

Distance Learning Programme



Environment & Disaster Management



O drishti ENVIRONMENT & DISASTER BISASTER MANAGEMENT

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Disaster Management

Life on earth has always been vulnerable to disasters, be it natural or man-made. The natural disasters are caused by unique geo-climatic conditions, while the man-made disasters result from varied socio-economic vulnerabilities. Some of the natural disasters include earthquake, cyclone, cloudburst, landslide, etc., while fire, air, road, railway accidents, industrial accidents, etc., fall in the category of man-made disasters.

In the recent past, we have witnessed a dramatic increase in the incidences of disasters throughout the globe, which has become both national and international concern. Often due to action or inaction, people aggravate the perils of disaster.

Disasters may cause huge loss of life, property, infrastructure and environment, which can be at times, irreversible. Therefore, there is need of preparedness and effective response mechanism to cope with a disaster.

What is a 'Disaster'?

"Disaster is a crisis situation that far exceeds the capabilities."

- Quarentelly, 1985

The term disaster is derived from a French word "Desastre" which implies 'bad/evil star'. Disasters are debilitating events in which there is widespread loss of life and property in a given society. The social and environmental losses are beyond the capacity of community to cope using its own resources. Therefore, external support is required to overcome its effects. The United Nations Office for Disaster Risk Reduction (UNISDR) defines disaster as:

"A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources."

The UNISDR definition pro<mark>vides three important compon</mark>ents of a disaster:

- Firstly, there should be serious disruption or abnormality in life of people;
- Secondly, the community cannot deal with the consequences on its own and;
- Lastly, the consequences of the event must be faced by a 'community', i.e., a group of people.

The Disaster Management Act of India defines disaster as:

"A catastrophe, mishap, calamity or grave occurrence in any area arising from natural or man-made causes or by accident or negligence, which results in substantial loss of life or human suffering or damage to and destruction of property or damage to, or degradation of environment and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area." • From the above definitions, it can be said that disaster is an event which either causes serious loss to the people or disrupts the normal pattern of life. It is to be remembered that only when people or public life is affected, it amounts to a disaster; without people there can be no disaster. An earthquake or flood in an uninhabited place cannot be considered as a disaster.

Causes of Disaster

For a long time, geographical literature viewed disasters as a consequence of natural forces (examples are earthquakes, floods, and tsunamis, etc.) and human beings were treated as innocent and helpless victims in front of the mighty forces of nature. But natural forces are not the only causes of disasters. Disasters are also caused by some human activities. Bhopal Gas tragedy, Chernobyl nuclear disaster, wars, release of CFCs (Chlorofluorocarbons) and increase of greenhouse gases, environmental pollutions like noise, air, water and soil are some of the disasters which are caused directly by human actions. There are some other activities of human beings that accelerate or intensify disasters indirectly.

Landslides and floods due to deforestation, unscientific land use and construction activities in fragile areas are some of the disasters that are the results of indirect human actions. It is a common experience that human-made disasters have increased both in their numbers and magnitudes over the years and concerted to prevent and minimise their occurrence.

The UNISDR describes disaster as a product resulting from exposure to a hazard, vulnerability of a community to such exposure and insufficient capacity of the community to deal with the adverse consequences due to such exposure. Thus, disaster risk involves the presence of three variables, i.e., hazards, vulnerability and insufficient coping capacity. The people, through their action or inaction can either escalate or reduce the impacts of disasters. In order to understand the causes of disaster, we must understand certain terms like hazard, vulnerability, insufficient capacity and disaster risk.

Hazard

The UNISDR defines a hazard as "a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social or economic disruption or environmental damage". Hazards are such natural or human caused events which can possibly become a disaster with negative consequences when people are exposed to it. Typical examples of hazard can be the absence of rainfall leading to drought, excessive rainfall causing flooding or leakage of chemicals from manufacturing units. Such events near to human settlement are regarded as hazardous as they expose human beings to peril. When there are widespread negative impacts of such events on humans, then hazard turns to become disaster. It is to be noted that if such natural or man-made events occur far away from human settlement and do not pose any threat to people or property, then they are merely a natural/manmade occurrence and not natural/man-made hazard.

Types of Hazard

Primarily hazards are of two kinds-natural hazards and human induced hazards. However, disaster may be caused by a combination of both. The UN Inter Governmental



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Panel on Climate Change (IPCC) has shown that man-made hazards have significantly increased the intensity of disasters. The effects of cyclone, heavy rainfall, earthquake, etc., have been worsened by human activity.

