KARPAGAM ACADEMY OF HIGHER EDUCATION

(Established Under Section 3 of UGC Act, 1956)

COIMBATORE-641 021

B.E Civil Engineering **2019-2020**

Semester-IV

19BECE403	**Disaster Preparedness & Planning Management**	**2H-2C**

Instruction Hours/week: L: 1 T: 1 P: 0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3 Hours

Course Objective

- To understand basic concepts in Disaster Management
- To understand Definitions and Terminologies used in Disaster Management
- To understand Types and Categories of Disasters
- To understand the Challenges posed by Disasters
- To understand Impacts of Disasters Key Skills

Course Outcome

The student will develop competencies in

1. the application of Disaster Concepts to Management
2. Analyzing Relationship between Development and Disasters.
3. Ability to understand Categories of Disasters and
4. realization of the responsibilities to society

Proposed Syllabus

UNIT-I: Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks- severity, frequency and details, capacity, impact, prevention, mitigation).

UNIT-II: Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT-III: Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT-IV: Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post- disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Alternate Communication systems-Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT-V: Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land- use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text/Reference Books:

2. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
3. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
4. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
5. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
6. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
7. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
8. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

Staff Incharge HOD Dean

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19BECE403 Disaster Preparedness & Planning Management Lecture Plan

Staff Name : **Mrs.S.PRATHEBA, M.E,**
Semester : **4 (2019-20 EVEN)**
Course Type : **Core**
Number of credits : **2**
LTPC : **1 1 0 2**

S.No	Lecture Duration (Hour)	Topics to be covered	Support Materials
UNIT I INTRODUCTION-CONCEPTS AND DEFINITIONS			
1.	1	Introduction about disaster preparedness & planning management	T_1/12
2.	1	Concepts & Definitions : Disaster	T_1/11,12
3.	1	Concepts & Definitions : Hazards & Vulnerability	T_1/12
4.	1	Concepts & Definitions : Risks and security	T_1/13
5.	1	Concepts & Definitions : Frequency & Details capacity	R_2/8
6.	1	Concepts &Definitions:Impact Prevention & Mitigation.	T_1/47
7.	1	Mitigation & it's measures	T_1/47
8.	1	Planning Management	T_1/53
9.	1	Vulnerability Types	T_1/13
UNIT II DISASTERS - DISASTERS CLASSIFICATION			
10.	1	Disasters - Disasters classification; Natural disasters	T_1/18
11.	1	Natural disasters : Floods, draught, cyclones	T_1/25,26
12.	1	Volcanoes, Earthquakes, Tsunami,	T_1/25,29,30
13.	1	Landslides, Coastal Erosion,	T_1/28
14.	1	Soil erosion, Forest fires	T_1/29,27
15.	1	Manmade disasters : Industrial pollution,	T_1/89
16.	1	Manmade disasters :Artificial flooding in urban areas&nuclear radiation, chemical spills	R_2/53,60
17.	1	Transportation Accidents, Terrorist strikes& Hazard and vulnerability profile of India	R_2/59,97
18.	1	Mountain and coastal areas, ecologicalfragility	W_1
UNIT III DISASTER IMPACTS			
19.	1	Disaster impacts : Environmental, physical	R1/29
20.	1	Social, Ecological impacts	R1/29
21.	1	Economic, Political impacts	W_1
22.	1	Health, Psychological &social issues	W_1
23.	1	Demographic aspects ; gender, age, special needs	
24.	1	Hazard locations; Global and National disaster trends	W_1
25.	1	Climate change and urbandisasters.	R_2/25
26.	1	National Disaster trends in details	W_1
27.	1	Issues by Disaster impact	W_1
UNIT IV DISASTER RISK REDUCTION (DRR)			

28.	1	Disaster Risk Reduction (DRR)	R_1/7
29.	1	Disaster management cycle & its phases	T_1/128
30.	1	Disaster management cycle prevention	T_1/128
31.	1	Mitigation, Preparedness,	T_1/107,134, R_1/79
32.	1	Disaster management cycle relief and recovery	R1/80
33.	1	Structural and Non-structural measures; risk analysis & vulnerability and capacity assessment	R_1/315
34.	1	Early warning systems, Post- disaster environmental response &Alternate Communication systems	T_1/259, R_1/313
35.	1	Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders	T_1/152 R_1/145
36.	1	Policies and legislation for disaster risk reduction & DRR programmes in India and the activities of NDMA	R_1/231,232
UNIT V DISASTERS, ENVIRONMENT AND DEVELOPMENT			
37.	1	Disasters, Environment and Development	W_1
38.	1	Factors affecting vulnerability such as impact of developmental projects	R_1/12
39.	1	Environmental modifications including of dams	R_1/75
40.	1	Land- use changes	W_1
41.	1	Urbanization	W_1
42.	1	Sustainable andenvironmental friendlyrecovery	R_1/46
43.	1	Reconstruction and development Methods.	R_2/76
44.	1	Methodologies of Development in Details	W_1
45.	1	Reconstruction New techniques	R_2/55

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Handbook of Disaster Management: Techniques & Guidelines	*Singh B.K*	Rajat Publication.	*2008*
2	Disaster Risk Reduction	Pradeep Sahni,	South Asia, PrenticeHall.	2004
3	Disaster Management	*Ghosh G.K*	APH Publishing Corporation	*2006*

REFERENCE:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Disaster Management	Er.Arun Kumar	Rajput publication	2004
2	Disaster Management	D M Kavitha Singh	Rajput publication	2006

WEBSITES:

- http://ndma.gov.in/ (Home page of National Disaster Management Authority)
- http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

LIST OF JOURNALS:

- **Disaster Medical Systems Guidelines**. Emergency Medical Services Authority, State of California, EMSA no.214, June2003
- **Inter Agency Standing Committee (IASC) (Feb. 2007)**. IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva:IASC

COURSE CO ORDINATOR **HOD (CIVIL)** **DEAN/FOE**

DISASTER PREPAREDNESS & PLANNING MANAGEMENT

UNIT – I INTRODUCTION

CONCEPTS AND DEFINITIONS:

DISASTER:

"A serious disruption of the functioning of a society, causing widespread human, material, or environmental losses which exceed the ability of the affected society to cope using its own resources".

The term disaster is sometimes also used to describe a catastrophic situation in which the normal patterns of life (or ecosystems) have been disrupted and extraordinary, emergency interventions are required to save and preserve human lives and/or the environment. Disasters are frequently categorized according to their perceived causes and speed of impact.

The term 'disaster' owes its origin to the French World '*Desastre*" which refers to bad or evil star. A disaster can be defined as 'a serious disruption in the functioning of the community or a society causing wide spread material, economic, social or environmental losses which exceed the ability of the affected society to cope using its own resources.'

A disaster is a result from the combination of hazard, vulnerability and insufficient capacity or measures to reduce the potential changes of risk. A disaster is the product of a hazard such as earthquake, flood or wind storm coinciding with a vulnerable situation which might include communities, cities or villages. A disaster happens when hazard impose on the vulnerable population and causes damage, casualties and disruption. Without vulnerability or hazard there is no disaster. A disaster occurs when hazards and vulnerability meet. Hazard, thus may be termed as a dangerous condition or event that threat or has the potential for causing injury to life or damage to property or the environment.

There has been increase in the number of natural disasters over the past years, on account of urbanization and population growth; as a result impact of natural disasters is now felt to a larger extent. According to the United Nations, in 2001 alone, natural disasters of medium to high range caused at least 250,000 deaths around the world, more than double the previous year, and economic losses of around 836 billion.

The natural disasters are not bound by political boundaries and have no social or economic considerations. They are borderless as they affect both developing and developed countries. Since 1991, two third of the victims of natural disasters were from developing countries, while just 2 per cent were from highly developed nations. Those living in developing countries and especially those with limited resources tend to be more adversely affected.

A disaster is the product of a hazard such as earthquake, flood or windstorm coinciding with a vulnerable situation which might include communities, cities or villages. There are two main components in this definition: hazard and vulnerability. Without vulnerability or hazard there is no disaster. A disaster occurs when hazards and vulnerability meet.

There are several important characteristics that make disasters different from accidents. The loss of a sole income earner in a car crash may be a disaster to a family, but only an accident to the community. Variables such as causes, frequency, and duration of the impact, speed of onset, and scope of the impact, destructive potential, and human vulnerability etc determine the difference.

Disasters are events that disrupt the functioning of a society. They cause widespread human, material, or environmental losses that exceed the ability of the affected society using its own resources. Earthquakes, floods, and cyclones, landslides are not disasters in themselves. They become disasters when human life, livelihoods and properly are adversely and severely affected.

HAZARD:

Hazard may be conceptualized as a dangerous condition or events that threaten or have the potential for causing injury to life or damage to property or the environment. They can be categorized in various ways but, they are basically grouped in two broad headings:

1. Natural Hazards (hazards with meteorological, geological or even biological origin)
2. Unnatural Hazards (hazards with human-caused or technological origin)

It is also important to know that natural phenomena are extreme climatologically, hydrological, or geological, processes that do not pose any threat to persons or property. A massive earthquake in an unpopulated area is a natural phenomenon, *not a hazard*. It is when these natural phenomena interact with the man made environment or fragile areas which causes wide spread damage.

Hazards may be grouped into two broad categories, namely natural and manmade. Natural hazards are those hazards which are caused because of natural phenomenon. Cyclones, tsunamis, earthquake, and volcanic eruption are exclusively of natural origin. Manmade hazards are hazards which occur due to human negligence. Manmade hazards are associated with industries or energy generation facilities and include explosions, leakage of toxic waste, pollution, dam failure, wars or civil strife etc. There may be another category which includes landslides, floods, drought, fires are socio-natural hazards since their causes are both natural and manmade.

Hazard refers to the potential occurrence, in a specific time period, and geographic area, of a natural phenomenon that may adversely affect human life, properly or activity to the extent of causing a disaster. A hazard occurrence becomes a disaster when it results in loss of life, displacements and homelessness, destruction and damage to infrastructure and property. Methods of predicting various hazards and the likelihood and frequency of occurrence vary widely by type of hazard.

VULNERABILITY:

What is Vulnerability?

Vulnerability describes the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include:

- poor design and construction of buildings,
- inadequate protection of assets,
- lack of public information and awareness,
- limited official recognition of risks and preparedness measures, and
- disregard for wise environmental management.

Vulnerability varies significantly within a community and over time. This definition identifies vulnerability as a characteristic of the element of interest (community, system or asset) which is independent of its exposure. However, in common use the word is often used more broadly to include the element's exposure.

The above explanation was taken from the United Nations (UN) International Strategy for Disaster Reduction (ISDR) Terminology on Disaster Risk Reduction. Follow the **link** to look up other terminologies.

There are four (4) main types of vulnerability:

1. Physical Vulnerability may be determined by aspects such as population density levels, remoteness of a settlement, the site, design and materials used for critical infrastructure and for housing (UNISDR).

Example: Wooden homes are less likely to collapse in an earthquake, but are more vulnerable to fire.

