



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF CIVIL ENGINEERING

UNIT – I – Disaster Management – SCIA4001

I. Introduction to Disasters

1. Introduction

Disasters disrupt progress and destroy the hard-earned efforts. Often pushes the nation in quest for progress, back by several decades. Efficient management of disaster rather than mere response to their occurrence has received increased attention. India is vulnerable in varying degrees to a large number of natural as well as man-made disasters. 59% of land mass is prone to earthquake of moderate to very high intensity. Over 40 million hectares (12% of land) is prone to floods and river erosion. 5700km, out of 7516km coast line is prone to cyclones and tsunamis. 68% of cultivable area is vulnerable to drought and hilly areas are at land slide risk.

Vulnerability to disaster, emergencies of chemical, biological and nuclear origin also exists. Disaster risk can be related to expanding population, rapid urbanization, and industrialization, development in high risk zones, environmental degradation and climate change. The national policy enacted Disaster Management Act in 2005, envisages capacity building on various aspects of disaster management at different levels. It includes measures for disaster prevention, mitigation, preparedness, response and reconstruction.(Dr. Ramachandran)

India with its varied geographical, geological and climatic conditions is prone to different types of disasters. 5700km /7516km coastal line is prone to cyclones and tsunamis, 40 million hectare (12%) of land is prone to flood and river erosion, 58% of land prone to earthquakes, 68% of cultivable land is vulnerable to drought by non availability of river water. All hill areas at risk of land slide. Apart from this, we have radiological and nuclear radiation and environmental degradation due to abnormal dumping of greenhouse gases in the atmosphere by the use of fossil fuel for most of energy generation activities and transportation. Foundations to risk reductions are

- Planning in advance
 - Robust design methodology, to withstand higher level of risk and technological adoption such as tsunami warning system and Polari metric radar.
 - Implementing it in right time to reduce risk
 - Ensuring safety and security in case of disaster in separate incident or in a combination of multiple disasters.
- (Dr.APJ Abdul Kalam)

Disaster management is an important topic of discussion after 2001 Bhuj earth quake and 2004 Tsunami. In R&D GOI has implemented warning system for tsunami and storm surges. Tsunsmi vulnerability assessment, climate disaster resilience index, drought assessment and coastal chronic disasters such as shoreline erosion using satellite remote sensing data are carried out during last decade. DM is introduced in school curriculum. Networking of universities in Asia has helped in higher education in DM. various case studies done by many organizations in the past decade. It aimed to provide disaster education, training and capacity building. Tsunami impact studies along Chennai coast and Andaman Islands

After 26.12.2004, Indian Ocean tsunami event inundation mapping of tsunami water was carried out along Chennai coast in TN and assessment through field survey and micro paleontological investigation along islands. A quantitative assessment at Chennai was made by interating thematic details from satellite data. The study reveals that parameters such as shore bathymetry, land evaluation, nature of water waves, manmade protection measures play a vital role in controlling the effect of tsunami. They mapped the shore as low, moderate and high risk zone. It is useful for local govt, revenue, highways and town planning departments. Under the ministry of earth science, a national program on early warning system for tsunami was made. Several cities and towns along coast are facing fury of climate change and flooding the lowlying area. Chennai with high population is more vulnerable to climate disasters.

The **Disaster Management Act, 2005**, (23 December 2005) No. 53 of 2005, was passed by the Rajya Sabha, the upper house of the Parliament of India on 28 November, and by the Lok Sabha, the lower house of the Parliament, on 12 December 2005. It received the assent of The President of India on 9 January 2006. The Disaster Management Act, 2005 has 11 chapters and 79 sections. The Act extends to the whole of India. The Act provides for "the effective management of disasters and for matters connected therewith or incidental thereto."

National Authority

The Act calls for the establishment of National Disaster Management Authority (NDMA), with the Prime Minister of India as chairperson. The NDMA may have no more than nine members including a Vice-Chairperson. The tenure of the members of the NDMA shall be five years.^[4] The NDMA which was initially established on 30 May 2005 by an executive order was constituted under Section-3(1) of the Disaster Management Act, on 27 September 2006. The NDMA is responsible for "laying down the policies, plans and guidelines for disaster management" and to ensure "timely and effective response to disaster". Under section 6 of the Act it is responsible for laying "down guidelines to be followed by the State Authorities in drawing up the State Plans".

National Executive Committee

The Act under Section 8 enjoins the Central Government to Constitute a National Executive Committee (NEC) to assist the National Authority. The NEC is composed of Secretary level officers of the Government of India in the Ministries of home, agriculture, atomic energy, defence, drinking water supply, environment and forests, finance (expenditure), health, power, rural development, science and technology, space, telecommunication, urban development, and water resources, with the Home secretary serving as the Chairperson, ex officio. The Chief of the Integrated Defence Staff of the Chiefs of Staff Committee is an ex officio member of the NEC. The NEC under section of the Act is responsible for the preparation of the National Disaster Management Plan for the whole country and to ensure that it is "reviewed and updated annually".

State Disaster Management Authority

All State Governments are mandated under Section 14 of the act to establish a State Disaster Management Authority (SDMA). The SDMA consists of the Chief Minister of the State, who is the Chairperson, and no more than eight members appointed by the Chief Minister. State Executive Committee is responsible (Section 22) for drawing up the state disaster management plan, and implementing the National Plan. The SDMA is mandated under section 28 to ensure that all the departments of the State prepare disaster management plans as prescribed by the National and State Authorities.

District Disaster Management Authority

The Chairperson of District Disaster Management Authority (DDMA) will be the Collector or District Magistrate or Deputy Commissioner of the district. The elected representative of the area is member of the DDMA as an ex officio co-Chairperson, (Section 25).

National Disaster Response Force (NDRF)

The Section 44–45 of the Act provides for constituting a National Disaster Response Force "for the purpose of specialist response to a threatening disaster situation or disaster" under a Director General to be appointed by the Central Government.[1] Recently in September 2014 Kashmir-floods NDRF played a vital role in rescuing the armed forces and tourists, for which NDRF was awarded by the government of India.

Other Provisions

Section 42 of the Act calls for establishing a National Institute of Disaster Management. Section 46-50, mandates funds for Disaster Mitigation at various levels. The Act provides for civil and criminal liabilities for those who violate the provision of the Act.

Implementation

The implementation of the National Disaster Act, 2005 has been slow, and slack. On 22 July 2013 Indian Supreme Court Justices A K Patnaik and M Y Eqbal in response to a Public Interest Litigation issued notices to the Governments of Uttarakhand, Tamil Nadu, Odisha, Andhra Pradesh, Gujarat, Rajasthan Maharashtra and the Central government for alleged failure to implement the Disaster Management Act, 2005. The petitioner alleged that the non-implementation of the Disaster Management Act by the Government of Uttarakhand endangered the lives of citizens. He sought "reasonable ex-gratia assistance on account of loss of life, damage to houses and for restoration of means of livelihood to victims of flash floods in Uttarakhand under the Disaster Management Act".

Criticism of the Act

The act has been criticized for marginalizing Non-governmental organizations (NGOs), elected local representatives, local communities and civic group; and for fostering a hierarchical, bureaucratic, command and control, 'top down', approach that gives the central, state, and district authorities sweeping powers. It is also alleged that the "Act became a law almost at the will of the bureaucrats who framed it." Disasters have caused extensive damage to life and property and have adversely impacted economic development governments. Need to have a proactive, comprehensive and sustained approach to disaster management to reduce the detrimental effects of disaster.

India has been traditionally vulnerable to natural disasters such as floods, droughts, cyclones, earthquakes and landslides on account of its unique geo-climatic conditions. 60% of the landmass is prone to earthquakes of various intensities. Over 40 million hectares is prone to floods. 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought. About 30 million people are affected by disasters every year. United National General Assembly, in 1989, declared the decade 1990-2000 as the 'International Decade for Natural Disaster Reduction with the objective to reduce loss of lives and property and restrict socio-economic damage through concerted international action in developing countries. Super Cyclone in Orissa in 1999 and the Bhuj earthquake in Gujarat in 2001 underscored the need to adopt a multidimensional scientific, engineering, financial and social process. GOI have brought about a paradigm shift in the approach to disaster management. This approach proceeds from the conviction that development cannot be sustainable unless disaster mitigation is built into the development process. Mitigation has to be multidisciplinary spanning across all sectors of development. Approach has been translated into a National Disaster Framework covering institutional mechanisms, disaster prevention strategy, early warning system, disaster mitigation, preparedness and response and human resource development.

This disaster framework has been shared with all the state Governments and Union Territory administrations. Ministries and Departments of GOI, and the State Governments administrations have been advised to develop their respective framework talking the national framework as a broad guideline. Disaster management requires multidisciplinary and proactive approach because various measures for putting in place institutional and policy frame work. Our mission is vulnerability reduction to all types of disaster. Relief expenditure related to natural disaster is based on the recommendation given by the planning commission. Understand the relief expenditure through 5 years plan for disaster management. Relief expenditure related to natural disasters is based on the recommendations of successive finance commissions. The Calamity Relief Fund is used for meeting the expenditure for providing immediate relief to the victims of cyclone, droughts, earthquake, fire, flood and hailstorm. Expenditure on restoration of damaged capital works met from the normal budgetary heads. GOI contributes 75% of the total yearly allocation in the form of a non-plan grant and the balance amount is contributed by the state government.

State governments need to make full use of the existing plan schemes and give priority to implementation of such schemes that will help in overcoming the conditions created by the calamity. Each state needs to build a team, skilled personnel, make provision for specialized equipments, efficient communication network, and relevant, intelligent and easily accessible database. Disaster management means a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for prevention of danger, reduction of risk of any disaster or its severity or consequences, capacity building, preparedness to deal with any disaster, prompt response to any threatening disaster and assessing the severity or magnitude of effects. Policy states that State governments are primarily responsible for disaster management including prevention and mitigation, while the GOI provides assistance where necessary as per the norms laid down from time to time. Board objective of the policy are to minimize the loss of lives and social, private and community assets because of natural or man-made disasters, contribute to sustainable development and better standards of living for all.

The States have been advised to enact disaster management acts. These acts provide for adequate powers for authorities coordinating mitigation, preparedness and response as well as for mitigation and prevention measures required to be undertaken. Every State government after the issue of the notification under sub section (1) of section 3, establish a State disaster management authority for the state with such name as may be specified in the notification of the state government. When considers necessary, constitute an advisory committee, consisting of experts in the field of disaster management and having practical experience of disaster management to make recommendations on different aspects of disaster management to make recommendations on different aspects of disaster management. The state department of relief and rehabilitation may be converted into department of disaster management with the responsibility of looking at the whole cycle of disaster management such as prevention, mitigation, preparedness, response, relief rehabilitation steps for prevention, mitigation will need to be taken across a number of departments. The department of disaster management will coordinate the steps taken by the different department of the government.

2. DEFINITION

Disaster Management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to bring down the impact of disasters.

A disaster can be defined as an event that occurs in most cases suddenly and unexpectedly, causing severe disturbances to people or objects affected by it, and resulting in loss of life and harm to the health of the population, the destruction or loss of community property, and severe damage to the environment. This cause a disruption in the normal pattern of life, generating misfortune, helplessness and suffering, effects on the socioeconomic structure of a region or a country and the modification of the environment.

Disaster Management refers to how we can protect or preserve maximum number of lives and property during a natural disaster. Disaster management plans are multi-layered and are aimed to address such issues as floods, hurricanes, fires, bombings and even mass failures of utilities or the rapid spread of disease.

Disaster Management can be defined as the organization and *management* of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular *preparedness*, response and recovery in order to lessen the impact of *disasters*.

Disaster Management is a strategic planning and procedure that is administered and employed to protect critical infrastructures (also known as "critical assets") from severe damages when natural or human made calamities and catastrophic even occur.

Hazard may be defined as “a dangerous condition or event, that threat or have the potential for causing injury to life or damage to property or the environment.”

Vulnerability may be defined as “The extent to which a community, structure, services or geographic area is likely to be damaged or disrupted by the impact of particular hazard, on account of their nature, construction and proximity to hazardous terrains or a disaster prone area.”

Vulnerabilities can be categorized into

1. Physical and
2. socio-economic vulnerability.

Physical Vulnerability: It includes notions of who and what may be damaged or destroyed by natural hazard such as earthquakes or floods. It is based on the physical condition of people and elements at risk, such as buildings, infrastructure etc; and their proximity, location and nature of the hazard. It also relates to the technical capability of building and structures to resist the forces acting upon them during a hazard event.

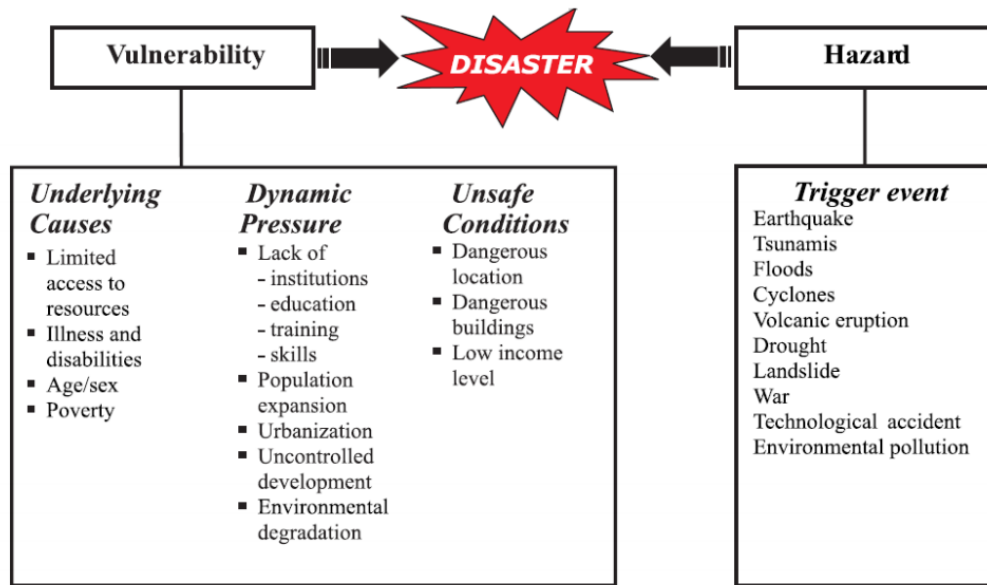
Socio-economic Vulnerability: The degree to which a population is affected by a hazard will not merely lie in the physical components of vulnerability but also on the socioeconomic conditions. The socio-economic condition of the people also determines the intensity of the impact. For example, people who are poor and living in the sea coast don't have the money to construct strong concrete houses.

Risk is a “measure of the expected losses due to a hazard event occurring in a given area over a specific time period. Risk is a function of the probability of particular Hazardous event and the losses each would cause.”

The level of risk depends Upon:-

- a) Nature of the hazard.
- b) Vulnerability of the elements which are affected.

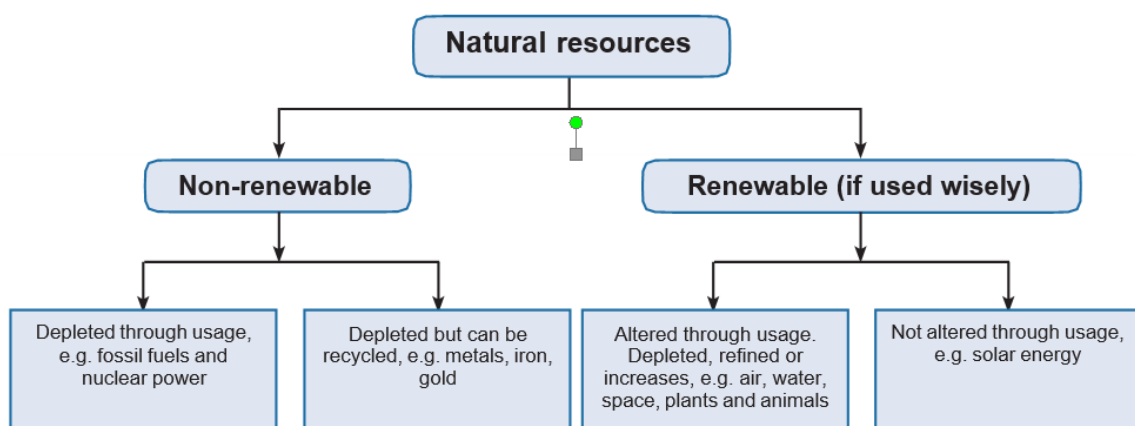
c) Economic value of those elements.



3. NATURAL RESOURCE AND ITS IMPORTANCE

Resources occur within the environment in their original and natural form. Natural resources are derived from the environment. While few of them are used for our survival like water, air, rest of them like coal, gas, oil is used for satisfying our daily needs. From forests to mountains to minerals to coastal shores and wetlands, each of this natural resource has its own importance.

There are two broad categories of natural resources: renewable and non-renewable.

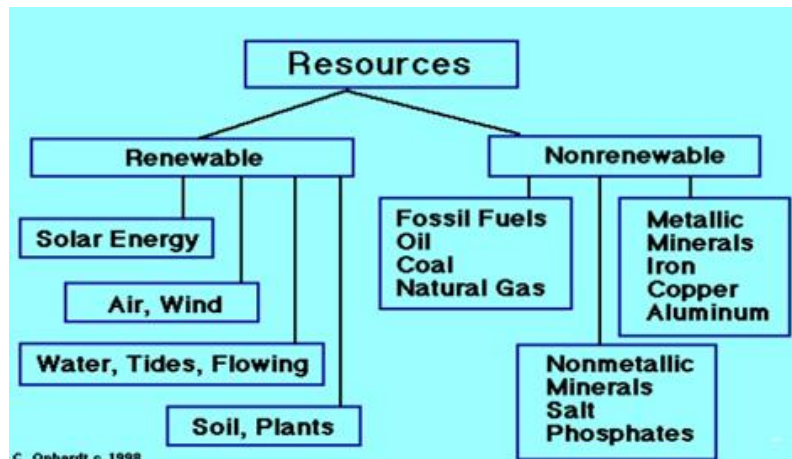


Renewable resources are resources that can grow again or replenish themselves. Trees, grass, other plants and animals are **organic** (living) resources. Water and certain gases like oxygen are **inorganic** (non-living).

Table 1: Threats to renewable resources

Renewable resources	Possible threats to renewable resources that can make them non-renewable
Fresh water	We are only able to use $\frac{1}{4}$ of the Earth's groundwater as the rest depends on steady rainfall over long periods of time. People can use up the groundwater in an area because of drought and insufficient rainfall to restore it. Water can be polluted by humans through improper sewage management, and by chemical spills. This makes the water unsafe and unusable.
Land/soil	The land can be overgrazed or the nutrients in the soil can be used up through improper farming practices. Natural vegetation can also be removed to make way for building projects. In these cases the soil cannot renew itself and plants cannot grow. This makes it easy for the rain to wash away the soil and for the wind to blow it away. We refer to this as soil erosion.
Oxygen/clean air	The rainforests are often called the lungs of the world because the trees absorb carbon dioxide, which cannot be used by the human body, and release oxygen into the air. When forests are destroyed or die through pollution they are not able to carry out this important function. As a result the quality of the air decreases. When chemicals pollute rivers the oxygen in the water is depleted and living things in the water die.
Trees and other plants (vegetation)	Trees and other plants play a vital role in maintaining the balance in an environment. Where trees and other plants are cut down and not replanted, the soil and climate of the natural environment change. As a result plants may die and animals may lose their habitat (the natural conditions or environment in which living things live).

Non-renewable natural resources are those that can be used up or finished and cannot be produced, re-grown or replenished in a reasonable amount of time. Examples include **fossil fuels** such as coal, crude oil, and natural gas. Minerals that are taken out of the Earth through mining such as diamonds, gold, silver and copper are also considered non-renewable. All these resources exist in a fixed amount in nature and they cannot be replaced as fast as they are being used up. The time will come in the near future when the world's oil reserves will be used up. It is for this reason that countries around the world are looking at alternative and renewable sources of energy. For example, energy from the sun or solar power, wind power, and power from the movement of water (hydropower) are possible new sources of energy that are practically infinite and that cannot be used up.



Top 10 Natural Resources in the World

Here are the **top 10 natural resources in the world**. They are already in danger from the current demands. Using alternate resources will help. Better resource management plans will help to preserve these resources for the future.

1. Water

On earth most is water, only about 2.5% is fresh water. From which even less is considered to be potable. Potable water is safe to drink and cook. Due to changes in the climate the amount of rain and ice melts affect the reserve supplies of freshwater. To educate and regulate the use of water as well as exploration into the technology of water farming become important.

2. Air

Clean air is necessary for the existence of human life, plants, animals. Polluted air degrades the environment and can cause health problems. Riding buses instead of using personalized vehicle will reduce air pollution.

3. Coal

Coal is estimated to last lesser than 200 years. China increases their demand on the coal. Coal is the major source of air pollutant. It is the cheapest sources of fuel for industrial applications.

4. Oil

For last 30-40 more years, Many are drilling in protected areas to look for undiscovered oil fields. Even if new fields and methods of oil extraction are discovered, geologists say that it is impossible for the Earth to have an unlimited supply of oil. It takes millions of years for oil to be created.

5. Natural gas

Natural gas reserves are slightly better than oil, last after 60 years. Gas is a much cleaner fuel source than oil, which has led to an increased level of consumption of it as an alternative fuel.

6. Phosphorus

Phosphorus comes from phosphate rock and is used to grow all of our food and crops. Phosphate rock is found in three places on Earth – US, China and Morocco. The projected lifespan of this resources is about 100 years. There is no significant research in developing new and safe fertilizers that can be effective replacements for phosphorus.

7. Other Minerals

Minerals like gypsum, bauxite, phosphate, bentonite, mica, titanium, zirconium are found in sea beds along the coastal plains. Rare earth elements like scandium and terbium are two of the earth powerful minerals that are used in wind turbines and electronic circuits in smart phones. Coastal plains contains deposits of potassium carbonate and rare elements like cerium and neodymium.

8. Iron

Iron is also in limited supply. It is made from silica which then heated to create the pig iron. Iron is the important natural resource on earth. It is used in stronger weapons, transportation and buildings. Both iron and steel are used in modern industries.

9. Soil

Soil is composed of many different particles and nutrients in the soil helps plants to grow. Soil used to provide shelter. A pile of garbage along with some soil when placed in worm compost bin, creates nutrient rich soil which helps in growth of plants and makes them healthy.

10. Forests and Timber

As the world population grows, more demand for housing and construction projects. This reduces open green spaces. Forests are necessary to preserve the ecology of the world that supports all of the natural resources and life. Forests also play a critical role in providing clean air and the lumber that builds the homes.

Apart from the list, rocks and sediments, rivers and lakes, mountains, farmland, wetlands, coastal shores, clays, sand, copper, manganese and stone are some of the other natural resources.

4. FRAGILE ECOSYSTEM

A fragile ecosystem is an ecosystem or community which lacks resilience (elasticity) or which is so heavily impacted by human event that it changes in unexpected and undesirable ways leading into the conditions that are termed as natural catastrophe (destruction).

Causes:

High dense of population, un planned industrialization, more urbanization, agriculture production, resource exploitation, more use of limited resources, lowered water table, polluting surroundings, decline of resource and high rise in price and poverty etc.

