natural or man-made, is known as disaster epidemiology. Disaster epidemiology is one of the newer fields of disaster management. It entails studying the characteristics of disasters from an epidemiologic perspective. Such a perspective can be used to measure and describe the negative effects of natural and human-caused disasters.

There are two approaches that can be utilized in epidemiologic investigation of a disaster. They are:

- **Understanding the causes of a disaster:** This approach focusses on the disaster event. Learning as much as possible about the reasons for disasters is important for developing prevention activities in the future.
- **Understanding ways of controlling a disaster:** This approach focusses on mechanisms that can be developed to relieve the burden associated with a disaster once it has occurred. Such an approach can be applied during the phase of disaster preparation or at the stage of disaster relief and rehabilitation. The most direct application of epidemiology in this situation is the establishment of surveillance systems to identify injuries and the possible emergence of communicable diseases.

The types of studies that come under disaster epidemiology include:

- Surveillance
- Public health impact evaluation
- Natural history evaluation
- Analytic studies of risk factors
- Clinical investigation
- Population based study
- Studies of psychological effects of disasters

Before a disaster, epidemiologic methods can be applied in hazard and vulnerability analysis. During a disaster, they can be applied in damage assessment, collection of information and public

health surveillance. Post disaster, epidemiologic methods can be applied in analysing the frequency of deaths, injuries, illnesses and other negative health related factors related to a disaster. They can also be applied in analysing the risk factors that cause death and injury so as to formulate evidence-based prevention strategies.

Clearly, the application of epidemiology can offer much needed information on which a rational, effective, and flexible disaster management policy can be based. Epidemiology in particular offers the tools for swift and efficient problem solving during public health emergencies such as natural and technological disasters.

Remote Area Planning

One of the factors that lead to an effective disaster relief response is the time it takes for disaster management agencies to spring into action. While it is relatively easier to respond to disasters in well-connected areas, responding to disasters in remote areas requires advance planning.

During the recent floods in Uttarakhand, communication links were destroyed in the upper regions of the Himalaya. Flood and debris washed away roads, bridges and cut off entire districts from the country. The situation was such that government agencies were not able to figure out the extent of the disaster for a few days after the event. Moreover, bad weather made it impossible to fly in relief materials to upper regions of the Himalaya, or to rescue pilgrims who were stranded in temple towns. Although, the Indian armed forces came to the rescue of those stranded, flying in dangerous weather and sometimes even climbing mountains to reach those who were stranded, a lot of victims could have been saved if the civilian agencies had responded in time. Such a response would have been only possible if the state government or the disaster management agencies had taken steps towards remote area planning.

Any remote area plan entails giving planners in the regions better access to valuable knowledge for disaster mitigation, preparedness and response. It entails creating local level response teams, making local communities aware of risks and preparing them for all eventualities, as well as putting in place policies of relief and response that would take into account the adverse local conditions of the area.

REHABILITATION, RECONSTRUCTION AND RECOVERY

Counter disaster planning means the planning, organization, co-ordination and implementation of measures that are necessary or desirable to prevent, minimize or overcome the effects of an emergency or disaster upon members of the public or any property and includes the conduct of or participation in training for those purposes and for civil defence measures. The four phases of a counter disaster cycle are prevention, preparedness, response and recovery. In this section, we shall focus on recovery and rehabilitation.

The damage caused by floods, earthquakes and cyclones is on a much larger scale than other disasters and recovery after these disasters poses a challenge. In disasters like drought, the relief phase is prolonged and since there is no damage to the infrastructure and property, the rehabilitation is confined to restoration of livelihoods which can get subsumed in normal development programmes. Recovery in case of epidemics is more in the form of

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sanitising the locality against any future recurrence and may also involve counseling of the victims. Industrial disasters being quite varied in nature, the rehabilitation in major ones like the 'Bhopal Gas Tragedy' could involve rehabilitation efforts spanning over a generation of victims apart from restoring livelihoods and providing social and psychological assistance. Rehabilitation following disasters such as landslides and avalanches is localised and is of a similar nature as in earthquakes but on a smaller scale. Finding safer sites near such locations often poses challenges and resistance.

