



DIFFERENT ASPECTS OF NATURAL DISASTER, THEIR REDUCTION AND MANAGEMENT

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Abstract

In India many regions are highly prone to different type of natural disasters. Nearly 60% of our landmass is highly susceptible to earthquakes, 8% areas are prone to floods, 68% area is prone to droughts and 8000 Kilometres of our coastline is prone to cyclones. So the purpose of this paper is to discuss, what natural disasters are? How they occurred? Where they occurred? How we can define different type of disasters? The global scenario of various disasters, their history etc. At the same time for the reduction and management of various disasters, essential steps for preparedness, mitigation, preventions are also highlighted. Different stages of reduction and management like pre-disaster stage or post- disaster stage are also discussed. In fact disaster management has emerged as high priority areas for research in our country. Now, disasters are not limited to natural processes only man-made emergencies often cause bigger disasters. Fire-incidents, industrial accidents or other man-made disasters involving chemical, biological or radio-active materials are also severe disasters. Different historical disasters around the world are discussed. We also come to know that the regional distribution of natural disasters like tropical and sub-tropical zones is highly prone to cyclones and “Pacific ring of Fire” is prone to earthquake. How disasters really become a disaster?

Different Aspects of Natural Disasters, Their Reduction and Management

1.1 Natural disaster is a physical event that has the potential to cause loss of life, damage property and infrastructure. In recent human history there are two darkest days-9/11/2001 and 7/7/2005 there were both manmade disasters which brought untold damage of thousands of men, women and children. Both terrorist attacks were well-planned to cause destruction, chaos and fear, those were the worst man-made disasters we have seen in recent times. Before attempting detail discussion on natural disaster lets define some important terms.

1. Extreme Events
2. Environmental Hazards
3. Disasters
4. Environmental Stress

Extreme Events:- Extreme events or accidents are those events which are caused by natural processes or human factors, occurs very rarely but suddenly like volcanic eruption, earthquakes etc. Extreme events can be classified into two categories:-

1. **Natural Extreme event:-** earthquake, floods, atmospheric disturbances, volcanic eruptions etc.
2. **Anthropogenic Extreme events:-** leakage of poisonous gases, nuclear disasters etc.

Environmental Hazards:- As per the definition of the UNO hazard is “a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic or environmental degradation.” Hazards have following characteristics:-

1. Hazards are natural or man-made.
2. Hazards have the potential to damage different forms of life.
3. Hazard may or may not become disaster.

Disaster: - Disaster is sudden adverse unfortunate extreme event or hazard that cause great damage to human being as well as plants and animals. Disasters may be natural or man-made induced, occurs rapidly, instantaneously and indiscriminately.

All the extreme events are hazards but not all the hazards are disasters. A hazard may become disaster only when it strikes the inhabited area. Following features of disasters:-



1. Disaster is natural or man induced.
2. Disaster occurs rapidly, instantaneously or indiscriminately.
3. Disaster cause many social-economic and health problem etc.
4. Disasters are such uncontrollable extreme event that disturbs social and economic structure totally that is needed to support human life.

Environmental Stress :- When the environmental hazards, environmental disasters and many other forms of degradation and pollution crosses the tolerance limit of environmental balance that highly disturbed natural environment is called environmental stress.

1.2 Classification of Hazards and disasters:- Basically hazards and disasters are divided into two categories and these can be further subdivided into following sub-categories:

- (1) Natural Hazards and Disasters.
 - (I) Planetary Hazards (A) Terrestrial/Endogenous Hazards Examples:-Volcanic eruption, Earthquake and Landslides.
 - (B) Atmospheric/Exogenous Hazards (a) abnormal/Infrequent Events Examples:-Cyclones, Lightning and hailstorms.
 - (b) Cumulative atmospheric Hazards/Disasters Examples:-Floods, Droughts, Cold Waves and Heat Waves.
- (2) Man-induced (anthropogenic) Hazards and Disasters.
 - (I) Physical Hazards/disasters:- Earthquakes, Land-slides and Soil erosion.
 - (II) Chemical Hazards/Disasters:- Release of toxic chemicals and Nuclear Explosion.
 - (III) Biological Hazards/Disasters:-Population Explosion and Eutrophication.