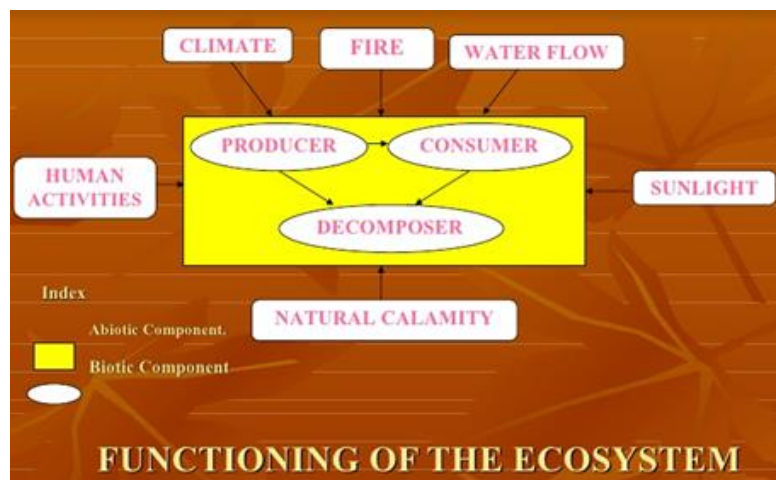


Figure 1: Functioning of the Ecosystem

5. CHARACTERISTICS AND TYPES OF DISASTER

Disasters can be caused by a natural phenomenon, by human, by technical failure of industrial or military systems. Cause of natural disasters cannot be neutralized since their origins can hardly be forestalled, in some cases they can be partially controlled. Earthquakes, volcanic eruptions, tidal waves (tsunamis) and hurricanes are examples of hazards that still cannot be prevented in practice, while floods, drought and landslides can be controlled or mitigated by applying drainage systems and stabilization of soils.



Here is a list of natural phenomena which can cause disasters or calamities:

- Earthquakes
- Tsunamis (tidal waves)
- Volcanic eruptions
- Hurricanes (storms, gales)
- Floods (slow, rapid)
- Massive land movements (landslides, collapses, mudflows)
- Droughts (desertification)
- Epidemics (biological)
- Pests Tornadoes
- Hurricanes
- Ice storms
- Blizzards (ice puyal)

Occasionally they generate other effects, as is the case with avalanches or mudslides, and the ash rains or lava flows that are directly associated with volcanic eruptions, or other kinds of phenomena that may be considered equivalents, such as tornados, tropical cyclones, or hurricanes. Most of these phenomena are cataclysmic (pralayam), that is, they occur suddenly and affect a not very large area. There are cases such as desertification and drought which occur over a long period and affect extensive areas in an almost irreversible way.

Man-made disasters can either be deliberate or due to a technical failure, which can trigger a series of other breakdowns and cause a major disaster. Man-made disasters include:

- Wars (terrorism)
- Explosions
- Fires
- Accidents
- Deforestation

- Contamination
- Collapses (impacts)

There exists a broad range of possible disasters of technological origin. At present, urban centers and ports are highly vulnerable to this type of disaster due to the high density of industry, building and mass cargo and passenger transport systems.

Oil spills, Toxic Spills, Wildfires, Transportation accidents (plane / bus / train), Bridge collapses, Mass shootings, Terrorist attacks, Bioterrorism, Pandemics / public health emergencies, Power outages/ blackouts, Violent public disturbance / civil disorder

Principles of Disaster Management:

- Disaster management is the responsibility of all spheres of government
- Disaster management should use resources that exist for a day-to-day purpose.
- Organizations should function as an extension of their core business
- Individuals are responsible for their own safety.
- Disaster management planning should focus on large-scale events
- Disaster management planning should recognize the difference between incidents and disasters.
- Disaster management operational arrangements are additional to and do not replace incident management operational arrangements
- Disaster management planning must take account of the type of physical environment and the structure of the population.
- Disaster management arrangements must recognise the involvement and potential role of non- government agencies

6. Effects of disasters

The effects of a disaster vary depending on the characteristics of the exposed elements and on the nature of the event itself. The elements at risk are the population, the environment and physical structures in housing, industry, trade and public services.

The effects can be classified as direct and indirect losses. Direct losses are related to physical damage, expressed in the number of victims, in damage to the infrastructure of public services, damage to buildings, the urban area, industry, trade and deterioration of the environment, that is, physical alteration of the habitat.

The indirect losses can be broken down into social effects such as the interruption of transportation, public services, and the media and the unfavorable image that a region may acquire with respect to others; and economic effects such as disruption of trade and industry as a consequence of the decline in production, disincentives for investment, and the expense of rehabilitation and reconstruction.

In developing countries, such as the countries of Latin America and the Caribbean, there have been disasters in which thousands of people have died and hundreds of millions of dollars have been lost in thirty seconds. Often the direct and indirect costs cannot be calculated, but amount to a huge percentage of a country's GDP. Due to the recurrence of different types of disasters, in the Region average annual losses due to natural disasters amount to a significant percentage of the GNP. This translates into impoverishment of the population and stagnation, because it entails unforeseen expenditures that affect the economic development of a country.

If existing levels of risk are to be reduced, preventive measures against the effects of disasters should be considered a fundamental part of comprehensive development at the regional and urban level. Given that disasters of the magnitude referred to above can have a serious impact on the development of affected communities, the cost of carrying out preventive measures ought to be measured against that of recovery from disasters, and risk analyses ought to be included in the assessment of the social and economic aspects of every region or country.

Wind disaster

Cyclones may be referred to as 'typhoons' or 'hurricanes'. ... Storms that start in the Southern Pacific between longitudes of 100-180 degrees east are called typhoons. These storms have the potential of causing massive destruction due to wind, rain, and flood damage.

India: Disaster Profile and Management. The Indian subcontinent is among the world's most disaster prone areas. Almost 85% of India's area is vulnerable to one or multiple hazard. Of the 28 states and 7 union territories, 22 are disaster-prone.

What is damage caused by wind?

Damaging winds are often called "straight-line" winds to differentiate the damage they cause from tornado damage. Strong thunderstorm winds can come from a number of different processes. Most thunderstorm winds that cause damage at the ground are a result of outflow generated by a thunderstorm downdraft.

Wind disasters (WDs) contribute to tremendous physical destruction, injury, loss of life, and economic damage. The effects of WDs may not be limited to wind damage, as concurrent heavy rains and flooding often wreak additional havoc. While there is some evidence pointing towards increasing number of destructive wind phenomena over the last few decades, these findings are at least partly due to the fact that our observational capabilities and recording of such events have improved markedly, leading to greater public awareness of severe weather events worldwide.

A natural disaster is defined as an event of nature that overwhelms local resources and threatens the function and safety of the community. Disasters are the ultimate test of a community's emergency response capability. Planning is very difficult due to the unpredictable character of natural disasters. A thoughtful and well-organized emergency strategy that is

flexible and adaptable in face of unforeseen circumstances is crucial. WDs may affect the economic, social, physical, and psychological fabric of any community.

In recent years, the combination of population growth and development along vulnerable coastal areas has led to an increase in hurricane-related deaths, injuries, and economic costs.[3] Most hurricane-driven mortality originates from secondary disasters (i.e., storm surges, flash flooding, and tornados) triggered by the original event. In coastal regions, the level of a hurricane's storm surge is one of the strongest predictors of mortality. Winds are the second deadliest aspect of a hurricane, often causing property damage (collapse of houses and other man-made structures). In a hurricane, many injuries are caused by airborne objects. The most common non-fatal traumatic injury pattern in a hurricane consists of superficial lacerations from airborne glass and/or other debris

Tornados

Tornados usually develop during intense thunderstorms classified as “supercell thunderstorms”. Within these storms, tornados result from updrafts created by solar warming of the earth's surface. These updrafts then develop into a vortex with strong rotary winds and violent pressure changes. In an average year, 800 tornados are reported in the United States. Due to the relatively brief or absent warning, a tornado gives a community little time to prepare or seek shelter, and the morbidity and mortality is proportionally higher compared to other WDs.

Tornado outbreaks are among some of the most destructive weather phenomena. During the last 50 years, tornados have been documented to cause at least 9,000 deaths and over 70,000 injuries. During the same period of time, the cumulative monetary damages exceeded \$20 trillion, and almost 100,000 applications for federal disaster assistance have been submitted as a result of tornados between 1970-1980. In the United States, May tends to be the peak month for tornado occurrence in the Southern plains states, while the upper Midwest and Great Lakes region suffer the highest frequency in the summer months.

Cyclones/Hurricanes

Cyclones may be referred to as ‘typhoons’ or ‘hurricanes’. A cyclone is an atmospheric system characterized by the rapid inward circulation of an air mass around a low-pressure center, accompanied by destructive weather. These weather events rotate clockwise in the Southern hemisphere and counterclockwise in the Northern hemisphere and typically number 10-15 per annum. Tropical cyclones in the North Atlantic, the North east Pacific east of the International Date Line or the South Pacific with sustained winds >74 mph are termed hurricanes. Storms that start in the Southern Pacific between longitudes of 100-180 degrees east are called typhoons. These storms have the potential of causing massive destruction due to wind, rain, and flood damage.

The United States ranks first in the number of annual hurricane impacts. For the period 1900-2004, hurricane mortality for the United States was approximately 15,000. Interestingly,

half of these deaths occurred in 1900 when the deadliest hurricane (and the deadliest natural disaster) in U.S. history killed 7,200 people in Galveston, Texas. Three other hurricanes in the U.S. have been especially devastating-1,836 people perished in a hurricane that pummeled Florida's Lake Okeechobee region in 1928, 408 people died in the 1935 Florida Keys Labor Day "Storm of the Century", the most intense hurricane ever recorded for the United States, and approximately 1,000 people died as a result of Hurricane Katrina in 2005.

In developing nations, cyclone mortality continues to be significant, with deaths occurring primarily during the storm surge of the cyclone impact phase. This is in contrast with developed nations, where tropical cyclone mortality has declined markedly, and the majority of deaths now occur in the post-impact period, Typhoon Saomei in Southern China had a death rate 530 times that of Hurricane Andrew. In a recent article describing Saomei, injuries were highest with the first peak of wind speed and were associated with living in houses directly facing the sea. Other risks included failure to reinforce doors or windows, staying in a damaged room, near a window or door

Water Disaster

Water and Disasters. UN-Water. When disaster strikes, it usually manifests itself through water. Floods, landslides, tsunamis, storms, heat waves, cold spells, droughts and waterborne disease outbreaks are all becoming more frequent and more intense.

Water-related Disasters

Water-related hazards or hydro-hazards are the results of complex interactions in the ocean atmosphere-land process cascade. Floods and droughts are expected to increase due to global warming. Increased hydro-hazard impacts and costs are attributable to such factors as increased event frequency and magnitude, unplanned urbanization, degradation of ecosystem services, vulnerable livelihoods, and inaccurate public perception of risk. The challenge is to identify

Preventing water-related disasters

Water is perhaps the most crucial natural resource, and yet it can wreak havoc when unleashed during tsunamis and floods. Mercy Corps works with Xylem Watermark, the social investment arm of the global water technology provider, to shore up communities in the world's toughest places against the threat of water-related disasters.

Disaster risk reduction programs, gaining more traction as climate change increases the global water crisis, often include managing floodplains, engineering barriers along river banks and building bridges to evacuate frequently flooded areas. These programs, now under way in Indonesia (pictured), Colombia, China, Ethiopia, Nepal and Tajikistan, can save the greatest number of lives by addressing water-related risks before disaster strikes.

Drought disaster

India has experienced 22 major droughts during the last 131 years. The 2002 drought, one of the severest in India, affected 56 per cent of its geographical area, the livelihoods of 300 million people and 150 million cattle in 18 states.

Drought in India has resulted in tens of millions of deaths over the course of the 18th, 19th, and 20th centuries. Indian agriculture is heavily dependent on the climate of India: a favorable southwest summer monsoon is critical in securing water for irrigating Indian crops. In some parts of India, the failure of the monsoons result in water shortages, resulting in below-average crop yields. This is particularly true of major drought-prone regions such as southern and eastern Maharashtra northern Karnataka, Andhra Pradesh, Odisha, Gujarat, Telangana and Rajasthan.

What is drought disaster?

A drought is a period of below-average precipitation in a given region, resulting in prolonged shortages in the water supply, whether atmospheric, surface water or ground water. A drought can last for months or years, or may be declared after as few as 15 days.

Which is the most drought prone state of India?

- Tirunelveli district, south of Vaigai River in Tamil Nadu.
- Coimbatore area in Kerala.
- Saurashtra and Kutch regions in Gujarat.
- Mirzapur plateau and Palamu regions in Uttar Pradesh.
- Purulia district of West Bengal.
- Kalahandi region of Orissa.

What are the causes of drought?

- Land and water temperatures cause drought. ...
- Air circulation and weather patterns also cause drought. ...
- Soil moisture levels also contribute to drought. ...
- Drought can also be a supply and demand of water issue

How can we overcome drought in India?

There are several things you can do to ease your plants through a dry summer and even improve your landscape at the same time.

1. Assess your priorities.
2. Identify root zones.
3. Try a root irrigator.
4. Check soil moisture.

5. Irrigate slowly. ...
6. Build watering basins.
7. Use soaker hoses.
8. Apply mulch.
9. Modify lawn care.
10. Be water-wise with pots
11. Harvest rain

Tsunamis

Tsunamis are giant waves caused by earthquakes or volcanic eruptions under the sea. Out in the depths of the ocean, tsunami waves do not dramatically increase in height. But as the waves travel inland, they build up to higher and higher heights as the depth of the ocean decreases



What is the biggest tsunami ever recorded?

World's Biggest Tsunami: The largest recorded tsunami with a wave 1720 feet tall in Lituya Bay, Alaska.

How tsunamis are caused?

A tsunami is a series of large waves generated by an abrupt movement on the ocean floor that can result from an earthquake, an underwater landslide, a volcanic eruption or - very rarely - a large meteorite strike. However, powerful undersea earthquakes are responsible for most tsunamis

What are the 4 main causes of tsunamis?

Some of the major reasons for formation of tsunamis are as follows:

- Undersea earthquakes:
- Landslides:

- Volcanic Eruptions:
- Meteorites and Asteroids

Why are tsunamis so dangerous?

Very large tsunamis can cause damage to coastal regions thousands of miles away from the earthquake that caused them. Beaches, lagoons, bays, estuaries, tidal flats and river mouths are the most dangerous places to be. It is rare for a tsunami to penetrate more than a mile inland.

How bad are tsunamis?

A tsunami is a series of ocean waves caused by an underwater earthquake, landslide, or volcanic eruption. More rarely, a tsunami can be generated by a giant meteor impact with the ocean. These waves can reach heights of over 100 ft. About 80% of tsunamis happen within the Pacific Ocean's "Ring of Fire"

How can tsunami be controlled?

1. Avoid building or living in buildings within several hundred feet of the coastline. ...
2. If you do live in a coastal area, elevate your home to help reduce damage. ...
3. Take precautions to prevent flooding.
4. Have an engineer check your home and advise about ways to make it more resistant to tsunami water.

Tsunami Preparedness

Tsunamis are large ocean waves generated by major earthquakes beneath the ocean floor or major landslides into the ocean. Rising to several feet or higher, they can strike the coast with devastating force. People on beaches or in low coastal areas, such as estuaries and rivers, need to be aware that a tsunami could arrive within minutes of a severe earthquake – and the danger period can continue for many hours. Tsunamis can occur any time of year, day or night.

- To escape a tsunami, go as high and as far as you can – ideally to a spot 100 feet above sea level or 2 miles away.
- Every foot inland or upward may make a difference!
- If you can see the wave, you are too close for safety.

Man-made disasters

Man-made disasters can include hazardous material spills, fires, groundwater contamination, transportation accidents, structure failures, mining accidents, explosions and acts of terrorism.

Forest fires increase carbon dioxide levels in the atmosphere, contributing to the greenhouse effect and climate change. In addition, ashes destroy much of the nutrients and erode the soil, causing flooding and landslides.

What are the main causes of forest fire?

Humans and Wildfire. As many as 90 percent of wildland fires in the United States are caused by humans. Human-caused fires result from campfires left unattended, the burning of debris, negligently discarded cigarettes, and intentional acts of arson.

What are the effects of forest fire?

But fire can be deadly, destroying homes, wildlife habitat and timber, and polluting the air with emissions harmful to human health. Fire also releases carbon dioxide— a key greenhouse gas—into the atmosphere. Fire's effect on the landscape may be long-lasting.

What is forest fire how can it be controlled?

Fire is a natural part of both forest and grassland ecology and controlled fire can be a tool for foresters. Hazard reduction or controlled burning is conducted during the cooler months to reduce fuel buildup and decrease the likelihood of serious hotter fires.

What is forest fire disaster?

A forest fire is a natural disaster consisting of a fire which destroys a forested area, and can be a great danger to people who live in forests as well as wildlife. Forest fires are generally started by lightning, but also by human negligence or arson, and can burn thousands of square kilometers.

A wildfire or wildland fire is a fire in an area of combustible vegetation that occurs in rural areas. Depending on the type of vegetation where it occurs, a wildfire can also be classified more specifically as a brush fire, bush fire, desert fire, forest fire, grass fire, hill fire, peat fire, vegetation fire.

Earth is an intrinsically flammable planet owing to its cover of carbon-rich vegetation, seasonally dry climates, atmospheric oxygen, and widespread lightning and volcanic ignitions. Wildfires can be characterized in terms of the cause of ignition, their physical properties, the combustible material present, and the effect of weather on the fire. Wildfires can cause damage to property and human life, but they have many beneficial effects on native vegetation, animals, and ecosystems that have evolved with fire. High-severity wildfire creates complex early seral forest habitat (also called “snag forest habitat”), which often has higher species richness and diversity than unburned old forest. Many plant species depend on the effects of fire for growth and reproduction. However, wildfire in ecosystems where wildfire is uncommon or where non-native vegetation has encroached may have negative ecological effects. Wildfire behaviour and severity result from the combination of factors such as available fuels, physical setting, and weather. Analyses of historical meteorological data and national fire records in western North America show the primacy of climate in driving large regional fires via wet periods that create substantial fuels or drought and warming that extend fire weather.

Strategies of wildfire prevention, detection, and suppression have varied over the years. One common and inexpensive technique is controlled burning: permitting or even igniting smaller fires to minimize the amount of flammable material available for a potential wildfire. Wildland fire use is the cheapest and most ecologically appropriate policy for many forests. Wildfire itself is reportedly "the most effective treatment for reducing a fire's rate of spread, fireline intensity, flame length, and heat per unit of area" according to Jan Van Wagtendonk, a biologist at the Yellowstone Field Station. Building codes in fire-prone areas typically require that structures be built of flame-resistant materials and a defensible space be maintained by clearing flammable materials within a prescribed distance from the structure.

FOREST FIRES IN INDIA

The most common hazard in forests is forests fire. Forests fires are as old as the forests them self. They pose a threat not only to the forest wealth but also to the entire regime to fauna and flora seriously disturbing the bio-diversity and the ecology and environment of a region. During summer, the forests become littered with dry senescent leaves and twinges, which could burst into flames ignited by the slightest spark. The Himalayan forests, particularly, Garhwal Himalayas have been burning regularly during the last few summers, with colossal loss of vegetation cover of that region.

Causes of Forest Fire

Forest fires are caused by Natural causes as well as Man made causes

Natural causes- Many forest fires start from natural causes such as lightning which set trees on fire. However, rain extinguishes such fires without causing much damage. High atmospheric temperatures and dryness (low humidity) offer favorable circumstance for a fire to start.

Man made causes- Fire is caused when a source of fire like naked flame, cigarette, electric spark or any source of ignition comes into contact with inflammable material.

Classification of Forest Fire: Forest fire can broadly be classified into three categories;

- Natural or controlled forest fire.
- Forest fires caused by heat generated in the litter and other biomes in summer through carelessness of people (human neglect) and
- Forest fires purposely caused by local inhabitants.

Types of Forest Fire

There are two types of forest fire i) Surface Fire and ii) Crown Fire

Surface Fire-A forest fire may burn primarily as a surface fire, spreading along the ground as the surface litter (senescent leaves and twigs and dry grasses etc) on the forest floor and is engulfed by the spreading flames.

Crown Fire- The other type of forest fire is a crown fire in which the crown of trees and shrubs burn, often sustained by a surface fire. A crown fire is particularly very dangerous in a coniferous forest because resinous material given off burning logs burn furiously. On hill slopes, if the fire starts downhill, it spreads up fast as heated air adjacent to a slope tends to flow up the slope spreading flames along with it. If the fire starts uphill, there is less likelihood of it spreading downwards.

Vulnerability

The youngest mountain ranges of Himalayas are the most vulnerable stretches of the world susceptible to forest fires. The forests of Western are more frequently vulnerable to forest fires as compared to those in Eastern Himalayas. This is because forests of Eastern Himalayas grow in high rain density. With large scale expansion of chirr (Pine) forests in many areas of the Himalayas the frequency and intensity of forest fires has increased.

Preparedness and Mitigation Measures

Forest fires are usually seasonal. They usually start in the dry season and can be prevented by adequate precautions. Successive Five Year Plans have provided funds for forests fighting. During the British period, fire was prevented in the summer through removal of forest litter all along the forest boundary. This was called "Forest Fire Line"

This line used to prevent fire breaking into the forest from one compartment to another. The collected litter was burnt in isolation. Generally, the fire spreads only if there is continuous supply of fuel (Dry vegetation) along its path. The best way to control a forest fire is therefore, to prevent it from spreading, which can be done by creating firebreaks in the shape of small clearings of ditches in the forests.

Precautions

1. The followings are the important precautions against fire:
2. To keep the source of fire or source of ignition separated from combustible and inflammable material.
3. To keep the source of fire under watch and control.

4. Not allow combustible or inflammable material to pile up unnecessarily and to stock the same as per procedure recommended for safe storage of such combustible or inflammable material.
5. To adopt safe practices in areas near forests viz. factories, coalmines, oil stores, chemical plants and even in household kitchens.
6. To incorporate fire reducing and firefighting techniques and equipment while planning a building or coal mining operation.
7. In case of forest fires, the volunteer teams are essential not only for firefighting but also to keep watch on the start of forest and sound an alert
8. To arrange firefighting drills frequently.

Impacts of Forest Fires on Biological Environment:

Forest fires also pose serious health hazards by producing smoke and noxious gases, as the events in Indonesia after the forest fires on the islands of Sumatra and Borneo in 1977. The burning of vegetation gives not only carbon dioxide but also a host of other, noxious gases (Green house gases) such as carbon monoxide, methane, hydrocarbons, nitric oxide and nitrous oxide, that lead to global warming and ozone layer depletion. Consequently, thousands of people suffered from serious respiratory problems due to these toxic gases. Burning forests and grasslands also add to already serious threat of global warming. Recent measurement suggest that biomass burning may be a significant global source of methyl bromide, which is an ozone depleting chemical.

NUCLEAR DISASTER

Nuclear explosions produce both immediate and delayed destructive effects. Immediate effects (blast, thermal radiation, prompt ionizing radiation) are produced and cause significant destruction within seconds or minutes of a nuclear detonation.



What is a nuclear disaster definition?

A nuclear and radiation accident is defined by the International Atomic Energy Agency (IAEA) as "an event that has led to significant consequences to people, the environment or the facility."

What are the main causes of nuclear disasters?

A core damage incident can occur even after a reactor is shut down because the fuel continues to produce decay heat. A core damage accident is caused by the loss of sufficient cooling for the nuclear fuel within the reactor core

What are the effects of nuclear disaster?

Apart from the damage caused by fires and explosions, accidents also release radioactive materials which can cause radiation sickness. Radiation exposure above a certain threshold, usually only received by workers and emergency teams in a stricken plant, causes acute radiation syndrome within hours of exposure

How does a nuclear disaster occur?

When a reactor is turned on, the uranium nuclei undergo nuclear fission, splitting into lighter nuclei and producing heat and neutrons. ... If they begin to melt the nuclear reactor core and the steel containment vessel, and release radiation into the environment, nuclear meltdown occurs.

