



Coping with natural and man-made disasters: A synoptic view

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Abstract

Disasters are unpredictable, speedy, immediate and threatening and hence are feared the most. They can be natural and man-made. Some accidents happen because of a clash between man's inventions and nature. Accidents that effect the masses becomes disasters. The damage caused by disasters is often immeasurable and varies with the geographical location and climate. Disaster management initiatives may be undertaken in order to overcome the widespread loss caused by disasters. Against this background, the present paper makes a modest attempt to understand the term disaster with relation to the environment, get informed about the causes and effects of some major natural and man-made disasters, and know about disaster management.

Keywords: Disaster management cycle, man-made disasters, natural disasters, rehabilitation, mitigation

Introduction

Disaster is a sudden, calamitous, terrible event bringing great damage, loss, and destruction to life and property. The damage caused by disasters is often immeasurable and varies with the geographical location and climate. Accidents that effect the masses become disasters. An earthquake claiming 10,000 lives and a flood resulting in a crop loss of one crore can be termed as disasters.

It takes a long time to overcome the widespread loss caused by disasters. It disturbs the normal functioning of a society, system and country at stretch.

Generally, disaster has the following effects on an affected area:

- Disruption of normal day-to-day life
- Destruction of infrastructure of a place like roads, railways, buildings
- Normal needs and processes like food, shelter, health, etc. are affected and deteriorate depending on the intensity of the disaster

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Natural Disasters

A natural disaster is the consequence of a natural hazard such as earthquake, flood or landslide, which affects human activities. These disasters can take place suddenly or else slowly, like in the case of draught and desertification.

Earthquakes

The surface of our Earth is made up of seven massive rigid plates about 100-150 kms thick, called the tectonic plates. They keep floating on the molten rocks of earth's mantle. They are in a continuous but very slow motion (2-12 cm per year). While moving they meet occasionally. This meeting may build up pressure by pushing into or squeezing past each other. When they cannot hold the pressure anymore, they release the stress by slipping suddenly along faults, or cracks in earth's surface. This sudden movement sends a

rippling or shock wave called seismic wave through the ground and earthquake follows.

When it is just rubbing, it is a small quake which we come across many times; but, sometimes this violence bursts onto earth's surface when earthquakes rattle our houses, volcanoes erupt, or mountains rise from flat land. The point where this rippling comes to the surface is called the epicentre of the earthquake and it is here that the effect of a quake is most. The intensity of a quake is measured on Richter Scale. Up to 4 on this scale, it is not high and damaging but 5 and more may cause great damage.

Moreover, it is the time span of the quake which also matters. Even a quake at 4 Richter Scale could be dangerous if it stays for a long time, say 40 seconds. Another important factor causing disaster on a quake is the population density of that area. For instance, the intensity of quake in Bhuj (Gujarat) in year 2001 was 6.9 on Richter Scale lasting for 30 seconds, whereas there was an earthquake in Chamoli (U.P.) some years back, which also measured 6.8, lasted for 40 seconds and the damage was very less as compared to that of Bhuj. It was because Chamoli is not as densely populated as Gujarat is.

Table 1: Details of Some Major Earthquakes in India

Location	Year	Intensity (Richter Scale)	Death Toll (Apprx)
Kangra (H.P)	1905	8.0	Major
Uttar Kashi (U.P)	1991	6.6	160
Latur (Maharashtra)	1993	6.6	160
Bhuj (Gujarat)	2001	6.9	20000

Source: www.seismo.gov.in

Earthquakes can result in large-scale destruction of life and property. The rumbling produced by earthquakes usually leads to the destruction of even huge structures such as multi-storeyed buildings, bridges, and dams. They can also trigger landslides.

Floods and Droughts

Floods are one of the most common hazards. It can be defined as a progressive rise in the water level of streams or

rivers, which results in submerging of low lying land areas. Floods can be caused by heavy rainfall, dam or levee failures, and torrential rains from cyclones or tsunamis. In 2005, the disastrous flooding brought by Hurricane Katrina, which caused more than \$200 billion in losses, constituted the costliest natural disaster in U.S. history.

Heavy floods result in massive soil erosion. As the rivers flow much above danger level, the affected places are totally cut-off from rest of the world. Casualties are high as epidemics are at toll. The flood water also damages several hutments, granaries, fisheries and standing crops. Flood may cause the loss of entire harvest and spoiling of stored grains and Livestock deaths. Water logging on the roads disrupts the traffic and transportation network. Thus it becomes difficult to rescue people or provide victims with clothes, medicines and other necessities. Incessant rains after a flood result in landslides. Floods can roll boulders, tear out trees, destroy buildings and bridges. Flood waters can reach heights of 10 to 20 feet and often carry a deadly cargo of debris.