- **Natural Hazard:** Hazard which is the result of natural phenomena is called natural hazard. Deslnventar (Deslnventar is a conceptual and methodological tool for the construction of databases of loss, damage, or effects caused by emergencies or disasters) has classified natural hazards into five categories:
 - **Geophysical:** Geophysical hazards relate to earth phenomena like earthquakes, volcanic activity, tsunami, landslides, land subsidence, etc.
 - **Hydrological:** Hydrological hazards are caused by abnormal water cycle like flood, landslide, wave action, etc.
 - **Meteorological:** Meteorological hazards are caused due to atmospheric processes like cyclone, storm, lighting, etc.
 - **Climatological:** Climatological hazards are caused by long term natural processes like rise in sea level, droughts, glacial lake outburst, etc.
- Biological: Biological hazards are caused by bioactive substances (pathogenic microorganisms). These include epidemics, insect infestation, etc.
- Human Induced Hazard: Human induced hazards are caused by human activity. They are also referred as anthropogenic hazards. Some examples of such hazards include, industrial pollution, dam failures, transport or industrial accidents, etc. Most of the man-made disasters are caused by rising population, rapid urbanization and industrialization, environmental degradation, development in high risk zones, etc. Hazards are also distinguished on the basis of timing:
 - **Slow Onset Hazard:** Such hazards develop over a long period of time. Also, onset hazards can be predicted by early warning systems. Examples of such hazards include, droughts, landslides, desertification, cyclones, etc.
 - **Rapid Onset Hazard:** Such hazards appear suddenly without early warnings. Examples of such hazard include, fires, flash floods, cloudburst, volcanic eruptions, earthquake, etc.

Vulnerability

The term vulnerability implies the possibility of being harmed. In respect to disaster, it signifies the extent of exposure of the people to suffer damage due to hazard. UNISDR explains the vulnerability as "a set of prevailing or consequential conditions arising from various physical, social, economic and environmental factors, which increase the susceptibility of a community to the impact of hazards".

Causes of Vulnerability

The magnitude of vulnerability depends on several factors like marginalisation of people in poverty, high or dense population, problems of economic opportunity, unequal access to resources, etc. The disaster risk scholars have identified several factors responsible for vulnerability:

Political Factors: Exposure to hazard is strongly linked to decision making and development process. Since, the state is a key player in disaster risk reduction, political will is fundamental in disaster risk management. Favourable political vision towards disaster risk management influences the development plan and the manner in which vulnerability can be reduced. Now most of the countries have disaster policy and laws which describe their approach towards disaster management.



- Economic Factors: The economic status of the society is directly linked to the standard of life, property and infrastructure, and capacity to deal with disasters. All disaster studies have established that rich societies either survive or recover quickly from disasters. Poverty, lack of opportunity and basic services, often push people to migrate to urban areas where they are forced to live in densely populated clusters, slums, unsafe dwellings and other hazard prone areas. Therefore, it is important for political leaders to eradicate poverty and provide sustainable livelihood for disaster risk reduction.
- Social Factors: Social factors like high level of education, training, information availability, social cohesiveness, strong cultural beliefs, etc., determine the vulnerability of the society. Certain groups like women, orphan, old people are more vulnerable than others. If people do not have access to early warning, knowledge and training for how to react in times of distress, do not know whom to approach at the time of disaster, the impact of the hazard escalates enormously. Also, due to the lack of social cohesion, especially in urban areas often civil conflicts (like communal riots) occur due to religious, social or economic differences.
- Infrastructural Factors: Infrastructural factors include aspects like suitable land (for housing, agriculture, etc.), land use planning (rules related to not building houses in flood plains and wetland areas, etc.), housing design, dense and unplanned settlement, accessibility to roads, standard material for building houses, bridges, roads, etc. Poor infrastructure exposes people to hazards like landslide, flood, fire, disease and epidemics.
- Environmental Factors: Disasters are often caused by or escalated due to environmental degradation. In the recent case of South Asian tsunami, degraded coral reefs and mangrove swamps in a few areas worsened the impact of tsunami on victims, which could otherwise have absorbed the energy of tsunami surge. The environmental factors causing vulnerability include: Natural resource degradation; Pollution; Permanent loss of biodiversity; Climate change and Loss of resilience of ecosystems.

Most of the environmental hazards are caused by overexploitation of the natural resources. The unrestrained and haphazard urbanisation and industrialisation is a major cause of environmental degradation. Further, the overconsumption of natural resources has escalated pollution of land, water and air and significantly increased the vulnerability of humankind.