How can we prevent nuclear explosions?

1. Get inside the nearest building to avoid radiation. ...
2. Stay inside for 24 hours unless local authorities provide other instructions. ...
3. Tune into any media available for official information such as when it is safe to exit and where you should go.

Nuclear and radiation accident is defined by the International Atomic Energy Agency (IAEA) as "an event that has led to significant consequences to people, the environment or the facility." Examples include lethal effects to individuals, radioactive isotope to the environment, or reactor core melt." The prime example of a "major nuclear accident" is one in which a reactor core is damaged and significant amounts of radioactive isotopes are released, such as in the Chernobyl disaster in 1986.

The impact of nuclear accidents has been a topic of debate since the first nuclear reactors were constructed in 1954, and has been a key factor in public concern about nuclear facilities. Technical measures to reduce the risk of accidents or to minimize the amount of radioactivity released to the environment have been adopted, however human error remains, and "there have been many accidents with varying impacts as well near misses and incidents". As of 2014, there have been more than 100 serious nuclear accidents and incidents from the use of nuclear power. Fifty-seven accidents have occurred since the Chernobyl disaster, and about 60% of all nuclear-related accidents have occurred in the USA. Serious nuclear power

plant accidents include the Fukushima Daiichi nuclear disaster (2011), Chernobyl disaster (1986), Three Mile Island accident (1979) and the SL-1 accident (1961). Nuclear power accidents can involve loss of life and large monetary costs for remediation work.

Biological disaster refers to calamity caused by the exposure of living organisms to germs and toxic substances. For instance, spread of a disease, a virus, an epidemic, and a locust plague. It belongs to the class of natural disasters.

What are some examples of biological hazards?

Sources of biological hazards may include bacteria, viruses, insects, plants, birds, animals, and humans. These sources can cause a variety of health effects ranging from skin irritation and allergies to infections (e.g., tuberculosis, AIDS), cancer and so on.

What are the causes of biological disasters?

It can also include substances harmful to other animals. History: Major Events across In general, biological disasters develop when some form of malignant agent (usually bacteria or virus) enters a population that is vulnerable to its actions and which lives Biological Agents as Causes of Mass destruction

What is biological disaster?

Biological hazards, also known as biohazards, refer to biological substances that pose a threat to the health of living organisms, primarily that of humans. This can include samples of a microorganism, virus or toxin (from a biological source) that can affect human health.

Biological disasters are causative of process or phenomenon of organic origin or conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. Examples of biological disasters include outbreaks of epidemic diseases, plant or animal contagion, insect or other animal plagues and infestation. Biological disasters may be in the form of:-

Epidemic

Epidemic affecting a disproportionately large number of individuals within a population, community, or region at the same time, examples being Cholera, Plague, Japanese Encephalitis (JE)/Acute Encephalitis Syndrome (AES); or,

Pandemic

Pandemic is an epidemic that spreads across a large region, that is, a continent, or even worldwide of existing, emerging or reemerging diseases and pestilences, example being Influenza H1N1

Plan for Family Biological Disaster.

Preparation by ensuring Prevention measures:-

- Personal cleanliness - daily bath, don't grow long nails and wear clean clothes.
- Hand Hygiene (Wash hands with soap and water before preparing food or eating, after passing stools, coughing or sneezing)
- Eat nutritious and balanced food.
- Immunisation state should be upto date.
- Prevent overcrowding.
- Good ventilation.
- Protect from hot and cold weather.
- Health Education.
- Surveillance.

Diarrhoeal Group of Diseases Including Cholera

Respiratory Group of Diseases like Tuberculosis, Influenza, Chickenpox, Meningitis

Mosquito Borne Diseases like Malaria, Dengue, Filariasis, Chikungunya

What is chemical disaster definition?

A chemical accident is the unintentional release of one or more hazardous substances which could harm human health or the environment. Chemical hazards are systems where chemical accidents could occur under certain circumstances

What are the causes of chemical disaster?

There are 4 main causes of accidents in a chemical plant: human error, improper training, manufacturing defects, and improper maintenance.

- Human Error. A majority of the industrial accidents that occur every year are a result of human error. ...
- Improper Training. ...
- Manufacturing Defects. ...
- Improper Maintenance.

What are the effects of chemical disaster?

Disasters: Chemical Accidents and Spills. By their nature, the manufacture, storage, and transport of chemicals are accidents waiting to happen. Chemicals can be corrosive, toxic, and they may react, often explosively. The impacts of chemical accidents can be deadly, for both human beings and the environment.

What is chemical disaster management?

It has been realised that effective Chemical Disaster Management (CDM) is possible by the adoption of preventive and mitigation strategies as most chemical disasters are preventable in comparison to natural disasters that are difficult to predict and prevent.

What are the various causes and adverse effects of chemical...

- From Industrial Wastes. When industrial wastes containing poisonous chemicals are dumped carelessly, they contaminate vegetation, surface water as well as ground water supplies. ...
- Accidents in Chemical Factories. ...
- Excessive Use of Fertilizers. ...
- Use of Pesticides. ...
- Release of Gaseous Pollutants in Air. ...
- Pollution Caused by Dust.

What is an example of chemical pollution?

Chemicals can pollute our air, water, soil, etc. The fossil fuels that are commonly used in our automobiles generate gases and particulate matter. One gas of particular interest is carbon dioxide due to its greenhouse potential. ... DDT pollution is an often-cited example of chemical pollution of soil and water.

Chemical, being at the core of modern industrial systems, has attained a serious concern for disaster management within government, private sector and community at large. Chemical disasters may be traumatic in their impacts on human beings and have resulted in the casualties and also damages nature and property. The elements which are at highest risks due to chemical disaster primarily include the industrial plant, its employees & workers, hazardous chemicals vehicles, the residents of nearby settlements, adjacent buildings, occupants and surrounding community. Chemical disasters may arise in number of ways, such as:-

1. Process and safety systems failures
 - Human errors
 - Technical errors
 - Management errors
2. Induced effect of natural calamities
3. Accidents during the transportation
4. Hazardous waste processing/ disposal
5. Terrorist attack/ unrest leading to sabotage

Status of Chemical Disaster Risk in India

India has witnessed the world's worst chemical (industrial) disaster "Bhopal Gas Tragedy" in the year 1984. The Bhopal Gas tragedy was most devastating chemical accident in history, where over 2500 people died due to accidental release of toxic gas Methyl Iso Cyanate (MIC).

Such accidents are significant in terms of injuries, pain, suffering, loss of lives, damage to property and environment. India continued to witness a series of chemical accidents even after Bhopal had demonstrated the vulnerability of the country. Only in last decade, 130 significant chemical accidents reported in India, which resulted into 259 deaths and 563 number of major injured.

There are about 1861 Major Accident Hazard units, spread across 298 districts and 25 states & 3 Union Territories, in all zones of country. Besides, there are thousands of registered and hazardous factories and un-organized sectors dealing with numerous range of hazardous material posing serious and complex levels of disaster risks.

Safety initiatives taken in India to address chemical risk

The comprehensive legal/ institutional framework exists in our country. A number of regulations covering the safety in transportation, liability, insurance and compensations have been enacted.

Following are the relevant provisions on chemical disaster management, prevailing in country:-

1. Explosives Act 1884
2. Petroleum Act 1934
3. Factories Act 1948
4. Insecticides Act 1968
5. Environment Protection Act 1986
6. Motor Vehicles Act 1988
7. Public Liability Insurance Act 1991
8. Disaster Management Act 2005

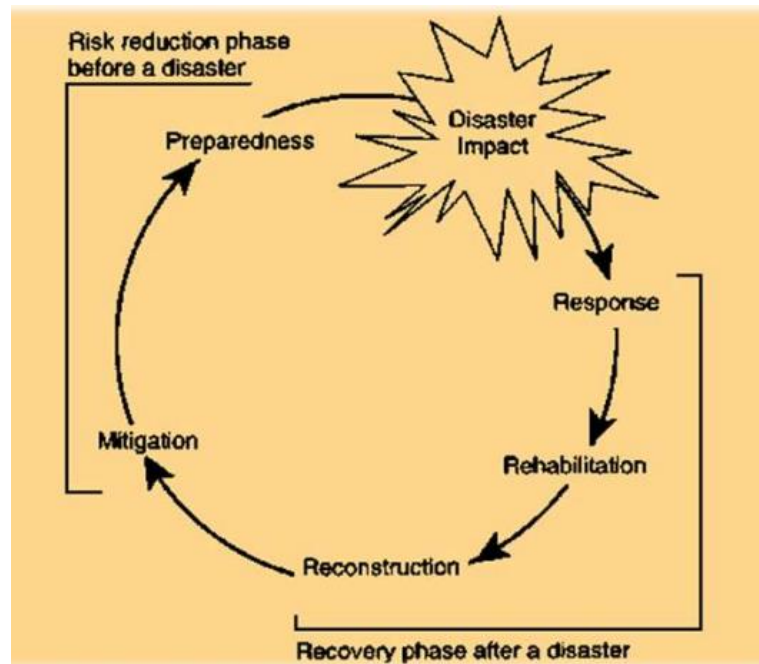
Government of India has further reinforced the legal framework on chemical safety and management of chemical accidents by enacting new rules such as MSIHC Rules, EPPR Rules, SMPV Rules, CMV Rules, Gas Cylinder Rules, Hazardous Waste Rules, Dock Workers Rules and by way of amendments to them.

The National Disaster Management Authority (NDMA) of India had come out with very specific guidelines on Chemical Disaster Management. The guidelines have been prepared to provide the directions to ministries, departments and state authorities for the preparation of their detailed disaster management plans. These guidelines call for a proactive, participatory, multi-disciplinary and multi-sectoral approach at various levels for chemical disaster preparedness and response. Further, NDMA has provided specific inputs to the GOM for avoidance of future chemical disasters in the country, along with suggested amendments on the existing framework. NDMA is also working on revamping of CIFs (Chief Inspectorate of Factories) to strengthen chemical safety in India. In addition, MoEF and NDMA are in process of finalizing the National Action Plan on Chemical Industrial Disaster Management (NAP-CIDM), which will act as the roadmap for chemical disaster management in India.

7. The Disaster Management Cycle

Goals of Disaster Management:

- 1) Reduce, or avoid, losses from hazards;
- 2) Assure prompt assistance to victims;
- 3) Achieve rapid and effective recovery.



Corina Warfield

Disaster management aims to reduce, or avoid, the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery. The Disaster management cycle illustrates the ongoing process by which governments, businesses, and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred. Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle. The complete disaster management cycle includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure.

The mitigation and preparedness phases occur as disaster management improvements are made in anticipation of a disaster event. Developmental considerations play a key role in contributing to the mitigation and preparation of a community to effectively confront a disaster. As a disaster occurs, disaster management actors, in particular humanitarian organizations, become involved in the immediate response and long-term recovery phases. The four disaster management phases illustrated here do not always, or even generally, occur in isolation or in this precise order. Often phases of the cycle overlap and the length of each phase greatly depends on the severity of the disaster.

- Mitigation - Minimizing the effects of disaster.
Examples: building codes and zoning; vulnerability analyses; public education.
- Preparedness - Planning how to respond.
Examples: preparedness plans; emergency exercises/training; warning systems.
- Response - Efforts to minimize the hazards created by a disaster.
Examples: search and rescue; emergency relief.
- Recovery - Returning the community to normal.
Examples: temporary housing; grants; medical care.

Sustainable Development

Developmental considerations contribute to all aspects of the disaster management cycle. One of the main goals of disaster management, and one of its strongest links with development, is the promotion of sustainable livelihoods and their protection and recovery during disasters and emergencies. Where this goal is achieved, people have a greater capacity to deal with disasters and their recovery is more rapid and long lasting. In a development oriented disaster management approach, the objectives are to reduce hazards, prevent disasters, and prepare for emergencies. Therefore, developmental considerations are strongly represented in the mitigation and preparedness phases of the disaster management cycle. Inappropriate development processes can lead to increased vulnerability to disasters and loss of preparedness for emergency situations.

Mitigation

Mitigation activities actually eliminate or reduce the probability of disaster occurrence, or reduce the effects of unavoidable disasters. Mitigation measures include building codes; vulnerability analyses updates; zoning and land use management; building use regulations and safety codes; preventive health care; and public education.

Mitigation will depend on the incorporation of appropriate measures in national and regional development planning. Its effectiveness will also depend on the availability of information on hazards, emergency risks, and the countermeasures to be taken. The mitigation phase, and indeed the whole disaster management cycle, includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure.

Preparedness

The goal of emergency preparedness programs is to achieve a satisfactory level of readiness to respond to any emergency situation through programs that strengthen the technical and managerial capacity of governments, organizations, and communities. These measures can be described as logistical readiness to deal with disasters and can be enhanced by having response mechanisms and procedures, rehearsals, developing long-term and short-term strategies, public education and building early warning systems. Preparedness can also take the form of ensuring that strategic reserves of food, equipment, water, medicines and other essentials are maintained in cases of national or local catastrophes.

During the preparedness phase, governments, organizations, and individuals develop plans to save lives, minimize disaster damage, and enhance disaster response operations. Preparedness measures include preparedness plans; emergency exercises/training; warning systems; emergency communications systems; evacuations plans and training; resource inventories; emergency personnel/contact lists; mutual aid agreements; and public information/education. As with mitigations efforts, preparedness actions depend on the incorporation of appropriate measures in national and regional development plans. In addition, their effectiveness depends on the availability of information on hazards, emergency risks and the countermeasures to be taken, and on the degree to which government agencies, non-governmental organizations and the general public are able to make use of this information.

Humanitarian Action

During a disaster, humanitarian agencies are often called upon to deal with immediate response and recovery. To be able to respond effectively, these agencies must have experienced leaders, trained personnel, adequate transport and logistic support, appropriate communications, and guidelines for working in emergencies. If the necessary preparations have not been made, the humanitarian agencies will not be able to meet the immediate needs of the people.

Response

The aim of emergency response is to provide immediate assistance to maintain life, improve health and support the morale of the affected population. Such assistance may range from providing specific but limited aid, such as assisting refugees with transport, temporary shelter, and food, to establishing semi-permanent settlement in camps and other locations. It also may involve initial repairs to damaged infrastructure. The focus in the response phase is on meeting the basic needs of the people until more permanent and sustainable solutions can be found. Humanitarian organizations are often strongly present in this phase of the disaster management cycle.

Recovery

As the emergency is brought under control, the affected population is capable of undertaking a growing number of activities aimed at restoring their lives and the infrastructure that supports them. There is no distinct point at which immediate relief changes into recovery and then into long-term sustainable development. There will be many opportunities during the recovery period to enhance prevention and increase preparedness, thus reducing vulnerability. Ideally, there should be a smooth transition from recovery to on-going development.

Recovery activities continue until all systems return to normal or better. Recovery measures, both short and long term, include returning vital life-support systems to minimum operating standards; temporary housing; public information; health and safety education; reconstruction; counseling programs; and economic impact studies. Information resources and services include data collection related to rebuilding, and documentation of lessons learned.

Disaster Management Cycle (National Disaster Management Authority- GOI)

A holistic and integrated approach will be evolved towards disaster management with emphasis on building strategic partnerships at various levels. The themes underpinning the policy are:

- Community based DM, including last mile integration of the policy, plans and execution.
- Capacity development in all spheres.
- Consolidation of past initiatives and best practices.
- Cooperation with agencies at national and international levels.
- Multi-sectoral synergy.



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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF CIVIL ENGINEERING

UNIT – II – Disaster Management – SCIA4001

II. Disaster Preparedness

Disaster management Mitigation and preparedness

Planning for disaster preparedness should lead to development of measurable objectives and outcomes to strengthen readiness. It is necessary to develop a national framework in which all elements of preparedness, response, recovery, accountability, and investment mechanisms are represented in detail, published, updated, communicated, and executed all organizations and agencies that are involved in disaster preparedness and response should be familiar with the international and national policies and strategies to plan for disasters and develop a protocol at the organizational level. Strategies and objectives at the provincial and local levels should be consistent with the requirements and obligations at the national level. In addition, to achieve improvement, each national plan should be evaluated and revised at least every year



What are steps involved in disaster management?

Goals of Disaster Management:

- Mitigation - Minimizing the effects of disaster. Examples: building codes and zoning; vulnerability analyses; public education.
- Preparedness - Planning how to respond
- Response - Efforts to minimize the hazards created by a disaster
- Recovery – Regain of community to normal.

Table 1 Contents of preparedness and mitigation

Theme	Category	Subcategory
Preparedness	Planning	Codification of NBC preparedness plan
		Codification of psychological preparedness plan
		Risk management
		Codification of national preparedness plan
	Resource development	Surge capacity
		Recourse demobilization
		Management of funds
	Organizational framework	Organizing for effective response
		Intersectoral coordination and cooperation
		Community involvement
	Information system	Information technology development
		Information documentation
		Confidentiality of information
	Early warning system	Early warning system development
		Strengthen information system related to early warning
	Training	Community based public education
		Supporting the research
	Evaluation and exercise	Structure evaluation
		Program evaluation
	Vulnerability assessment	Vulnerability assessment
	Response mechanism	Community readiness for response
		Support of government of involving organization in disaster
Mitigation	Funding for mitigation measures	Investment for mitigation
	Mitigation and passive defense	Integrating of passive defense in disaster management
		Land use planning
	Control	Supervision of mitigation measures in organization
	Legal issues	Regarding to the legal issue in mitigation measures
	Encourage	Encouraging safety measures
	Compensation	Development of compensation mechanism

	Standard for development	Development standard for mitigation
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There are six phases in Disaster Management Cycle such as Prevention, Mitigation, Preparedness, Response, Recovery and Reconstruction.

What is preparedness in disaster management?

Disaster preparedness refers to measures taken to prepare for and reduce the effects of disasters. That is, to predict and, where possible, prevent disasters, mitigate their impact on vulnerable populations, and respond to and effectively cope with their consequences.

What do you mean by disaster preparedness?

Disaster preparedness refers to measures taken to prepare for and reduce the effects of disasters. That is, to predict and, where possible, prevent disasters, mitigate their impact on vulnerable populations, and respond to and effectively cope with their consequences.

Disaster preparedness for people and infrastructure

Disaster Preparedness for People with Disabilities has been designed to help people who have physical, visual, auditory, or cognitive disabilities to prepare for natural disasters and their consequences.

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The best way to cope with a disaster is to learn about the challenges you might face if you could not use your home, office, and personal belongings. You can meet your basic personal needs by preparing beforehand.

After a disaster, your environment may be very different. Exits may be blocked, sidewalks may be impassable. If you are prepared ahead of time, you will be better able to cope with the disaster and recover from it more quickly.

How disaster-related stress may affect your disability

Psychological and Emotional

Anxiety, Irritability, restlessness, over excitability, Depression, moodiness, crying, Anger, blaming, Feelings of apathy, diminished interest, in usual activities, Feelings of isolation, detachment, estrangement., Feelings of guilt about surviving, Denial or constriction of feelings, Flashbacks or unwelcome memories of the disaster, An exaggerated reaction to being startled, Recurrent nightmares about the disaster or about other traumatic events, Inability to fall or stay asleep, Sleeping excessively.

Physical

Headaches, Weakness, Nausea, upset stomach, gastrointestinal problems, and Muscle soreness, Hot or cold spells; sweating or chills, Numbness or tingling in body parts, Heavy feeling in arms and/or legs, Feeling a “lump” in your throat, Chest pains, Trouble catching your breath; rapid Breathing, Tremors, Fatigue, Increase in allergies, colds, or flu, Heart palpitations.

Thought

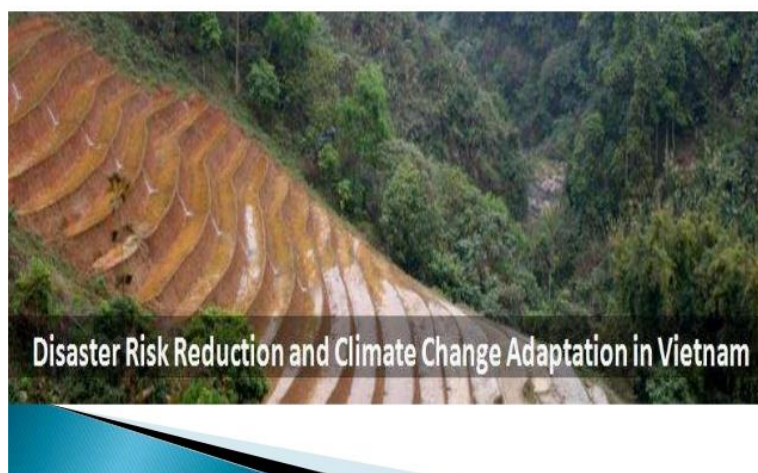
Poor concentration, Mental confusion, Slowness of thought, Inability to express yourself verbally or in writing, Forgetfulness, Inability to make judgments and decisions, Loss of ability to think of alternatives or prioritize tasks.

Behavior

Hyperactivity, Outbursts of anger or frequent arguments, Loss of objectivity, Withdrawal, social isolation, distancing yourself from others, Increased use of alcohol, tobacco, or other drugs, Avoidance of activities or places that remind you of the disaster, Family problems

Personal support network (sometimes called a selfhelp team, but referred to only as a “network” in this booklet) can help you prepare for a disaster. They can do this by helping you identify and get the resources you need to cope effectively with a disaster.

Organize a network for your home, school, workplace, volunteer site, and any other place where you spend a lot of time. Members of your network can be roommates, relatives, neighbors, friends, and co-workers. They should be people you trust and who could check to see if you need assistance. They should know your capabilities and needs, and offer help within minutes. Do not depend on only one person. Include a minimum of three people in your network for each location where you regularly spend a lot of time during the week.



PERSONAL DISASTER PREPARATION

How well you prepare and how much you practice before a disaster occurs will determine how successfully you deal with and recover from disasters. Your personal disaster preparation is a continuing process. It helps you and your network identify, get, develop, manage, and maintain the information and resources you will need to deal with a disaster when it happens.

Make an emergency information list that you and your network can use.

Ask a relative or friend who lives more than 100 miles away from you to be your “contact person.”

Medical Information List

What You Can Do to Prepare for a Disaster

Identify safe places to go to during a disaster.

Earthquake: Identify a sturdy table or desk to get under in each room. This is important because while the earth is shaking, the movement of the ground will probably make it difficult or impossible for you to move any distance. If you cannot safely get under a desk or table, move near an inside wall of the building and cover your head and neck as best you can. Decide how you will get there when the earthquake begins. Lock your wheels if you are in a wheelchair. In bed, pull the sheets and blankets over you and use your pillow to cover and protect your head and neck.

Tornado: The lowest floor or below-ground area of your home or workplace is safest. If there is no basement or you cannot get there, choose a room without windows, such as a bathroom or closet. Identify where this safe place is and how you would get there.

Hurricane or flood: If local officials have not told you to leave the area, stay upstairs and in the middle of the building, away from windows. Avoid going to the lowest floor because hurricanes often cause flooding. If you are Blind or visually impaired, use a long cane in areas where debris may have fallen or furniture may have shifted. This is recommended even if you do not usually use a cane indoors.

For information about how to prepare for disasters that are specific to your area, contact your local Red Cross chapter. Keep your service animals with you in a safe place at home, or take them with you to a shelter. Install at least one smoke detector on each level of your home, outside sleeping areas. If you are Deaf or have hearing loss, install a system that has flashing strobe lights to get your attention. If you have battery-operated detectors, replace batteries at least once a year, such as on your birthday, New Year’s Day, etc. Test smoke detectors once a month by pushing the test button.