2. Social Vulnerability refers to the inability of people, organizations and societies to withstand adverse impacts to hazards due to characteristics inherent in social interactions, institutions and systems of cultural values. It is linked to the level of well being of individuals, communities and society. It includes aspects related to levels of literacy and education, the existence of peace and security, access to basic human rights, systems of good governance, social equity, positive traditional values, customs and ideological beliefs and overall collective organizational systems (UNISDR).

Example: When flooding occurs some citizens, such as children, elderly and differently-able, may be unable to protect themselves or evacuate if necessary.

3. Economic Vulnerability. The level of vulnerability is highly dependent upon the economic status of individuals, communities and nations The poor are usually more vulnerable to disasters because they lack the resources to build sturdy structures and put other engineering measures in place to protect themselves from being negatively impacted by disasters.

Example: Poorer families may live in squatter settlements because they cannot afford to live in safer (more expensive) areas.

4. Environmental Vulnerability. Natural resource depletion and resource degradation are key aspects of environmental vulnerability.

Example: Wetlands, such as the Caroni Swamp, are sensitive to increasing salinity from sea water, and pollution from stormwater runoff containing agricultural chemicals, eroded soils, etc.

RISKS:

What is Risk?

Risk (or more specifically, disaster risk) is the potential disaster losses (in terms of lives, health status, livelihoods, assets and services) which could occur to a particular community or a society over some specified future time period. (Reference UNISDR Terminology)

It considers the probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environmentally damaged) resulting from interactions between natural or human induced hazards and vulnerable conditions.

Risk can be calculated using the following equation: Risk = Probability of Hazard x Degree of Vulnerability.

There are different ways of dealing with risk, such as:

Risk Acceptance: an informed decision to accept the possible consequences and likelihood of a particular risk.

Risk Avoidance: an informed decision to avoid involvement in activities leading to risk realization.

Risk Reduction refers to the application of appropriate techniques to reduce the likelihood of risk occurrence and its consequences.

Risk Transfer involves shifting of the burden of risk to another party. One of the most common forms of risk transfer is Insurance.

Risk - Risk analysis is an integral part of the field of business and finance. In disaster management, applied scientists initially developed risk studies to project probable disaster loss and to determine which scientific and technical solutions were to be applied either to modify the hazard or modify physical vulnerability to the hazard. Risk is commonly used to mean the probability or likelihood of meeting danger or suffering harm and loss. Risk is sometimes taken as synonymous with hazard but risk has an additional implication of the chance of a particular hazard actually occurring. It is also the exposure of something of human value (life, property, and the environment) to a hazard and is often regarded as the combination of probability and loss.

Disaster Management Cycle- A collective term encompassing all aspects of planning for and responding to disasters, including both pre (prevention, mitigation and preparedness) and post disaster (response, search and rescue, relief, reconstruction and rehabilitation) activities. It may refer to the management of both the risks and consequences of disasters.

Disaster Risk Assessment (HRCV)- Disaster risk assessment is a participatory process to access the hazards, which threaten the community, its vulnerabilities and capacities. Through hazard assessment, the likelihood or probability of the occurrence and the magnitude, frequency, scope and duration of various hazards is determined. The vulnerability assessment identifies what elements are at risk and analyzes the causes and root causes of vulnerable conditions. The households and groups that are most exposed to any given hazard are identified. The assessment takes into account the physical, geographical, economic, social, political and psychological factors that cause some people to be particularly exposed to the dangers of a hazard while others are relatively protected. In the capacity assessment, the community's resources and coping strategies area identified. The result of the disaster risk assessment is a measurement and ranking of the disaster risks faced by the community as basis for risk reduction planning.

Disaster Risk Reduction- The reduction of disaster risk is the foundation of community–based disaster management. Disaster risk reduction includes all measures, which reduce related losses of life, property or assets by either reducing the hazard or vulnerability of the elements at risk.

Disasters and Development- Disasters can provide a specific window of opportunity for all areas of development, social, economic and environmental. Although most disasters bring large scale damage and loss affecting the social, economic and environmental aspects of human life, 3 they also offer an opportunity to engage in long term recovery and reconstruction which can help build back better. This can be done by reducing the vulnerabilities of people at risk and enhancing their coping capacities. During the reconstruction and recovery phase that would follow a disaster, DRR strategies can be implemented where it may not have been possible or practical to do so before.

CAPACITY:

Capacity- Capacity (as contrasted to vulnerability) has been included in disaster management initially as a guide for both international and local agencies who work with vulnerable communities to link disaster to development – even in emergency situations disaster survivors have capacities. They are not helpless victims but have 'coping' mechanisms on which to build on for emergency response and recovery. For many vulnerable groups, the viable track to reduce vulnerabilities has been by increase their social and organization capacities are resources means and strengths. These exist in households and communities and enable them to withstand, prepare

for, event, mitigate, or quick recovery from a disaster. People's capacity can also be categorized in the same categories as was done with vulnerabilities in the previous section.

• **Physical and Material Capacity**: When the people whose houses have been developed by a typhoon and crops, destroyed by a flood can salvage things from their homes and from their farms. Sometimes they have food in storage or crops that can be recovered from the fields or 2 farm implements for planning again. Some family members have skills, which enable them to find employment if they migrate, either temporarily or permanently.

• **Social and Organizational Capacity**: When everything physical is destroyed, people still have their skills and knowledge; they have family and community organization. They have leaders and systems for making decisions. They have tribal loyalties or church affiliations. They have capacities within the social and organizational realm. • Attitudinal and Motivational Capacity: People also have positive attitudes and strong motivations such as the will to survive, love and concern for each other, bravery and willingness to help each other. These, too, are important capacities and from the basis for development just as much as the physical resources that people have.

MITIGATION:

The term Mitigation can be comprised in the term Prevention. Mitigation means to reduce the severity of the human and material damage caused by the disaster.

Principal Objectives of Mitigation :

The objective of prevention is to reduce the risk of being affected by a disaster. Even if the hazard cannot be removed, vulnerability can be decreased and in case of an impact, the capacity to withstand, to respond and to recover will be stronger.

"**Primary" Mitigation:**

- reducing the PRESENCE of the Hazard
- reducing Vulnerability

"Secondary" Mitigation: reducing the effects of the Hazard (Preparedness)

PREVENTION:

Prevention is to ensure that human action or natural phenomena do not result in disaster or emergency.

Primary prevention is to reduce -avert- avoid the risk of the event occurring, by getting rid of the hazard or vulnerability, e.g. to avoid overcrowding, deforestation and to provide services. Healthier people in a healthy environment will be less vulnerable to most hazards. E.g. immunizing people against smallpox made them less vulnerable to the virus, and slowly eradicated the disease.

Secondary prevention means to recognise promptly the event and to reduce its effects, e.g. by staying alert to possible displacements of population; by being ready to provide immunisation, food, clean water, sanitation and health care to refugees. Healthier people in a healthy environment will also be more capable to overcome the emergency.

UNIT – II CLASSIFICATION OF DISASTERS

Natural disasters are the result of natural phenomena, for instance,earthquake, volcanic eruption, hurricane, tornado, avalanche or flood.

Man-made disasters are of an anthropogenic origin, and exemplifiessome of the terrible accidents that have resulted from human beings interaction with artificial environment, which they themselves have created.

Hybrid Disasters arise from a linkage of anthropogenic events andnatural events. For example, spread of disease from a community in which the disease is endemic to a community which has no natural immunity, destruction of forests and resulting increased floods; large scale deaths due to smog, etc.

Popular Classification of Disasters

(i) Natural Disasters

1. Heavy Rains
2. Floods,
3. Droughts,
4. Earthquake
5. Volcano Eruption,

6. Avalanche,
7. Landslide,
8. Epidemic,
9. Cyclone
10. Heat Wave, Cold Wave.

(ii) Manmade Disasters

(a) Un-Intentional or Inadvertent

(b) Wilfully and Intentional

(c) Industrial and Technological - (Mostly system/Process Malfunction)

1. Nuclear Radiation
2. Gas Leak.
3. Explosion.
4. Fire

Natural disaster:

Blizzards and Snowstorms: A snowstorm is a winter storm in which the primary form of precipitation is snow. When such a storm is accompanied by winds above 32 mph that severely reduce visibility, it becomes a blizzard. Hazards from snowstorms and blizzards include traffic-related accidents, hypothermia for those unable to find shelter, as well as major disruptions to transportation and fuel and power distribution system.

Drought: A drought is a long-lasting weather pattern consisting of dry conditions with very little or no precipitation. During his period, food and water supplies can run low, and other conditions, such as famine, can result. Droughts can last for several years and are particularly damaging in areas in which the residents depend on agriculture for survival.

Earthquakes: An earthquake is a sudden shift or movement in the tectonic plate in the Earth's crust. On the surface, this is manifested by a moving and shaking of the ground, and can be massively damaging to poorly built structures. The most powerful earthquakes can destroy even the best built of structures. In addition, they can trigger secondary disasters, such as tsunamis and volcanic eruptions. Earthquakes occur along fault line, and are unpredictable. They are capable of killing hundreds of thousands of people, such as in the 1976 Tangshan and 2004 Indian Ocean earthquakes.

Epidemic: An epidemic is a massive outbreak and spread of an infectious disease, and is historically the most dangerous of all natural disasters. Different epidemics are caused by different diseases, and different epidemics have included the Black Death, smallpox, and AIDS. The Spanish flu of 1918 was the deadliest ever epidemic, it killed 25-40 million people. The Black Death, which occurred in the 14th Century, killed over 20 million people, one third of Europe's population.

Famine: Famine is a natural disaster characterized by a widespread lack of food in a region, and can be characterized as a lack of agriculture foodstuffs, a lack of livestock, or a general lack of all foodstuffs required for basic nutrition and survival. Famine is almost always caused by pre-existing conditions, such as drought, but its effects may be exacerbated by social factors, such as war. Particularly devastating examples include the Ethiopian famine and the Irish Potato Famine.

Flood: A flood is a natural disaster caused by too much rain or water in a location, and could be caused by many different sets of conditions. Floods can be caused by prolonged rainfall from a storm, including thunderstorms, rapid melting of large amounts of snow, or rivers which swell from excess precipitation upstream and cause widespread damage to areas downstream, or less frequently the bursting of man-made dams. A river which floods particularly often is the Huang He in China, and a particularly damaging flood was the Great Flood of 1993.

Forest Fire: 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.

Hailstorm: A hailstorm is a natural disaster where a thunderstorm produces a numerous amount of hailstones which damage the location in which they fall. Hailstorms can be especially devastating to farm fields, ruining crops and damaging equipment. A particularly damaging hailstorm hit Munich, Germany on August 31, 1986, felling thousands of trees and causing millions of dollars in insurance claims.

Heat Wave: A heat wave is a disaster characterized by heat which is considered extreme and unusual in the area in which it occurs. Heat waves are rare and require specific

combinations of weather events to take place, and may include temperature inversions, katabatic winds, or other phenomena. The worst heat wave in recent history was the European Heat Wave of 2003.