Droughts are generally defined as a temporary reduction in water or moisture availability significantly below the normal level in any given area. If floods create abundance of water, droughts create the scarcity. Droughts vary in severity. In a severe drought, there may be total absence of rain fall for years. These are more common in regions near desert zones of the world. In a drought the whole balance of the ecosystem is ruined as the valuable top soil gets eroded by dry winds. In such areas people tend to migrate putting greater stress on resources to where they have got shifted.

Tsunami

Besides producing floods and destroying buildings, earthquakes that take place under the ocean can sometimes cause tsunamis, or tidal waves. The term tsunami is the Japanese word for harbour wave, and can be caused by volcanic eruptions, landslides and extra-terrestrial collisions too. Due to their high speed and size, these waves can wipe out entire coastal settlements.

Tsunami waves may travel in the open sea as fast as 450 miles per hour. The big waves merge with shallow water along the coast, grow to a great height and smash into the shore. They can be as high as 100 feet. The killer backwash caused afterwards wipe away the entire area.

The majority of tsunamis that occur in the Pacific Ocean happen around the "Ring of Fire" area surrounding the Hawaiian Islands. The periphery has also been dubbed the 'Ring of Fire' because of the extraordinarily high number of active volcanoes and seismic activity located in the region. Since 1819, over 40 tsunamis have struck the Hawaiian Islands. One of the largest and most destructive tsunamis ever recorded was generated in August 26, 1883 after the explosion and collapse of the three volcanoes of Krakatoa (Krakatau), in Indonesia. This explosion generated waves that reached 135 feet, destroyed coastal towns and villages along the Sunda Strait in both the islands of Java and Sumatra, killing 36, 417 people. We feel sad by remembering tsunami of December 2004 in South east Asia which lead to a death toll of 2.5 lakhs of people in Indonesia, Srilanka, India and Sumatra.

Cyclones

Cyclones are violent storms characterized by high winds rotating about a calm centre of low atmospheric pressure. They develop over warm seas near the equator.

Air heated by the sun rises very swiftly, which creates areas of very low pressure. As the warm air rises, it becomes loaded with moisture which condenses into massive thunderclouds. Cool air rushes in to fill the void that is left. The constant turning of the earth on its axis, makes this air to bent inwards and then upwards in spirals with great force. The swirling winds rotate faster and faster, forming a huge circle which can be up to 2,000 km across.

The most destructive force of a cyclone comes from the fierce winds that are strong enough to topple fences, sheds, trees, power poles and caravans. Many people are killed when cyclones cause buildings to collapse and houses to get blown. A cyclone churns up the sea in a typical way, causing giant waves and surges of water known as storm surges. The water of a storm surge rushes inland with deadly force, flooding low-lying coastal areas. The rains from cyclones are also heavy enough to cause serious flooding, especially along river areas.

The 'life-cycle' of the average tropical cyclone is about seven days, but can extend to over three weeks. The impact depends on the population of the place, housing and existing infrastructure. Cyclones also spoil the standing crop. Transport and communication links are completely destroyed.

Cyclones are called by different names depending on the region they have occurred in:

- A tropical cyclone is the term for violent circular winds accompanied by torrential rain that originate in the tropics.
- In Atlantic Ocean they are called hurricanes.
- In the Pacific Ocean region, they are termed as typhoons.
- In the Indian Ocean they are termed as cyclones.

Volcanic Eruptions

The earth's crust, as we know, is made up of the tectonic plates which float on underlying molten mantle. Due to certain tectonic movements and other disturbances, sometimes the magma (molten rocks) is forced out of cracks in the crust above which volcanoes are formed. This magma is released with lot of smoke and ash. Magma post-eruption is termed as lava.

The depth till which magma would rise to the surface is determined by the density of the magma and the weight of the rocks above it. As the magma rises, bubbles start to form from the gas dissolved in the magma. The gas bubbles exert tremendous pressure. This pressure pushes the magma to the surface and forces it in the air, sometimes to great heights.