How to Prepare Your Family for a National Disaster

1. Take an emergency preparedness course.
2. Keep a basic first aid kit on hand at all times.
3. Water is vital.
4. You should also have a water purification method ready to go, such as boiling your water, having a water disinfectant, or a filtration system

What should you do in a natural disaster?

- Earthquake. "Drop, take cover, and hold on."
- Explosion. Take shelter under a desk or table during the explosion, and exit the building as soon as possible once it's over.
- Fire evacuation.
- Flood.
- Hurricane.
- Terrorist attack.
- Tornado.

Infrastructure for Disaster Management

Database Creation for DMS. National Database for Emergency Management (NDEM), conceived as a GIS based repository of data to support disaster/ emergency management for the country, is being realized.

Communication Support for Disaster Management

The communication revolution initiated through INSAT series of satellites, have made it possible to establish connectivity even with remote and inaccessible rural areas and off-shore islands. This ensures fail-safe communication during disasters, which is mandatory to plan and provide relief measures. Towards providing emergency communication for disaster management activities, and at the behest of Ministry of Home Affairs (MHA), ISRO has set up a satellite based Virtual Private Network (VPN) facilitating secure data access through a dedicated electronic network connecting all the key players of disaster management - the information providers as well as the users at different levels. The National Emergency Operation Centre (NEOC) of MHA, Cabinet Secretariat, NDMA, PMO, other key data providing agencies (IMD, CWC, GSI, SOI, INCOIS, NIDM), and the 20 multi-hazard prone State Emergency Operation Centres (SEOCs) are connected to the Decision Support Centre (DSC) of NRSC / ISRO.

For a fail-safe communication during emergency, ISRO/DOS has developed INSAT Type-D terminals (portable satellite phones with solar chargeable battery packs). These terminals are positioned in different ISRO/ DOS Centres, for deployment by various States during disasters. Distress Alert Transmitter is a low cost satellite transmitter for emergency communication of alert messages from fishing boats. INSAT based Distress Alert Transmitter

(DAT) developed by ISRO/DOS is distributed to fishermen through the Indian Coast Guard. The DTH based Disaster Warning Dissemination System (DWDS) is a customized Set-top box developed through BEL, Bangalore for dissemination of Disaster warnings directly to the potential victims. In the DTH based warning system, individual or group of DTH receivers can be selected for sending siren warning followed by voice message. The DTH based Digital Disaster Warning System (DDWS) is being established in 500 locations in association with India Meteorological Department (IMD) and Doordarshan.

Community Based Disaster Preparedness

What is community based disaster preparedness?

Community-based disaster preparedness (CBDP) refers to a specific form of local-level capacity building and represents increasingly important elements of vulnerability reduction and disaster management strategies. CBDP strategies leverage the knowledge and capabilities of local community resources.

What is community based disaster management?

Community-based disaster management (CBDM) is an approach to building the capacity of communities to assess their vulnerability to both human induced and natural hazards and develop strategies and resources necessary to prevent and/or mitigate the impact of identified hazards as well as respond, rehabilitate,

Community Based Disaster Preparedness is a process of bringing people together within the same community to enable them to collectively address a common disaster risk and to collectively pursue common disaster preparedness. Community Based Disaster Preparedness is a process that mobilizes a group of people in a systematic way towards achieving a safe and resilient community/group. Its end view is a dynamic community that equalizes power relations, binds the group cohesively in the process of making decisions, deals with conflicts, resolves issues, and manages individual and collective tasks through addressing and bouncing back from hazard events.

Role and responsibilities of different agencies and Government

What is the role of governmental agencies during a disaster?

Types of Assistance

A state Administration may request three types of Central assistance:

Individual Assistance

For individuals, families, farmers, and businesses, in the form of loans, grants, emergency housing, tax relief and unemployment assistance.

Public Assistance

Funds for states, local communities and nonprofit groups to restore public systems and facilities.

Matching Mitigation Funds

For states and local communities, for projects which eliminate or reduce an area's vulnerability to a hazard.

CENTRAL ASSISTANCE FOR STATE AND LOCAL GOVERNMENTS MAY INCLUDE THE FOLLOWING:

- 1) Provision of equipment, supplies, facilities and personnel;
- 2) Technical assistance;
- 3) Loans and sometimes grants.

Private nonprofit institutions that provide educational, utility, medical and other essential services are also eligible for Central aid. The Central government also provides matching "mitigation funds" to reconstruct buildings or utility systems to withstand future disasters.

The Emergency Support Functions Are:

1. Transportation

Provides civilian and military transportation. Lead agency: Department of Road Transportation, Railways, waterways etc .

2. Communications

Provides telecommunications support. Lead agency: National Communications System.

3. Public Works and Engineering

Restores essential public services and facilities. Lead agency: Army Corps of Engineers, Department of Defense, PWD

4. Fire Fighting

Detects and suppresses wild land, rural and urban fires. Lead Agency: Forest Service, Fire Service.

5. Information and Planning

Collects, analyzes and disseminates critical information to facilitate the overall Central response and recovery operations. Lead agency: Emergency Management Agency.

6. Mass Care

Manages and coordinates food, shelter and first-aid for victims; provides bulk distribution of relief supplies; operates a system to assist family reunification. Lead agency: Red Cross and other NGOs

7. Resource Support

Provides equipment, materials, supplies and personnel to Central entities during response operations. Lead agency: General Services Administration.

8. Health And Medical Services

Provides assistance for public health and medical care needs. Lead agency: Public Health Service, Department of Health and Human Services.

9. Urban Search and Rescue

Locates, extricates and provides initial medical treatment to victims trapped in collapsed structures. Lead agency: Emergency Management Agency.

10. Hazardous Materials

Supports Central response to actual or potential releases of oil and hazardous materials. Lead agency: Environmental Protection Agency.

11. Food

Identifies food needs; ensures that food gets to affected areas. Lead agency: Food and Nutrition Service

12. Energy

Restores power systems and fuel supplies. Lead agency: Department of Energy.

There is a systematic structural framework for coordination of disaster management **tasks** at the central, state and district levels. It is essential that there is some level of understanding between these levels in order to avoid delays and overlapping of time and efforts.

Role of Various Agencies in Disaster Management in India

In this article we will discuss about the role of various agencies in disaster management in India.

1. Role of the Union Government:

Although the State Government concerned has the primary responsibility for crisis management, the Union Government plays a key supportive role in terms of physical and financial resources and providing complementary measures, such as early warning and co-ordination of efforts of all union ministries, departments and organizations. At the apex level, a Cabinet Committee on Natural Calamities reviews the crisis situation.

A high level committee of ministers under the chairmanship of Minister of Agriculture deals with the issue of financial support to be provided to the State Governments from the National Disaster Response Fund, if the funds available with the State Governments under State Disaster Response Fund are not adequate. Matters relating to nuclear, biological and chemical emergencies are looked after by the Cabinet Committee on Security.

2. National Crisis Management Committee:

The Cabinet Secretary, as the highest executive officer, heads the National Crisis Management Committee (NCMC). Secretaries of ministries and departments concerned and heads of other organisations are members of NCMC, which reviews and monitors crisis situations on a regular basis and gives directions to the Crisis Management Group, as deemed necessary. The NCMC can give directions to any ministry, department or organisation for specific action needed for meeting the crisis situation.

As disaster management is a multi-disciplinary process, all Central Ministries and Departments have a key role in the field of disaster management. In view of the highly technical and specific nature of certain disaster events such as aviation disasters, rail accidents, chemical disasters and biological disasters etc.; the ministries dealing with that particular subject have the nodal responsibility for handling that particular type of disaster.

Nodal Ministries/Department for Disaster Management at the National Level:

- i. Droughts – Ministry of agriculture
- ii. Epidemics and Biological Disasters – Ministry of Health
- iii Chemical or Industrial Chemical Disasters – Ministry of Environment & Forest
- iv. Nuclear Accidents – Department of Atomic Energy
- v. Railway Accidents – Ministry of Railways
- vi Air Accidents – Ministry of Civil Aviation
- vii. Natural Disasters except Drought & Epidemics and Civil Strife – Ministry of Home Affairs

The Secretaries of the Nodal Ministries and Departments of GOI, i.e. the Ministry of Home Affairs (MHA), Agriculture, Civil Aviation, Environment and Forests, Health, Atomic Energy, Space, Earth Sciences, Water Resources, Mines, Railways etc. are all members of the NEC and function as nodal agencies for specific disasters based on their core competencies or as assigned to them.

The coordination between various nodal ministries/departments is done by National Executive Committee (NEC), which is headed by Home Secretary. The NEC has to prepare the national plan for disaster management based on the National Disaster Management Policy.

3. Crisis Management Group:

The Crisis Management Group (CMG) consists of nodal officers from various concerned ministries. Apart from CMG, the National Executive Committee headed by the Home Secretary performs the statutory coordination and functions as per the DM Act, 2005.

The CMG's functions are to review annual contingency plans formulated by various ministries, departments and organisations in their respective sectors, measures required for dealing with natural disasters, coordinate the activities of the Union Ministries and State Governments in relation to disaster preparedness and relief, and to obtain information from the nodal officers on all these issues.

In the event of a disaster, the CMG meets frequently to review relief operations and extends all possible assistance required by the affected states to overcome the situation. The Resident Commissioner of the affected state is also associated with such meetings.

4. Funding Mechanism:

Each state has a corpus of funds, called State Disaster Response Fund, administered by a state level committee headed by the Chief Secretary of the State Government. The size of the corpus is determined with reference to the expenditure normally incurred by the state on relief and rehabilitation over the past ten years. In case the funds under State Disaster Response Fund are not sufficient to meet the specific requirements, State Governments can seek assistance from the National Disaster Response Fund—a fund created at Central Government level. Both these funds, as the names suggest, are meant for relief and rehabilitation and do not cover either mitigation or reconstruction works, which have to be funded separately by the State or Union Government.

Role of State Government:

In India, the basic responsibility to undertake rescue, relief and rehabilitation measures in the event of natural disasters rests with the state government. Since the very beginning, the entire structure of crisis administration in the state governments had been oriented towards post disaster relief and rehabilitation.

Most of the states have Relief Commissioners who are in charge of the relief and rehabilitation measures. Most of the states have switched over to a Disaster Management Department with the required linkages with the various development and regulatory departments concerned with prevention, mitigation and preparedness.

Every state has a Crisis Management Committee under the chairpersonship of the Chief Secretary, consisting of secretaries in charge of concerned departments, which reviews crisis situations on a day-to-day basis at the time of crisis, coordinates the activities of all departments and provides decision support system to the district administration. At the

ministers' level, a Cabinet Committee on Natural Calamities under the chairpersonship of the Chief Minister takes stock of situations and is responsible for all important policy decisions.

6. Role of District Administration:

The District Magistrate/Collector has the responsibility for overall management of disasters in the district. He has the authority to mobilise the response machinery and has been given financial powers to draw money under the provisions of the General Financial Rules/Treasury Codes.

All departments of the State Government, including the police, fire services, public works, irrigation etc., work in a coordinated manner under the leadership of the Collector during a disaster, except in metropolitan areas where the municipal body plays a major role. The District Collector also enjoys the authority to request for assistance from the Armed Forces if circumstances so demand. NGOs have also been effective in providing relief, rescue and rehabilitation in recent times.

7. Role of Local Self-Governments:

Local self-governments, both rural and urban, have emerged as important tiers of governance, after the 73rd and 74th Amendments to the Constitution. For the people, they are also the nearest units of administration and are among the first responders to any crisis besides being closely knit with the communities. These units can thus play an important role in crisis management under the overall leadership of the District Administration.

8. Role of Public/NGO/Civil Society/Media:

The local community is usually the first responder in case of a disaster. Local community also carries traditional knowledge and relevant counter measures regarding disaster management. So the role of local community must be utilized with the help of NGOs and media.

They should be encouraged to play an active role in all three phases of disaster management. District administration should also focus on capacity building, participation and empowerment of these stakeholders in disaster management.

Mobilisation of community action supported by local NGOs, along with government machinery is a must for quick, efficient and effective response. For this, healthy coordination must exist between local administration and local community/NGOs. Local NGOs and civil society must work on developing a deep culture of safety and prevention in society.

NGOs, civil society and media also play an active role as pressure groups in a democracy so that any laxity on part of the government can be traced and fixed. So, the

public and the NGOs should keep a close vigil over the functioning of the government regarding disaster management and render their services as a watchdog.

What is needed?

We cannot prevent natural hazards, which are endemic to our geology, geography, climate, social and cultural settings, but we can certainly strive to manage crisis more efficiently so that hazards do not degenerate into disasters. With a coherent and meaningful crisis management strategy in place, it is quite possible to visualize our country, despite its manifold hazards, as a place that will eventually be free of all disasters.

In the realm of crisis management, announcing a policy, or promulgating a law, or creating an institution is a relatively easy task; the challenge lies in implementing policies to achieve the desired outcomes. Crisis management, a governance issue that is both vital and complex, is at the core of India's administrative system.

The system requires innovative thinking and fundamental changes in order to quicken the emergency responses of the administration and increase the effectiveness of the machinery to meet the crisis situation and enhance crisis preparedness. To that end, it is necessary that the apparatus of crisis management should perform and deliver. What is needed is ushering in a new paradigm in the quality and efficacy of our institutional capacity and delivery mechanisms while, at the same time, ensuring that they are embedded in both the structures of authority and the mechanisms of accountability.

Our aim should not only be having more efficient systems of governance but also innovative ways of capacity building and empowerment of all stakeholders at all levels, including panchayats and the community, strategic applications of science and technology, realisation of a sound emergency communication network, building safe homes and infrastructure, and learning from research and development, as also from the experiences of handling crisis situations in the past.

Each of these tasks is a challenge and calls for careful strategy of planning and implementation coupled with coordinated efforts of a variety of players, both within and outside the governmental structure. Our target should be establishing the synergy and convergence of advances in the technological and knowledge era with our rich socio-cultural practices and indigenous coping mechanisms. Systematic preparedness, early warning, quick response and sustainable recovery have been the cornerstones of approach to disaster management.

Institutional Support of Science and Technology Institutions for Disaster Management:

Disaster management depends heavily upon the inputs from various science and technology institutions. Indeed, major improvements in disaster management efforts may be attributed to developments in science and technology. As crisis management is

multidisciplinary in nature, the relevant research is carried out in several sector-wise research and development organisations.

The 2nd Administrative Reforms Committee has recommended that The National Disaster Management Authority, assisted by NIDM, may facilitate a common platform between the science and technology organisations and the users of relevant technologies. Such mechanisms may be made operational both at the Union and State levels.

Professionalization of Disaster Management:

Institutional development for disaster management in the country has clearly suffered on account of paucity of professionally qualified personnel. While civil servants and other senior personnel in organisations like the police, armed forces and municipal bodies have provided a leadership role and their leadership will continue to be required, it is time that special attention is paid to the long-felt need to professionalize disaster management in the country.

The best practices in disaster management are the strategies and methods perfected by several developed countries and India can take advantage from exposure to these practices. It is, therefore, desirable that the possibility of bilateral agreements with foreign governments for exchange of experiences and learning from their documentation and research efforts be fully explored.

Use of Mass Media and Social Media:

Mass media plays a very important role in spreading awareness about disasters. Immediately after a major disaster in any part of the world, the curiosity and apprehension among the communities about their own risk is at its maximum.

This is an opportune time to carry out public awareness campaigns and use media to focus on generating awareness about the risk the community is exposed to. This could best be achieved through a healthy partnership between the media and the disaster management machinery.

An important input in such awareness generation programmes could be the lessons that have been learnt from disasters in the past or from those in other areas. For this purpose, the details of all such disasters need to be properly documented and kept in the public domain. The District Disaster Management Authorities, the State Disaster Management Authorities and the NDMA should have these details along with the lessons learnt, on their respective websites.

Building Community Resilience:

The community is also a repository of knowledge and skills which have evolved traditionally and these need to be integrated in the risk reduction process. It is necessary to educate the community about the entire disaster risk reduction and even to impart skills and assign specific roles to the members of the community, so that the first response from the community is a well-coordinated one.

Focus on District Disaster Management Plan:

The District Administration should discuss the hazard, risk and vulnerability profile of the district. The Administration should know the vulnerability map of the district, historical profile of various disasters that have happened in the past, their impact on the district and how the district was able to cope up. What is the preparedness of the district now? Would the district be able to handle the disaster if it is hit now?

What is the present capacity of preparedness of the district administration or DDMA for search and rescue, relief distribution, logistics, ensuring life-line services, providing security and safety to the people, law and order situation, resource mobilisation, etc.? The administration needs to know the answers for all these questions. This would give an idea of the capacity, of the district and also give direction to start planning. The administration or DDMA then consolidates the risks of the district and take the level forward.

What is the role of international agencies in disaster management?

There are so many International agencies working in disaster management services around the world. The Pakistan face world natural disaster in October 2008 in which 80,000 people died and 38,000 injured and 3.5 million people become homeless. After the deadliest earthquake many national and international NGOs in Pakistan working to help the helpless people. Lets see the role of International agencies role in disaster management:

1 International Committee for Red Cross:

The International Committee for Red Cross is always on for front to provide humanitarian and medical relief services around the world. As in 2005 earthquake the ICRC actively participated in humanitarian and relief services in disaster affected areas and provide them instant relief.

2 Medicines Sans Frontieres:

The Medicines Sans Frontieres is an organizations of doctors without border as it provides humanitarian and medical relief services in war-zones areas and the countries affected by the endemic diseases. As recently working for Rohingya refugees.

3 Oxfam International:

The Oxfam International organization committed to provide relief services and eliminations of social evils like poverty, lack of healthcare facilities, illiteracy as it is a confederation of charitable organizations which are working for well being of our society.

Education, communication and training on DM

Training attempts to improve knowledge, skills and attitudes amongst the recipients. Information Education Communication and Training activities are to be based on appropriate needs analyses. It needs to be holistic as there are several categories of personnel involved in disaster management activities.

Information, Education and Communication (IEC) are of vital significance for disaster preparedness, prevention and mitigation. It promotes an alert community which is *sine-qua* non for any successful activity. IEC are the essential constituents of any programme especially in a disaster related scenario. IEC requires the administrative machinery, Non-Governmental Organizations (NGOs), Community-based Organizations (CBOs), other agencies and the community to be prompt, active and well informed to carry out the activities confidently. Hence **ZEC** should be given top priority in any disaster management programme.

Creation of awareness is an integral part of the process of social development, Communication has the power to liberate the minds and potential of people. Critical awareness is needed in every field linked to human development. The generation of an alert public will hinge on effective communication of information and ideas that relate to people's needs, aspirations and capacities. In this sense, getting the development process initiated is largely the task of information, education and communication.

Armed force, police, Para military forces on DM

Broadly speaking, the defence forces (also called the military) consists of a country's Army, Navy and Air Force. The central armed police forces are BSF, CRPF, ITBP, CISF and SSB. The paramilitary forces are Coast Guard, Assam Rifles and Special Frontier Force (and other forces like NSG, RR).

Which are paramilitary forces?

Central Armed Police Force (CAPF)

- Assam Rifles (AR)
- Border Security Force (BSF)
- Central Industrial Security Force (CISF)
- Central Reserve Police Force (CRPF)
- Indo Tibetan Border Police (ITBP)
- National Security Guard (NSG)

- Sashastra Seema Bal (SSB)

What is the meaning of paramilitary forces?

A paramilitary is a semi-militarized force whose organizational structure, tactics, training, subculture, and (often) function are similar to those of a professional military, but which is not included as part of a state's formal armed forces

A **paramilitary** is a semi-militarized force whose organizational structure, tactics, training, subculture, and (often) function are similar to those of a professional military, but which is not included as part of a state's formal armed forces

It is the duty of the civil administration to be prepared for and to manage disasters (natural or manmade) when they occur. There is a structured organization in which the district administration under the charge of the District Collector plays the vital role. The Police, which is a civilian service, assists in disaster management in the efforts related to law and order, evacuation, search, rescue, wireless communication, disposal of dead, and general security. Nongovernmental organizations and community based organizations render help according to their capability and capacity. In most situations, this combined civilian effort is able to manage. However, when the disaster and its effects are of such severity and suddenness that is beyond the combined capacity of civilian agencies, the military and paramilitary forces have to be summoned and they always rise to the occasion.

In the earlier days, Military i.e., the Armed Forces used to take care of the outside enemies and conventional police used to look after internal security and law and order. With the growth of population and new activities resulting in the need for specialized security services to valuable sectors such as the borders, the industry, vital installations etc., it became necessary to create a variety of paramilitary forces under the Govt. of India. More prominent of these paramilitary forces are:

- a) Border Security Force (BSF)
- b) Central Reserve Police Force (CRPF)
- c) Central Industrial Security Force (CISF)
- d) Indo Tibet Border Police (ITBP)
- e) Railway Protection Force (RPF)
- f) Assam Rifles
- g) National Security Guard (NSG)
- h) Coast Guard
- i) Rapid Action Force (RAF)
- j) Territorial Army

Role of Non Governmental organization in Disaster Management

NGOs are organizations that are nonprofit making, voluntary and independent of government, engaged in activities concerning various societal and developmental issues.

NGO's have a faster response to situations because it does not need to clear paperwork.

Role of NGOs – From a Policy Perspective:

The High Powered Committee (HPC) 2001 has recommended a nationwide network of NGOs for coordinated action encompassing all aspects of disaster management.

The Disaster Management Act 2005 emphasizes the need for continuous and integrated process of planning, organising, coordinating and implementing policies and plans on DM in a holistic, community based, participatory, inclusive and sustainable manner. The Act entrusts/mandates the State Executive Committees at different levels with the responsibility to advise, assist and coordinate the activities of NGOs engaged in disaster management.