Hurricanes: A hurricane is a cyclonic storm system which forms over the oceans. It is caused by evaporated water which comes off of the ocean and becomes a storm. The Coriolis Effect causes the storms to spin, and a hurricane is declared when this spinning mass of storms attains a wind speed greater than 74mph. In different parts of the world hurricanes are known as cyclones or typhoons. The former occur in the Indian Ocean, which the latter occur in the Eastern Pacific Ocean. The most damaging hurricane ever was Hurricane Andrew, which hit southern Florida in 1992.

Ice Storm: An ice storm is a particular weather event in which precipitation falls as rain, due to atmosphere conditions, but the in an area in which the temperature is below the freezing point of water. The rain falls to the ground, and immediately turns to ice, accumulating in that fashion. A heavy ice storm can cause large accumulations of ice cause trees to fall over or lose branches, and power lines to snap. The worst recent ice storm was the 1998 Ice Storm that struck eastern Canada and areas of the US northeast.

Lahar: A lahar is a type of natural disaster closely related to a volcanic eruption, and involves a large amount of material; including mud, rock, and ash sliding down the side of the volcano at a rapid pace. These flows can destroy entire towns in seconds and kill thousands of people. The Tangiwai disaster in an excellent example, as is the one which killed an estimated 23,000 people in Armero, Colombia, during the 1985 eruption of Nevado del Ruiz.

Landslides and Mudslides: A landslide is a disaster closely related to an avalanche, but instead of occurring with snow, it occurs involving actual elements of the ground, including rocks, trees, and parts of houses, and anything else which may happen to be swept up. Landslides can be caused by earthquakes, volcanic eruptions, or general instability in the surrounding land. Mudslides, or mud flows, are a special case of landslides, in which heavy rainfall causes loose soil on steep terrain to collapse and slide downwards; these occur with some regularity in parts of California after periods of heavy rain.

Sinkholes: A localized depression in the surface topography, usually caused by the collapse of a subterranean structure, such as a cave. Although rare, large sinkholes that develop suddenly in populated areas can lead to the collapse of buildings and other structures.

Tornado: A tornado is a natural disaster resulting from a thunderstorm. Tornadoes are violent currents of wind which can blow at up to 318mph. Tornadoes can occur one at a time, or can occur in large tornado outbreaks along a squall line. The worst tornado ever recorded in terms of wind speed was the tornado which swept through Moore, Oklahoma on May 3, 1999. This tornado has wind speeds of 318mph and was the strongest ever recorded.

Tsunami: A tsunami is a giant wave of water which rolls into the shore of an area with a height of over 15 m (50 ft.). It comes from Japanese words meaning harbor and wave. Tsunami can be caused by under sea earthquakes as in the 2004 Indian Ocean Earthquake, or by landslides such as the one which occurred at Lituya Bay, Alaska. The tsunami generated by the 2004 Indian Ocean Earthquake currently ranks as the deadliest tsunami in recorded history. The highest Tsunami ever recorded was estimated to be 85m (278 ft.) high. It appeared off Ishigaki Island, Japan.

Volcanic Eruption: This natural disaster is caused by the eruption of a volcano, and eruptions come in many forms. They range from daily small eruptions which occur in places; like Kilauea, in Hawali, or extremely infrequent supervolvano eruptions in places like Lake Toba. Greatest Volcanic explosion occurred when Krakatoa in Indonesia blew up in 1883, hurling rocks 55km (34 miles) in the air! The explosion was heard in Australia and generated a 40m. (131 ft.) High Tsunami; 36,000 people died. The greatest volcanic eruption was of Mt.Tambora on Sumbawa, Indonesia in 1815 which threw up more than 100 cubic km. (24cu. miles) of ash. The island was lowered by 1250m (4100 ft.); 92,000 people died.

Ice Age: An ice age is a geologic period, but could also be viewed in the light of a catastrophic natural disaster, since in an ice age, the climate all over the world would change and places which were once considered habitable would then be too cold in permanently inhabit. A side effect of an ice age could possibly be a famine, caused by a worldwide drought.

Volcano: A super volcano is a eruption which is thousands of times more massive than a normal eruption, the lower threshold for an eruption being declared that of a super volcano is that such an

eruption must expel at least 1000 cubic kilometers of material. The last eruption of this magnitude occurred over 75,000 year ago at Lake Toba. If such an eruption were to occur today, a wholesale general die-off of both animals and humans would occur, as well as a significant short-term climate change.

MANMADE DISASTERS:

War

War is a conflict between relatively large groups of people, which involves physical force inflicted by the use of weapons. Warfare has destroyed entire cultures, countries, economies and inflicted great suffering on humanity. Other terms for war can include armed conflict, hostilities, and police action. Acts of war are normally excluded from insurance contracts and sometimes from disaster planning.

Industrial hazards

Industrial disasters occur in a commercial context, such as mining accidents. They often have an environmental impact. TheBhopal disaster is the world's worst industrial disaster to date, and the Chernobyl disaster is regarded the worst nuclear accident in history. Hazards may have longer-term and more dispersed effects, such as dioxin and DDT poisoning.

Structural collapse

Structural collapses are often caused by engineering failures. Bridge failures may be caused in several ways, such as under-design (as in the Tay Bridge disaster), by corrosion attack (such as in the Silver Bridge collapse), or by aerodynamic flutter of the deck (as in *Galloping Gertie*, the original Tacoma Narrows Bridge). Failure of dams was not infrequent during the Victorian era, such as the Dale Dyke dam failure in Sheffield, England in the 1860s, causing the Great Sheffield Flood. Other failures include balcony collapses or building collapses such as that of the World Trade Center.

Power outage

A power outage is an interruption of normal sources of electrical power. Short-term power outages (up to a few hours) are common and have minor adverse effect, since most businesses and health facilities are prepared to deal with them. Extended power outages, however, can disrupt personal and business activities as well as medical and rescue services, leading to business losses and medical emergencies. Extended loss of power can lead to civil disorder, as in the New York City blackout of 1977. Only very rarely do power outages escalate

to disaster proportions, however, they often accompany other types of disasters, such as hurricanes and floods, which hampers relief efforts.

Electromagnetic pulses and voltage spikes from whatever cause can also damage electricity infrastructure and electrical devices.

Recent notable power outages include the 2005 Java–Bali Blackout which affected 100 million people, 2012 India blackoutswhich affected 600 million and the 2009 Brazil and Paraguay blackout which affected 60 million people.

Forest fire and mine fire:

Forestand mine fires are generally started by lightning, but also by human negligence or arson. They can burn thousands of square kilometers. If a fire intensifies enough to produce its own winds and "weather", it will form into afirestorm. A good example of a mine fire is the one near Centralia, Pennsylvania. Started in 1962, it ruined the town and continues to burn today. Some of the biggest city-related fires are The Great Chicago Fire, The Peshtigo Fire (both of 1871) and the Great Fire of London in 1666.

Casualties resulting from fires, regardless of their source or initial cause, can be aggravated by inadequate emergency preparedness. Such hazards as a lack of accessible emergency exits, poorly marked escape routes, or improperly maintained fire extinguishers or sprinkler systems may result in many more deaths and injuries than might occur with such protections.

Hazardous materials

Radiation contamination

Chernobyl nuclear power plant

When nuclear weapons are detonated or nuclear containment systems are otherwise compromised, airborne radioactive particles (nuclear fallout) can scatter and irradiate large areas. Not only is it deadly, but it also has a long-term effect on the next generation for those who are contaminated. Ionizing radiation is hazardous to living things, and in such a case much of the affected area could be unsafe for human habitation. During World War II, United States troops dropped atomic bombs on the Japanese cities of Hiroshima and Nagasaki. As a result, the radiation fallout contaminated the cities' water supplies, food sources, and half of the populations of each city were stricken with disease. In the Soviet Union, the Mayak industrial complex (otherwise known as Chelyabinsk-40 or Chelyabinsk-65) exploded in 1957. The Kyshtym disaster was kept secret for several decades. It is the third most serious nuclear accident ever recorded. At least 22 villages were exposed to radiation and resulted in at least 10,000 displaced persons. In 1992 the former soviet union officially acknowledge the accident. Other Soviet

republics of Ukraine and Belarus suffered also when a reactor at the Chernobyl nuclear power planthad a meltdown in 1986. To this day, several small towns and the city of Chernobyl remain abandoned and uninhabitable due to fallout.

The Goiânia accident was a radioactive contamination accident that occurred on September 13, 1987, at Goiânia, in the Brazilian state of Goiás, after an old radiotherapy source was stolen from an abandoned hospital site in the city. It was subsequently handled by many people, resulting in four deaths. About 112,000 people were examined for radioactive contamination and 249 were found to have significant levels of radioactive material in or on their bodies.[1][2] In the cleanup operation, topsoil had to be removed from several sites, and several houses were demolished. All the objects from within those houses were removed and examined. Time magazine has identified the accident as one of the world's "worst nuclear disasters" and the International Atomic Energy Agency called it "one of the world's worst radiological incidents"

Another nuclear power disaster that is ongoing is Fukushima Daiichi.

In the 1970s, a similar threat scared millions of Americans when a failure occurred at the Three Mile Island Nuclear Power Plant in Pennsylvania. However, the incident was resolved and the area fortunately retained little contamination.

The Hanford Site is a decommissioned nuclear production complex that produced plutonium for most of the 60,000 weapons in the U.S. nuclear arsenal. There are environmental concerns about radioactivity released from Hanford.

Two major plutonium fires in 1957 and 1969 at the Rocky Flats Plant, located about 15 miles northwest of Denver was not publicly reported until the 1970s.

A number of military accidents involving nuclear weapons have also resulted in radioactive contamination, for example the1966 Palomares B-52 crash and the 1968 Thule Air Base B-52 crash.

CBRNs

CBRN is a catch-all acronym for chemical, biological, radiological, and nuclear. The term is used to describe a non-conventional terror threat that, if used by a nation, would be considered use of a weapon of mass destruction. This term is used primarily in the United Kingdom. Planning for the possibility of a CBRN event may be appropriate for certain high-risk or high-value facilities and governments. Examples include Saddam Hussein's Halabja poison gas attack, the Sarin gas attack on the Tokyo subway and the preceding test runs in Matsumoto, Japan 100 kilometers outside of Tokyo,[3]and Lord Amherst giving smallpox laden blanketstoNativeAmericans

Transportation

Aviation

The ditching of US Airways Flight 1549 was a well-publicised incident in which all on board survived An aviation incident is an occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations, passengers, or pilots. The category of the vehicle can range from a helicopter, anairliner, or a space shuttle. The world's worst airliner disaster is the Tenerife crash of 1977, when miscommunications between and amongst air traffic control and an aircrew caused two fully laden jets to collide on the runway, killing 583 people.

Rail

Rail disasters

A railroad disaster is an occurrence associated with the operation of a passenger train which results in substantial loss of life. Usually accidents with freight (goods) trains are not considered disasters, unless they cause substantial loss of life or property. One of the most devastating rail disasters occurred in 2004 in Sri Lanka when 1,700 people died in the Sri Lanka tsunami-rail disaster. Other notable rail disasters are the 1989 Ufa accident in Russia which killed 574, and the 1917 Modane train accident in France which killed 540.