Assessment

The first step after stabilizing the situation in a disaster hit region by providing sufficient relief is to assess the damage caused by the disaster. A meticulously executed assessment exercise would provide an ideal base for the rehabilitation efforts. This exercise is best carried out through multi-disciplinary teams which go into all aspects of damage (social, economical, psychological) in participation with the local community. Based on the assessment of the damage and the needs, a recovery strategy has to be formulated. The strategy should include all interventions - economic, social, political and psychological. The resources should be identified and the roles and responsibilities of all concerned should be defined.

Coordination

Following any major disaster, a number of players arrive on the scene and as already stated, ensuring proper coordination amongst them becomes very important. Recovery activities are taken up by government agencies, local bodies, international agencies, voluntary organizations and others, through separate, overlapping and uncoordinated interventions. This leads to imbalances in the scale of operations, duplication of efforts in some areas, gaps in others and leakage and misuse of resources. Therefore, establishing a framework for coordination is extremely important for effective recovery. The role of voluntary organizations including international ones like the Red Cross is extremely useful for mitigating the impact of disaster.

The administration is also required to set up a voluntary organizations' coordination centre to coordinate the relief and rehabilitation activities of the multiple organizations so that they are not concentrated in a few pockets. It is often observed that post-disaster recovery efforts tend to focus on rapid and visible solutions to restore normalcy at the cost of sustainable development. The post- disaster recovery phase provides a 'window of opportunity' for disaster risk reduction. Risk reduction aspects should therefore be built into the re-development process

Recovery

Recovery is not only about the restoration of structures, systems and services in a disaster hit region; a successful recovery is also about individuals and families being able to bounce back from their losses, and sustain their physical, social, economic and spiritual well-being. The goal of recovery is to bring a community back to a new normal after it has been devastated by a disaster.

There are two phases of recovery:

- Short-term recovery
 - Many emergency and relief programs complete their work
 - Restoration of infrastructure and vital life support systems happen in this phase

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- The community identifies local resources to form a long term recovery group (LTRG), and initiation of plans for permanent housing begins
- Long-term recovery
 - Transition occurs between the presence of national organizations and the local community
 - Implementation begins for disaster case management and recovery initiatives administered by the local community
 - Construction activities to include repairing, rebuilding and/or relocation of homes proceeds during this phase
 - Resumption of the routines of daily life characterizes this phase

Disaster Resistant House Construction

Shelter is one of the most visible and immediate needs in a post-crisis setting. Relief efforts are often focused on providing shelter quickly, without taking into account the impact of short-term shelter strategies. Long-term shelter strategies help not only to focus on determination and implementation of realistic and permanent reconstruction plans for the affected communities, but are also concerned with rebuilding community confidence and support structure for civic responsibility and urban governance through participatory planning of reconstruction. The development of disaster resistant housing is a major factor in reducing vulnerability to disasters. However, shelter issues in mitigation go beyond the structural aspects. Rights to ownership and security of tenure make an enormous difference to the maintenance, management and development of shelter, particularly in urban areas.

Construction of a Disaster Resistant House in Tamil Nadu after the 2004 Indian Ocean Tsunami

Creation of long-term livelihood options

Normally, it is seen that the recovery efforts have a tendency of tapering off with the passage of time. The Bureau for Crisis Prevention and Recovery of the UNDP has also observed 'the general experience is that once the initial flurry of activities of providing rescue and relief is over, the attention received by the recovery efforts goes on declining steadily over a period of time and "business as usual" sets in'. Most of the time it is seen that post disaster relief and rehabilitation by the state or NGOs are usually haphazard measures that are not linked to the overall development goals of the disaster hit country. This tends to exacerbate the already fragile situation which results in people being dependent on aid to survive. Short-sighted relief operations are also a waste of resources. Relief and rehabilitation of disaster areas by government and non-governmental services can no longer exist in isolation; they must be linked to overall objectives of development for the community and require the participation of development agencies. The real test lies in broadening the portfolios of humanitarian and developmental actors and in bringing them together in shared realization of recovery processes for sustainable development.