Role of NGOs in Disaster Preparedness:

GO-NGO collaboration specifically at the district and Panchayat levels is imperative for disaster preparedness

Areas of Intervention

- (a) Advocacy
- (b) Assessment
- (c) Capacity building
- (d) Knowledge Management

Sector Specific Associations:

Education, Health including Reproductive Health, Shelter, Livelihood (Agriculture\ Livestock), Water and Sanitation, Protection, Environment management, Disability

Table Roles to be played by NGOs at the community, district, state and National levels

Key Components	Roles and Key Actions of NGOs to facilitate and support			
	Community Level	District Level	State Level	National Level
Institutional arrangements	Mobilise and organize community from village/local disaster management committees (VDMC). -Help VDMCs get	Participate in district level task forces, EOC level meetings -advocate for establishment of DDMA-NGO Advisory	Participate in State level task forces, EOC level meetings. -NGOs mobilise and organize inclusive Interagency Group (IAG)	Participate in National level NGO and other task forces. • Advocate for formal and institutionalized engagement and develop

	institutionalised by regular Disaster preparedness (DP) planning, documentation efforts VDMCs form Task Forces to work on specific needs and issues.	Committee, and assist in preparing inclusive DDMPs; assist in social equity audits at various levels, as worked out by the authority	-Advocate for establishment of SDMA-NGO Advisory Committee	protocols for consultation with NDMA, ,National Executive Committee, SDMA, State Planning Boards, State Executive Committees and such other bodies, including nodal
Coordination Mechanisms	Establishment of community level coordination mechanisms with frontline workers, panchayat and their link with block and district level line-departments.	Assist in developing and participating in district level GO- NGO and Inter Agency Coordination Mechanisms	Assist in developing and participating in state level GO-NGO & Inter Agency Coordination mechanisms	<ul style="list-style-type: none"> Assist in developing and participating in GO- NGO Inter Agency Coordination mechanisms Participate in GO-NGO Advisory Committee
Contingency Planning	contingency planning at community levels	Assist in development, piloting, validation and updating of the district level contingency and preparedness plans	Assist in development, piloting, validation and updating of the state level disaster management plans	Assist in development of the National level contingency and preparedness plans
Capacity Needs Analysis and Standardized Capacity building	Detailed assessment of current needs and capacities at community level <ul style="list-style-type: none"> Training, Simulation 	Facilitate detailed assessment of current needs and capacities at district levels Facilitate	<ul style="list-style-type: none"> Facilitate detailed assessment of current needs and capacities at state 	<ul style="list-style-type: none"> Facilitate detailed assessment of current needs and capacities at national level

	<p>and mock drills</p> <p>Conducting vulnerability mapping exercises with the community to know the areas of intervention by the GO-NGO collaboration in the field</p> <p>Training of community volunteers and linking them with the local administration to act in the event of disaster</p>	<p>Training and mock drills of different stakeholders</p>	<p>levels</p> <ul style="list-style-type: none"> • Facilitate and participate in Training and mock drills of different stakeholders 	<ul style="list-style-type: none"> • Facilitate and participate in Training and mock drills of different stakeholders
<p>Hazard Monitoring, Forecasting and Early Warning (EW)</p>	<p>Establish linkages with stakeholders for hazard monitoring and provide last mile connectivity for EW dissemination</p>	<p>Establish linkages with multiple stakeholders for hazard monitoring and provide last mile connectivity for EW dissemination</p>	<p>Establish linkages with authorities for hazard monitoring and provide last mile connectivity for EW dissemination</p>	<p>Establish linkages with authorities for hazard monitoring and provide last mile connectivity for EW dissemination</p>
<p>Information & Knowledge Management and communication</p>	<p>Facilitate and support mechanisms for information dissemination before, during and after disasters</p> <ul style="list-style-type: none"> • Collect, Manage, Process and share Data during and after 	<p>Facilitate mechanisms for public information dissemination before during and after disasters</p> <ul style="list-style-type: none"> • Collect, Manage and Process Data 	<p>Facilitate, support and establish mechanisms for information dissemination before, during and after disasters</p> <ul style="list-style-type: none"> • Collect, Manage and Process Data 	<ul style="list-style-type: none"> • Facilitate and establish mechanisms for public information broadcasting before and during disasters • Collect, Manage and Process Data

	disaster • Research, develop, document and disseminate best practices, including traditional coping strategies for replication and scale up	during and after disaster • Research, develop, document and disseminate best practices for replication and scaling up	during and after disaster • Research and promote best practice development / adoption	during and after disaster • Research and promote best practice development / adoption
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Emerging Trends in Disaster Mitigation

Sustainable Development and Disaster Mitigation

Epidemiological Surveillance

Sustainable Land-use Planning

Coastal Zone Management

Recent Advances & Future Trends in Disaster Management

Natural disasters have been visiting every part of the globe at one time or the other. The world is becoming increasingly vulnerable to natural disasters. From earthquakes to floods and famines, mankind is even more threatened by the forces of nature. Disasters can strike at any time, at any place. Nearly three million people worldwide may have been killed in past 20 years due to natural disasters such as landslides, earthquakes, floods, snow avalanches, cyclones etc. Ninety per cent of the natural disasters and ninety five percent of the total disaster related deaths worldwide occur in developing countries in which India has the second largest share. Natural Disaster Reduction” should focus on disaster management planning for prevention, reduction, mitigation, preparedness and response to reduce the loss of life and property due to natural disasters. Disasters in the communities come in all the shapes and sizes. Some impact a small number of people and put intense demands on the health system for a short period. Others may involve a large number of casualties but reach a plateau only after a latent period, placing heavy continuing demands on the health system. For some natural disasters like hurricanes, floods and volcanoes-hospitals are likely to receive advance warning and be able to activate their disaster plan before the event. For other natural disasters, such as earthquakes and tsunami, there is no advance warning, as of now. Many man-made disasters also provide no advance warning; these include chemical plant explosions, industrial accidents, building collapses and acts of terrorism. The emergence of state-sponsored terrorism, proliferation of chemical and biological agents, availability of materials and scientific weapons expertise all point toward a growing threat of a mass casualty incident (MCI). Preparing for MCIs is a daunting task, as unique issues must be considered with each type of event. For example, the systemic stress of a bio-threat is entirely different from that of a chemical disaster. These differences hold challenging implications for

the hospital preparedness and training. The hospital disaster preparedness has therefore taken on an increased importance at local, state and national levels. Despite a facility's best efforts, accidents and other emergency situations can occur. Effective emergency preparation and response can reduce injuries, prevent or minimize environmental impacts, protect employees and neighbors, reduce asset losses, and minimize downtime. An effective emergency preparedness and response (EP&R) program should include provisions for: (1) assessing the potential for accidents and emergencies; (2) preventing incidents and their associated environmental impacts; (3) responding to incidents (emergency plans and procedures); (4) testing of emergency plans and procedures periodically; and (5) mitigating impacts associated with accidents and emergencies. Consistent with the focus on continual improvement, it is important to review your emergency response performance after an incident has occurred so that you can correct deficiencies in the procedure. Use this review to determine if more training is needed or if emergency plans and procedures should be revised. This is another area where you should not have to start from scratch. Several environmental and health and safety regulatory programs require emergency plans and/or procedures. Hospitals would be among the first institutions to be affected after a disaster, natural or man-made. Because of the heavy demand placed on their services at the time of a disaster, hospitals need to be prepared to handle such an unusual workload. This necessitates a well documented and tested disaster management plan (DMP) to be in place in every hospital. To increase their preparedness for mass casualties, hospitals have to expand their focus to include both internal and community-level planning. The disaster management plan of a hospital should incorporate various issues that address natural disasters; biological, chemical, nuclear-radiological and explosive-incendiary terrorism incidents; collaboration with outside organizations for planning; establishment of alternate care sites; clinician training in the management of exposures to weapon infectious diseases, chemicals and nuclear materials; drills on aspects of the response plans; and equipment and bed capacity available at the hospital. The most important external agencies for collaboration would be state and local public health departments, emergency medical services, fire departments and law enforcing agencies. The key hospital personnel should be trained to implement a formal incident command system, which is an organized procedure for managing resources and personnel during an emergency. The hospitals should also have adequate availability of personal protective hazardous materials suits, negative pressure isolation rooms and decontamination showers. A hospital's emergency response plan has to be evaluated whether that plan addresses these issues. One of the key components of an effective health and medical care response is ensuring adequate supplies of a broad array of qualified health care providers who are available and willing to serve in a MCI. This could mean re-allocating non emergency and non-clinical doctors to emergency area of the hospital and recruiting retired or unemployed providers for temporary service. The traditional separation between the medical care community (e.g, hospitals, physicians and nursing homes) and the public health community needs to be bridged in preparation for mass casualty incidents. Mass casualties will provide more work than any organization itself can address. Coordination is the key and the historic separation is a genuine disadvantage. Several strategies help ensure protection of staff handling disasters e.g. safety measures including personal protective equipment,

prophylaxis, training specific for different events, adequate back-up staff for rotation to prevent burnout and fatigue related errors and care of families of staff. A wide range of training of hospital staff is needed to ensure an effective health and medical response to a mass casualty event. Preparedness for disasters is a dynamic process. In addition to having a well documented DMP in place, it is prudent to have regular drills to test the hospital's DMP. The drills may be hospital disaster drills, computer simulations and tabletop or other exercises. The disaster plan must anticipate and provide for all aspects of disaster operations. Means must be provided to meet the needs of hospital personnel while simultaneously providing procedures to meet with a multitude of emergency medical contingencies. The disaster plan will be executed by fallible people, often under considerable stress. If the disaster plan is as simple as possible, hospital personnel are less likely to make mistakes which would jeopardize patient care. Furthermore, a complex plan burdens hospital personnel with its own procedures rather than fulfilling its proper function of freeing their creative powers to attack the disaster's more substantial problems. The disaster plan attempts to simplify the conduct of a disaster by identifying and standardizing only the most important and general procedures. For each routine procedure a form is provided (or a standard hospital form is identified) which outlines the standard procedure so hospital personnel don't forget anything, provides work space so hospital personnel get complete and correct information and can organize their thoughts, and, finally, provides a written record for the accurate information of other personnel and for documentation of the mission afterwards. Natural disasters and calamities throw up major challenges for national governments in many countries of the Asia-Pacific region. Earthquakes, floods, cyclones, epidemics, tsunamis, and landslides have become of common occurrence in the region, repeatedly taking a heavy toll of life and property. In such serious disaster situations, the major challenge for authorities is the protection of life (human and animal), property, and the vital life-supporting infrastructure necessary for disaster mitigation. Any delay or laxity in disaster relief could escalate the magnitude of distress for the victims. Advanced disaster management technology could provide a critical support system for disaster management authorities at times of disaster-related crises. Such a technology also provides important inputs for any disaster management plan of action in modern times. Natural disasters inflict severe damage on almost the entire spectrum of social and natural habitats, ranging from housing and shelter, water, food, health, sanitation, and waste management to information and communication networks, supply of power and energy, and transportation infrastructure. The major challenges faced in all disasters include pre-disaster early warning infrastructure; the supply of food and clean drinking water; health and sanitation; information and communication; power and energy for lighting and cooking; waste collection and disposal, including rapid disposal of dead bodies of humans and animals; disaster-proof housing and shelter; emergency and post-disaster shelters; rescue and relief operations; and transport infrastructure. Rapid advancement of technology in all these sectors could be deployed in efficiently tackling the challenges emerging from disasters, minimizing the impact of disasters in terms of reducing the magnitude of death and casualties, improving the health and sanitary conditions of the affected population, rehabilitation of the victims, etc. Specific

technological solutions can be utilized in all the phases of disaster management, namely, disaster preparedness, disaster reduction, disaster mitigation, and post-disaster rehabilitation

Effective Disaster Management Strategies in the 21st Century

Natural disasters are becoming more frequent, growing more severe and affecting more people than ever before. The reasons vary but include climate change, population growth and shifting habitation patterns. According to a statement released from the Centre for Research on the Epidemiology of Disasters and the United Nations in January 2009, the average number of natural disasters reported each year increased more than 60 percent from 2003 to 2005, compared with 1996 to 1998. The World watch Institute reported that in 2007 alone there were 874 weather-related disasters worldwide, a 13 percent increase over 2006 and the highest number since systematic record keeping began in 1974.

As a result, developing the tools, processes and best practices to manage natural disasters more effectively is becoming an increasingly urgent global priority. Effective disaster management or disaster response can be defined as providing the technology, tools and practices that enable disaster response organizations to systematically manage information from multiple sources and collaborate effectively to assist survivors, mitigate damage and help communities rebuild.

Identify the Problems

Before organizations can improve their disaster response capabilities with new technology and training, they must have a clear idea of the problems they are trying to solve and have processes and practices in place to address the problems. Ongoing challenges in disaster management — such as cross-border issues when disasters affect more than one country, or the need to normalize data so that critical information can be quickly communicated, understood and acted upon — reinforce the need for such clarity and structure.

Another challenge to the effectiveness of disaster management and recovery is sharing information across organizations hampered by a lack of interoperability. In a disaster management situation, information is widely distributed and owned by different organizations, critical data is maintained in disparate systems that often don't interoperate well, and there are no common standards to enable organizations to efficiently organize and share their resources during response operations. To complicate matters, disaster management teams may be dealing with a badly damaged infrastructure making information sharing nearly impossible.

Another fundamental challenge is the need to automate manual records for disaster response and humanitarian assistance organizations, which is just as important as, if somewhat less glamorous than, other critical issues affecting their readiness. True interoperability is about connecting people, data and diverse processes and organizations, which requires not only flexible technology and accepted standards, but also the fewest

possible bureaucratic and regulatory barriers.

In many countries, the people and organizations that work in disaster management also have responsibilities related to national security. The processes and technology solutions they use for critical infrastructure protection can also be adapted for disaster management. These responders increasingly rely on information and communications technology (ICT) systems that can streamline knowledge sharing, situational analysis and optimize collaboration among organizations. ICT can help reduce the loss of life and property, reunite families and alleviate human suffering by providing first responders with the tools for effective communication and collaboration to overcome challenges posed by distance, diverse languages, cultural differences, geographic barriers, international borders and damaged infrastructure.

Be Prepared

Organizations that are engaged in disaster management need technology solutions that will enable them to provide lifesaving response and recovery assistance to the people who need their help when disasters strike. Increasingly disaster management organizations look for applications that are industry-proven, robust, cost-effective, interoperable and, in some cases, able to operate with limited or intermittent connectivity and various levels of network capacity. When considering disaster management solutions, it's important to look for the following capabilities and benefits:

- Optimized situational awareness. Real-time communication, data management and data transmission deliver a full picture of the situation.
- Interoperable, collaborative environment. Responders save lives by improving information flow across all types of boundaries.
- Support for mobile, Web-based access across a range of devices. All components and people are connected in fixed and field locations.
- System security and reliability. A combination of powerful security and performance.
- Comprehensive system manageability. All facets of the solution are designed to work together.

Change occurs rapidly in disaster management. Mandatory policies and procedures frequently require the modification of existing systems. The ability to rapidly adapt applications to keep pace with evolving situations benefits response organizations, and the people who depend on them, while preserving their IT investments.

Using Technology to Improve Disaster Management Capabilities

Disaster response organizations must systematically manage information from multiple sources and collaborate effectively to assist survivors, mitigate damage and help communities rebuild. A growing number of these responders and governments around the world increasingly rely on ICT systems that can streamline knowledge sharing, situational analysis and collaboration.

Response organizations are using ICT to predict and prepare for natural disasters in an effort to prevent them from becoming large-scale human tragedies. For example, disaster management officials are improving their situational awareness by using GIS and geospatial imaging technology to track hurricanes, analyze data, and create models that enable them to predict the storm's destructive force and test different response scenarios. They can then use communications and collaboration technology to coordinate massive evacuations and other strategies, and to move people out of harm's way before the hurricane hits.

By enabling situational awareness and knowledge sharing, ICT can help governments and humanitarian-assistance organizations facilitate their relief services; speed the donation and distribution of food, medical supplies and other vital resources; and provide access to more complete and accurate information as communities and families work to recover and rebuild in the aftermath of a natural disaster.

During the next few years, it's anticipated that geospatial and mapping technologies will become increasingly important, as they enable first responders to increase situational awareness and provide new ways to display and analyze information. Many technology companies are already building these technologies into their solutions. Developers will also find new ways to use mobile technology and Web portals to create innovative disaster management solutions that streamline operations and increase the efficiency of response organizations. As a result of these efforts and technologies, many organizations are able to streamline their operations, make more efficient use of their resources and respond more quickly to natural disasters.

The Road to Recovery

As communities and economies move from responding to a natural disaster to following the longer road of recovery, those involved have an opportunity to ensure that investments are designed for long-term sustainability and innovation. This requires a degree of planning and reconstruction that's designed not only to rebuild a community to what it was before, by revitalizing the culture and core of what enabled it to thrive in the past, but also to infuse new concepts of innovation and resiliency that will increase economic vitality.

For long-term disaster recovery, it's important to focus on driving innovation and resiliency through new and creative uses of ICT. It has been proven that technology and processes are most effective when they are part of or similar to one's day-to-day operational experience. This is not to say that unique solutions won't be used to manage specific issues, but the goal is for organizations to be familiar with tools and solutions related to disaster management before disasters occur. By extending the same information and communications tools that people use every day, it will help reduce training time and organizations can be prepared to respond more effectively during times of crisis.

The private sector, public sector and nongovernmental organization community must

work together to deploy technology solutions in the most effective manner, and to ensure that solutions are appropriate, sustainable and designed to achieve the best possible results. Public and private sectors face challenges to expand technology-based solutions that increase personnel efficiency, effectiveness, knowledge and flexibility when responding to disasters and crisis situations. In areas prone to natural disasters, such as the Asia-Pacific region, interest is growing in the potential for employing commercial, off-the-shelf software-based simulations for enhanced learning using virtual environments. Lastly, recovery of the business community after a natural disaster should be a high priority. The vitality of the business community is a critical dependency for successful economic and social recovery from a disaster. One of the reasons for the slow recovery in New Orleans after Hurricane Katrina was the struggle to revitalize the small-business community. Small and medium-sized businesses are essential for sustaining a returning population in an area hit hard by a disaster.

Moreover, technology can be a powerful force that opens exciting opportunities for organizations to better achieve their missions and accelerate their impact.

Beyond	Traditional	Telecommunications
When disasters occur anywhere in the world, the safety of people in the affected areas depends on first responders being prepared and then staying connected and in close collaboration 24 hours a day, until the crisis is resolved.		

The increasing impact of natural disasters and other crisis management situations is prompting the creation of a new generation of ICT solutions that can enhance disaster preparedness, response and recovery. Governments and response organizations are looking beyond traditional telecommunications means to explore the robust and incredibly diverse offerings that the ICT sector can bring to a crisis-response situation.

However, despite recent advances in using ICT for disaster response and humanitarian assistance, many desirable solutions do not yet exist. More solutions need to be developed to help organizations create and manage response resources and infrastructure between disasters, while others will focus on helping organizations learn from their experiences and capture knowledge that can be used for learning and better planning, and built into training models.

Global disaster management and humanitarian assistance requires a multifaceted approach that leverages the skills, resources and commitments of corporations, government agencies, intergovernmental organizations, nongovernmental organizations and individuals.

Coordination in Disaster Management

Coordination decision support systems (CDSS)

- Agent-Based CDSS

- Coordination Algorithms for Heterogeneous Agents
- Greedy Set Cover Algorithm
- Hungarian Algorithm
- Semi-Centralized Coordination Algorithms
- Low-Energy Adaptive Clustering Hierarchy (LEACH) Algorithm
- Extension of the LEACH Algorithm
- Experimental Evaluation
- Coordination Metric
- Fire/Rescue Problem



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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF CIVIL ENGINEERING

UNIT – III – Disaster Management – SCIA4001

III. Rehabilitation, Reconstruction and Recovery

Damage Assessment

What is damage assessment?

Damage Assessment is a preliminary onsite evaluation of damage or loss caused by an accident or natural event. Damage assessments record the extent of damage, what can be replaced, restored or salvaged. It may also estimate the time required for repair, replacement and recovery.

What is disaster assessment?

Disaster Risk assessment is a process to determine the nature and extent of such risk, by analyzing hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.

PURPOSE

Damage assessment is the process of determining the location, nature, and severity of damage sustained by the public and private sectors after a disaster. The typical damage assessment estimates the losses and the impacts of those losses on the affected individuals and communities. Federal, state, county, and local governments share the responsibility of conducting damage assessments. Each level of government must be prepared to carry out its role to complement and support the others. This document focuses on the role of the county and local governmental units in the damage assessment process.

A strong damage assessment supported by accurate information will:

- Identify the needs of individuals and communities affected by the disaster.
- Determine if there exist sufficient county and local resources address recovery needs or if state and federal government resources are required for successful recovery
- Identify, allocate and prioritize the state and federal resources that are needed for the response and recovery efforts.
- Document and substantiate requests for federal assistance.

PROCESS

Assessing the damage caused by a particular event is essentially a three-phased process. Each phase of the process serves a distinct purpose and will be explained further on subsequent pages.

- Phase 1 begins immediately after the disaster, but in some cases may actually begin during the event. Its purpose is to be prepared to respond to any immediate requests for assistance, such as sandbags or protective measures.
- Phase 2 is a more detailed look at the needs and usually occurs prior to a request for federal or state assistance, so that the most accurate and timely information can be included in the Governor's request.

- Phase 3 takes place after receiving a federal or state declaration. Its purpose is to review and update the information previously gathered in order to prioritize the delivery of assistance.

Infrastructure development and economic growth in India

Infrastructure is a major sector which plays a key role for propelling India's overall development. A country's development is strongly linked to its infrastructure strength and its ability to expand trade, cope with population growth, reduce poverty and produce inclusive growth.

The role of infrastructure in spearheading economic development of a country and also setting its pace can hardly be over emphasized. Like a foundation in an edifice, the place of infrastructure as well as its soundness, are crucial to the nation's total development. The economic growth of a country has evidently happened hand in hand with the development of its infrastructure. To quote famous economist Dr. V.K.R.V. Rao, “the link between infrastructure and development is not a once for all affair. It is a continuous process and progress in development has to be preceded accompanied and followed by progress in infrastructure, if we are to fulfill our declared objectives of a self-accelerating process of economic development”.

A sound infrastructural foundation is the key to the overall socio-economic development of a state. This acts as a magnet for attracting additional investment into a state and thus provides a competitive edge to it over other states. Availability of adequate and efficient infrastructural set up not only promotes rapid industrialization but also improves the quality of life of the people. The all pervading importance of infrastructure would be more clear from the fact that it encompasses the whole spectrum of vital services such as roads, railways, civil aviation, shipping, power generation transmission, telecommunications, postal facilities and urban development. Adequate infrastructure facilities are an absolute necessity for rapid achievement of sustainable economic growth. Infrastructure facilities are like wheels of development without which the economy cannot function properly.

Infrastructure stocks, labour force and total investment play an important role in economic growth in India. Infrastructure development in India has a significant positive contribution toward growth than both private and public investments. From a policy perspective, there should be greater emphasis on infrastructure development to sustain the high economic growth. Infrastructure development is one of the major factors contributing to overall economic development in many ways, such as: (1) direct investment in infrastructure creates production facilities and stimulates economic activities; (2) it reduces transaction costs and trade costs, improving competitiveness; and (3) it provides employment opportunities and physical and social infrastructure to the poor. Lack of infrastructure creates bottlenecks for sustainable growth and poverty reduction. Therefore, infrastructure

development contributes to investment and growth through an increase in productivity and efficiency and acts as a link between resources to factories, people to jobs and products to market.

Major infrastructure indicators are

- 1) Per capita electricity power consumption.
- 2) Per capita energy use (kg of oil equivalent).
- 3) Telephone line (both fixed and mobile) per 1000 population.
- 4) Rail density per 1000 population.
- 5) Air transport, freight million tons per kilometer.
- 6) Paved road as percentage of total road.

Damage to Infrastructure Due to Disasters

Infrastructure in the influenced territory would get damaged or collapse directly due to the impact of the hurricane. After these direct impacts or during the disaster impact on infrastructure, secondary impact will be on the services of associated industries. These service failures occur due to damaged infrastructure. Recent events show a significant increase in the number of disasters with natural and/or technological causes, which could have potentially serious consequences for critical infrastructures. Were these infrastructures to fail or be destroyed, the resulting cascade effect (chain of accidents) could lead to catastrophic damage and affect not only the plants, but also people, the environment and the economy. This rise in the number of disasters over the years is due to industrial and human activity as well as society's sensitivity to major events (hazards). The construction of industrial complexes brings with it stocks of hazardous substances, increased transport infrastructure (road, railways, shipping and pipelines), a rise in population and its concentration, malicious behavior and human error.

Damage to houses Due to Disasters

Floods have caused considerable damage across India this season. In the 64 years from 1953 to 2017, more than one lakh people have died due to floods and damage to crops. Also, infrastructure and housing has been pegged at Rs 3,65,860 crore, which is 3 percent of the country's current Gross Domestic Product. Floods have caused considerable damage across India 2017. So much that 91 districts in 12 Indian states have been affected by floods since the beginning of this monsoon. A total of 511 people have lost their lives and 176 people have been injured. Floods have damaged around 55,000 houses with the greatest number being Manipur's (17,846). People have also lost their means to livelihood as 1,37,008 animals have been affected and crops in an area of 81,147 ha all over the country have been damaged by flood waters. According to data from the Central Water Commission (CWC), one fifth of global flood related deaths take place in India. In the 64 years from 1953 to 2017, more than one lakh people have died due to floods and damage to crops. Also, infrastructure

and housing has been pegged at Rs 3,65,860 crore, which is 3 percent of the country's current Gross Domestic Product (GDP).