See also the list of train accidents by death toll.

Road

Traffic collisions are the leading cause of death, and road-based pollution creates a substantial health hazard, especially in major conurbations.

Space

Disintegration of the Space Shuttle Challenger

Space travel presents significant hazards, mostly to the direct participants (astronauts or cosmonauts and ground support personnel), but also carry the potential of disaster to the public at large. Accidents related to space travel have killed 22 astronauts and cosmonauts, and a larger number of people on the ground.

Accidents can occur on the ground during launch, preparation, or in flight, due to equipment malfunction or the naturally hostile environment of space itself. An additional risk is posed by (unmanned) low-orbiting satellites whose orbits eventually decay due to friction with the extremely thin atmosphere. If they are large enough, massive pieces travelling at great speed can fall to the Earth before burning up, with the potential to do damage.

The worst space disaster to date occurred on February 15, 1996 in Sichuan, China, when a Long March 3B rocket, carrying the Intelsat 708 telecommunications satellite, suffered a guidance

system failure two seconds after liftoff and crashed into a nearby village. The Chinese government officially reported six deaths and 57 injuries, but some U.S. estimates run as high as 200 deaths.

The second worst disaster was the Nedelin catastrophe which occurred in the Soviet Union on October 24, 1960, when anR-16 intercontinental ballistic missile exploded on the launch pad, killing around 120 (best estimate) military ground support personnel. The Soviet government refused to acknowledge the incident until 1989, then claiming only 78 deaths. One of the worst human-piloted space accidents involved the Space Shuttle *Challenger* which disintegrated in 1986, claiming all seven lives on board. The shuttle disintegrated 73 seconds after taking off from the launch pad in Cape Canaveral, Florida.

Another example is the Space Shuttle *Columbia*, which disintegrated during a landing attempt over Texas in 2003, with a loss of all seven astronauts on board. The debris field extended from New Mexico to Mississippi.

Sea travel

The capsized cruise ship Costa Concordia with a large rock lodged in the crushed hull of the ship

Ships can sink, capsize or crash in disasters. Perhaps the most infamous sinking was that of the Titanic which hit an iceberg and sank, resulting in one of the worstmaritime disasters in history. Other notable incidents include the capsizing of the Costa Concordia, which killed at least 32 people; and is the largest passenger ship to sink, and the sinking of the MV Doña Paz, which claimed the lives of up to 4,375 people in the worst peacetime maritime disaster in history.

UNIT – III IMPACTS OF DISASTERS

PHYSICAL IMPACTS OF DISATER:

The Physical impacts of Disaster include causalities earths and injuries and property damages and both vary substantially across hazard agents.

It is difficult to say that how many of the deaths and injuries occurs due to a disaster. In some cases it is possible to say how many persons are missing and if so whether this is due to death or because of not proper maintenance of records.

Also are important measures of physical impacts include damages people, society, and health, to cropland and wood lands.

Social Impacts:

Social impacts, which include psychosocial socio demographic, socio economic and socio political impacts can develop over a long period of time, can be difficult to assess when they occur. Despite the difficult in measuring these social impacts it is nonetheless important to minor them because they can cause significant problems from the long – term functioning of specific types of households and business in an affected community. A better understanding of disaster is social impacts can provide a basis for pre impacts predication and the development of contingency plans to prevent adverse consequences from occurring.

Psychosocial Impacts:

One type of social impacts not measured by certain data consists of psychosocial impacts. Such as fatigue, gastro intestinal upset and tiles as well as cognitive signs such as confusion, impaired concentration impacts include emotional signs such as anxiety depression and grief as well as behavioral effects such as sleep and appetite changes such as sleep and appetite charges ritualistic, behavior and substance abuse.

Socio Demographic Impacts:

Perhaps the most significant socio demographic impact of a disaster on a stricken community is the destruction of households dwellings such an event initiates what can be a very long process of disaster recovery from some population segments The first stage is emergency shelter which consists of unplanned and spontaneously sought locations that are intended only to provide protection from the elements. The next steps is temporary shelter, which includes food preparation and sleeping facilities that usually are sought from friends and relatives or are found in commercial lodging although “Mass Care” facilities in school gymnasiums or church auditorium are acceptable as a last resort the third step is temporary housing which allows victims to re establish house hold reclines is non preferred locations or structures. The step is permanent housing which reestablishes household routines in preferred locations and structures.

Socio economic Impacts:

The property damage caused by disaster impact causes direct economic losses that can be thought of as a loss in asset value, the Ultimate economic impact of a disaster depends upon the disposition of the damage assets some of these assets are not replaces and so their loss causes a reduction in consumption and thus a decrease in quality of life or a reduction in investments and thus a decrease in economic productivity other assets are replaced either through in kind

donations. E.g.: Food and clothing or commercial purchases. In the latter case, the cost of replacement must come from some source of recovery funding, which generally can be characterized an either inter temporal transfer to the present time from part savings or future from one group to another at a given time.

Political Impacts:

There is substantial evidence that disaster impacts can cause social, economic damages, these activities resulting in political disruption especially during the period of disaster recovery and rehabilitation. Some of the catastrophic disasters in recent times have led to changes in disaster management policy and creation of new organization. Policy changes include the enactment of disaster management Act 2005 and development of the national disaster management response frame work.

The common causes are

PHYSICAL IMPACT

- Injuries
- Death
- Physical disability
- Burns
- Epidemic
- Weakness/uneasiness
- Physical illness
- Sanitation
- Miscarriage
- Reproductive health
- Fatigue, Loss of Sleep
- Loss of Appetite

ECONOMIC IMPACT

 Loss of life Unemployment

 Loss of Livelihood

 Loss of property/Land

 Loss of household articles

 Loss of crops

 Loss of Public Infrastructure

SOCIAL IMPACT

 Change in individual's role Disruption of social fabric

 Isolation

 Change in marital status

 Sexual abuse

 & domestic violence Orphans

 Single parent children

 Family

 & social disorganization Migration

 Life style changes

 Breakdown of traditional Social Status

PSYCHOLOGICAL IMPACTS

 Distress Flash backs

 Intrusion/Avoidance

 Hatred/Revenge

 Dependence/Insecurity

 Grief/Withdrawn/Isolation

 Guilt feeling

 Hyper vigilance

- Lack of trust
- Helplessness
- Hopelessness

ENVIRONMENTAL IMPACTS

- Houses, Buildings and other structures destroyed
- Fires
- Toxic gases released into the atmosphere
- Carbon di oxide emitted from volcanoes adds to the natural green house effect
- Loss of Habitat

ECONOMIC IMPACTS

- Assets
- Deposits
- Reserves
- Income
- Commerce
- Production
- Guarantee
- Insurance

Disaster Trends :

Development and relief agencies have long recognized the important role played by data and information in mitigating the impacts of disasters on vulnerable populations. Systematic collection and analysis of these data provides invaluable information to governments and agencies in charge of relief and recovery activities.

It also aids the integration of health components in development and poverty alleviation programs. However, there is a lack of international consensus regarding best practices for collecting these data.

Together with the complexity of collecting reliable information, there remains huge variability in definitions, methodologies, tools and sourcing. CRED has a long history of standardized data compilation, validation and analysis. It provides free and open access to its data through its website. One of CRED's core data products is the EM-DAT the International Disaster Database.

EM-DAT provides an objective basis for vulnerability assessment and rational decision-making in disaster situations. For example, it helps policymakers identify disaster types that are most common in a given country and have had significant historical impacts on specific human populations. In addition to providing information on the human impact of disasters, such as the number of people killed, injured or affected, EM-DAT provides disaster-related economic damage estimates and disaster-specific international aid contributions.

UNIT – IV DISASTER RISK

Disaster Management Cycle

1. Preparedness

This protective process embraces measures which enable governments, communities and individuals to respond rapidly to disaster situations to cope with them effectively. Preparedness includes the formulation of viable emergency plans, the development of warning systems, the maintenance of inventories and the training of personnel. It may also embrace search and rescue measures as well as evacuation plans for areas that may be at risk from a recurring disaster.

Preparedness therefore encompasses those measures taken before a disaster event which are aimed at minimizing loss of life, disruption of critical services, and damage when the disaster occurs. All preparedness planning need to be supported by appropriate legislation with clear allocation of responsibilities and budgetary provisions.

2. Mitigation

Mitigation embraces all measures taken to reduce both the effect of the hazard itself and the vulnerable conditions to it in order to reduce the scale of a future disaster. Therefore mitigation activities can be focused on the hazard itself or the elements

exposed to the threat. Examples of mitigation measures which are hazard specific include modifying the occurrence of the hazard, e.g. water management in drought prone areas, avoiding the hazard by sitting people away from the hazard and by strengthening structures to reduce damage when a hazard occurs.

In addition to these physical measures, mitigation should also be aimed at reducing the physical, economic and social vulnerability to threats and the underlying causes for this vulnerability.

Human Capacity: Human capacities are the qualities are resources of an individual or community to anticipate, cope with, resist and recover from the impact of a hazard. Human Capacities and Human vulnerability are inversely related. Higher the Human capacity lower will be the vulnerability and vice versa.

Approaches of Disaster Management

Disaster risk management can be addressed in three ways: structural measures, non-structural measures and establishing communication networks. Structural measures would reduce the impact of disasters and non-structural measures would enhance the management skills and improve capacities of the community, local self governments, urban local bodies and the state authorities to prepare, prevent and respond effectively to disasters. Non-structural measures are more important and include vulnerability mapping, risk assessment analysis, hazard zoning, inventory of resources to meet the emergency etc. The approaches of disaster management are shown in chart

The dynamics and machinery of urban development is complex. Therefore, careful attention is needed to find the best opportunities and effective routes to introduce safety measures. Many authorities fail to recognize the rich range of measures that need to be adopted and integrated into a viable and affordable programme. The expanding scale of urban pressures, problems, and risks in India is a daunting challenge. However, India has certain assets that many countries envy when it comes to reducing urban risks. There is strong and increasing government commitment to disaster protection, a vibrant civil society's network which provides base of community participation and high share of private sector in humanitarian aid to

disaster's victims and reconstructions of disaster affected areas. However, there is lack of coordination and integrated approach for disaster response.

Approaches of Disaster Management

	Type of approach	Proponents	Viewpoint
1.	Geographical approach	Harland Barrows Gilbert F. White	Focus on chorological and chronological distribution of disasters, their impact and vulnerability. Based on this understanding of spatio-temporal factors, choices are made among various kinds of adjusting to such disasters.
2.	Anthropological approach		A community oriented approaches with focus on role of disasters in guides the socio-economic evolution of population of civilization. They also search for threshold points for local communities beyond which they no longer provide the basic requirements for survival of their members.
3.	Sociological approach	Russel R. Dyness Enrico L. Quarantelli	Focus is on vulnerability and its impact on human behaviour andpsychologically determind defensive reaction pattern. Impact of disasters on community is major area of study.