The sustainability component in recovery process therefore is important. This could be achieved by capability building of the community and awareness generation and preparing local crisis management plans.

Monitoring and Evaluation of Rehabilitation Work

A system of accountability needs to be evolved during the relief and rehabilitation phase. This system should ensure that the relief material reaches the target groups and that the funds are being utilized efficiently and optimally. A grievance redressal mechanism should also be put in place.

After the recovery phase, it is necessary to conduct a detailed evaluation of all aspects of crisis management. This should bring out the strengths and weaknesses of the disaster management machinery and also provide the basis for future improvements. Such an evaluation should be carried out by an independent professional agency like the NIDM, in all major disasters. This assessment should also include a quick audit of the expenditure incurred.

Assessing nature of damage to houses and infrastructure

Any post-disaster response is based on an assessment of damages to understand the nature and extent of impact on various aspects of human life and living conditions. From the past experiences, it has been learnt that damages are measurable, but without getting in to the subjective dimensions, the human sufferings cannot be fully understood.

Damage to Housing

Good housing conditions are a prerequisite for the well-being of a family. Housing is not only a shelter for a family to live in, but also in many cases, a setting for an economic enterprise. A natural disaster can cause varying degrees of damage to houses depending on various factors. The quality of construction, materials used, construction technology, type of dwelling, location, and so on add to the vulnerability of built structures and affect the extent of damage. The restoration of respectable habitat for the affected families is usually one of the primary objectives of humanitarian response. To ensure reduction of vulnerable constructions in the post-disaster period, an assessment of the extent and type of housing damage is required.

The geographic location of the settlement is the first information needed to understand the impact of the disaster. The location describes its setting with respect to land forms and proximity to natural features such as lakes, rivers or sea. The assessment should further elaborate, in terms of urban or rural, size, typology on the basis of design and structural system, types of ownership and functional usage. Additionally, information about the average dwelling size, average number of inhabitants per dwelling unit and average area should also be collected. The number of dwellings in the affected area needs to be determined, specifying in each case whether they are single- or multi-family, owned by men or women, as freehold, state conferred or customary title, rented or without title. The issues like land title and tenancy are important to understand for planning for housing.

The houses need to be categorized based on the extent of damage. This helps in formulating a suitable response. Participation of the affected people in the process of enumeration is essential, as recovery policies and responses are based on this database.

The number of houses affected and the extent of damage may be categorized as:

- Completely destroyed houses or the buildings which are beyond repair
- Partially damaged houses which are repairable

- Houses with minor damage
- Undamaged houses

The indicators for such categorisation may require inputs from housing professionals. This assessment should also identify the various prevalent construction materials and techniques. Information on quality of existing dwellings, disaggregated by its conditions or the type of construction materials (mud, bamboo, wood, brick, reinforced concrete) can help us in estimating financial, material and skill resources required for reconstruction. Damage depends on both the types of disaster and the type of construction. Poorly built dwellings sometimes, even with seemingly so-called strong materials like RCC, tend to be the hardest hit. These comparisons, therefore, provide important clues and relation between types of disaster and vulnerability of shelter for post-disaster reconstruction and help in developing safety guidelines.



Housing Damage after the 2001 Gujarat Earthquake

Damage to infrastructure

The infrastructure required for various goods and services that are essential for well being of people is frequently damaged due to disasters. This affects people's lives adversely. Basic services like drinking water, access roads, sewage disposal, electricity, and so on, if affected can pose, not only difficulties for the community but also challenges for the humanitarian workers in undertaking rescue and relief operations.