Funding arrangements for reconstruction

Reconstruction is the core concern in the disaster aftermath. A systematic and well-designed reconstruction package requires enormous financial support and resources from the governmental, non-governmental and international agencies. This Unit focuses on reconstruction, particularly from the point of view of funding arrangements. It focuses on the limited extent of resources available for reconstruction, and the different ways of resource generation. The Unit examines the major processes and considerations involved in funding for reconstruction. It also looks at the funding and resource arrangements at the national and international levels. In this context, it highlights the way disaster management projects are funded at different levels, and discusses the role of the community, which is of great significance in ensuring accountability of the agencies involved in funding.

Reconstruction Requirements

The common characteristics of the disaster-affected site are: a sudden and violent disruption of the social system caused by the disaster aftermath, large number of distressed people in need for basic life support components such as food, clothes, shelter, medicine, etc., severe shortages of relief material and medical aid; and medium and long-term repair of physical, social and economic damage. The reconstruction efforts aim at restoring the affected structures to a condition equal to or better than what existed before the disaster. They also aim at construction of permanent housing and full restoration of basic services. The concern with reconstruction is central to developing nations where disasters are common occurrences and resources available to withstand them are always limited. Some important questions in this regard relate to Conditions wherein development in general is rather neglected, disasters only aggravate the woes. The request function process needs to take into account the generation of resources and address some the fundamental development concerns (a) Mobilization of resources; and (b) Equitable utilization of resources for reconstruction

Funding Arrangements:

- Calamity Relief Fund
- Margin Money Scheme
- National Fund for Calamity Relief
- Natural Calamity Contingency Fund
- Members of Parliament Local Area Development Scheme (MPLADS)
- Prime Minister's National Relief Fund
- Insurance Schemes
- National Agricultural Insurance Scheme
- Seed Crop Insurance

- Kisan Credit Card
- SEWA Insurance
- District Level Funds
- International Monetary Fund (ZMF) and World Bank
- United Nations fund
- Asian Development Bank
- Bilateral and Multilateral Donor Agencies

Monitoring and evaluation of rehabilitation work: training, rescue

The objective of the Recovery Project is to produce a universally-applicable suite of indicators and techniques that allow donors and executing agencies to Monitor and Evaluate (M&E) post-disaster recovery and reconstruction. The framework allows users to monitor recovery in a manner that is rapid, independent and reliable. Such a system is required to promote transparency and accountability and to contribute towards a more systematic understanding of the process of recovery. The indicators are based on the use of Very High Resolution Optical Satellite Imagery and have been developed to fit existing humanitarian approaches, such as the Post-Disaster Needs Assessment (PDNA) and the Humanitarian Cluster Framework, and according to the needs of the users, affected communities and appropriate stakeholders. The indicators encompass a range of physical, environmental, social and economic factors, which can be independently analyzed or combined to provide a holistic representation of the reconstruction process.

Training in disaster management

Disaster preparedness and response are two of the four core areas for focus in Strategy, the strategy document of the International Federation. This strategy guides the National Societies in their work and the Secretariat and delegations who support them and underlines the need for improving the Red Cross Red Crescent Movement's response to emergencies. The aim of disaster management training is to build the capacity of National Societies' staff and volunteers, and that of International Federation delegates, to improve preparedness and response at all levels before during and after disasters and to give all components of the Movement the means to work together in a coordinated manner. The focus of disaster management training is generally on improving the technical skills of the participants on personnel and team management. It aims to encourage an exchange of experience and knowledge and the creation of networks amongst the disaster managers. It also aims to improve coordination of disaster response and the quality and availability of disaster management tools.

The role of the International Federation is to standardize training curriculum, train trainers in National Societies, facilitate and support training in disaster management at national, regional and international level. Training at national level is the responsibility of individual National Red Cross and Red Crescent Societies, supported as needed by technical delegates of the

International Federation. This training will reflect the mandate of the National Society in disaster management in its country and vary but will generally include:

- Volunteer induction.
- Volunteer management
- Community based first aid (CBFA)
- Community based disaster management (CBDM).
- Participatory hygiene and sanitation transformation (PHAST).
- Water and sanitation
- Vulnerability and capacity assessment needs assessment training
- Relief and distribution.
- Logistics management
- National disaster response team (NDRT).
- Public health in emergencies
- Food security and nutrition.
- IT/Telecommunications.
- Basic training course for delegates.

Disaster Health and Sheltering for Nursing Students

Disaster management training at regional level and at international level includes:

- Field Assessment and Coordination Team (FACT)
- Emergency Response Unit
- Team Leader.
- Relief.
- Emergency Needs Assessment.
- Technical training in Logistics
- IT/Telecommunications.

Seven States (Andhra Pradesh; Arunachal Pradesh; Assam; Manipur; Mizoram; Nagaland; Tripura), and one Union Territory (Andaman & Nicobar Islands) have already started training, and taken steps to form Incident Response Teams (**IRTs**).

Rescue operations

Disasters generally arise with little or no warning, causing or threatening death, injury or serious disruption to people & services which cannot be dealt with Fire department, Ambulance services and Police alone. The incident will require from the outset Special mobilization & co-operation of various bodies & voluntary organizations. If the incident has reached the magnitude of disaster, the other factors to be seen is the location of incident &

time that will be taken to rescue trapped & injured persons & restoration. It may be natural or man-made disaster should well aware of significance of disaster management plan, factors to be considered while formulating it & what are all is to be included in it. The massive earthquake in Nepal which resulted over 3000 casualties, it is imperative that all organizations & institutions prepare themselves & carryout periodic evacuation & train their teams in disaster management & rescue operations by providing them with requisite knowledge, tools & equipment.

During disaster it may be fire, explosion, earthquake, flood or storm many buildings collapse so our rescue operations should be in such a way that it does not worsen the situation of persons trapped in the collapsed building. Whenever, building Collapse there are void spaces, if a person is trapped in these void spaces, there are chances of being alive. The suggested guidelines help for which one should be prepared at all times. Search Procedure: For rescue, the first thing is to search for live persons. This searching has to be done very carefully and discreetly with a well defined system.

Analysis: To collect the facts about the accident / disaster and analyze the situation. This is necessary to arrive at various decisions & avoid any further damage. Whenever there is a collapse of building, many people move towards the place. There are certain miscreants who try to loot this will hinder the search operations. Hence it is necessary to make security arrangements around the site. Inspect the collapsed structure carefully, make markings and draw a rough layout. This layout will help in deciding the rescue path, rescue area & method to be adopted for search operations. After drafting the search plan we can easily move to our task. Provide first aid to victims. With the help of tools & resources available, try to find if any more live victims are there.

Equipment: The personal protective equipments such as Halmets, Masks, Gloves, self-contained breathing apparatus (SCBA) Sets, Protective Suits, a complete medical aid kit and communication system.

Warning System: Personnel Supplies like food, drinking water for at least 12 hours, Search & rescue tools, If required hazardous material guide & hazardous gas detectors.

Void Spaces: These void spaces are formed by falling beams, pillars etc. Beams & Pillars do not crush as they have steel rod inside. They form bridge like structure on which the debris gets entangled & the space below is safe. This safe space is called void space.

Listening for help Calls: The search & rescue team members should reach the accessible points of the collapsed structure and should keep silence to listen for any call for help. If not, they should try to approach nearest safe locations and shout “Any Body Inside” “who hears me” and wait & try to listen the response.

Searching Patterns: This may be categorized into two classes such as primary search & secondary search.

Primary search: This is also known as hasty search. This search is started instantly after the disaster. This search entails three main benefits like immediate detection of victims, assessment of the situation & preparation of planning & deciding priorities.

Secondary search: This is also known as Grid / Extensive Search. After the Primary Search, the need is of well planned search in a methodical manner. In this search we pin point the trapped victims & try to rescue them, without creating any further damage. As this search is in a systematic manner, here we decide upon the alternative methods for further searches. Methods applied for Searches.

Physical search: This is carried out in random way. This does not require any expertise or any specific rescue tool.

Canine search: During search operations sometimes we cannot find easily whether a victim is there or not under the debris. For this purpose we use specially trained dogs. These dogs have acute sense of smell. This method helps to detect even the victims who are trapped in inaccessible locations.

Technical search: In this search we use certain specialized equipments handled by well trained persons. These equipments can be categorized into two such as visual search instruments like telescope, mirror, video cameras etc and electronic listening devices like acoustic sensors, sound transmitters etc.

Hailing method procedure: Search team leader directs his team to be silent all work to be stopped around the area. Four members of search & rescue team take position in a cross pattern, positioned at interval of approximately 8 to 10 meters at safe location as close as possible around the search area. Going around, each of these searcher calls out loudly or with a megaphone. Instead of hailing, searchers may also knock something solid (Metallic) that is contagious part of the site debris in order to elicit response. All searchers then listen & point in the direction of any potential response to the instructions. This must be noted on the site sketch or on personal notes, where each rescuer makes a rough sketch of the area and the direction of the source of sound.

Physical Search Pattern: An organized search will yield the best opportunity to locate a victim & declare the area to be searched.

Multiple Rooms: The basic instructions for searching multiple rooms is Go Right, Stay Right after entering the structure, turn to the right, stay in contact with the right wall, either visually or physically, until the entire accessible area has been searched & the team return to the starting point.

Large open area (Life search): Use the line search method in auditoriums & offices with multiple partitions. Speed search team members move in a straight line across the open area, 3 to 4 meters apart. Slowly walk through the entire open area to the other side. Team members on the end of line search perimeter room to use the Go right, stay right method. The procedure may be repeated in the opposite direction.

Perimeter search: This search pattern can be successful when it is unsafe to search from the top. Four search team members take position equidistant around the search area. After using an appropriate search method each searcher rotate 90 degrees clock wise. This process to be repeated until all searchers complete four rotations.

Search of building on fire: The leader shall ascertain from neighbors, if there is anyone still trapped in the burning building. In factories the HR department has nominal rolls of the day & physical verifications from the safe assembly points. If possible rescue team should work in pairs. Start searching from the top of the building, so that the searcher may be nearer the fresh air at the end of search operation. Do not avoid any possible hiding place.

Search in smoke filled room: Never open the door of the smoke filled room suddenly. Open the door slowly with yourself in a crouching position, this will allow the hot gases & smoke to pass over your head. In case the door of the room opens outwards, place one foot against the bottom of the door & open gently. This will protect you from injury from sudden outward swing of the door as a result of considerable pressure on it due to the expansion of the heated gases inside the room. Enter the room in a crawling position as there is less smoke & less hot air near the floor. Keep a piece of cloth with rescue team. Always move in a crawling posture while inside the room. Keep yourself near the wall while moving. Make a complete circuit in the room. Find under & on the beds. Open and find inside cupboards, wardrobes, other likely places of hiding. Cross the room diagonally to make sure that no one is lying in the middle.

Victim Management: Continue search till the last victim is rescued.

Precautions during search: Always assume someone is listening to you. The victim is in the worst possible position & fighting to stay alive. You can enhance his chances of survival by being positive about the possibility of finding & saving him. You may be first person the victim is able to communicate with; therefore it is important to project a sense of confidence & hope.

Steps for Initial Contact with a located Victim: Identify & overcome language barriers. Identify yourself as a rescuer, projecting confidence & be calm in your voice & choice of words.

Information to be sought from victim: Name, Adult / Child, Type / Extent of injury, Hydration Status, Warmth, provide emergency treatment as quick, ask about other potential

victims & their condition. Inform victim about rescue operations. Provide protection from environment.

It is basically for disasters of higher magnitude like earthquakes, building collapse, explosions due to chemical reactions & other natural & man made calamities for preparedness of Rescue Operations for immediate reaction. Gear up the Central & Local Admin with trained teams, equipment & general awareness of people.

Role of Government and NGOs in DM

NGOs are organizations that are nonprofit making, voluntary and independent of government, engaged in activities concerning various societal and developmental issues. The role of the NGO's during a disaster is to have quick response and to try and save as many lives as it can with the given funds. The main role performed by the NGOs were providing relief materials, organizing health camp, involved in rescue operation, arranging temporary shelters and so on. Emerging trends in managing natural disaster have highlighted the role of Non-Governmental Organizations (NGOs) as one of the most effective alternative means of achieving an efficient alternative means of achieving an efficient communication link between the disaster management agencies and the affective community. The specific role of NGOs in respect to disaster management is:

Pre-disaster

- Training and capacity building of NGO staffs and task forces;
- Set up of information channel to the village and district;
- Advocacy and planning;
- Regular contact with block control room.

During disaster

- Activate of channel of warning dissemination to reach the target groups;
- Help block administration for wide dissemination of warning;
- Immediate rescue and first-aid, including psychological aid, supply of food, water, medicines, and other immediate need materials;
- Ensuring sanitation and hygiene;
- Damage assessment.

Post- disaster

- Technical and material aid in reconstruction;
- Assistance in seeking financial aid;
- Monitoring

What is the role of Governments and organizations in disaster management?

Governments have an inherent obligation to provide for the welfare of those who are governed by them. The government is expected to apply its assets to providing relief for those who are affected by the disaster. Governing bodies have offices of emergency services or emergency management as well as being connected to other governments of similar size and authority. As such, they have plans in place and can utilize government services. Governments have access to funding that is not necessarily available to other organizations, so they can tap the reserves that are help for emergency situations. They also have a vested interest in restoring services to the affected areas in order to bring them back to full functionality because that is how they must be in order for the government to make money on taxes. If the businesses and the population are unable to pay taxes, the government is without funds for all of its needs. That makes disaster recovery a very high priority if the governing body wants to remain in power. Failure to provide services in a time of critical need makes the government look bad to the governed.

Organizations are not bound by some of the same restrictions as governments are bound. Faith-based groups may focus on the needs of those within the same faith. Some non-governmental organizations may focus on the needs of children, women, or people of a particular cultural heritage in their efforts to provide aid to them. These organizations may exclude others from receiving their aid whereas governments cannot pick and choose with the same freedom. A city might not be able to direct the efforts of county personnel who answer to the county level authorities. The organization can simply cross over the jurisdictional lines by showing up and going to work. Organizations are very effective at filling in the gaps that are often left in governmental responses to disasters. They bring in supplemental personnel, materials, and represent an expanded network of responders that may not cost the government money because their work is paid for by donations or other funding processes.

Governments are often bound by their relationships with surrounding governments. For example, the government of one country may not accept aid from another country if it imagines that members of the aid givers may be spies who will report on the weaknesses of the affected state or attempt to sow dissent among the people in the affected area by suggesting that their current government cannot support them adequately or does not even care to do so. There may also be restrictions imposed on responders in terms of where they may or may not be allowed to go and what they may or may not be allowed to do. Organizations are expected to be neutral about their political views and to provide services for the sake of bringing aid to those in need. There are governments that are very suspicious of organizations for this reason as well. If they suspect that the aid providers will undermine their authority, they will not allow them to enter the affected area.

Governments can be very prideful. They do not want to look weak or unprepared to support their people. This could lead to problems for them later on and so they will posture that they are fine when they could really use some help. The flip side of that is there are governments that would be more than happy to show up on the scene to say that no one can survive without their help and that makes them look good. When Anderson Cooper reported

from the airport in Haiti during the early days of the response effort, he mentioned that aircraft were parked on the tarmac in order for people to pose for pictures while people waited for relief. The people who keep governments in power may expect favored responses to arrive where they want them and when they want them ahead of others in need and it is hard for the government to say no to them because that is the way that favors work. Organizations are not quite as likely to be constrained in the same way, but they may favor one element of society over another in more subtle ways. It is best when the governments and the organizations are unified in their efforts. Good communication and clearly defined objectives with cross supporting efforts produce the best results.

Participative rehabilitation process: case studies

India is one of the world's most disaster-prone areas. Both natural and man-made disasters frequent the country every year. Natural disasters such as floods, droughts, cyclones and earthquakes occur here with regular periodicity. The situation is compounded by communal riots, conflicts, fires, epidemics, building collapse and other man-made disasters. The Government of India through its National Crisis Management Committee and the organizational set-up at the state level has been ranking efforts to meet the exigencies as they arise. All these efforts and contingency plans concentrate on the post-disaster situation, especially just after disaster occurrence.

A half-baked approach is adopted for preventing and mitigating the adverse impact of natural disasters. We prepare ourselves for managing the aftermath of crisis rather than planning towards prevention or mitigation of disasters. There is a need for a fundamental change in the national disaster management approach itself. The community has to be involved in the planning and implementation of disaster management programmes. Some Case studies talk about relief process and while others involve participatory approach of the NGOs, Community-based Organizations (CBOs), government and community towards rehabilitation.

Case studies

Malpa Landslide 1998,
Latur Earthquake 1993,
BhuJ Earthquake 2001.

Participative programmes

- Linking Disasters to Development
- Networking Teachers For Educational Rehabilitation in Kutch
- Livelihood and Employment Restoration Programme in Orissa
- Echo Disaster Preparedness Programme



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DEPARTMENT OF CIVIL ENGINEERING

UNIT – IV – Disaster Management – SCIA4001

IV. DISASTER RESPONSE AND DISASTER MANAGEMENT

Disaster response plan

An emergency management plan is a course of action developed to mitigate the damage of potential events that could endanger an organization's ability to function. Such a plan should include measures that provide for the safety of personnel and, if possible, property and facilities.

Disaster response is the second phase of the disaster management cycle. It consists of a number of elements, for example; warning/evacuation, search and rescue, providing immediate assistance, assessing damage, continuing assistance and the immediate restoration or construction of infrastructure (i.e. provisional storm drains or diversion dams). The aim of emergency response is to provide immediate assistance to maintain life, improve health and support the morale of the affected population. Such assistance may range from providing specific but limited aid, such as assisting refugees with transport, temporary shelter, and food, to establishing semi-permanent settlement in camps and other locations. It also may involve initial repairs to damage or diversion to infrastructure.

The focus in the response phase is on putting people safe, prevent need disasters and meeting the basic needs of the people until more permanent and sustainable solutions can be found. The main responsibility to address these needs and respond to a disaster lies with the government or governments in whose territory the disaster has occurred. In addition, Humanitarian organizations are often strongly present in this phase of the disaster management cycle, particularly in countries where the government lacks the resources to respond adequately to the needs.

Emergency Response Plan

The actions taken in the initial minutes of an emergency are critical. A prompt warning to employees to evacuate, shelter or lockdown can save lives. A call for help to public emergency services that provides full and accurate information will help the dispatcher send the right responders and equipment. An employee trained to administer first aid or perform CPR can be lifesaving. Action by employees with knowledge of building and process systems can help control a leak and minimize damage to the facility and the environment.

The first step when developing an emergency response plan is to conduct a risk assessment to identify potential emergency scenarios. An understanding of what can happen will enable you to determine resource requirements and to develop plans and procedures to prepare your business. The emergency plan should be consistent with your performance objectives.

At the very least, every facility should develop and implement an emergency plan for protecting employees, visitors, contractors and anyone else in the facility. This part of the emergency plan is called “protective actions for life safety” and includes building evacuation (“fire drills”), sheltering from severe weather such as tornadoes, “shelter-in-place” from an exterior airborne hazard such as a chemical release and lockdown. Lockdown is protective action when faced with an act of violence.

When an emergency occurs, the first priority is always life safety. The second priority is the stabilization of the incident. There are many actions that can be taken to stabilize an incident and minimize potential damage. First aid and CPR by trained employees can save lives. Use of fire extinguishers by trained employees can extinguish a small fire. Containment of a small chemical spill and supervision of building utilities and systems can minimize damage to a building and help prevent environmental damage.

Some severe weather events can be forecast hours before they arrive, providing valuable time to protect a facility. A plan should be established and resources should be on hand, or quickly, available to prepare a facility. The plan should also include a process for damage assessment, salvage, protection of undamaged property and cleanup following an incident. These actions to minimize further damage and business disruption are examples of property conservation. Guidance for the development of an emergency response plan can be found in this step. Build your emergency response plan using this worksheet.

Protective Actions for Life Safety

When there is a hazard within a building such as a fire or chemical spill, occupants within the building should be evacuated or relocated to safety. Other incidents such as a bomb threat or receipt of a suspicious package may also require evacuation. If a tornado warning is broadcast, everyone should be moved to the strongest part of the building and away from exterior glass. If a transportation accident on a nearby highway results in the release of a chemical cloud, the fire department may warn to “shelter-in-place.” To protect employees from an act of violence, “lockdown” should be broadcast and everyone should hide or barricade themselves from the perpetrator.

Protective actions for life safety include:

- Evacuation
- Sheltering
- Shelter-In-Place
- Lockdown

Your emergency plan should include these protective actions. If you are a tenant in multi-tenanted building, coordinate planning with the building manager.

Evacuation

Prompt evacuation of employees requires a warning system that can be heard throughout the building. Test your fire alarm system to determine if it can be heard by all employees. If there is no fire alarm system, use a public address system, air horns or other means to warn everyone to evacuate. Sound the evacuation signal during planned drills so employees are familiar with the sound.

Make sure that there are sufficient exits available at all times.

- Check to see that there are at least two exits from hazardous areas on every floor of every building. Building or fire codes may require more exits for larger buildings.
- Walk around the building and verify that exits are marked with exit signs and there is sufficient lighting so people can safely travel to an exit. If you find anything that blocks an exit, have it removed.
- Enter every stairwell, walk down the stairs, and open the exit door to the outside. Continue walking until you reach a safe place away from the building. Consider using this safe area as an assembly area for evacuees.

Appoint an evacuation team leader and assign employees to direct evacuation of the building. Assign at least one person to each floor to act as a “floor warden” to direct employees to the nearest safe exit. Assign a backup in case the floor warden is not available or if the size of the floor is very large. Ask employees if they would need any special assistance evacuating or moving to shelter. Assign a “buddy” or aide to assist persons with disabilities during an emergency. Contact the fire department to develop a plan to evacuate persons with disabilities.

Have a list of employees and maintain a visitor log at the front desk, reception area or main office area. Assign someone to take the lists to the assembly area when the building is evacuated. Use the lists to account for everyone and inform the fire department whether everyone has been accounted for. When employees are evacuated from a building, OSHA regulations require an accounting to ensure that everyone has gotten out safely. A fire, chemical spill or other hazard may block an exit, so make sure the evacuation team can direct employees to an alternate safe exit.

Sheltering

If a tornado warning is broadcast, a distinct warning signal should be sounded and everyone should move to shelter in the strongest part of the building. Shelters may include basements or interior rooms with reinforced masonry construction. Evaluate potential shelters and conduct a drill to see whether shelter space can hold all employees. Since there may be little time to shelter when a tornado is approaching, early warning is important. If there is a severe thunderstorm, monitor news sources in case a tornado warning is broadcast. Consider purchasing an Emergency Alert System radio - available at many electronic stores. Tune in to

weather warnings broadcast by local radio and television stations. Subscribe to free text and email warnings, which are available from multiple news and weather resources on the Internet.

Shelter-In-Place

A tanker truck crashes on a nearby highway releasing a chemical cloud. A large column of black smoke billows into the air from a fire in a nearby manufacturing plant. If, as part of this event, an explosion, or act of terrorism has occurred, public emergency officials may order people in the vicinity to “shelter-in-place.” You should develop a shelter-in-place plan. The plan should include a means to warn everyone to move away from windows and move to the core of the building. Warn anyone working outside to enter the building immediately. Move everyone to the second and higher floors in a multistory building. Avoid occupying the basement. Close exterior doors and windows and shut down the building’s air handling system. Have everyone remain sheltered until public officials broadcast that it is safe to evacuate the building.

Lockdown

An act of violence in the workplace could occur without warning. If loud “pops” are heard and gunfire is suspected, every employee should know to hide and remain silent. They should seek refuge in a room, close and lock the door, and barricade the door if it can be done quickly. They should be trained to hide under a desk, in the corner of a room and away from the door or windows. Multiple people should be trained to broadcast a lockdown warning from a safe location.