4.	Developmental studies approach	Davis (1978)	Major areas of interest are aid, relief measures, refugee management, health care and avoidance of starvation. Line of thinking holds developing countries as most disaster prone and poverty responsibe for increased human

prevention and preparedness. It shows functional structure of natural disaster mitigation. The main three elements are rehabilitation, prevention and response. In responsive measures, relief, medical aid, shelter, food rescue, warning, evacuation, assessment of vulnerability and risks, public awareness, capacity building for livelihoods restoration etc. are included.

Disasters are the ultimate test of emergency response capability. The ability to effectively deal with disasters is becoming relevant because of the increasing risk factors. Increase in population density population shifts and increasing technology are some of the important factors for increasing risks, leading to disasters. As areas become more densely populated, there are more potential victims when a disaster strikes. National disasters such as earthquakes, hurricanes, cyclones, Tsunami, and floods tend to result in greater losses due to densely populated areas in India. Another reason for increasing disaster losses are that population density in disaster prone areas is increasing. The increasing settlements development in high risk areas is the cause of concern. The pattern of settlement in high risk areas is reflected in the increasing mortality ratio in India. In the process of setting high risk areas, natural protection against environmental threats is removed. In India, the vegetative coverage and forests were destroyed in coastal areas for promoting shrimp farming, business, and tourism and housing colonies. This lead to damage of natural protection against hurricanes, and Tsunami and ultimately Tsunami affected to the large population in coastal areas in southern states recently. The vulnerability of people living in high risk areas is increasing because the habitations are often unaware of potential risks and how to deal with them. Even, the prices of land for house construction in high risk areas are lower which attract people for housing construction, even without proper approval of housing structures. People are living in structures that are not designed to resist the forces of local hazards. In India, earthquakes have affected severely due to lack of good design technology and inadequate earthquake resistance housing and building structures. The new technology is also adding to the list of disaster agents at an ever increasing rate. A large quantity of hazardous chemicals, wastes, bio-medical wastes, and dumping adds proliferation of high risk office buildings and hotels that subject their inhabitants to fire threats not experienced before. The society is also becoming more dependent on technology and specialization, making more vulnerable to disaster. Our dependence on computers is introducing a new form of disaster vulnerability.

In the context of ever increasing risks of disaster losses, it is imperative to deal with these catastrophes with full preparedness and planning. In disasters there are often conditions that may make the traditional division of labour and resources,

characteristics of routine emergency management, unsuitable for disaster response. These are as follows:

- Disaster may put demands on organizations, requiring them to make internal changes in structure and delegation of responsibilities;
- Disasters may create demands that exceed the capacities of single organizations, requiring them to share tasks and resources with other organizations that use unfamiliar procedures;
- Disaster may attract the participation of organization and individual volunteers who usually do not respond to emergencies;
- Disasters may cross jurisdictional boundaries, resulting in multiple organizations being faced with overlapping responsibilities;
- Disasters may create new tasks for which no organization has traditional responsibility;
- Disasters may render unusable the normal tools and facilities used in emergency response;

The typical response to a disaster includes multiple independent organizations from the private sector as well as from agencies of city, country, state, region and district governments. Disasters do not need to cover large geographical areas in order to cross multiple levels of government responsibility. However, disaster management is the only responsibility of government. Community based organizations and NGOs have to play a critical role in disaster management. Disasters are characterized by great uncertainty. Often the character and extent of damage and the secondary threats are not immediately apparent and therefore the necessary counter measures not undertaken. Disasters often create the need for different organizations to share resources. Therefore, coordination of multi organizational task accomplishment is required. The needs such as fuel and maintenance for vehicles, sanitary facilities, food, shelter and rest facilities, relief and replacement, personnel and emergency message, contact arrangement also are to be included in the logistic support of an organization

responding to a disaster. In contrast to daily emergencies, disasters often call for large scale search and rescue operations.

An important security task in disasters is keeping unauthorized persons out of the disaster area in order to prevent looting and decrease congestion hampering rescue efforts, and to prevent persons from being injured in the wreckage. Moreover, mass handling of the dead creates problems that may not have been faced in routine emergencies. Handling the dead poses different problems in disasters. The other tasks that are important in disaster response are:

- Warning and communicating with the public Shelter and feeding of displaced persons Evacuating neighborhoods
- Evacuating hospitals, prisons, nursing homes and psychiatric facilities Coordinating volunteers
- Acquiring and allocating unusual resources
  Dealing with mass arrival carcasses
- Dealing with livestock or family pets that had to be left behind or sheltered

Procedures for condemning damaged buildings

- Disposing of unclaimed valuable and merchandise found in the rubble at the scene
- Control of air traffic

Disposing of large amounts of donations

- Controlling emergency vehicle traffic in order to avoid blockage of routes by emergency vehicles
- Checking the hospitals, nursing homes and day care centers that may need assistance

Prioritizing of utility sources delivery

Adequate communication is a recurring challenge in disaster response. The importance of communication is its ability to get people to work together on a common task or toward a common goal to coordinate. It is the process by which each person understands that how his individual efforts intermesh with those of others. The information is required for need assessment and rescue operations. The most crucial types of information that need to be shared are related to

An ongoing assessment of what the disaster situation is and what disaster counter measures need to be undertaken;

An ongoing determination of what resources are needed to undertake the counters measure. What resources are presently available and how they can be obtained;

A determination of the priority of needed disaster counter measures; A determination of what persons and organizations will be responsible for the various tasks necessary to accomplish the counter measures

Computers are not only useful for sharing and analyzing disaster information, but also for sharing it. The internet facility may provide strong base for efficient communications in the following measures:

Sharing and collecting information about what agencies have responded and what resources they have dispatched.

Locating and specifying procedures for obtaining special disaster resources;

Sharing information about the location, scope, and character of the disaster and damage that has resulted;

Sharing information about the status of transportation routes facilities, docking and landing sites;

Generating and sharing predictions about weather and other expected conditions;Obtaining information on how to deal with a specific hazardous chemical;

General electronic mail.

Thus, it is clear that the communication and equipments and procedures used by most emergency agencies are established primarily to deal with information flow within the organization. Disasters care for inter agency communication also. To some extent, it can be facilitated by the availability of inter-agency radio networks. However, the critical information requirements of the various organizations involved in disaster response need to be mutually understood and the responsibility for gathering and disseminating it needs to be made clear.

Significantly, disasters pose problems for resource management. A prerequisite to effective and efficient resource management is an accurate system for overall analysis of the disaster situation and the available resources. Overall, need, assessment, involves two major processes: (1) situation analysis; and (2) resource analysis. Situation analysis is the collection of information about the extent and character of the disaster itself and problems that have to be tackled. While resource analysis involves the collection of information about the resources needed to be handled. The source allocation of disaster resources depends on the task priorities already decided for the response of disaster.

In contrast to most routine emergencies, efficient response in disaster requires procedures for triage and casualty distribution. Triage has been called the key stone to mass causality management. The technique for assigning priorities for treatment of the injured when resources are limited is called triage. Generally, attention is given first to those with the most urgent conditions and to those who are the most salvageable. The triage is beneficial in disaster response due to the facts: (i) triage separates out those who need rapid medical care to some life or lives, (ii) by separating out the minor injuries; triage reduces the urgent burden on medical facilities and organizations, (iii) by providing for the equitable and rationale distribution of causalities among the available hospitals. Triage reduces the burden on each to a manageable level, often even to non-disaster level. In order to distribute casualties rationally among the hospitals, capacity assessment of the existing hospitals, dispensaries and clinics need to be examined.

It is to be noted that convincing the public to evacuate areas threatened by impending disaster is often challenging one. In disasters, communication with the public assumes new dimensions not present in routine emergencies. Warning can be one of the most important types of disaster communication allowing the recipients to avoid the threat altogether or to significantly lesson its effects. However, people are often reluctant to evacuate the premises stricken by disaster. There are a number of reasons why persons hesitate to evacuate in the face of threatening disaster. They may not be convinced that they are actually at risk, they may wish to stay and protect their property, or they may want to assure the safety of other family members and property

before leaving. Those living in disaster threatened areas are more likely to evacuate if they are encouraged by invitations from relatives and friends outside.

In the impact area people prefer to seek shelter with friends or relatives rather than at public shelters. Importantly, the process of warning is complicated since it requires the accomplishment of a number of tasks. Jammed telephone lines and circuits as well as traffic congestion, make the process more difficult.

Disaster response and preparedness is most effective when it is built in to development programmes. In long run, disaster mitigation could be implemented at nominal cost by incorporating them into development programmes. The expenditure on disaster mitigation would reduce the potential losses that disaster cause. Significantly, urban planning urgently begs fundamental conceptual change, with a need for locating urban disaster management strategies in a holistic framework embracing issues like poverty, provision of institutional support for informal sector activities, over urbanization, environmental degradation and unchecked consumerism etc. A sound, effective and people centric urban disaster management strategy can emerge only in the context of a truly sustainable, and people centric development paradigm. Disaster management and mitigation be organized around local recovery efforts. In an integrated disaster risk management approach, activities from structural interventions to community based disaster management, which reduces hazard and vulnerability, should be coordinated. It is imperative to orient and train development agencies to integrate disaster risk management into the national and local planning process, thus mainstreaming disaster reduction into development collaboration among the stakeholders is a critical strategy in disaster reduction. It enhances complements the respective capabilities of concerned sectors and organizations in the pursuit of development objectives.

2. Community Based Disaster Preparedness

Analyses of response to past disasters have highlighted reaching out to the victims within the critical period during an emergency as a major requirement to protect people and assets. This has resulted in developing mechanisms to mitigate disasters at the grassroots level through participation of communities. Communities being the first responder and having more contextual familiarity with hazards and available resources are

in better position in planning and executing immediate rescue and relief actions. In areas that have experienced repeated disasters, the communities are realizing that they need to work out a plan to prevent losses and at the same time enable faster recovery in the event of an emergency situation. To convert this realization into an effective plan, they need guidelines which will help them to prepare their own Community Based Disaster Management plans to safeguard lives, livelihood and property.

The Community Based Disaster Preparedness (CBDP) planning referred to in the following sections pertains to preparedness, mitigation and response plans. The primary goal of CBDP is to reduce vulnerability of the concerned community and strengthen its existing capacity to cope with disasters. The approach of preparing the CBDP plans considers people's participation a necessary pre-requisite for disaster management. By involving the community in the preparedness phase, it not only increases the likelihood of coordinated-action by the communities to help in mitigation disasters but also brings the community together to address the issue collectively. There are evidence of collective and coordinated action yielding good results and to a great extent it has been effective in lessening the impact of disaster.

In view of the above, the Government of India and United Nations Development Programme reviewed various models of CBDP being conducted in the country. Several entities have been supporting communities in developing CBDP. The concept varies; for some, CBDP is getting the communities organized to maintain a cyclone structure and having a well developed evacuation plan. Similarly, the process followed also differs-some organizations have been developing the plan and explaining the components to the communities; other preferred to develop the plan with the involvement of the communities. Most of these process remained outside the Government system and it has the inherent danger of communities forgetting the roles and responsibilities, especially if they did not have to use the plan over a period of time.