Volcanic eruption in Mt. Vesuvius (Italy) was the reason for the lost city of Pompeii and its neighbour, Herculaneum in 79 AD. More than 16,000 people were suffocated by volcanic gases and got buried alive by ash and rock. When the city of Pompeii was dug out in 1749, the city artifacts and inhabitants were almost perfectly preserved by the ash that covered them. When Mt. Tambora (Indonesia) erupted, the sky turned black with ash and stayed that way for three days. Whole of the year clouds of ash blocked the sunlight, creating a "Year without Summer".

Volcanoes may grow either by intrusion or extrusion. An intrusion is magma that moves up into a volcano and then it stops, never erupting. This way the volcano grows on the inside. An extrusion is an eruption. It can add layers of lava or ash. This way the volcano grows on the outside.

Volcanoes are of three kinds according to their temperament active, dormant and extinct volcano. An active volcano is

one that erupts regularly. A dormant volcano is one that has not erupted for many years, although there is still some activity deep inside. An extinct volcano has ceased to be active.

Volcanoes cause complete degradation of the environment, loss of vegetation and physical damages. They cause total devastation and leave the affected area redundant for years. Eruptions can cause lateral blasts, lava flows, hot ash flows, mudslides, avalanches, falling ash and floods. Volcano eruptions have been known to knock down entire forests. An erupting volcano can trigger tsunamis, flash floods, earthquakes, mudflows and rock falls.

Man-made Disasters

Man-made hazards may have an element of human intent, negligence, error or may even involve the failure of a system. Some commonly occurring man-made disasters include fires, road/railway/airway accidents and crashes and epidemics. The following are some serious man-made disasters:

Extinction of Species of Plants and Animals

Over utilization of resources, deforestation, indiscriminate killing of animals have led to extinction of many species of plants and animals. The destruction of forests in the developing countries has been so rapid and alarming that only 0.2 hectare per capita forests are left in Asia. This has snatched away the habitats of several species.

Bio-terrorism

A bio-terrorism attack is the deliberate release of viruses, bacteria, or other germs that can cause illness or death in people, animals, or plants. Terrorists may use biological agents because they can be extremely difficult to detect and do not cause illness for several hours to several days. These agents are typically found in nature, but it is possible that they could be changed to increase their ability to cause disease, make them resistant to current medicines, or to increase their ability to be spread into the environment.

Chemical Leakages

A chemical emergency occurs when a hazardous chemical gets released and the release has the potential of harming community health. Chemical releases can be unintentional, as in the case of an industrial accident, or intentional, as in the case of a terrorist attack.

Many hazardous chemicals are used in industries like chlorine, ammonia, and benzene. They need to be used carefully following strict safety measures.

The Bhopal Disaster that occurred on December 3, 1984 is one of the major chemical disasters in world history of disasters. A Union Carbide subsidiary pesticide plant released 40 tonnes of methyl isocyanate (MIC) gas, killing between 2500 and 5000 people. Bhopal is frequently cited as one of the world's worst industrial disasters.

Ozone Depletion and Formation of Ozone Hole

Ozone occurs naturally in the upper atmosphere at concentrations of tenths of a part per million. Although it forms a very small component of the atmosphere, it plays a vital role in limiting the amount of solar ultraviolet radiation that reaches the earth's surface.

It was discovered in 1985, that ozone layer has a hole which has occurred over the Antarctic continent. The biggest contributors to stratospheric ozone reduction are chlorofluorocarbons (CFCs), chlorinated solvents, halons and methyl bromide. These chemicals are widely used as refrigerants, aerosols, cleaning solvents, fire-fighting chemicals and fumigants.

The much-reduced ozone layer now allows more ultraviolet radiation (UVR) to penetrate the atmosphere, with significant implications for human health and the environment. CFC's should be replaced by HCFC's i.e. hydro chlorofluoro carbons.

Nuclear Accidents

Nuclear accidents occur when radioactive substances get released into the atmosphere due to human lapse, negligence or some other accidental factor. With the increase of nuclear power plants and mining operations, a lot of toxic substances are being released in the atmosphere. Large scale destruction is caused by fully burnt nuclear weapons or bombs. The worst examples are the atom bomb attacks on Hiroshima and Nagasaki during the Second World War in 1945, and the Chernobyl Nuclear Reactor accident near Kiev, Ukraine.

The Three Mile Island accident is considered the most significant in the history of the American commercial nuclear power generating industry.

The accident that occurred on Wednesday, March 28, 1979 resulted in a partial core meltdown in Unit 2 of the nuclear power plant of the Three Mile Island Nuclear Generating Station in Dauphin County, Pennsylvania near Harrisburg. Fortunately, there were no deaths or injuries to plant workers or members of the nearby community. However, it led to serious economic consequences.