Resources for Protective Actions for Life Safety

In addition to the following resources available on the Internet, seek guidance from your local fire department, police department, and emergency management agency.

- Means of Egress – U.S. Occupational Safety & Health Administration (OSHA) 29 CFR 1910 Subpart E
- NFPA 101: Life Safety Code® – National Fire Protection Association
- Employee Alarm Systems – OSHA 29 CFR 1910.165
- Evacuation Planning Matrix – OSHA
- Evacuation Plans and Procedures eTool - OSHA
- Design Guidance for Shelters and Safe Rooms – Federal Emergency Management Agency (FEMA 453)

Incident Stabilization

Stabilizing an emergency may involve many different actions including: firefighting, administering medical treatment, rescue, containing a spill of hazardous chemicals or handling a threat or act of violence. When you dial 9-1-1 you expect professionals to respond

to your facility. Depending upon the response time and capabilities of public emergency services and the hazards and resources within your facility, you may choose to do more to prepare for these incidents. Regulations may require you to take action before emergency services arrive.

If you choose to do nothing more than call for help and evacuate, you should still prepare an emergency plan that includes prompt notification of emergency services, protective actions for life safety and accounting of all employees.

Developing the Emergency Plan

Developing an emergency plan begins with an understanding of what can happen. Review your risk assessment. Consider the performance objectives that you established for your program and decide how much you want to invest in planning beyond what is required by regulations.

Assess what resources are available for incident stabilization. Consider internal resources and external resources including public emergency services and contractors. Public emergency services include fire departments that may also provide rescue, hazardous materials and emergency medical services. If not provided by your local fire department, these services may be provided by another department, agency or even a private contractor. Reach out to local law enforcement to coordinate planning for security related threats.

Document available resources: Determine whether external resources have the information they would need to handle an emergency. If not, determine what information is required and be sure to document that information in your plan.

Prepare emergency procedures for foreseeable hazards and threats. Review the list of hazards presented at the bottom of the page. Develop hazard and threat specific procedures using guidance from the resource links at the bottom of this page.

Warning, Notifications, and Communications

Plans should define the most appropriate protective action for each hazard to ensure the safety of employees and others within the building. Determine how you will warn building occupants to take protective action. Develop protocols and procedures to alert first responders including public emergency services, trained employees and management. Identify how you will communicate with management and employees during and following an emergency.

Roles and Responsibilities for Building Owners and Facility Managers

Assign personnel the responsibility of controlling access to the emergency scene and for keeping people away from unsafe areas. Others should be familiar with the locations and functions of controls for building utility, life safety and protection systems. These systems

include ventilation, electrical, water and sanitary systems; emergency power supplies; detection, alarm, communication and warning systems; fire suppression systems; pollution control and containment systems; and security and surveillance systems. Personnel should be assigned to operate or supervise these systems as directed by public emergency services if they are on-site.

Site and Facility Plans and Information

Public emergency services have limited knowledge about your facility and its hazards. Therefore, it is important to document information about your facility. That information is vital to ensure emergency responders can safely stabilize an incident that may occur. Documentation of building systems may also prove valuable when a utility system fails—such as when a water pipe breaks and no one knows how to shut off the water.

Compile a site-plan and plans for each floor of each building. Plans should show the layout of access roads, parking areas, buildings on the property, building entrances, the locations of emergency equipment and the locations of controls for building utility and protection systems. Instructions for operating all systems and equipment should be accessible to emergency responders.

Provide a copy of the plan to the public emergency services that would respond to your facility and others with responsibility for building management and security. Store the plan with other emergency planning information such as chemical Material Safety Data Sheets (MSDS), which are required by Hazard Communication or “right to know” regulations.

Training and Exercises

Train personnel so they are familiar with detection, alarm, communications, warning and protection systems. Review plans with staff to ensure they are familiar with their role and can carry out assigned responsibilities. Conduct evacuation, sheltering, sheltering-in-place and lockdown drills so employees will recognize the sound used to warn them and they will know what to do. Facilitate exercises to practice the plan, familiarize personnel with the plan and identify any gaps or deficiencies in the plan.

10 Steps for Developing the Emergency Response Plan

1. Review performance objectives for the program.
2. Review hazard or threat scenarios identified during the risk assessment.
3. Assess the availability and capabilities of resources for incident stabilization including people, systems and equipment available within your business and from external sources.
4. Talk with public emergency services (e.g., fire, police and emergency medical services) to determine their response time to your facility, knowledge of your facility and its hazards and their capabilities to stabilize an emergency at your facility.

5. Determine if there are any regulations pertaining to emergency planning at your facility; address applicable regulations in the plan.
6. Develop protective actions for life safety (evacuation, shelter, shelter-in-place, lockdown).
7. Develop hazard and threat-specific emergency procedures using guidance from the resource links on this page. Write your emergency response plan using this template
8. Coordinate emergency planning with public emergency services to stabilize incidents involving the hazards at your facility.
9. Train personnel so they can fulfill their roles and responsibilities.
10. Facilitate exercises to practice your plan

Search and rescue

Search and rescue (SAR) is the search for and provision of aid to people who are in distress or imminent danger. The general field of search and rescue includes many specialty sub-fields, typically determined by the type of terrain the search is conducted over. These include mountain rescue; ground search and rescue, including the use of search and rescue dogs; urban search and rescue in cities; combat search and rescue on the battlefield and air-sea rescue over water. International Search and Rescue Advisory Group (INSARAG) is a UN organization that promotes the exchange of information between national urban search and rescue organizations. The duty to render assistance is covered by Article 98 of the UNCLOS.

Types of search and rescue:

Ground (Lowland) search and rescue

Mountain rescue

Cave rescue

Urban search and rescue

Combat search and rescue

Maritime search and rescue

Logistics management and Challenges

Emergency logistics management has emerged as a worldwide-noticeable theme as disasters, either artificial or natural, may occur anytime around the world with enormous consequences. This may hold particularly under conditions of large-scale calamities such as the Chichi earthquake in Taiwan (1999), the Bam earthquake in Iran (2003), the tsunami in the Indian Ocean (2004), as well as the Hurricane Katrina in the US (2005), which need quick-responsive emergency logistics systems for efficient disaster relief supply and recovery. For instance, the Indian Ocean tsunami of 2004 engendered by a major earthquake has reportedly caused more than 200,000 casualties, 100,000 missing, and more affected people who had their homes and livelihoods swept away. Despite the fact that such a catastrophe had increasingly raised global humanitarian supports in relief supply and rehabilitation, emergency logistics remains as the key to efficient and effective alleviation of

disaster impact in the immediate aftermath. Although emergency logistics is vital, it has also raised numerous challenging issues, which may not be addressed as easily as in business logistics. Here, the challenges of emergency logistics management can be characterized in the following four main facets.

The definition of emergency logistics remains ambiguous

The timeliness of relief supply and distribution is hardly controllable in the emergency context

Resource management for emergency logistics remains challenging

Accurate, real-time relief demand information is required but almost inaccessible

HUMAN BEHAVIOUR AND RESPONSE:

There is an old saying that "No two individuals in this world are alike". It is interesting to notice how widely a mother differs from her daughter and father from his son in individual behaviour. But what is the human behaviour which separates the personalities of one person from another. In a layman's language, it is the way different individuals react when facing a situation. One person might be mild in his reaction, while the other might be very aggressive. One might find it difficult to separate normal behaviour from abnormal. It may be difficult to say what constitutes a normal behaviour when faced with an unexpected situation. Abnormal is simply a label given to behaviour that deviates from social expectations.

Stress Management Techniques

Purpose:

According to the World Health Organization, stress is a significant problem of our times and affects both physical as well as the mental health of people. Stress is defined as a situation where the organism's homeostasis is threatened or the organism perceives a situation as threatening. Stress coping methods are the cognitive, behavioral and psychological efforts to deal with stress.

Method:

The following techniques were identified such as progressive muscle relaxation, autogenic training, relaxation response, biofeedback, emotional freedom technique, guided imagery, diaphragmatic breathing, transcendental meditation, cognitive behavioral therapy, mindfulness-based stress reduction and emotional freedom technique. These are all evidence based techniques, easy to learn and practice, with good results in individuals with good health.

Integrating human behavior and response issues into fire safety management of facilities

Although there is a growing international movement toward the use of engineered or performance-based fire safety design, current practice is dominated by prescriptive-based design. In prescriptive-based fire safety design, only those requirements prescribed by appropriate building regulations, installation standards, or approved documents tend to be applied. Because these requirements typically include fire protection measures, such as fire detection and signaling systems, automatic sprinkler systems, fire compartmentation, and emergency egress systems, there is often an assumption that occupants, employees, and users of a facility will be safe should a fire occur. However, there are a variety of factors that could affect the actual fire safety of a facility that comply with the appropriate regulations. Fuel type, loading, configuration, and location can change, leading to an increase in fire risk. Occupants may not see, hear or understand fire alarm signals as fire alarm signals. Fire detection and signaling systems, fire suppression systems, or smoke management systems may not be 100 percent functional at all times. Fortunately, many of these factors can be controlled for, if they are understood and addressed, within a fire safety management plan. To assist with such planning, this paper discusses various human behavior and response issues that may affect life safety during a fire or emergency, and provides suggestions for integrating these issues into a fire safety management plan.

Rumour and Panic Management

Bioterrorism: How to Vaccinate a City against Panic

Bioterrorism policy discussions and response planning efforts have tended to discount the capacity of the public to participate in the response to an act of bioterrorism, or they have assumed that local populations would impede an effective response. Fears of mass panic and social disorder underlie this bias. Although it is not known how the population will react to an unprecedented act of bioterrorism, experience with natural and technological disasters and disease outbreaks indicates a pattern of generally effective and adaptive collective action. Failure to involve the public as a key partner in the medical and public-health response could hamper effective management of an epidemic and increase the likelihood of social disruption. Ultimately, actions taken by nonprofessional individuals and groups could have the greatest influence on the outcome of a bioterrorism event. Five guidelines for integrating the public into bioterrorism response planning are proposed: (1) treat the public as a capable ally in the response to an epidemic, (2) enlist civic organizations in practical public health activities, (3) anticipate the need for home-based patient care and infection control, (4) invest in public outreach and communication strategies, and (5) ensure that planning reflects the values and priorities of affected populations.

Controlling Rumors on Social Media Crucial During a Disaster, Terrorist Attack

Authorities around the world should set up emergency communication teams to manage the amount of misinformation that is circulated on social media websites during disasters, terrorist attacks and other social crises. Twitter is emerging as the dominant social reporting tool to report eye-witness accounts and to share information on disasters, terrorist attacks and social crises as a collective effort to make sense of what is happening.

When it's the online community that creates and exchanges news about a crisis situation rather than official news media, the facts and perceptions about unfolding events can be exaggerated. It also unintentionally turns this information into mis-information, diverting attention from the real problems. Authorities and organizations involved in responding to a disaster or terrorist attack need to set up an emergency communication center to provide speedy, relevant information on an unfolding crisis and to confirm or dispel misinformation circulated on social media.

Within minutes of the initial terrorist attack in Mumbai, a local resident posted a stream of pictures on the photo sharing website Flickr. Almost concurrently, a group of people voluntarily formed a Twitter page with a link to the Flickr site and spread eyewitness accounts of the terrorist attacks with texts, photos and links to other sources.

While the flurry of social media activity had many positive outcomes — enabling people to contact family members, encouraging blood donations and providing eyewitness accounts — it also caused many rumors to circulate. Natural disasters and crises such as terrorist attacks provide the optimum conditions for rumors to spread which can exacerbate the situation for emergency response operations and cause panic amongst the public. For example, during the Mumbai terrorist attacks, the police control room was flooded with incorrect reports of explosions at leading hotels.

Misinformation on the internet was also influencing what was being reported on official news channels. The BBC was forced to admit they had made a mistake after using Twitter coverage of the Mumbai terror attacks as a source of their official news. What people involved in the crisis really want is much localized information in real time to aid their decision-making. Hence, they rapidly realize that mainstream media do not provide them with local information that they desperately need to overcome the extreme situation.” Consequently, “they turn to social media such as facebook and Twitter.

Emergency response teams need to put in place prompt emergency communication systems to refute the misinformation and provide citizens with timely, localized and correct information through multiple communication channels such as website links, social network websites, RSS, email, text message, radio or TV. In cases of community disasters, emergency responders need to make extra effort to distribute reliable information and, at the same time, control collective anxiety in the community to suppress the spreading of unintended rumor information. This includes the setting up of an ‘emergency communication center’ in the

local community who would monitor social media very closely and respond rapidly to unverify and incorrect rumor information.

Medical and Health Response to Different Disasters

After disasters is the loss of human lives, and the spread of communicable diseases, and epidemics. This is mainly due to the disruption in hygiene and sanitation conditions, contamination of food and drinking water, want of immediate medical and health response, inadequate medical and health services, damaged medical and health infrastructure, and lack of preventive and preparedness measures. To mitigate these losses, we need to have a proper system of contingency planning, which should operate on the principles of trigger mechanism. Again, planning should be multi-institutional. All institutions, like the government, civil society, private, corporate, international, media, academia, professionals, armed forces, and civil defense should participate in preparing it. All agencies need to have their standard operating procedures well rehearsed and ready, to meet any disaster situation. The role of medical and health department, hospitals, health centres, nursing homes, NGOs, volunteers, community, international agencies, individuals, and armed forces is very crucial in rendering immediate medical relief, and resuscitation to the affected.

Public health management of disasters is, therefore, very significant, when it comes to saving lives. It is based on four important aspects, prevention, preparedness, response, and recovery. Prevention aspects deal with the study of risk factors associated with different disasters on public health, and analysis of vulnerability of population of a particular place to different disasters. It is based on epidemiological studies and surveillance data, which helps in developing case definitions of various diseases and injuries pertaining to different disasters. Preparedness measures provide for arrangement at casualty areas and disaster sites, and hospitals/ health centres. It provides planning of medical and health management of disasters in remote areas, logistics management, and education and training of the medics, and paramedics in responding to disasters. Response and recovery measures aim at carrying out immediate rescue, relief, resuscitation, first aid, transportation, needs assessment, damage assessment, community health management, and psychological rehabilitation of the affected.

Medical and health response will be effective when based on well drawn prevention and preparedness plans. Hence, we will be discussing the prevention and preparedness measures pertaining to different disasters briefly to understand the response aspect to them.

Relief Measures

What is a relief measure?

Specific measures which are imposed by a government when the desire is to temporarily suspend or restrict the importation of products in order to protect its domestic manufacturers from competition.

What is import relief?

Import relief refers to governmental measures imposed to temporally restrict imports of a product or commodity to protect domestic producers from competition.

Guidelines for minimum standards of relief.-

The National Authority shall recommend guidelines for the minimum standards of relief to be provided to persons affected by disaster, which shall include-

- The minimum requirements to be provided in the relief camps in relation to shelter, food, drinking water, medical cover and sanitation;
- The special provisions to be made for widows and orphans
- Extra assistance on account of loss of life as also assistance on account of damage to houses and for restoration of means of livelihood
- Such other relief as may be necessary.

Relief management



Disaster relief (or emergency management) refers to the process of responding to a catastrophic situation, providing humanitarian aid to persons and communities who have suffered from some form of disaster. It involves dealing with and avoiding risks and preparing, supporting, and rebuilding society when natural or human-made disasters occur. In general, any emergency management is the continuous process by which all individuals, groups, and communities manage hazards in an effort to avoid or limit the impact of disasters resulting from the hazards. Disaster relief is the monies or services made available to individuals and communities that have experienced losses due to disasters such as floods, hurricanes, earthquakes, drought, tornadoes, and riots.

Phases and responses

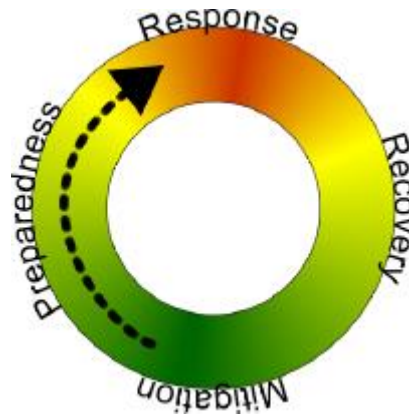


Fig. Four phases in emergency management

The nature of emergency management is highly dependent on economic and social conditions local to the emergency, or disaster. This is true to the extent that some disaster relief experts, such as Fred Cuny, have noted that in a sense the only real disasters are economic. The cycle of emergency management must, therefore, include long-term work on infrastructure, public awareness, and even human justice issues. This is particularly important in developing nations. The process of emergency management involves four phases: Mitigation, preparedness, response, and recovery.



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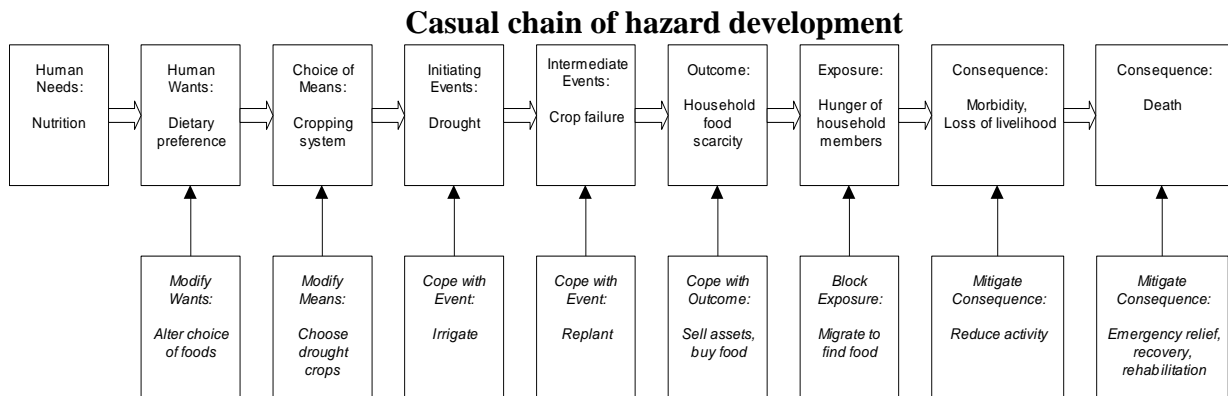
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UNIT – V – Disaster Management – SCIA4001

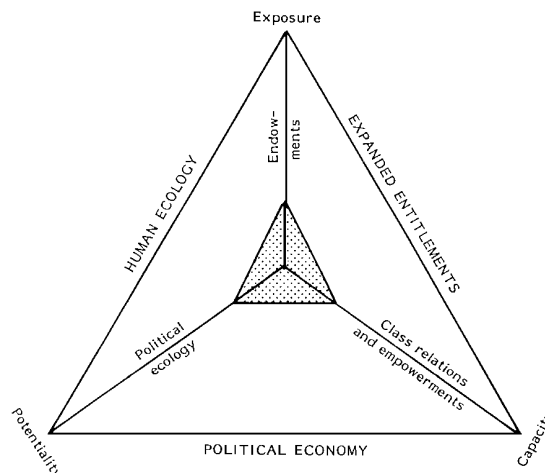
V. Risk Assessment and Vulnerability

1. Definitions of hazard, vulnerability, risk and disasters

Hazard	:	potential threat to humans and their welfare
+		
vulnerability	:	exposure and susceptibility to losses
=		
risk	:	probability of hazard occurrence
disaster	:	realization of a risk

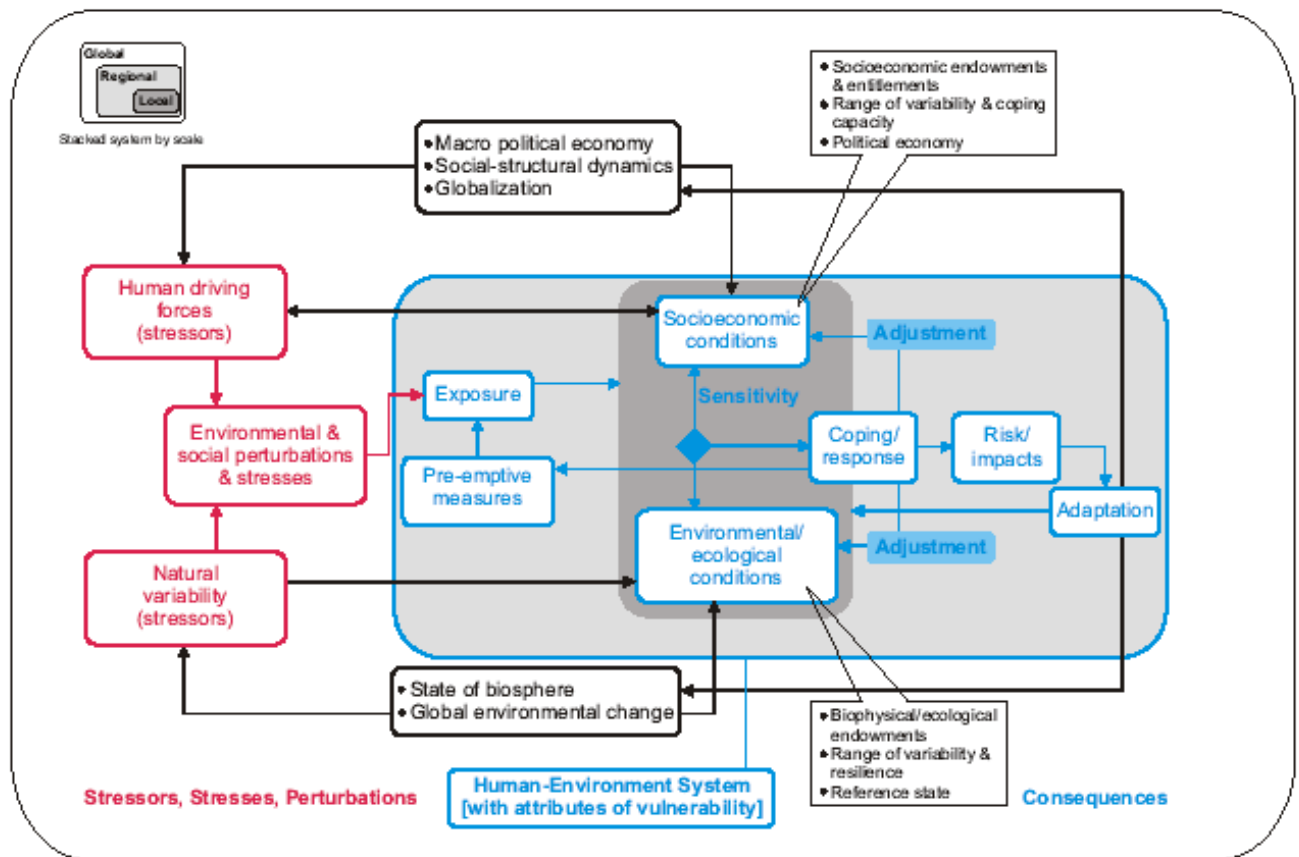


Three dimensions of vulnerability



Source: after Bohle et al. (1994).

Environmental vulnerability



Source: Kasperson, et al.