1.3 An Overview of Natural Disasters Around the World:- Environmental disasters are natural, so these can also be called “ Natural Hazardous Processes” the concept and the perception of environmental disasters are closely related to the impact on organisms in general and mankind in particular. So in other words, we can say that the natural sudden physical processes and events become disasters when it closely disturbs the people lives. Let’s simplify it with an example, if an earthquake of more than 8 on Richter scale but occurs in totally uninhabited area it is not a disaster at all but if an earthquake of less than 7 on Richter scale occurs in heavily populated area it becomes a severe disaster.

Example 1.1.:- Earthquake of Muzaffarabad (in Pakistan occupied Kashmir) occurred on 8 oct. 2005 was only of 6.5 magnitude on Richter scale but was one of the disastrous earthquake affected 50,000 human lives.

According to the report of United Nation Disasters Relief Coordinator (UNDRC) about 90% of all reported natural disasters occurred in developing countries. This observation may not be entirely true because natural disasters do not know any political boundaries but the fact behind it is that most of the developing countries are located in tropical or sub tropical zones where numerous natural disasters occurs very frequently like floods, forest fires, volcanic eruptions and earthquakes.

Fig1.2: No of disaster per disaster type:-Major Natural Disasters 1960-1987

Country	Events (Disasters)	Time	Deaths (of human beings)	Loss(US\$ 10 (6))	GNP (US\$ 10(9))
Morocco	Earthquake	Feb. 1960	13100	120	12
Chile	Earthquake	May 1960	3000	800	17
Yugoslavia	Earthquake	July 1963	1070	600	45
Peru	Earthquake	May 1970	67000	500	17
Nicaragua	Earthquake	Dec. 1972	5000	800	3
Honduras	Hurricane	Sept. 1974	8000	540	3



Guatemala	Earthquake	Feb. 1976	22778	1110	9
Italy	Earthquake	May 1976	978	3600	352
China	Earthquake	July 1976	242000	5600	280
Romania	Earthquake	March 1977	1581	800	51
Caribbean /USA	Hurricane	Aug. 1979	1400	2000	-
Algeria	Earthquake	Oct. 1980	2590	3000	47
Italy	Earthquake	Nov. 1980	3114	10000	352
Yemen	Earthquake	Dec. 1982	3000	90	4
Bangladesh	Cyclone	May 1985	11000	-	-
Mexico	Earthquake	Sept. 1985	10000	4000	136
Colombia	Volcano	Nov. 1985	23000	230	35
El Salvador	Earthquake	Oct. 1986	1000	1500	4
Ecuador	Earthquake	March 1987	1000	700	10
Bangladesh	Floods	Sept. 1987	1600	1300	12

Source :- Environmental Geography by Savindra Singh and Sweta Singh page no. 335.

1.4. Global Scenario of Natural Disasters

Natural disaster have the capacity to injure And disturb lives. From 2005 to 2015 this is believed the natural hazards have killed over 7 lakh people worldwide. According to an estimate 1.4 million people were injured, 23 million made homeless and the total economic loss was estimated more than 1.3 trillion US\$.

1.4.1 Bhopal Gas Tragedy: An accident can turn into a disaster:-

It was a dark night of 3th and 4th Dec. 1984 when a worst industrial disaster happened. Toxic gas were released due to the negligence of the maintenance and operating staff in Bhopal factory. With blowing wind gas were carried away for miles. Many people were die without any warning and when the event has gone it created many serious health problems behind, some are still suffering. Thus a small accident became a killer disaster that killed thousands innocent people.

1.4.2 Katrina: An disastrous Hurricane

On 29th August 2005, Hurricane Katrina hit the coast of Orleans of USA. Its disastrous effect was unimaginable. Wind speed was 230 km/hours, that flattened everything. Heavy flow of water converted streets into streams. According to an estimate more than 80% of New Orleans got flooded. Dead bodies of human beings and animals were floated into the water for days. It was an unbearable tragedy in USA history.

1.4.3 Earthquake: Kashmir and Pakistan: The recent earthquake of oct.8, 2005 in Pakistan occupied Kashmir flattened all the buildings and millions of people became homeless. Epicentre of the earthquake was near to Muzaffarabad in (POK). It is estimated that more than 7300: Opeople were killed in Pakistan and lakhs were injured.

Earthquake: Bihar and Nepal

In the afternoon of 15th January 1934 a powerful earthquake strikes near Bihar and Nepal border. It was the greatest seismic event of the world that struct Northern Bihar plain and the Himalayas adjoining areas of Nepal. Epicentre was at 26°.6 and 86°.8 near Darbhanga. It was disastrous earthquake that damages 10700 human deaths caused Land sliding, faults and irreparable damage to human structures in India, Nepal and Tibet.

