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Disaster Management Preview

DISASTER MANAGEMENT

GS Mains Paper III

For Civil Services Exams

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Chapter 1 Meaning and Classification of Disasters

Introduction

The International Strategy for Disaster Reduction (ISDR) of the United Nations (U.N.) defines a hazard as "a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation." Hazards could be, natural (geological, hydro- meteorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Accordingly, Hazard Analysis entails the identification, study and monitoring of a hazard to determine its potential, origin and characteristics.

Hazard and Resource

A fine line separates environmental hazards and environmental resources, as between water out of control (flood hazard) and water under control (reservoir resources). The atmosphere is considered 'benign' when it produces holiday sunshine but 'hostile' when it produces damaging 'loo'.

Disaster

A disaster is a result of natural or man-made causes that leads to sudden disruption of normal life, causing severe damage to life and property to an extent that available social and economic protection mechanisms are inadequate to cope. Even at the outset, the conceptual distinction between 'hazards' and 'disasters' needs to be brought out clearly. Floods, Cyclones, and so on are events in nature until a configuration of factors, which could be man-made or natural or both, cause the hazard to turn to a disaster. Disaster is the actual occurrence of the apprehended catastrophe.

Disasters proceed by cause-effect due to endogenous (inherent) and exogenous (external) factors, which combine to excite the phenomenon into a large-scale destructive event. Disasters are a result of vulnerabilities, which go on unabated/unchecked over time, which crystallises finally in a destructive event of great magnitude, which is a disaster.

Understanding of the term 'disaster' itself that is important. As reported in the World Disasters Report, 2004, heat waves have been missing from disaster and public health policies, despite mounting death tolls, particularly in Europe. This is probably because sudden high-profile disasters, such as earthquakes evoke greater dread than road accidents, despite evidence that more people die in road accidents than earthquakes. The higher the dread factor, the more people want action to reduce those risks. The challenge for health professionals and disaster specialists is to raise public awareness of the potential harm caused by extreme temperatures and treat the problem as a disaster.

Classification of Disasters

High Powered Committee (HPC) was constituted in August 1999 under the chairmanship of J.C. Pant. The mandate of the HPC was to prepare comprehensive model plans for disaster management at the national, state and district levels. This was the first attempt in India towards a systematic comprehensive and holistic look at all disasters. Thirty odd disasters have been identified by the HPC, which were grouped into the following five categories, based on generic considerations:

1. Water and Climate

- Floods
- Cyclones
- Tornadoes and hurricanes (cyclones)
- Hailstorms
- Cloudburst
- Heat wave and cold wave
- Snow avalanches
- Droughts
- Sea erosion
- Thunder/ lightning

2. Geological

- Landslides and mudflows
- Earthquakes
- Large fires
- Dam failures and dam bursts
- Mine fires

3. Biological

- Epidemics
- Pest attacks
- Cattle epidemics
- Food poisoning

4. Chemical, industrial and nuclear

- Chemical and Industrial disasters
- Nuclear

5. Accidental

- Forest fires
- Urban fires
- Mine flooding
- Oil spill
- Major building collapse
- Serial bomb blasts
- Festival related disasters

- Electrical disasters and fires
- Air, road, and rail accidents
- Boat capsizing
- Village fire

This is a broad classification, although one can suggest a different categorisation. For example, tsunami can be considered to be of geological origin but it has been put under the water related category in the above classification because the disastrous effect is caused by the giant sea waves.

Each of these phenomena are explained and discussed in detail in the subsequent chapters. However, at this introductory stage, brief descriptions are given.

1. Earthquake

A sudden geological event below the surface of the earth results in generation of waves that travel far and wide and cause vertical and horizontal vibrations. The consequential motion produced on the surface of earth on account of these vibrations is called earthquake.

The severity of the impact depends on the magnitude of the earthquake, which in turn depends on the amount of energy released at the spot where the geological event took place below the surface of the earth. Earthquakes occur suddenly, and thus there is no dependable technique for prediction of earthquakes as yet. India is highly vulnerable to earthquakes and has been visited by some very severe earthquakes.

2. Volcanic Eruption

Volcano can be described as a vent or chimney, to the earth's surface, from a reservoir of molten rock, called magma, deep in the crust of the earth. It is not that volcanoes are always emitting lava, steam or smoke. Many volcanoes have been "sleeping" for decades or even longer. In the context of forecasting of volcanic eruptions, it can be stated that short-term forecasts within hours or days may be made through volcano monitoring techniques.