Preparation of CBDP plans are being promoted under the GOI-UNDP Disaster Risk Management programme in 169 districts in 17 states by institutionalizing the process within the Government system, with the local authorities playing a dominant role in partnership with other key stakeholders. It is a scientific approach, tested in

some pilot states and covers all aspects of disaster management through a process involving communities at risk. Recently the Government of India has decided to launch a project in the remaining multi-hazard regions of the country.

3. Components of CBDP

(a) Disaster Management Committee: Village Disaster Management Committee (VDMC) is formed in each village and it is responsible for initiating disaster preparedness activities. It consists of local elected representatives, grass root level Government functionaries, local Non-Government Organizations (NGOs)/Community Based Organizations (CBOs), members of youth groups such as the National Service Scheme (NSS) and Nehru Yuva Kendra Sangatan (NYKS), women groups, youth club members, grass root level Government functionaries, etc. The size of VDMC is based on the population and need of the villagers. The head of the VDMC takes a lead in mobilizing the community for the preparation of the CBDP plans.

(b) Review & Analysis of Past Disasters: It refers to prioritizing disasters based on its frequency and analysis of the estimated losses. This is an important activity as it forms the basis for preparedness and mitigation plans.

(c) Seasonality Calendar of Disasters: While analyzing the past experience pertaining to various natural disasters, communities develop the seasonality calendar based on the occurrence of disaster events. In the calendar below prepared by the community show the month of occurrence of the disaster and month for preparedness and mock drill.

(d) Mapping Exercise: One of the most important activities of the CBDP is the mapping of risk, vulnerabilities and capacities of the village by the community itself because it is considered to be a very simple and cost effective tool to collect ground level data. This is done through Participatory Rural Appraisal (PRA) exercise. Before the mapping exercise starts, the community members first discuss among themselves, about the experience of previous disasters they have faced or the disasters they may face in future. It aims to provide a pictorial base to the planning process especially for the semi- literate populace and ensures maximum community involvement across gender, caste and other divides. It has also been found to be very effective in raising awareness among the community and thereby enhancing participation of the community in problem identification. The maps generate awareness among the community about the avenues for smooth

evacuation during any imminent disaster. The strategy adopted is to use locally available resources rather than depending on the external agencies for helps and support. The villagers/community members are encouraged to draw the maps on the ground using locally available materials such as stone, stand and various colour powders for different items and indicators.

The maps drawn need not be to scale. The types of maps are as follows:

- Resource Map: Resource mapping focuses on identifying locally available assets and resources that can be utilized for building the capacities of the community during and after disasters. Apart from infrastructure and funds, this could be individuals with specific skills, local institutions and people's knowledge as all these have the capacity to create awareness and bring about changes in the community. A resource map is therefore not limited to a map depicting the available resources but also plotting of the distribution, access and its use by taking into consideration prevailing sensitiveness within the village.

- Risk and Vulnerability Map: In the vulnerability map the community members have to identity the hazards that the village is prone to and the possible areas that would be affected. They also demarcate the low lying areas, areas near the water bodies such as the sea and river, direction of wind, etc. Through this mapping exercise the community members identify the location of groups at risk and the assets that require protection from various hazards.

- Safe and Alternate Route Map: In a similar exercise, the villagers identify safe areas such as strong houses/buildings, raised platforms etc. These act as a shelter place for the people in the event of an evacuation. It would be useful to identify the alternate approach routes which could be used during the time of an emergency.

(e) Disaster Management Team

Village level Disaster Management Team (DMT)/Task Forces are formed to outline coordinated response during crisis situations. DMTs have sectoral focus such as early warning, shelter management, evacuation & rescue, medical and first aid, water and sanitation, carcass disposal, counseling, damage assessment and relief and coordination. Based on a needs assessment of the teams, specialized training could be provided to the members. DMT members would be linked to the existing service providers for continuous training and discharging of their responsibilities effectively. The roles and responsibilities of the DMTs are the following:

1. Early Warning Team: The members of this team are responsible for providing latest warning information to the villager so that the villagers get ample time to get prepared for the advent of the hazard. At the time of the disaster the members of this team keep a track of the developments. Emergency contact telephone numbers are collected well in advance of the hazard season, tools such as radio, television etc. are to be kept in working condition prior to the hazard period. During the occurrence of the event, the team would be responsible to inform every household of the latest position. They would also keep a track of the situation and listen to the de-warning messages to decide on the timing for calling off the emergency state.
2. Evacuation, Search and Rescue Team: Members of this task force are mainly responsible to evacuate and carry out search and rescue operation during the time of emergency. The members of this team are mainly young men and women of the village, ex-service men; swimmers, etc. Rescue kits necessary to carry out the activities of this team would be ideally made locally with indigenous materials available. These members are trained with the help of Civil Defense, Police, Fire services etc.

3. Shelter Management Team: Members of this team takes care of the identified shelter buildings in pre, during and post disaster scenario. Care needs to be taken to stock necessary material such as food, drinking water, medicines, bleaching powder, firewood, lantern, etc. Special care needs to be taken for the animal stock during any disaster. The team needs to ensure hygiene in and around the shelter place. Women are generally active members of the shelter team as they are well acquainted with house management, and are able to manage shelter during emergency. The team leader or any other team member should have the keys of the safe shelters so that prior to the disaster they will clean up the place and make available the necessary materials like food, water, medicines, bleaching powder, firewood, lantern, etc. required for the evacuees during disaster period.

4. Water & Sanitation Team: Members of this team ensures availability of safe drinking water and the cleanliness of the village so that there is no danger of epidemics even after the event. They will make arrangements for storing drinking water and water for cooking and other chores. First Aid Team: This specialized team is responsible for preparing and updating the list of vulnerable population like old and ailing people, pregnant ladies, children etc. They also have to procure the necessary medicines before the hazard season and conduct a routine check-up of the ailing people in the village. They have to collect health related information and make the community aware of the health measures to be taken up. Women and existing health practitioners of the village are the members of this team. This team would receive periodic training from the local medical (local health centre) personnel.

5. Relief and Coordination Team: This team maintains the list of all household members so that they can arrange or procure sufficient quantity of food materials for each category of people. They are also responsible for the distribution of relief materials. And in the post disaster period they will make arrangements for getting relief materials from the Block office. They should have the list of shops/ wholesale dealerships where food grains are available for use during the time of emergency.

6. Carcasses Disposal Team: The team is responsible for the clearing of carcasses (if any) after the disaster. They are exposed to different types of carcasses disposal methods. The team should put in all their effort to check spread of diseases by disposing of the carcasses at the earliest and in the right manner.

8. Trauma Counseling Team: The existing relief system does not have any provision for treatment of mental health, which enhances suicidal cases after any major disaster. It has been seen that most of the community members are traumatized due to loss of family members and assets. After the large scale damages, it becomes difficult for some of the victims to get back to normalcy. In such a situation, the counseling team is responsible for counseling the victims to ease them of their trauma.

9. Damage Assessment Team: With things getting better after the disaster, the damage assessment team carries out an assessment of the damaged houses, livelihood assets and crops etc. Usually a Govt. functionary from the state Revenue Department carries out such assessment after a particular period. During this exercise, the damage assessment team helps him/her in making a timely and useful assessment.

(f) Mock Drill: Mock drill is an integral part of the village CBDP plan, as it is a preparedness drill to keep the community alert. Keeping this in view, mock drills are organized in all villages to activate the DMTs and modification of the DM plan based on the gaps identified during such exercises. Basically this is a simulation exercise, which if practiced several times, would help in improving the cohesiveness of the community during an emergency.

(g) Identification of Hazard Specific Mitigation Activities: While developing the CBDP, the villagers would develop a mitigation plan for

h. Community Contingency Fund (CCF): Availability of resources for various activities to be carried at different phases of the cycle is very crucial. To meet this contingency, each household in the village would be motivated to contribute resources which could be in the form of funds and/or food grains, which becomes the grain bank for the village. A very nominal amount based on the affording capacity of the inhabitants (households) is

collected and kept as the Community Contingency Fund or village emergency fund. In the annual meeting they decide how to use this fund as per the need and developmental plan of the village.

4. Preparation of CBDP Plan-Process

In order to ensure ownership by the community and to ensure reflection of local conditions and sensitiveness, preparation of CBDP will have to be

through a participatory approach. Community based organizations and the NGOs who have been working with communities are to be identified to facilitate a PRA exercise. The process followed is listed below:

(a) Awareness Campaign: A massive awareness campaign is necessary to support the community in preparation of the disaster management plans. These campaign are carried out through various means like rallies, street plays, competitions in schools, distribution of IEC materials, wall paintings on do's and don'ts for various hazards. Meetings with key persons of a village such as the village head, health worker, school teachers, elected representatives and members of the youth clubs and women also motivate the villagers to carry forward these plans for a safer living.

(b) Training of Gram Panchayat/Block Members: In several states of India Gram Panchayat is the intermediary administrative unit between block and village level, which has a vital link for disaster management activities. It is the responsibility of the Gram Panchayat Disaster Management Committee to supervise and guide the community in this process. Similarly block is the administrative unit that executes all developmental programmes in the rural areas, and has a very good linkage with upper level of administration. Therefore, both levels of functionaries are very important to ensure risk reduction as a part of the development programme. The district level master trainers are responsible to train the functionaries of GP and blocks before initiation of the activities at the village level.

(c) Identification of Village Volunteers and Training: One of the major objective of CBDP process is to develop a cadre of trained human resources at community level to carry out all disaster management and mitigation

initiatives. An innovative method is used in this programme to train at least two persons as disaster management volunteers who, after being trained are supporting the community in development of the village disaster management plan. These volunteers are selected by the representatives of local self-Government, block functionaries and CBOs. Most of the volunteers are from local youth clubs, women self help groups or from CBOs and belong to the same community.

(d) Training of PRI Members: The three tier Panchayat Raj System (peoples' representatives) existing in India has laid down responsibilities of elected local Government officials at various levels. To mainstream CBDP. It is suggested to involve PRIs in the process to address the vulnerability reduction initiatives through the developmental programme because they are responsible for the local area's development. All PRIs are oriented by the master trainers on disaster risk management initiatives and encouraged to be involved to reduce the disaster impact. These oriented PRIs would help the trained volunteers and community on disaster preparedness and management. They are vital players in the disaster reduction programme and help to sustain the same.

(e) Sensitization Meeting at Village/ Community Level: Village sensitization meetings are organized with help of the representative of local self-Government, trained volunteers, local NGOs etc. for the implementation of disaster preparedness and mitigation initiatives. In some villages the communities are ready for disaster management planning and other activities in one meeting or in some places they require more efforts.

(f) Women Participation in Community Based Disaster Preparedness: Women, children and old age people are the most vulnerable groups in any emergency situation and need special attention and support. While preparing the preparedness and response plan of a village, importance is laid on the vulnerability of women and children. It gives equal opportunity to women groups to participate in the preparedness and mitigation

initiatives of the village. Women are encouraged to be the members of shelter management, search & rescue and first aid and water and sanitation DMTs. Special trainings such as swimming, first aid etc. are organized to enhance the skills of women DMTs to perform their duties better during the time of an emergency. In formation of DMCs/DMTs, efforts are being given to ensure 30 percent membership for women to improve the local level planning and response process. This would also provide equal opportunities to show their capability, sincerity and dedication.