Infrastructure damage includes not only the damage to basic services, but also to public buildings essential for providing education, health care or those serving other social functions. In addition to these, there are many community owned infrastructural facilities like religious places, community halls, animal shelters, fodder lands or forests, old monuments, tanks and wells, check dams and minor dams. Damage to community infrastructure adversely affects or restricts important functions of the community. Typically, the community infrastructure involves high capital and social process costs. Given the nature and importance of such community infrastructure, it is imperative to design it with all appropriate safety considerations.

The assessment of infrastructural damage should cover all the components of public delivery systems of goods and services located in the affected community. These goods and services

may be provided by the public institutions, local community collectives-formal or informal and other civil society institutions.

The three categories that need to be included in the assessment are:

Public buildings: These include *anganwadis*, schools, health centres, community halls, panchayat building, PDS shop, vocational training centres or any other government structures. The disaster may damage these buildings and affect the services being provided through them. Usually, the public buildings also serve as rescue centres, after the disaster; and if they are damaged, the affected community may face difficulties in coping.

Basic services: The basic services such as drinking water supply, access roads, sewage disposal, drainage, electricity and communication are very important for the community's well-being. If these services are disrupted, many lives may be threatened due to the possible outbreak of diseases or other such problems. Therefore, damage assessment must try understand how these services have been affected, the extent of damage in terms of quantum and the people it serves. Sometimes, damage to these services may be qualitative. For example contamination of the drinking water supply of the community. Thus, it is essential to understand such impacts in the damage assessment. Another critical aspect to be included in damage assessment is to determine the worst affected in the community due to disruption, so that appropriate priority and targeting may be assigned during the recovery process.

- **Community owned infrastructure:** Much of the infrastructure may be community-owned in many settlements affected by the disaster. Community owned infrastructure is the outcome of various collective social processes, formal or informal, at the community level. The infrastructure may belong to different social groups within the community or to the entire village. It is essential to understand the damage to such infrastructure in terms of its spread, quantum, type and extent. The examples of such infrastructure are tanks, wells, community hall, animal shelters, religious buildings and spaces, cooperative buildings and so on. The extent and type of damage to the community-owned infrastructure should be assessed. Here, it is essential to identify the worst affected within the community.

Development of physical and economic infrastructure

When a natural or a man-made disaster occurs, people, houses and property are always the most affected. Thus, any relief measure, in addition to immediate human needs, must also consider the problems that may arise in settling humans in large numbers temporary and providing them adequate infrastructure. In most post disaster situations it has been seen that interventions are most effective when they are designed to begin concurrently; consideration of long term impacts of short term interventions can add value to the latter, and depth to the former. Thus, any planning for long term recovery must be concurrent even while short term relief measures are underway.

The first challenge for any sustainable recovery is to provide security and protection of the displaced population. To do this, it is extremely important to restore the institutions of the state, the law and order machinery backed by an impartial judiciary.

A natural or a man-made disaster also wrecks the livelihood of the victims of the disaster. Poverty lack of resources increases vulnerability, weakens coping strategies and delays

the recovery process. One of the most vital components of recovery is a vibrant economy, yet most disaster rehabilitation experts feel the economic recovery of a disaster area is the most difficult aspect of rehabilitation. Despite disasters, many communities have resources that can be tapped such as the availability of local building materials, existence of a labour force, and most importantly eagerness of local communities and the private sector to participate in the recovery process. Restoring employment opportunities in a disaster area and reinforcing the local building sectors all are contributing to sustainable recovery.

Managing Relief Camps

A refugee camp is a temporary camp built to receive refugees. Hundreds of thousands or even millions of people may live in any one single camp. Usually, they are built and run by a government, the United Nations, or international organizations, (such as the Red Cross) or NGOs. Refugee camps are generally set up in an impromptu fashion and designed to meet basic human needs for only a short time. Some refugee camps are dirty and unhygienic. If because of any reason, whether a civil war or government incompetence, the return of refugees is prevented, it may result in a humanitarian crisis. Some refugee camps grew into permanent settlements, such as the Palestinian refugee camp in Lebanon called Ein el-Hilweh, and have existed for decades, which has major implications for human rights.