1.4.4 Mumbai Floods

On 26th July, 2005 megacity Mumbai got flooded due to monsoon rains, rainfall was 944mm in 24 hours. It was such a devastating rainfall to handle. Cars were lifted up and some passengers trapped inside could not rescued.



Recent floods of Punjab, Karnataka and Kerala were also disastrous. Nobody can forget the loss of property, agricultural crops and human beings etc.

1.4.5 Sumatra Tsunami 2004

Tsunami disaster caused by killer oceanic-sea-waves, undersea earthquake being the most significant factor, claims human lives and can have devastating effects to the coastal areas. For most of the Indians “Tsunami” word was alien before 26 Dec.2004, when a powerful tsunami hit the southern coast of India and played a dreadful drama with killing of thousands of people and destroys property of billions. These killer waves claimed more than 2, 50,000 human lives of 12 countries bordering Indian Ocean wherein Indonesia, Sri Lanka and Thailand were worst sufferers. If we talk about the history the first tsunami event in India was recorded on 31 Dec. 1881, caused by subduction of plates to the east of Nicobar Island triggered tsunami waves.

1.5 Natural Disaster: Reduction and Management:-

1.5.1 Reduction and Management processes of natural disaster includes following aspects:-

- (A) Elements/Components of reduction and management.
- (B) Stages of disaster reduction and management.

1.5.1.(A) Components Includes

1. Hazards Analysis.
2. Vulnerability Analysis.
3. Risk Analysis.

Hazard Analysis

It includes the history, nature and mode of occurrence of a particular region. There is a set of factors that are important to taken into account to present detail information for the reduction and management of a specific disaster. Factors are:-

1. Frequency of hazardous event.
2. Intensity and magnitude.
3. Duration and Severity.
4. Degree of Predictability and Manageability.

Hazard analysis also includes the types and occurrence of hazards.

Examples

1. Slow on-set hazards (droughts)
2. Rapid on-set hazards (earthquakes, cyclones etc.)
3. Short-duration hazards (cyclones)
4. Long-duration hazards (floods, droughts etc.)

Disaster Vulnerability Analysis

According to WCDR (world conference on disaster reduction, 2005) has adopted the following definition of vulnerability:

“Vulnerability denotes the condition determined by physical, social, economic and environmental factors or processes, which increase susceptibility of a community to the impacts of hazards. Vulnerability is the probability of being damaged, destroyed or lost because of a natural hazard”.

Vulnerability is far from being a static process: it is a dynamic process that keeps on changing the probability of process of loss and damage of all the elements exposed to disasters. Vulnerability elements includes:-

1. Name of hazards/ disaster such as earthquake, floods etc.
2. Particular locality or spatial unit such as a region or country.
3. Vulnerability community, such as human, animal and plant community etc.



Disaster Risk Analysis

Disaster Risk has different definitions in different discipline e.g. environmental sciences, economic, ecology and engineering etc.

In a very simple term it can be define as an adverse impact of a particular disaster on different aspects of human society such as social, economic, political, psychological, medical etc. Risk management is very important aspect of natural disaster reduction and management. For example the people living in hill slope are more vulnerable to seismic events ,so they are liable to maximum risk .Likewise, inhabitants of coastal areas are at maximum risk of cyclonic storms ,tsunami.

1.5.2.(B) Stages of disaster Reduction and Management

Basically the occurrence of hazards and disasters studied in three stages:-

1. Pre-disaster stage (anticipatory stage):- (Preparedness,Mitigation,Prevention)
2. on-disaster stage (participatory stage)
3. Post-disaster stage (recovery stage):- (Relief,Recovery,Rehabilitation)*Three “R”stage.

These three stages can also be termed as PMR stages:

1. Preparedness stage.
2. Mitigation stage.
3. Recovery stage.

Pre-disaster stage :- Pre-disaster stage of disaster reduction and management aims to inform the people in advance, to make the community prepared or mentally ready to face the disaster: to minimize the adverse effects etc. Now we will discuss PMP steps to manage the disaster:-

P – Disaster preparedness stage

M – Disaster mitigation stage

P – Disaster prevention stage

P- Disaster Preparedness Stage Involves

1. Vulnerability of a region or locality.
2. Identify the hazards.
3. Mode of occurrence and severity.
4. To determined the magnitude.
5. To educate the people about the adverse impacts of disaster etc.