5. Linkages with Development Programmes:

The GOI-UNDP Disaster Risk Management programme primarily focuses institutionalization of the CBDP process. While external support is being provided to facilitate the plan preparation, the plans become an integral part of the Government's development agenda. At the village level, the disaster seasonality calendar prepared by the communities indicates the appropriate timing for conducting mock drills, which helps the community and authorities to remind various groups their roles and responsibilities. Some of the measures that are being promoted to ensure sustainability and institutionalization are as follow:

- Approval of DM plan by the Development Committee at district level to mainstream the vulnerability reduction activities. All DM plans are the integral part of the developmental plan of villages as per the Government instruction.

- DM plan, DMC and DMTs are recognized by the Government institutions as an integral part of the disaster preparedness and mitigation process.

- Priority is given to the need of the area while developing the development plan of the Gram Panchayat by the community. Utilisation of GP fund for mitigation activities and capacity building of DMTs is encouraged. Special provision for disaster preparedness activities is being made in fund allocation by the Government at various levels.

- It is the Gram Panchayats' responsibility to guide the villagers on development of disaster preparedness plan and after its completion on the compilation of all village plans at the GP level. In a similar way GP Mitigation Plans are consolidated at block level, which ultimately become the block mitigation plan. Now Gram Panchayats are responsible for development programme as well as disaster management progrmme. Thus the govt. has decentralized the process of disaster preparedness and mitigation.

- The existing government service providers are used for up grading the knowledge and skills of GP DMTs and village DMTs. Training institutions are strengthened for a comprehensive training programme of DMCs and DMTs before the hazard season.

- Trained volunteers, CBOs and NGOs are based at grass root level and make the process sustainable.

The process of preparation of CBDP plans through a participatory process, institutionalization of risk management as well as linking it to the overall developmental planning process could be ensured only with capacity enhancement of the stakeholders. Simultaneously, there is a need to create large scale awareness about various options of development process which reduces risks. These cannot be a one-time activity. The chart below outlines some of the essential tools at various stages that would ensure sustainability of community based disaster management.

DISASTER RISK REDUCTION AND MANAGEMENT (DRR)

The Disaster Risk Reduction (DRR) should be seen as on integral part of environment (climate change also) and development. The impending risk analysis should be done in the light of disasters and possible threat of high intensity disasters due to climate change. Accordingly, mitigation and adaptation programmes should be developed. The mitigation plan should address the issues of structural and non-structural interventions along with the fiscal and monetary tools (for DRR & adaptation) for pre and post disaster planning. If this is main streamed, sustainable development can be attained and miseries of the people could be minimised. The top down and

bottom up institutional linkages for policy formulation and programme execution would be interdependent with each other.

Systematic process of using administrative decisions,ϖ organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities

Setting of related goals and objectives in development and land useϖ areas.

It involves the formulation of strategies and Plans, Programs andϖ Activities (PPAs)

WHAT MUST BE DONE TO REDUCE RISK ?

- Institutionalize Local Disaster Risk Reduction & Management Office
- Establish Early Warning System
- Formulation of Communication Protocol
- Formulation of Evacuation Procedures at the community level andϖ establishments
- Organize Local DRRMC and define the functional roles andϖ responsibilities of the members and task units
- Establish Standard Operating Procedures (SOP)
- Hazard awareness through Community-Based trainings and seminars
- Integrate disaster risk reduction into the Comprehensive Land Use Plan (CLUP) and land use planning
- Integrate hazard, risk and vulnerability assessment into theϖ development plan
- Cluster Approach on Recovery Program
- Good working relationship with Warning Agencies and the Localϖ Media Installation of rain gauges on mountain slopes.

National Plan on Disaster Management (NDMA)

3An institutional mechanism for preparation of the National Plan has been put in place, which is under preparation in three parts namely:-

(i) National Response Plan,

(ii) National Mitigation Plan and

(iii) National Capacity Building Plan.

A Facilitation Committee under the Chairmanship of Secretary (Border Management) in the Ministry of Home Affairs and three sub-committees namely:

(i) National Response Plan Committee

(ii) National Mitigation Plan Committee and

(iii) National Capacity Building Disaster Management in India 72 Plan Committee have been constituted for preparation of the National Plan on Disaster Management.

The National Mitigation Plans are under preparation by the concerned nodal ministries for disasters in respect of which the Nodal Ministries have been identified and designated

The Nodal Officers of the ministries concerned with the disasters are the conveners of the National Mitigation Plan Committees and are required to complete the Mitigation Plan in consultation with the members concerned with the respective disasters in NDMA.

Focus and Objectives of Guidelines :

NDMA is engaged in the formulation of guidelines through a consultative process involving multiple stakeholders, including the government, non-government organisations, academic and scientific institutions, the corporate sector and community. Since its inception, NDMA has so far released various disaster specific and thematic guidelines. These may be visited at the site www.ndma.gov.in. Salient features of the guidelines issued are as follows

Management of Landslide and Snow Avalanches: The objectives of these guidelines are to institutionalise the landslide hazard mitigation efforts, to make the society aware of the various aspects of landslide hazard in the country and to prepare the society to take suitable action to reduce both risks and costs associated with this hazard. The guidelines include regulatory and non-regulatory frameworks with defined time schedules for all activities.

Management of Cyclones: The guidelines aim to deal with the tropical cyclones by way of appropriate coping strategies and risk reduction plans along with greater public awareness. The guidelines call for proactive, participatory, fail safe, multi-disciplinary

and multi-sector approach at various levels. An approach encompassing Early Warning System on cyclones, structural measures for preparedness and mitigation, covering cyclone shelters, buildings, road links, drains, embankments, communication/power transmission networks, and non-structural mitigation options, such as coastal zone management, coastal flood plain management, natural resources management, awareness generation related to CDM, hazard zoning and mapping, including the use of GIS tools, capacity development, etc; and its implementation strategies are suggested.

Management of Earthquake: The guidelines emphasise that all new structures are built in compliance with earthquake resistant building codes. Town planning, bye-laws, structural safety audits of existing lifeline structures and other critical structures in earthquake prone areas, carrying out selective seismic strengthening and retrofitting ought to be addressed.

Management of Floods: The guidelines aim at measures for preparedness, prevention, mitigation in the pre-flood stage and on prompt and effective response, relief and recovery during Disaster Management in India 74 – and post flood stages. Importance on non-structural measures besides structural measures is emphasized in the guidelines. Setting of basin-wise organisations for flood management and also for setting up a National Flood Management Institute for training, education and research are suggested in the guideline

Chemical Disasters (Industrial): These guidelines call for a protective, participatory, well-structured, fail-safe, multi-disciplinary and multi-structural approach at various levels. On the basis of vulnerabilities and consequences of chemical accidents, the guidelines review the existing regulatory framework and practices and thus propose for a regulatory framework, code of practices, capacity development, institutional framework, etc. They further set out an approach for implementation of the guidelines.

Management of Chemical (Terrorism) Disasters: The guidelines focus on outlining the preparedness and efforts made for mitigating the chemical terrorism, the act of violence perpetrated to achieve professed aims, using chemical agents. While reviewing the existing legislations and regulatory framework, the guidelines identify the gaps and propose the measures required to fill the gaps in the legislative and regulatory

frameworks. They also deal with the aspects of surveillance measures for strengthening the intelligence in order to prevent intentional use of chemical agents.

Preparation of State Disaster Management Plans: The aim of the state DM plan is to ensure that the components of DM are addressed to facilitate planning, preparedness, operational, coordination and community participation. The guideline suggests outlays for preparation of the plan to include the state profile, vulnerability assessment and risk analysis, prevention measures, mainstreaming DM concerns into developmental plan and programme projects, preparedness measures, response and partnership with the other stakeholders besides providing for financial arrangement.

Psycho-Social Support and Mental Health Services in Disasters: Disasters leave a trail of agony and affect the survivors' mental health. The guidelines on this subject outlay the entire gamut of psycho-social support and mental health services with a view to build the nation resilient to respond effectively in all types of disasters. The intent of these guidelines is to develop and integrate a holistic, coordinated and pro-active strategy for management of psycho-social support and mental health services after a disaster through a culture of prevention, mitigation and preparedness to generate a prompt and effective response.

Medical Preparedness and Mass Casualty Management: A Mass Casualty Event (MCE) is an incident resulting in a number of victims large enough to disrupt the normal course of emergency and health care services. The guidelines for MCE focus on all aspects of medical preparedness and mass casualty management with emphasis on prevention, mitigation preparedness, relief and medical response etc. They aim to develop a rigorous medical management framework to reduce the number of deaths during MCE.

Management of Nuclear and Radiological Emergencies: The overall objective of the guidelines is to implement the concept of prevention of nuclear and radiological emergencies. . In rare cases of their occurrence due to factors beyond human control, the guidelines suggest the emergency should be managed through certain pre-planned and

established structural and non-structural measures to minimise risks to health, life and the environment.

Policy and Guidelines

Incident Response System: These guidelines provide directions and guidelines to central ministries and the states for an effective and well coordinated response. They suggest a multi-disciplinary, and systematic approach to guide administrative mechanisms at all levels of the government with scope for participation of private sector, NGOs, PRIs and communities to work together seamlessly in the response activities. The guidelines are applicable to the management of all incidents - natural or human-made. The proposed methodology is expected to be equally useful for handling all kinds of incidents such as terrorism (Counter Insurgency), law and order situations, serial bomb blast, hijacking, air accidents, chemical, biological, radiological and nuclear (CBRN) disasters, mine disaster, port and harbour emergencies, forest fires, oil field fires and oil spills.

Strengthening of Safety and Security for Transportation of POL tankers: The guidelines envisage measures for prevention and for adoption of preparedness practices to a level that there is no chance of error. This calls for firming up the regulations, setting up of mechanisms of strict conformation, as well as fail proof functioning by each role player.

Management of Biological Disaster: The guidelines for management of biological disasters focus on all aspects of Biological Disaster Management (BDM) including Bio-terrorism (BT). It emphasises a preventive approach such as immunisation of first responders and stockpiles of medical countermeasures based upon risk reduction measures by developing a rigorous medical management framework to reduce the number of deaths during biological disasters, both intentional and accidental. These include the development of specialised measures pertaining to the management of biological disasters.

Management of Tsunami :The guidelines present an introductory overview on the tsunami risk and vulnerability in the country and the preparedness as a nation. It provides for structural mitigation measures and lay down strategies for protecting lifeline with the sea front besides laying down the guidance for developing the techno legal regime and giving an account of various tool kits for tsunami risk management.

Role of NGOs in Disaster Management:

The guidelines discuss the role of NGOs in disaster preparedness, mitigation and response and spell out the institutional mechanism for improving the effectiveness of disaster management through effective coordination between NGOs and the government at different levels.

Urban Flooding: The guidelines aim to develop plans for the management of urban flooding with a view to guide the ministry and other government bodies for preparation of their disaster management plans on this aspect of disaster, recurrent in urban areas during monsoon. While reviewing the existing international and national practices for the design and maintenance of the urban drainage system, it addresses the issue of urban flood risk, vulnerability analysis and hazard mapping and provides for response action.