Disaster Management

It is undoubtedly true that human beings are helpless victims in the hands of natural disasters that strike them. However, some disasters are designed by man himself and have equally tragic consequences. Given below is a Disaster Management Cycle:

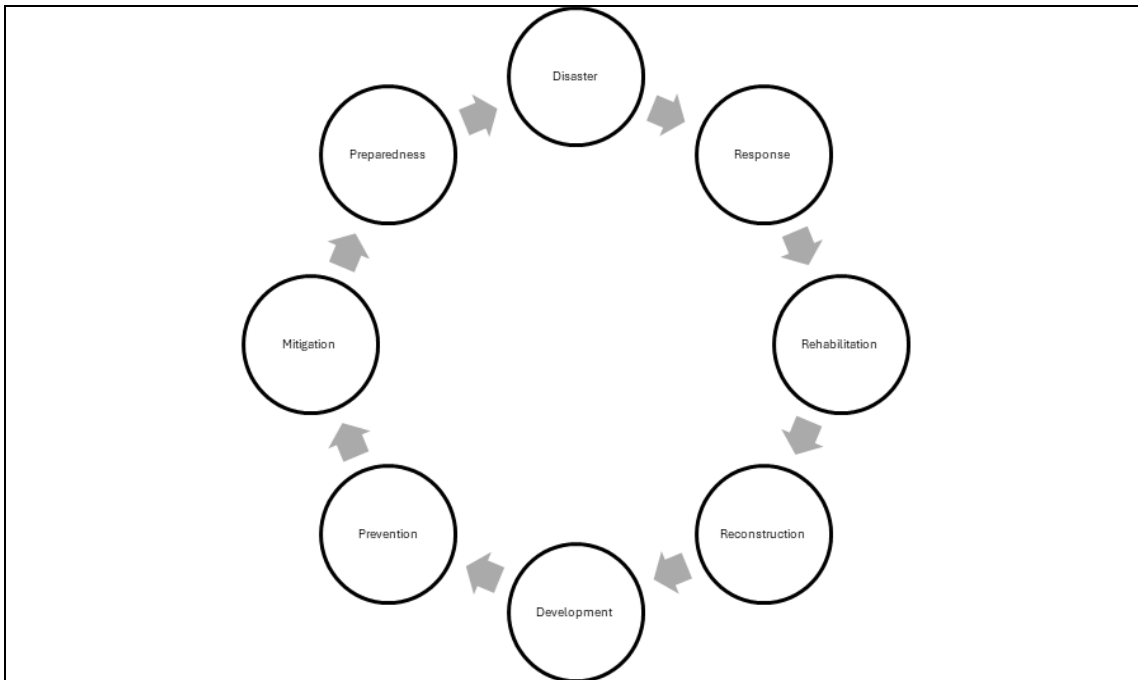
Disaster Management Cycle

Summing-up

Natural disasters are inevitable processes, but through smooth planning we can control the severe effects of disasters on human life and economy.

Disaster management involves disaster prediction facilities to be installed and improved so that arrangements could be done pre hand to control casualties. The factors that cause disasters should be studied well so that they could be averted to some extent. Citizens in disaster prone zones should be well informed about what to do in emergencies. Government agencies should be prompt and equipped enough to provide relief measures to victims as soon as possible.

Man-made disasters can be averted to a large extent if man stops degrading environment and succeeds in controlling himself getting indulged into the blind race of development ignoring the nature that has made his existence possible.



References

1. Divi S, Dorasamy N, Nakum V. Disaster Management in India: Need for an Integrated Approach. Disaster Advances,2022;15(8):60-68.
2. Goyal PK, Gupta AK. Disaster Management. Khanna Book Publishing Company Private Limited, New Delhi, 2026.
3. Narayan S. Anthropology of Disaster Management. Gyan Publishing House, New Delhi, 2000.
4. Pant H. Disaster Management: Natural and Man-made Disaster. Write and Print Publications, New Delhi, 2025.
5. Sharma SC. Disaster Management: Preparedness, Impact, Risk Reduction, Mitigation and Management. Khanna Book Publishing Company Private Limited, New Delhi, 2019.
6. Shastri KN. Disaster Management in India. Neha Publishers, Bangalore, 2012.
7. The Disaster Management Act, 2005.
8. www.disasterrelief.org
9. www.ndma.gov.in
10. www.undp.org
11. www.unisdr.org