DEFINITIONS

vulnerability: the degree to which a person, system or unit is likely to experience harm due to exposure to perturbations or stresses.

exposure: the contact between a system and a perturbation or stress.

sensitivity: the extent to which a system or its components is likely to experience harm, and the magnitude of that harm, due to exposure to perturbations or stresses.

resilience: the ability of a system to absorb perturbations or stresses without changes in its fundamental structure or function that would drive the system into a different state (or extinction).

stress: cumulating pressure on a system resulting from processes within the normal range of variability, but which over time may result in disturbances causing the system to adjust, adapt, or be harmed.

perturbation: a disturbance to a system resulting from a sudden shock with a magnitude outside the normal vulnerability.

adjustment: a system response to perturbations or stress that does not fundamentally alter the system itself. Adjustments are commonly (but not necessarily) short-term and involve relatively minor system modifications.

adaptation: A system response to perturbations or stress that is sufficiently fundamental to alter the system itself, sometimes shifting the system to a new state.

hazard: the threat of a stress or perturbation to a system and what it values.

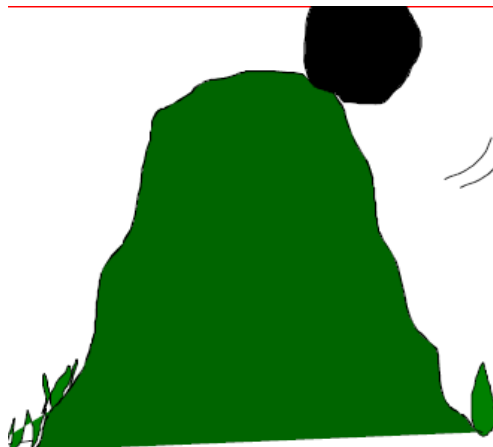
risk: the conditional probability and magnitude of harm attendant on exposure to a perturbation or stress.

PROGRESSION OF VULNERABILITY								
ROOT CAUSES	⇒	DYNAMIC PRESSURES	⇒	UNSAFE CONDITIONS	⇒	DISASTERS	⇐	HAZARDS
Limited <ul style="list-style-type: none">• Resources• Structures• Power		Lack of <ul style="list-style-type: none">• Institutions• Training• Skills• Investment		Fragile physical <ul style="list-style-type: none">• Dangerous• Unprotected		RISK		Earthquake
						=		Wind storm
Ideologies <ul style="list-style-type: none">• Political• Economic		<ul style="list-style-type: none">• Markets• Press• Civil		Fragile local <ul style="list-style-type: none">• Livelihoods at• Low income		HAZARD		Flooding
						+		Volcano
		Macro-forces <ul style="list-style-type: none">• Population• Urbanisati• Arms• Debt• Deforestati• Soil		Vulnerable <ul style="list-style-type: none">• Groups at risk• Little capacity		VULNERAB		Landslide
								Drought
				Public actions <ul style="list-style-type: none">• Lack of• Endemic				Virus and
								Heat wave

Structure of vulnerability and disasters. Source: Blaikie et al. (1994).

Hazard, Risk, Vulnerability and Disaster? How these terms are interconnected to each other?

There is a potential for occurrence of an event. Hazard is any substance, phenomenon or situation, which has the potential to cause disruption or damage to people, their property, their services and their environment.



Classification of Hazards

- Natural
- Biological
- Technological
- Societal

Atmospheric Single element

- Excess rainfall
- Freezing rain (glaze)
- Hail
- Heavy snowfall
- High wind speeds
- Extreme temperatures

Atmospheric Combined elements

- Hurricanes
- 'Glaze' storms
- Thunderstorms
- Blizzards
- Tornadoes
- Heat/cold stress

Hydrologic

- Floods – river and coastal
- Wave action
- Drought
- Rapid glacier advance

Geologic

- Mass -movement
- Land slides
- Mud slides
- Avalanches
- Earthquake
- Volcanic eruption
- Rapid sediment movement

Biologic

- Epidemic in humans
- Epidemic in plants
- Epidemic in animals
- Locusts

Technologic

- Transport accidents
- Industrial explosions and fires
- Accidental release of toxic chemicals
- Nuclear accidents
- Collapse of public buildings

Secondary hazards

These are hazards that follow as a result of other hazard events. Hazards secondary to an earthquake may be listed as follows to illustrate the concept. Primary hazard is the earthquake and the secondary hazards are

- Building collapse
- Dam failure
- Fire
- Hazardous material spill
- Interruption of power/ water supply/ communication/ transportation/ waste disposal
- Landslide
- Soil liquefaction
- Tsunami (tidal wave)
- Water pollution

Multiple hazards

When more than one hazard event impacts the same area, there arises a multiple hazard situation. These different hazard events may occur at the same time or may be spaced out in time.

The Return Period

Majority of hazards have return periods on a human time-scale. Examples are five-year flood, fifty-year flood and a hundred year flood. This reflects a statistical measure of how often a hazard event of a given magnitude and intensity will occur. The frequency is measured in terms of a hazard's recurrence interval.

Hazards on the rise?

- Climate Change
- Sea level rise
- Global warming
- Urbanization
- Population growth
- Land degradation
- poverty

A hazard is a potentially damaging event and the measure of hazard is its probability of occurrence at a certain level of severity within a specified period of time in a given area.

Hazard assessment is the process of studying the nature of natural /man-made hazards determining its essential features(degree of severity, duration, extent of the impact area) and their relationship.

Assessment Approaches

- Quantitative Approach
- Qualitative Approach

Assessment Methods

- **Deterministic Approach:** Determined through associated physical characteristics and analysis of consequences.
- **Probabilistic Approach:** Estimates the probability of each hazard affecting an area or region, and likelihood of occurrence and can be determined through research studies, simulation studies, etc (eg. Flood/erosion simulation studies, slope stability calculations, landslide hazard zonation).
- **Informal Ranking:** Uses subjectively defined scales to rank the hazards and associated risks according to an area specific or country specific ranking system.

Vulnerability

There is a potential for an event to occur. Vulnerability is a concept which describes factors or constraints of an economic, social, physical or geographic nature, which reduce the ability to prepare for and cope with the impact of hazards.

Categories of Vulnerabilities

- **Hazard-specific:** a characteristic which makes the element concerned susceptible to the force/s or impact of a hazard. The geo-physical and locational attributes of the element/s concerned are considered in this category. Based on the present-knowledge of the

distribution and frequency of hazards, a community or country may be threatened by specific hazards.

- **Setting-specific:** this is concerned with the prevailing socio-economic arrangement of the area concerned as to whether it is predominantly rural or urban. There are inherent setting characteristics that may be common to both as well as exclusive to each which contribute to the general susceptibility of the area.
- **Concentrations and Crowdedness:** the three aspects are crowdedness and disease; crowdedness and buildings; crowdedness and resource base.
- **Numbers of Peoples and Activities** - the two aspect of this condition are Technologies and the Management System.
- **Proximity to Man-made Hazards** - the aspects considered are Technological hazards, Economic hazards, and Social Hazards
- **Interdependency of Lifelines** – Major lifelines of the urban area are dependent on each other to function effectively. This interdependency is a factor that may contribute to the area's vulnerability.
- **Social and Organizational Dimension** – The existing arrangement of a society regarding relationships of individuals, groups and institutions may create adverse situations that weakens these elements' capabilities to face or withstand hazards and contribute instead to the intensifying of the effects.
- **Attitudinal and Motivational Dimension** – The prevalent worldview of the society or certain groups within society may contribute to a passive or non-active stance regarding the disasters that beset the area.

Risk: There is a potential for an event to occur. Therefore there is a risk.

Risk is the probability that negative consequences may arise when hazards interact with vulnerable areas, people, property, environment. Risk is a concept which describes a potential set of consequences that may arise from a given set of circumstances

Concepts of the Risk and its Analysis:

Risk is a combination of the interaction of hazard, exposure, and vulnerability, which can be represented by the three sides of a triangle if any one of these sides increases, the area of the triangle increases, hence the amount of risk also increases. If any one of the sides reduces, the risk reduces. If we can eliminate one side there is no risk.



Disaster Risk Reduction

DRR is a systematic approach to identifying, assessing and reducing the risks of disaster. It aims to reduce socio-economic vulnerabilities to disaster as well as dealing with the environmental and other hazards that trigger them. It is influenced by the researches on vulnerability. It is the responsibility of development and relief agencies. It should be an integral part of the way such organizations do their work. DRR is very wide-ranging: Its scope is much broader and deeper than conventional emergency management. There is potential for DRR initiatives in every sector of development and humanitarian work.

The UNDP defines the DRR as "The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development".

Disaster Risk Reduction (DRR) aims to reduce the damage caused by natural hazards like earthquakes, floods, droughts and cyclones, through an ethic of prevention. Disasters often follow natural hazards. A disaster's severity depends on how much impact a hazard has on society and the environment.

Risk assessment

Disaster Risk Assessment Process

Definition:

It is the process of determining the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability and capacity. (or) Disaster Risk assessment is a process to determine the nature and extent of such risk, by analyzing hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend. In this way, informed decisions can be made regarding steps to reduce the impacts of disasters.

A comprehensive risk assessment not only evaluates the magnitude and likelihood of potential losses in case of a disaster but also provides full understanding of the causes and impact of those losses. DRA is an integral part of the decision making process. It therefore needs to engage multi- stakeholders from various disciplines and requires close cooperation and collaboration of different organizations and institutions of the target area.

Steps in Risk Assessment:

Risk Assessment (RA) consists of the following steps:

1. Hazard Assessment:

In this section the researcher identifies the types of hazards that have occurred in the area in the past or can occur in the future. This is usually the first step which then defines other steps because for each hazard, different tools and techniques are used for analysis and assessment. Earthquakes, for example, require different instruments and specializations for analysis than e.g. landslides or floods. The next steps are to find the frequency, seasonality, magnitude, intensity, extent and causes of the occurrence of hazards.

2. Vulnerability Assessment:

This step is performed to determine the elements at risk, degree of vulnerability and the causes of the elements at risk. All elements (people, building, resources etc) which are prone to the hazard are identified and an inventory is prepared. Then the degree of their vulnerability is analyzed and causes of their vulnerability are determined. Critical facility analysis is also performed by determining the critical facilities (that play major role in daily routine life e.g. schools, hospitals, mosques, civic centers etc.) at risk, causes of their vulnerabilities and analyzing historical records of hazard occurrence in the identified facilities.

3. Capacity Assessment:

Capacity assessment means to identify the strengths and resources available to reduce the level of risk, or the effects of a disaster. In this step, resources of a community are evaluated by analyzing the available strengths like skills, expertise, equipment, infrastructure etc. Then the availability of these resources is evaluated to know how soon these resources can be deployed and become available to use. Another important step is to find out how durable and long lasting these resources are and what is the level of their operational integrity (Ability to complete tasks without supervision).

4. People's perception of Risk:

The process of finding out the perceptions of heterogeneous groups in the community regarding the disasters, hazards and risks that they are facing.

Vulnerability Analysis or vulnerability assessment

A vulnerability assessment is the process of defining, identifying, classifying and prioritizing vulnerabilities in computer systems, applications and network infrastructures and providing the organization doing the assessment with the necessary knowledge, awareness and risk background to understand the threats to its environment and react appropriately.

What is Vulnerability?

1. The analysis and study of the vulnerability of populations is a core responsibility and function of WFP.
2. Vulnerability is an important concept in food security. It is defined as the probability of an acute decline in food access or consumption levels below minimum survival needs. It is a result of both exposure to risk factors - such as drought, conflict or extreme price fluctuations - and also of underlying socio-economic processes which reduce the capacity of people's ability to cope. Thus, vulnerability can be viewed as follows:

vulnerability = exposure to risk + inability to cope

3. Fluctuations in food consumption levels usually result from:
 - variations in the home production of food commodities
 - variations in food prices
 - changes in the level of cash incomes from various sources.
4. Natural and man-made hazards, such as drought, floods, insect infestations, civil unrest and conflict can undermine household productive activities, limit access to non-farm sources of income, and disrupt the functioning of food markets.
5. Vulnerability tends to be greater when:
 - the risk of natural or man-made disasters is high;
 - long-term resource management practices and adverse government policies suppress productivity and consumption to chronically low levels;
 - poor households typically rely on a single, risky source of consumption or income, or on a range of sources for which are all equally risky.
6. The groups usually considered to be the most food insecure and vulnerable include:

- young children (especially those under 5 years of age)
- pregnant/lactating women who are living in poverty, with poor access to and utilization of food
- female-headed households
- the elderly
- the disabled
- disadvantaged groups with low levels of household labour, limited asset ownership, and insufficient means of support from family members and the community
- households under the threat of conflict, drought and other risks, particularly poor families which lack a diversified income and asset base.

7. Vulnerability is usually assessed as a probability. The country food needs assessment process concentrates on understanding:

- the geographic scope and intensity of a given situation
- the ability of different population groups to cope with the effects of such a situation and maintain an adequate level of consumption.

8. In this context, needs assessments must identify the most appropriate assistance to enable affected households to better cope with the implications of structural problems or emergency conditions and eventually, to re-gain some degree of economic viability and self-sufficiency

Vulnerability Identification:

At present, companies rely on information technology systems to achieve their business objectives, making them vulnerable to cybersecurity threats. Information security risk assessments help organizations to identify their risks and vulnerabilities. An accurate identification of risks and vulnerabilities is a challenge, because the input data is uncertain. So-called 'vulnerability identification errors can occur if false positive vulnerabilities are identified, or if vulnerabilities remain unidentified (false negatives). 'Accurate identification' in this context means that all vulnerabilities identified do indeed pose a risk of a security breach for the organization. An experiment performed with German IT security professionals in 2011 confirmed that vulnerability identification errors do occur in practice.

Strategies for Survival:

The safest and best thing to do when facing an approaching natural disaster is to heed your area's evacuation notices and take advantage of evacuation assistance when it's offered. It's possible, however, to be caught by an unexpected emergency or to be unable to leave a disaster-stricken region. When faced with those situations, what should you do to stay safe? How can you be better prepared? What kinds of choices will you need to make to survive?

Under titles: Preparation, remaining safe during the event, and withstanding its often-dangerous aftermath.

Preparation:

Every family should have an emergency plan that addresses the most likely disasters in their region. Practical survival skills should also be part of every family's game plan. Get some first aid training, find out how to cook without utilities, learn to source and disinfect water, figure out different ways to heat and cool at least one room in your home. Learn everything you can, since you never know what might be useful in a disaster. First, know what possible dangers could arise in your area. Second, know what to do for each one of them. And third, don't delay taking action. Those three things will keep you alive.

Necessary Supplies:

The basic list includes drinking water, no-cook food, non-flame light sources (flashlights instead of candles), first aid supplies, and a host of other handy supplies. Keep in home disaster kit items is a battery-powered weather radio. This communication tool (and any other type of portable radio) can provide survivors with lifesaving information, such as emergency broadcasts, evacuation orders, shelter-in-place instructions and much more.

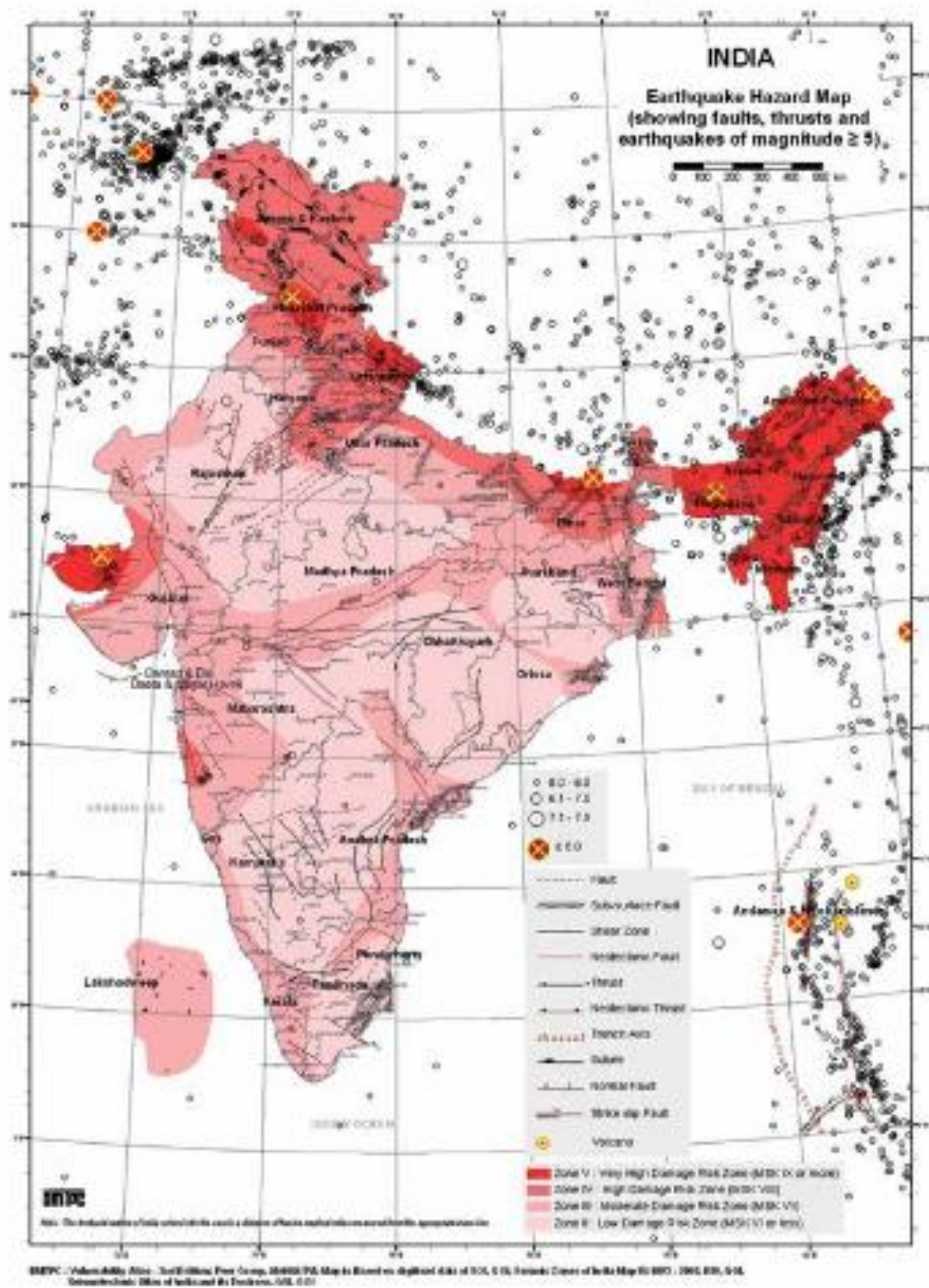
Safety during a Disaster:

Staying calm is the most important thing a person can do during any emergency. Fear is like an instinct that typically keeps us out of harm's way. Staying calm and preventing panic should be a priority for each person during a crisis.

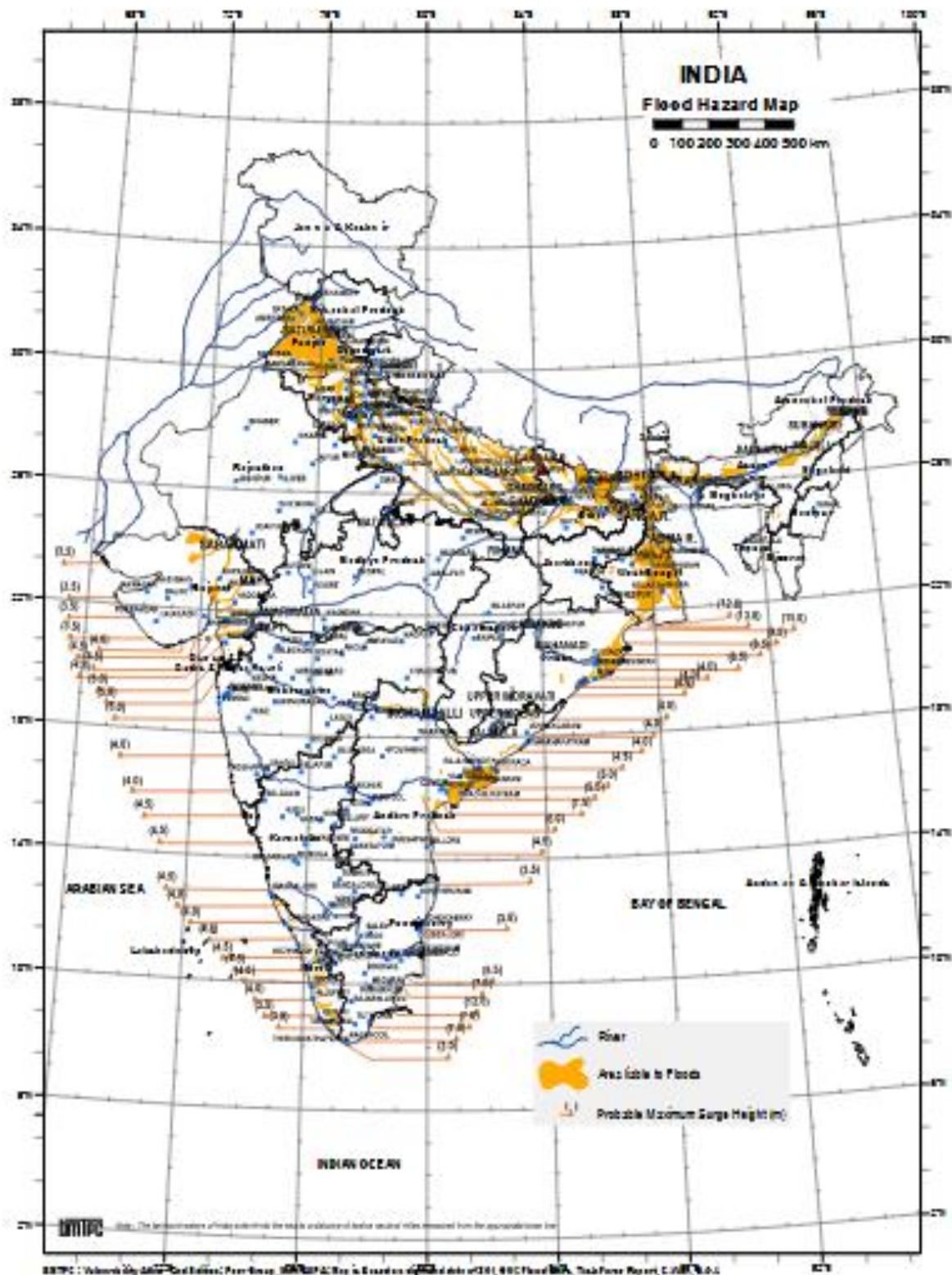
Vulnerability profile of India

Annexure-II: Hazard Vulnerability Maps for India

Earthquake Vulnerability Zones of India



Flood Vulnerability Zones of India



Social Infrastructure for Vulnerability Reduction

Infrastructure and the Management of Natural Disasters: investment in infrastructure for the management of water-related disasters, such as cyclones, floods and drought, has significantly reduced loss of life, from an annual average of 100,000 during the past 50 years to 41,000 during the past 15 years.

However, investment in disaster management infrastructure falls into two categories: (a) investment in infrastructure to support sustainable socio-economic development; and (b) investment in infrastructure for reconstruction and recovery. Recent World Bank data showed that the level of Asian and Pacific investment in infrastructure development during the past 15 years has been much lower than the economic value of the infrastructure damaged by natural disasters. The level of investment required was estimated at \$224 billion or about \$15 billion per year. The annual damage in the Asian and Pacific region was equivalent to about two-thirds of global annual lending by the World Bank. Disaster-related lending by the World Bank over the past 25 years has totalled only \$20 billion for Asia and the Pacific. Recent studies by ESCAP in seven pilot countries of Asia also indicate the vulnerability of infrastructure to natural disasters. The loss of infrastructure, including housing facilities, was estimated to be three quarters of total damage, and about 70 per cent of the damaged infrastructure belonged to the private sector. A study by the Asian Disaster Preparedness Center on the impact of the 2004 tsunami estimated infrastructure losses at about \$4 billion, about 70 per cent of total damage of \$5.6 billion.