Management of Dead in the Aftermath of Disaster: These guidelines are aimed at institutionalising the standard procedure for proper management of dead bodies and animal carcasses in the aftermath of disasters.

Plan to counter threats to Municipal Water Supply and Water Reservoirs : The plan aims to counter any threat to municipal water supply and water reservoir in view of such a Disaster Management in India perception and taking into account the present water supply system and legislative framework. The plan suggests to framing a preparedness plan and also outlining the guidelines for a standard operating plan.

NDMA from time to time has also been organizing workshops on different issues related to disasters and publishing its reports for action by concerned Ministry or agency. Such reports are given as under

(i) Training regime for disaster response: The key to efficiency in disaster response does not lie in good equipment but in effective ongoing training of NDRF personnel. . The report on the training regime is the outcome of detailed needs analysis, followed by extensive research on good practices in disaster response training in vogue within the country and elsewhere in the world. The training regime so devised aims to help the process of capacity building of NDRF for efficient and effective discharge of its onerous responsibility.

(ii) Pandemic Preparedness: The outcome of the workshop held on the subject on 21-22nd April, 2008 deals with the existing status of preparedness at different levels of the government and attached offices and inter-dependency of the sectors. The report presents the recommendations following two days of deliberations, on the subject.

(iii) Revamping of Civil Defence set up in the country: The changing scenario, reducing changes and occurrence of traditional wars, an steadily and increasing threat from natural and man- made disasters, with large scale devastation of life and property, warrants a greater role on the part of Civil Defence from merely hostile act-centric responsibility to a holistic role in all the facets of disaster management in the country. It recommends revamping the existing structure of civil defence for enhancing its functional responsibilities in realistic and cost effective manner.

UNIT – V

DISASTER,ENVIRONMENT AND DEVELOPMENT

Disasters occur when hazards meet vulnerable situations. Natural hazards, such as fires, floods, earthquakes and drought, are part of the natural cycles of the earth. When such hazards impact on vulnerable societies – whether it is an earthquake that collapses buildings, or a drought that kills crops – that society may face a catastrophic situation requiring emergency relief and assistance to save lives and to protect the environment

Natural disasters can have a life-altering impact on the individuals, families and society. But the effect of natural disasters can be felt at the community, city and state level, or many times can impact an entire country. How well the impact of a disaster event is absorbed has much to do with the intensity of the impact and the level of preparedness and resilience of the subject impacted. Just as a natural phenomenon can change the landscape of our personal lives as well as aspects of our community, so too can different types of disasters drastically alter the natural environment.

The impacts of disasters, whether natural or man-made, not only have human dimensions, but environmental ones as well. Environmental conditions may exacerbate the

impact of a disaster, and vice versa, disasters have an impact on the environment. Deforestation, forest management practices, agriculture systems etc. can exacerbate the negative environmental impacts of a storm or typhoon, leading to landslides, flooding, silting and ground/surface water contamination.

Impacts of Disasters on Environment Disasters are not random and do not occur by accident. They are the convergence of hazards and vulnerable conditions. Disasters not only reveal underlying social, economic, political and environmental problems, but unfortunately contribute to worsening them. Such events pose serious challenges to development, as they erode hard-earned gains in terms of political, social and educational progress, as well as infrastructure and technological development .

The impacts of disasters on environment and development are manifold. Disasters create substantial environmental degradation and ecological imbalance, hinder socioeconomic development and retard the process of improving the quality of life of the people. The interaction of disasters and environment has both short-term and long-term effects. These interaction and interdependencies work in a complicated way, affecting people, ecosystem and bio-diversity .

Environmental vulnerability

It includes the extent of natural resource depletion and data on resource degradation. Reduced access to clean air, safe water and sanitation and inappropriate forms of waste management, especially in heavily populated and urban environments, can aggravate socio economic vulnerability

Poorer environmental conditions such as diminished biodiversity, soil degradation or growing food scarcity can easily threaten food security for people dependent on the products of land, forests, pastures and marine environment for their livelihoods. As natural resources become scarcer, the range of options available to communities become more limited, reducing the availability of coping solutions and reducing local resilience to hazards or capacity to recover from disasters. Over a period of time, environmental factors can further increase vulnerability by

creating new and undesirable patterns of social discord, economic destitution and eventually forced migration of entire communities.

Environmental Management and Disaster Reduction Around the globe, land use and land cover changes are eroding the natural buffers that protect communities from hazard risk. These same changes often erode people's capacity to recover from disaster. Other environmental changes, such as anthropogenic global warming, promise to create new challenges to the security and sustainability of communities around the world. There are, however, opportunities to reduce disaster risk, and enhance community resilience. Environmental conditions may exacerbate the impact of a disaster, and vice versa, disasters have an impact on the environment. Deforestation, forest management practices, agriculture systems etc. can exacerbate the negative environmental impacts of a storm or typhoon, leading to landslides, flooding, silting and ground/surface water contamination - as illustrated by the 2004 hurricane and storm tragedies in Haiti, and in the Philippines. Comprehensive understanding of natural systems coupled with the application of management tools such as environmental evaluation and risk assessment can make a major contribution to a reduction of risks and mitigation of any impacts.

There is a need to highlight the role that comprehensive environmental management can play in reducing the risk of disasters, and to mitigate the consequences if they should nevertheless occur - both on human lives and on the broader ecology. We also need to explore the link between environmental systems and disasters, and also the synergies between man-made and natural disasters. The increasing frequency and severity of man-made and natural disasters may well be changing the global environment.

All of these threats to the environment have been apparent in recent disasters. Current response to disasters need to be based on the premise that disasters affect the environment when they have direct or indirect effects on ecology and human settlements that last far beyond the scope of immediate humanitarian response. Changing ecological conditions can provoke emergencies by placing concurrent stresses on the environment. Mitigating the effects of disasters are primary components in global efforts to ensure environmental security.

It is clear that further coordination and cooperation on environmental matters depends on the global community's ability to set an environmental agenda for disaster management, and in particular, to pay attention to the environmental conditions that lead to disasters, and to natural resource management for disaster prevention and reduction.

Sustainable development :

The World Commission on Environment and Development (also known as the "Brundtland Commission") has defined "sustainable development" in terms of livelihood security. A system is sustainable if it provides all people with secure livelihoods, in ways that do not compromise the ability of future generations to achieve secure livelihoods (World Commission on Environment and Development, 1987a). Livelihood is defined as access to adequate food and cash to meet basic needs. Security refers to secure ownership of, or access to, resources and income-earning activities, including reserves and assets to offset risk, ease shocks and meet contingencies. Sustainable refers to the maintenance or enhancement of resource productivity on a longterm basis (World Commission on Environment and Development, 1987b). Throughout this book, three key concepts are continually emphasized: — organization that is responsive to local needs; — improvisation; — incremental improvement. These three principles can and should be carried over into the period of full repair of infrastructure, economic rehabilitation and physical reconstruction of neighbourhoods and communities, and become a permanent feature of sustainable development.

Assessment for recovery

Continuing relief efforts, such as the provision of emergency shelter, water, sanitation, etc., will not produce recovery alone. By the very nature of the emergency response, such activities are often not well integrated into long-term development processes. More importantly, during the relief phase, populations are often supported by outside resources that are not sustainable in the long run. At a certain stage, people in camps must either return home, become integrated with the host population, or settle in a third location. Similarly, the self-sheltering population will need to support itself either in its old neighbourhoods or communities, or elsewhere. The reconstruction of housing and of water-supply and sanitation systems are priority areas.

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The reconstruction of housing and of water-supply and sanitation systems are priority areas. The information required for long-term planning and policy-making are outlined in the following sections.

Reconstruction of housing

Before long-term plans for the reconstruction of housing and other forms of shelter can be drawn up, the following information is required: The number of people concerned, their geographical distribution, age groups, etc. The number of houses damaged and destroyed and the standard and pattern of housing before the disaster. The number of families already engaged in repair or rebuilding; the way in which they are organized; the incorporation of risk-reducing features in rebuilding; the assistance they may require and the possibility of encouraging low-cost risk-reducing techniques. The available resources (land, labour power, skills, materials, equipment, access to transportation, and financial resources to support self-help). Remaining hazards that may be faced by people settling on certain sites. Economic data (previous rent levels, land prices, costs of materials, and the source and amount of funds available for investment in housing). Housing policy should take this information into account and a thorough consultation process should be carried out, with special efforts made to hear the opinions of people who may not normally be heard in the community.

Reconstruction of water-supply and sanitation systems

Once damaged systems have been repaired, and services to the disaster-affected population are adequate for protecting life and health, longer term reconstruction should be planned. The following information is required: The number of people affected, their geographical

distribution, age groups, etc. People's access to protected water supplies and sanitation systems and the pattern of water-related diseases before the disaster. The data (meteorological, hydrogeological, hydrological, and other relevant data) needed for planning improvements in water supply and sanitation in these areas. The results of an evaluation of emergency response and urgent repairs and measures (i.e. whether and how emergency measures have actually improved access to protected water and sanitation, and decreased the amount of water- and sanitation-related disease). The activities carried out by the people themselves to improve water supplies and sanitation in the disaster-relief phase (including the predisaster activities of community-based and nongovernmental organizations), and whether these activities incorporate low-cost improvements and health safeguards. The availability of labour, skills, materials, equipment and financial resources for assisting the community to continue the improvements, or for extending watersupply and sanitation systems, and the feasibility of collecting basic relevant data if none has been collected.

Post-disaster environmental health activities and sustainable development

Vulnerability reduction

A sustainable livelihoods approach to recovery focuses on encouraging the development of people's capacity through their access to food, cash and other basic resources and a corresponding reduction in their vulnerability to disasters. Sustainable livelihood security provides the resources that people will eventually use to improve their standards of housing, water supply, sanitation, food safety, dietary security and personal hygiene. Exposure to disease vectors and pests will also be expected to decline correspondingly. Improved nutrition will increase resistance to disease. People with livelihood security will be less likely to live on a grossly hazardous site (steep, unconsolidated slope; frequently flooded area; low-lying, unprotected coastal areas prone to frequent storms, etc.). They will also have time to attend meetings and to become involved in community-based organizations that will represent their interests politically.

Specific implications of sustainable development in environmental health planning

This section is based on two premises about sustainable development. The first is that sustainable development is linked with economic growth (although the two are certainly not identical). If this is true, then where sustainable development occurs, average household disposable income should rise, allowing spending on improvements in water supply, sanitation and food safety. The pricing of such items and services is crucial. They cannot usually be fully subsidized, since the cost is difficult for governments to bear for a large population, but a sliding scale of subsidies may be considered, so that the lowest income earners are also able to make improvements. There may be substantial local or national economic activity generated by households' spending on sanitary improvements. The second premise is that sustainable development stabilizes or even improves the ecological basis of livelihoods. If this is true, environmental health planners should be able to count on a number of direct and indirect positive effects of low-cost, "green" design and redesign of technology in rural and urban areas.