In the Indian territory, there are only two volcanoes viz., Narcondam and Barren Island- both in the Andamans. Both are 'sleeping volcanoes', although the Barren Island volcano emits some heat and smoke occasionally and goes to sleep again. In any case, there is no evidence of any serious damage by these volcanoes in the known past. Thus, India is not much affected due to volcanoes. However, other countries like Italy, Japan, Mexico, Indonesia and Iceland are worst affected.

3. Landslides

Landslides are defined as the mass movement of rock debris or mud down a slope and have come to include a broad range of motions, whereby falling, sliding and flowing under the influence of gravity dislodges earth material. They also occur as

secondary effects of heavy rainstorms, earthquakes and volcanic eruptions. In almost all cases, landslides occur as a consequence of changes, either sudden or gradual, in the composition and structure of rocks or vegetation on a slope, which loosens the soil or rocks, which act as a trigger for the occurrence of landslide.

Landslide can be caused by poor ground conditions, geomorphic phenomena, heavy rainfall, earthquakes or undercutting of the base of slopes by rivers and quite often due to heavy spells of rainfall with impeded drainage. They are common in mountainous areas, such as Himalayas and the Western Ghats where they frequently destroy the infrastructure, agriculture, and dwellings, resulting in considerable loss of life and property besides blocking vital roads in the inaccessible areas.

4. Snow Avalanche

An avalanche is defined as the event in which a large mass of snow, ice, rock or other material swiftly slides down a mountain and crushes everything in its path. An avalanche starts when the large mass of snow, ice and rock overcomes the frictional resistance of the sloping surface, either due to rain, melting of ice base or vibrations of any kind.

It will be seen that landslides and avalanches are events of mountain regions and are rather similar in nature and impact. The basic difference is that landslide involves movement of rock, soil and whereas avalanche comprises, snow, ice and rock. Landslides can occur in smaller hills or rocky slopes but avalanches occur in high mountains with snow in abundance.

5. Tsunami

Tsunami is a Japanese term for sea waves generated by undersea earthquakes. These waves may originate from undersea or coastal seismic activity, or volcanic eruption. Whatever may be the cause, sea water is displaced into a violent and sudden motion ultimately breaking over land even at very long distances with great destructive power. It is to be noted that while the coasts are hit by very high waves of water, there is hardly any appreciable wave on the high seas. Therefore, ships on the high seas are not affected.

In most cases, tsunami could be the after-effect of undersea earthquake due to which the abrupt vertical movement of ocean floor generates waves, which travel at high speed in the ocean. As they approach land, their speed decreases while their height increases. It can be highly destructive to coastal areas as was witnessed during the catastrophic tsunami event in December 2004.

6. Cyclone

Tropical cyclones are characterized by destructive winds and abundant rainfall, which causes flooding. In such storms, winds can exceed speeds of over 120 kmph. Due to such strong winds, sea-water accumulates ahead of cyclone as it moves

towards the coast. When a cyclone hits the coast, the accumulated enormous mass of sea-water strikes the coast as a giant sea wave called storm surge which can have heights of tens of metres. The storm surge with torrential rains and very strong winds brings widespread devastation to coastlines and islands lying in paths. Cyclones pose a major threat to life and property.

In India, there are two cyclone seasons viz., Pre-monsoon (April and May) and Post-monsoon (October and November). More cyclones form in the Bay of Bengal than in the Arabian Sea. As cyclones move generally westwards or northwestwards, the east coast of India is more vulnerable to cyclones than the west coast.

7. Flood

Flood denotes inundation or accumulation of water. In other words, it results from an imbalance between inflow and outflow of water. Floods can occur through heavy rains, dam failures, rapid snow melts, river blockages or even bursting of water mains. Floods result in damage, deaths and injuries, and create problems in drinking water supply and food shortages. In India, 40 million hectare area is vulnerable to floods, and about 8 million hectare area is affected by floods annually. India is highly prone to floods especially in the monsoon and cyclone seasons.

There are three types of floods: flash floods, river floods, and coastal floods. Flash floods are generally events of hill areas where sudden very heavy rain over a limited area can cause strong flow. Flash floods also occur when a temporary blockage in hilly areas impounds water, which when released suddenly creates the havoc.

River floods occur due to heavy inflow of water from abundant rainfall, snowmelt, and short intense storms. Flooding in rivers is also caused by inadequate capacity within the banks of river to contain high flows, river bank erosion, silting of riverbeds, synchronization of flood in the main and tributary rivers, flow retardation due to tidal and backwater effects.

Coastal floods are caused due to tsunami or heavy rainfall from cyclones and the storm surge associated with a cyclone. The situation could be aggravated due to high tide.

Tidal flooding is saline from the backflow of sea-water into coastal rivers at high tides. Flood due to surge is also saline and therefore, more corrosive.