Coping Ability

The coping ability implies availability of such means and mechanisms within the household and community at large, which can help people prepare, deal, prevent and recover from a disaster. The higher is the coping capacity of a society, lesser is the risks of disasters. Coping capacity is necessary for a resistant community. It must be remembered that hazards are always present, but it becomes a disaster only when the community is highly vulnerable and has less capacity to deal with hazards.

Disaster Risk

Risk signifies the chances that damage will occur due to exposure to the hazardous situation. Risk is the degree or extent to which human experiences the negative consequences. Accordingly, disaster risk refers to the possibility of suffering damage. Different communities are at different level of risk to suffer the loss due to their vulnerability





and coping capacity. Therefore, poorer communities are at greater risk than richer communities who have better capacity to cope with hazards. Thus, the level of risk depends upon: hazardous situation; vulnerability; and coping capacity of the given society.

Inter-relationship Betwe<mark>en Hazard, Vulnerability</mark>, Capacity and Disaster Risk

Disaster risk is the interplay of hazard and vulnerability. Hazards in themselves are innocuous. It is only when a society is exposed to the hazard and is unable to withstand the adverse effects of such hazard using its own capacity, disaster risk results. The following mathematical formula explains the inter-relationship between hazard, vulnerability, capacity and disaster risk:

Disaster Risk = (Vulnerability × Hazard)/Capacity

Assessing disaster risk depends on:

- Probability of occurrence
- Intensity and characteristics
- Socio-economic and political conditions
 Coping capacity



Disaster Management

Disasters are bound to happen. The natural hazards are inevitable phenomena, manmade hazards are also inescapable owing to rise of population, urbanization and industrial development. In order to overcome the losses due to disaster, we need to make systematic efforts towards disaster risk reduction. The modern day disaster risk management focuses on Total Risk Management (TRM), which includes both pre-disaster and post-disaster planning and preparedness.

The contemporary study of disaster risk management is divided into two schools. These schools are named as Constructivist and Objectivist (Realist) schools of thought. Kelman distinguished both the schools of thought by referring first one to be as a social scientist's focus and second one as a physical scientist's focus on disaster risk. The constructivists

view disaster risk as a social construct. As earlier stated, there can be no disaster without human beings, constructivists regard that the conditions of risk are found in the society. Such conditions make the less developed societies vulnerable to disaster risk, whereas, developed societies are able to cope with these risks. This school focuses on the relationship of gender, race, class, economic growth, etc., with disaster risk.

The objectivist school focuses on the physical aspect of the disaster. They believe that disaster risk can be quantified and objectively observed. They are concerned with understating the dynamics of hazards such as earthquakes, floods, cyclones or other man-made accidents. This school relies on hydrometeorology, geodynamics, mathematics and other technological sciences to deduce the probability and risks of disaster.

Disaster Risk Management vs. Disaster Management

Traditionally, the focus of disaster risk reduction has been towards response after the disaster has struck. Even UNDP, in 1992, defined disaster management as "the body of policy and administrative decisions and operational activities, which pertain to the various stages of a disaster at all levels". Thus, the focus was on disaster and to provide humanitarian aid as quickly as possible, rather than reducing the risk of disaster. The focus on causes of disaster and how to minimize the hazard and vulnerability was ignored. Also, the implementation of the disaster management activities were compartmentalised (phased approach), which did not bring the expected outcome.

The modern approach, however, focuses not only on disaster, but also on minimising the chances of disaster. It focuses on the uniqueness of each hazard, associated risks and means of its reduction. The new approach is also more integrated and it relies on diverse information (e.g., economy, social work, health, law, etc.). The Disaster Risk Management (DRM), as it is called includes pre-disaster measures to prevent disasters (i.e., risk management) and post-disaster management (i.e., emergency management). The disaster risk management has two objectives-to generate resilience towards hazards and to ensure that development works do not increase vulnerability.

Disaster Preparedness/Disaster Management Cycle

As disaster risk management focuses both on hazard and disaster, preparedness is also concerned to both the areas. Disaster management is a cyclic process which revolves around the four phases of loss reduction, i.e., mitigation, preparedness, response and recovery. Overall, preparedness aims that the different units of society like individual, household, institutions and communities cope with the disaster effectively and recover from the scourge of the disaster quickly. It includes measures to ensure life and property safety. The US National Emergency Management Association (NEMA) has identified twelve elements of preparedness. They are:

- Laws and Authorities;
- Hazard Identification and Risk Assessment;
- Hazard Mitigation;
- Resource Management;
- Direction, Control and Coordination;
- Communication and Warning;
- Operations and Procedures;



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- Logistics and Facilities;
- Training;
- Exercise, Evaluation and Corrective Actions;
- Crisis Communication, Education and Information;
- Finance and Administration.