So, the primary aim of disaster preparedness is to initiate such steps or actions that are needed to reduce the adverse impact of disaster in terms of loss of lives and property of human society. Following measures should be adopted to make the disaster preparedness effective:-

1. Disaster research: Mapping of disaster vulnerable areas
2. Levels of preparedness: Village level, district level, state level, national level
3. Disaster prediction: Prediction of seismic events are almost
4. Disaster warning system: if there does a network of Pacific tsunami warning system comprise 26 member oceanic countries that face the fury of tsunami waves very frequently.

Disaster Education: To educate the people about the various aspects of hazards and disaster. In fact education on disaster plays an important role in various programmes of disaster reduction and management. Disaster education must be broad-based and must and must reach everyone including scientist, policy makers, engineers and general public through cheap and popular media such as news channels, newspapers, workshops, seminars, documentary films, nukkar-natak etc.



M-Disaster Mitigation stage involves:-

1. to lesser the adverse impact of disasters.
2. to reduced the magnitude of disaster and minimize its destructive force.

We already have mentioned that disaster preparedness deals to save the human lives first but disaster mitigation emphasis to reduce economic losses in case of disaster occurrence. The nature of disaster mitigation depends upon the nature of disaster or environmental conditions of those areas.

For example in case of earthquakes terrain characteristics, building material, density of population and settlements are more important and the coastal configuration, ecological setup etc. of coastal areas may be more important in case of coastal storms like cyclones or tsunamis.

P- Disaster Prevention Stage Involves

Disaster prevention means to prevent the adverse impacts of natural disaster by adopting certain measures much in advance of the occurrence of the disaster. So it is based on the outcome of disaster preparedness and disaster mitigation .It includes all those activities that are helpful for human lives to preventing them from the devastating impacts of disaster. For example coral reefs and coastal wetlands (Sunder bans), mangroves, coastal sand dunes etc. can acts as natural buffers or barriers to save human lives of coastal areas in case of cyclones and tsunamis etc. Dense forests of hilly areas can protect them from land sliding but massive deforestation in hilly areas invites frequent landslides. Construction of roads, buildings has also destabilized hill slopes and has accelerated the process of landslides. For earthquake we should avoid the earthquake prone areas for human settlements and should also use standard building material etc.

(B)Post Disaster stage:-Post disaster stage involves these following steps to reduce the adverse impact of disaster.

1. Relief measures.
2. Recovery from shocks of disasters.
3. Rehabilitation of displaced communities.

Relief Measures:- When a disaster occurs in an area the immediate steps are to rescue people, provide them drinking water, food, medicine, shelter or men such as doctors, volunteers nurses etc. Relief measures includes following components:-

Social Response and Action:- Social response largely determined by the network of communication of T.V. news media, newspapers, reporters etc .If the news reports are based on misconceptions the problem of particular disaster becomes further complicated because the nature of social response to the disaster is guided by the nature of reports or news. Several nations and voluntary organisations involve themselves immediately in providing relief measures and helping or serving the disaster victims.

Participation in relief work:- As we already discussed above that teams of doctors, volunteers, nurses etc. are needed but huge amount of money and heavy equipment for rescue operations are also needed. And that cannot be possible without governmental help or non-governmental organisations (NGOs), so there participation in relief work is very significant.

Relief material:- Relief material not only includes food items, drinking water, it also include rescue teams ,expert technicians, heavy equipment, expert doctors, nurses, volunteers, tents medicine, coal, blankets, garments, financial aids etc. To the supply and distribution of relief materials local communities and voluntary social organisations are also needed.



Disaster Recovery: - The first and the foremost step in disaster recovery process is to rebuild the level of confidence of disaster victims. Disaster recovery involves mental recovery, social and economic recovery. Actually recovery is a process which involves adaptations and adjustments of disaster victims to new conditions that are created by a particular disaster, it may be physical or mental injuries, separation of family members (for these victims medical as well as psychological help, sense of belongingness and brotherhood is needed) loss of property, loss of native culture, loss of territory (for these victims financial and economic help is needed) etc.

Rehabilitation:- Recovery and Rehabilitation are time consuming, lengthy and costly processes because both of these requires a lot of time and money for the repair of damaged systems, reconstruction of buildings bridges and transport network etc. Actually success of rehabilitation depends upon the economic state of concerned country. So it is not a process that can be successful on local resources alone. Participation of administration, various government departments or international community's become necessary for the reduction and management of disasters.

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