8. Drought

Drought is a temporary reduction in water availability on an area for unusually long period. Depending on the resulting water scarcity, a drought has disastrous and long-term impacts, which may last for months and in some cases years. It is a slow onset phenomenon.

Three types of droughts are recognised:

- **Meteorological drought:** When the monthly or seasonal rainfall over an area is appreciably below normal.

- **Hydrological drought:** When the water scarcity over an area result in reduction in the available water in surface water bodies and the water table also recedes. Prolonged meteorological drought leads to hydrological drought.

- Agricultural drought: When the water scarcity results in partial or total loss of crops and affects agricultural activity adversely.

Drought is generally caused by adverse water balance, or scarcity of water to satisfy the normal needs of agriculture, livestock or human population. It can also occur in areas that normally enjoy adequate rainfall and moisture levels. Drought may be caused due to excessive evapo-transpiration losses, high temperature and low soil holding capacity.

Prolonged drought can result in aridity or even desertification when the exceptionally dry soil can no longer sustain any biological activity, whether organisms or vegetation.

9. Heat Wave and Cold Wave

As the name implies, these are spells of extreme surface air temperatures over a region for rather prolonged periods of several days or few weeks. When the maximum temperature in the day over an area over shoots in the hot weather months (March to June), it leads to heat wave. Similarly, when the minimum temperature falls appreciably below normal in the winter months, it is called cold wave. Both the phenomena are extreme weather events and lead to considerable discomfort, illness, epidemics and deaths due to exposure.

Vulnerability Profile of India

Vulnerability is defined as "the extent to which a community, structure, service, or geographic area is likely to be damaged or disrupted by the impact of particular hazard, on account of their nature, construction and proximity to hazardous terrain or a disaster-prone area". The concept of vulnerability therefore implies a measure of risk combined with the level of social and economic ability to cope with the resulting event in order to resist major disruption or loss.

The 1993 Marathwada earthquake in India left over 10,000 dead and destroyed houses and other properties of 200,000 households. However, the technically much more powerful Los Angeles earthquake of 1971 (taken as a benchmark in America in any debate on the much-apprehended seismic vulnerability of California) left over 55 dead.

This susceptibility and vulnerability to each type of threat will depend on their respective differing characteristics:

Physical Vulnerability

Physical vulnerability relates to the physical location of people, their proximity to the hazard zone and standards of safety maintained to counter the effects. For example, people are only vulnerable to a flood because they live in a flood-prone area.

Physical vulnerability also relates to the technical strength of buildings and structures to resist the forces acting upon them during a hazard event. The Indian subcontinent can be primarily divided into three geophysical regions with regard to vulnerability, broadly, as, the Himalayas, the Plains and the Coastal areas. The topographic and climatic characteristics of each region make them susceptible to different type of disasters.

Socio-economic Vulnerability

The degree to which a population is affected by a calamity will not purely lie in the physical components of vulnerability but in contextual, relating to the prevailing social and economic conditions and its consequential effects on human activities within a given society.

Disparate capacities of people are exposed during disasters, which explains differential vulnerability/losses, which are explained in disaster literature as socio-economic vulnerabilities. Disaster effects are seen to be directly proportionate to the poverty gap and poverty intensity in the society/location as it is the poor that normally live in high concentration in marginal areas (unstable slopes, flood plains) with little infrastructure and fewer resources to cope. Research in areas affected by earthquakes indicates that single parent families, women, handicapped people, children and the aged are the particularly vulnerable social groups.

Bad land use planning in seismic and flood prone zones; unplanned and inadequate developmental activity in high- risk areas is a cause for increased losses during disasters. One million houses are damaged annually in India apart from high human, social and other losses. Urban growth and concentration of limited resources are realities of our times, while the rural sector faces lack of access. This compounds the problems of disaster vulnerability, especially during earthquakes. Informal settlements that house most of the urban and rural poor give way easily to physical stress, during earthquakes and floods, causing large scale fatalities during such disasters. Single scale event fast turns into a compound phenomenon as the infrastructure gives way, leading to fire breaks, deaths due to electrocution, besides making response ever more difficult.

Following steps are imperative for the vulnerability assessment and preparedness in high-risk zones:

- Identification of various hazard prone areas. Preparation of detailed vulnerability profiles, mapping food insecurity, aviation hazard, landslide hazard etc.

- Vulnerability and risk assessment of buildings
- Developing disaster damage scenarios
- Developing technical guidelines for hazard resistant constructions
- Upgrading of hazard resistance of existing housing stock by Retrofitting, and
- Crafting techno-legal regime to be adopted for infrastructure development.