Facilities

Facilities in a refugee camp can include the following:

- Sleeping accommodations (tents)
- Hygiene facilities (cleaning and toilets)
- Medical supplies
- Communication equipment (like radio)
- Protection from bandits (like barriers, checkpoints, peacekeeping troops)

Duration

People may stay in these camps, receiving emergency food and medical aid, until it is safe to return to their homes. In some cases, often after several years, it is decided that it will never be safe to return these people and they are resettled in 'third countries' away from the border they crossed.

Exportation

Globally, about 17 countries (Australia, Benin, Brazil, Burkina Faso, Canada, Chile, Denmark, Finland, Iceland, Ireland, Mexico, Netherlands, New Zealand, Norway, Sweden, United Kingdom and United States) regularly accept 'quota refugees' from refugee camps. Refugee camps are typically used to describe settlements of people who have escaped war. In recent years, most quota refugees have come from Iran, Afghanistan, Iraq, Liberia, Somalia and Sudan, which have been in various wars and revolutions and the former Yugoslavia, due to the Yugoslav wars.

Some examples of refugee camps around the world are as follows:

- Camps in the east of Chad, such as Breidjing Camp, hosting approximately 250,000 refugees from the Darfur region in Sudan (starting 2002)
- Camps in the south of Chad, hosting approximately 50,000 refugees from Central

- African Republic
- Buduburam refugee camp, home to more than 12,000 Liberians (opened 1990)
- Camps for Sri Lanka Tamils, 110,000 in India in 1998, and more than 560,000 internally displaced (starting 1983)
- Four camps near Tindouf (opened in 1977)

Camp management

Refugees and internally displaced persons (IDPs) are given shelter and safety in the camps. They are, however, not very helpful in the long run due to various reasons. If they are run and managed well, they can provide short-term solutions by serving primary protection functions for these people displaced by armed conflict or natural disasters. The operations and types of camps and its settings, vary to a large extent based on the preceding disaster and the coping strategies in place.

Coordinating the activities on the campsite needs proper management by the relief workers. The relief workers are responsible to motivate and coordinate the various service providers to make their services available in a comprehensive manner where the primary motive that is to be kept in mind is the interest of camp residents.

Camp management is inclusive of the following activities:

- Securing and upholding the protection of the rights of refugees under international law (which includes an adequate standard of living in accordance with international minimum standards at all levels of planning, practice and participation)
- Forming camp committees
- Establishing community participation and mobilization mechanisms
- Promoting self-management, protection monitoring, data collection and sharing
- Providing defined services
- Monitoring the service delivery of other providers based on the set standards in order to avoid the duplication of activities and emergence of protection and assistance gaps
- Ensuring the maintenance of camp infrastructure

In order to ensure that the camps function smoothly, training is provided to individuals who will work as the camp managers. In providing camp management training, the following activities are ensured:

- Follow-up sessions, advising and coaching
- Contextualized training modules will be provided to make the training more effective and local case studies will also be used to aid comprehension, if possible
 - Training all stakeholders who are directly or indirectly related to the management of the camp
- Roles and responsibilities are clearly defined and the best practices for each of the positions are also highlighted
- Each relief worker involved with camp management, also participates in the training
- Any camp that aims to function in accordance with the interests of the refugees and internally displaced persons (IDPs) needs to:
 - Work with camp residents, humanitarian agencies, authorities and the local populations to provide security for all, especially the most vulnerable
 - Make sure that coordination plans between all relevant camp authorities have been

- established and maintained to internationally accepted standards
- Manage providers so that they provide services efficiently, including monitoring, plugging gaps and avoiding duplication
- To act like an advocate for those who are staying in the camp and act as the intermediary between the residents and the authorities, security forces, implementing agencies and the local community leaders
- Use and develop local capacity where possible
- Make sure to apply based approaches communities for all sorts of activities
- Notify the agencies coordinating activities in the camp, so that they allow intervention by national and international agencies

However, the activities and functioning of the camp need to be constantly monitored, in order to plug any loopholes present. Camp monitoring includes keeping a check on:

- Provision of defined services
- Standard of the services provided
- Duplication of activities
- Emergence of protection and assistance gaps
- Maintenance of the infrastructure of the camp
- Collecting and sharing data

Disaster Management in India

Disaster management in India has evolved from an activity-based reactive setup to a proactive institutionalized structure; from single faculty domain to a multi-stakeholder setup; and from a relief-based approach to a 'multi-dimensional pro-active holistic approach for reducing risk'. The beginnings of an institutional structure for disaster management can be traced to the British period following the series of disasters such as famines of 1900, 1905, 1907 and 1943, and the Bihar-Nepal earthquake of 1937. Over the past century, the disaster management in India has undergone substantive changes in its composition, nature and policy.

Emergence of institutional arrangement in India

A permanent and institutionalised setup of disaster management began in the decade of 1990s with set up of a disaster management cell under the Ministry of Agriculture, following the declaration of the decade of 1990 as the 'International Decade for Natural Disaster Reduction' (IDNDR) by the UN General Assembly. Following a series of disasters such as Latur Earthquake (1993), Malpa Landslide (1994), Orissa Super Cyclone (1999) and Bhuj Earthquake (2001), a high powered Committee under the Chairmanship of Mr. J.C. Pant, Secretary, Ministry of Agriculture was constituted for drawing up a systematic, comprehensive and holistic approach towards disasters. There was a shift in policy from an approach of relief through financial aid to a holistic one for addressing disaster management. Consequently, the disaster management division was shifted under the Ministry of Home Affairs in 2002.

Disaster Management Framework

Shifting from relief and response mode, disaster management in India started to address the issues of early warning systems, forecasting and monitoring setup for various weather related hazards. A structure for flow of information, in the form of warnings, alerts and updates about

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the oncoming hazard, also emerged within this framework. A multi-stakeholder high powered group was set up by involving representatives from different ministries and departments. Some of these ministries were also designated as the nodal authorities for specific disasters. Following a High Powered Committee Report on Disaster Management for establishment of a separate institutional structure for addressing disasters and enactment of a suitable law for institutionalizing disaster management in the country, a multi-level links between these ministries and the disaster management framework have emerged.

Present structure for disaster management in India

The institutional structure for disaster management in India is in a state of transition. The new setup, following the implementation of the Act, is evolving; while the previous structure also continues. Thus, the two structures co-exist at present. The National Disaster Management Authority has been established at the centre, and the SDMA at state and district authorities at district level are gradually being formalized. In addition to this, the National Crisis Management Committee, part of the earlier setup, also functions at the Centre. The nodal ministries, as identified for different disaster types of function under the overall guidance of the Ministry of Home Affairs (nodal ministry for disaster management). This makes the stakeholders interact at different levels within the disaster management framework.

Within this transitional and evolving setup, two distinct features of the institutional structure for disaster management may be noticed. Firstly, the structure is hierarchical and functions at four levels – centre, state, district and local. In both the setups – one that existed prior to the implementation of the Act, and other that is being formalized post-implementation of the Act, there have existed institutionalized structures at the centre, state, district and local levels. Each preceding level guides the activities and decision making at the next level in hierarchy. Secondly, it is a multi-stakeholder setup, i.e., the structure draws involvement of various relevant ministries, government departments and administrative bodies.

Disaster Management Act, 2005

The Disaster Management Act provides for the effective management of disaster and for matters connected therewith or incidental thereto. It provides institutional mechanisms for drawing up and monitoring the implementation of the disaster management. The Act also ensures measures by the various wings of the government for prevention and mitigation of disasters and prompt response to any disaster situation.