The above stated twelve elements are part of the four phases of disaster risk management cycle.

US Federal Emergency Management Agency (FEMA) defines preparedness as- "The leadership, training, readiness and exercise support and technical and financial assistance to strengthen citizens, communities, state, local and tribal governments and professional emergency workers as they prepare for disasters, mitigate the effects of disaster, respond to community needs after the disaster and launch effective recovery efforts."

Mitigation

Mitigation involves the efforts directed to prevent hazards developing into a disaster or to minimise the effects of disaster when they occur. Some steps generally taken under mitigation phase include preparing building codes, demarcating hazardous zones, public education, vulnerability assessment. In mitigation phase, focus is on long term measures to reduce or eliminate disaster risk. All mitigation activities are categorised as:

Structural Mitigation

Structural mitigation activities include causing physical construction changes which can reduce the frequency and intensity of the hazard. It involves building such infrastructure which can minimise the probability of occurrence or at least reduce the intensity of the disaster when it occurs. Such measures may include decreased runoff erosion, sediment control, making homes earthquake proof, wind proof, building sand bag barriers for flood, etc. These empirical measures help to protect life and property. The structural mitigation measures require the prior knowledge of the expected stress that the hazard may apply to the structure. It is necessary to build a strong structure which can withstand the hazard.

Non-structural Mitigation

The non-structural mitigation measures include carrying out non-physical activities (mostly policies and practices) to raise knowledge about the hazard. Such measures are directed towards mental preparedness, training, insurance, planning, discussion, etc. All such types of measures, indirectly, reduce the impacts of disasters. According to Virtual University for Small States of the Commonwealth (VUSSC), the overall mitigation measures involve the following tools:

- Hazard management and vulnerability reduction;
- Economic diversification;
- Political intervention;
- Public awareness.

Preparedness

The disaster risk preparedness aims at getting ready to deal with disaster situations. It implies capacity building to deal with disaster situations. The preparedness measures





may include numerous activit<mark>ies both long term and short t</mark>erm to deal with hazards. The action plan may focus on:

- Communication plan/infrastructure (information, contact list, etc.)
- Maintenance of supplies and building inventory
- Availability of emergency services (ambulance, fire fighters, social workers, etc.)
- Multi-agency coordination and chain of command
- Development of early warning systems
- Evaluation plan/training/procedure

The International Federation of Red Cross and Red Crescent Societies (IFRCRCS) regard disaster preparedness to be "continuous and integrated process involving a wide range of activities and resources from multi-sectoral sources". The disaster mitigation and preparedness are closely related. Disaster preparedness includes implementation of mitigation measures like building infrastructure, educating people about steps to be taken at the onset of a disaster, etc. However, mitigation and preparedness are different from each other in some aspects. Merely mitigation measures cannot stop a disaster. Mitigation measures merely reduce the vulnerability of the population. Disaster preparedness goes one step ahead and involves preparing the community and emergency services to respond in actual cases of disaster. Disaster preparedness is a holistic concept encompassing all activities which enhance the capacity to cope with disaster situations. Broadly, preparedness includes chalking out a plan of action and then implementing it. The plan of action should focus on:

- Hazard Knowledge: It includes impact and vulnerability assessment, dissemination of knowledge about hazard to all stakeholders, carrying out an estimation of expected loss, knowledge of different kinds of expected disaster situation (earthquake, flood, tsunami, cyclone, etc.) and potential impact on health, safety, infrastructure, environment, economy, etc.
- Management, Direction and Coordination: The administrative functions related to disaster preparedness include creation of institutions for disaster management, delineating line of authority, streamlining inter-agency cooperation and coordination mechanism, setting the scope of authority, directions related to accumulation of required resources, how the resources will be managed and used, ensuring representation of concerned stakeholders (safety, health, law and order, environment) in the management, etc. The management activities also include training, drills and exercises and education programme of line authorities and general public to ensure efficiency and effectiveness of disaster management activities.
- **Specific Planning:** Specific planning implies organising man and material to deal with the disaster not only within the administrative agency, but also outside it. It includes planning about deployment of resources, evaluation, sheltering, communication, collaboration between state and private players, finance, electricity, medicine and others.
- Resources: Availability of the key resources is an important aspect of a plan of action. It includes manpower, food, water, electricity, fuel, medicines, specialized equipments according to the kind of disaster (e.g. boats and sand bags during flood, ambulances, etc.), transportation, mortuary services, resources for displaced persons, etc. The manpower may include engineers, doctors, IT experts for communication services, both skilled and manual labours among others. The contact list information must be disseminated so as to inform people whom to approach during disaster. Law enforcement