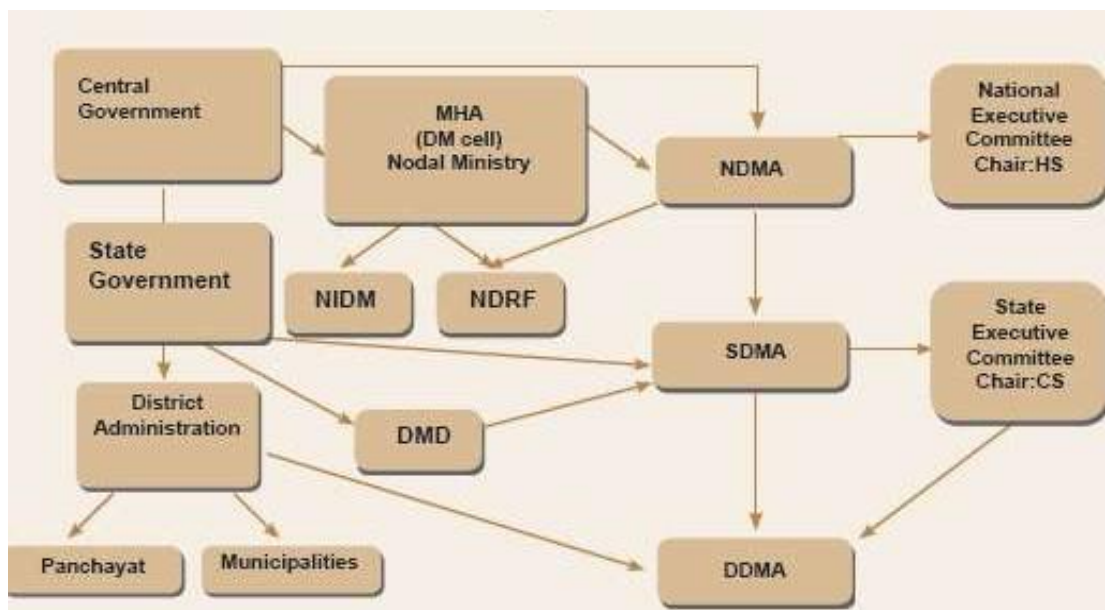
The Act provides for setting up of a National Disaster Management Authority (NDMA) under the Chairmanship of the Prime Minister, State Disaster Management Authorities (SDMAs) under the Chairmanship of the Chief Ministers, District Disaster Management Authorities (DDMAs) under the Chairmanship of Collectors/District Magistrates/Deputy Commissioners. The Act further provides for the constitution of different Executive Committee at national and state levels. Under its aegis, the National Institute of Disaster Management (NIDM) for capacity building and National Disaster Response Force (NDRF) for response purpose have been set up. It also mandates the concerned Ministries and Departments to draw up their own plans in accordance with the National Plan. The Act further contains the provisions for financial mechanisms such as creation of funds for response, National Disaster Mitigation Fund and similar funds at the state and district levels for the purpose of disaster management. The DM Act, 2005 also envisages specific roles to be played by the local bodies in disaster management.

National Disaster Management Authority (NDMA)

The NDMA has been mandated with laying down policies on disaster management and guidelines which would be followed by different ministries, departments of the Government of India and state government in taking measures for disaster risk reduction. It has also to laid down guidelines to be followed by the state authorities in drawing up the state plans

The details of these responsibilities are given as under:-

- Lay down policies on disaster management; *Legal Institutional Framework, DM Act 2005*
- Approve the National Plan
- Approve plans prepared by the Ministries or Departments of the Government of India in accordance with the National Plan
- Lay down guidelines to be followed by the State Authorities in drawing up the State Plan
- Lay down guidelines to be followed by the different Ministries or Departments of the Government of India for the purpose of integrating the measures for prevention of disaster or the mitigation of its effects in their development plans and projects
- Coordinate the enforcement and implementation of the policy and plan for disaster management
- Recommend provision of funds for the purpose of mitigation
- Provide such support to other countries affected by major disasters as may be determined by the Central Government
- Take such other measures for the prevention of disaster, or the mitigation, or preparedness and capacity building for dealing with the threatening disaster situation or disaster as it may consider necessary
- Lay down broad policies and guidelines for the functioning of the National Institute of Disaster Management



National Policy on Disaster Management (NPDM)

The National Policy on Disaster Management (NPDM) was approved by the Central Government in 2009. The policy envisages a safe and disaster resilient India by developing a holistic, proactive, multi-disaster oriented and technology driven strategy through a culture of prevention, mitigation, preparedness and response. The policy covers all aspects of disaster management including institutional and legal arrangements, financial arrangements, disaster prevention, mitigation and preparedness, techno-legal regime, response, relief and rehabilitation, reconstruction and recovery, capacity development, knowledge management, research and development. It focuses on the areas where action is needed and the institutional mechanism through which such action can be channelised.

The NPDM addresses the concerns of all the sections of the society including differently-abled persons, women, children and other disadvantaged groups in terms of granting relief and formulating measures for rehabilitation of the persons affected by disasters. The issue of equity and inclusiveness has been accorded due consideration. It aims to bring in transparency and accountability in all aspects of disaster management through involvement of community, community based organizations, Panchayati Raj Institutions (PRIs), local bodies and civil society.

Funding arrangements for reconstruction

Financial assistance in the wake of natural calamities is provided in accordance with the schemes of relief funds. These schemes are based on the recommendations of the successive Finance Commissions. While the budgetary provision of these relief funds is dealt with by Ministry of Finance, the processing of request of the state government for these funds is done by the Ministry of Home Affairs (DM Division). The present scheme of State Disaster Response Fund (SDRF) and National Disaster Response Fund (NDRF) are based on the recommendations of the 13th Finance Commission, operative from 1st April 2010 to 31st March 2015.

State Disaster Response Fund: Section 48 (1) of Disaster Management Act 2005 provides for constitution of State Disaster Response Fund (SDRF) by the state governments. The Ministry of Home Affairs has issued the guidelines to the state for operation of SDRF. Allocations to the State Relief Funds have been made based on the recommendations of the successive Finance Commissions. While allocating the funds to various states for a period of five years the factors considered include the expenditure incurred by the state government on relief operations during the last about 10 years, vulnerability of the state to natural disasters and economic status of the state. Currently, as per the recommendations of the 13th Finance Commission, the GoI has approved an allocation of 33580.93 crore in the State Disaster Relief Fund to all the states, comprising of 25847.93 crore as central share and 7733.00 crore as state share. The scheme of SDRF provides for release of the central share SDRF in two equal installments in the months of June and December.

National Disaster Response Fund (NDRF): Section 46(1) of DMA Act 2005 provides for constitution of NDRF for meeting any threatening disaster management situation or disaster. The Government of India raised this Fund by levying the 'National Calamity Contingency Duty' on imported petrol and products, crude oil, motor cars, imported multi utility vehicles, two wheelers, mobile phones, pan masala and certain specific tobacco products. The collection for year 2009-10 was 3160.00 crore and was expected to be around 3900.00 crore in the financial

year 2010-2011. For the year 2011-12, the estimate is 4525.00 crores.

Additional financial assistance: Over and above the provisions of the SDRF, funding is provided from the NDRF in the wake of calamities of severe nature. On receipt of the memorandum from the affected states, an Inter Ministerial Central Team comprising of representatives of the central ministries/ departments is constituted and its report after examination by the Inter Ministerial Group (IMG) headed by Home Secretary is placed before the High Level Committee (HLC) for their consideration and approval of funds from NDRF. The composition of HLC is given in the Policy and Guideline, Chapter-2, which at present are headed by Finance Minister with Home Minister, Minister for Agriculture and Vice Chairman of Planning Commission as its member on the committee.

Monitoring of expenditure from relief funds

The Ministry of Home Affairs oversees the operations of SDRF and monitors its compliance with these guidelines. A format for monitoring the relief expenditure in accordance with the extant items and norms of assistance has been prescribed. A web based computerized tracking system has also been developed for monitoring the relief expenditure. The Accountant General of the State maintains the accounts of the SDRF. The Comptroller and Auditor General of India audits SDRF every year.

END