

**Course : Disaster management (PGS 506)**

**Topic: Flood Disaster**

**Date: 13/04/2020**

# Flood

- A. Floods are among the most frequent natural disasters.
- B. Flood is a state of high water level along a river channel or on the coast that leads to inundation of land, which is not usually submerged. Floods may happen gradually and also may take hours or even happen suddenly without any warning due to breach in the embankment, spill over, heavy rains for several hours etc.
- C. Flash floods occur suddenly due to rapidly rising water along a stream or low-lying area. A flood is an excess of water (or mud) on land that's normally dry and is a situation wherein the inundation is caused by high flow, or overflow of water in an established watercourse, such as a river, stream, or drainage ditch; or ponding of water at or near the point where the rain fell. This is a duration type event.

# Types of Floods

**Flash Floods:** Floods occurring within six hours, mainly due to heavy rainfall associated with towering cumulus clouds, thunderstorms, tropical cyclones or during passage of cold weather fronts, or by dam failure or other river obstruction. Flash floods are characterised by very fast rise and recession of flow of small volume and high discharge, which causes high damages because of suddenness. This occurs in hilly and not too hilly regions and sloping lands where heavy rainfall and thunderstorms or cloudbursts are common. Depression and cyclonic storms in the coastal areas also cause flash floods.

**River Floods:** Floods caused by precipitation over a large catchments area, melting of snow or both. Built up slowly or on a regular basis, these floods may continue for days or weeks. The major factors of these floods are moisture, vegetation cover, depth of snow, size of the catchments basin, etc.

**Coastal Floods:-** Floods associated with cyclonic activities like Hurricanes, Tropical cyclones, etc. generating a catastrophic flood from rainwater which often aggravate wind-induced storm and water surges along the coast.

**Urban Flood:** As land is converted from agricultural fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. During periods of urban flooding, streets can become swift moving rivers, while basements can become death traps as they fill with water. The problem of urban flooding has become serious.

**Ice Jam:** Floating ice can accumulate at a natural or human-made obstruction and stop the flow of water thereby causing floods. Flooding too can occur when there the snow melts at a very faster rate.

**Glacial Lake Outbursts Flood (GLOF):** Many of the big glaciers which have melted rapidly and gave birth to the origin of a large number of glacier lakes. The accumulation of water in these lakes has been increasing rapidly and resulting sudden discharge of large volumes of water and debris and causing flooding in the downstream.

# Causes of Floods

## The primary causes for Floods are:

1. Intense rainfall when the river is flowing full.
2. Excessive rainfall in river catchments or concentration of runoff from the tributaries and river carrying flows in excess of their capacities.
3. Cyclone and very intense rainfall when the EL Nino effect is on a decline.
4. Synchronization of flood peaks in the main rivers or their tributaries.
5. Landslides leading to obstruction of flow and change in the river course.
6. Poor natural drainage system.
7. Backing water in tributaries at their confluence with the main river.

# Flood prone areas

India is one of the most flood prone countries in the world. India's high risk and vulnerability is highlighted by the fact that 40 million hectares is prone to floods. The frequency of major floods is more than once in five years. Most of the floods occur during the monsoon period and are usually associated with tropical storms or depressions, active monsoon conditions and break monsoon situations.

Floods occur in almost all rivers basins in India. Brahmaputra, Ganga, Narmada, Tapti, Mahanadi, Krishna & Cauvery are the most flood prone areas.

# Damages Caused by Floods/Flood Impact

The most important consequence of floods is the loss of life and property. Structures like houses, bridges; roads etc. get damaged by the gushing water, landslides triggered on account of water getting saturated, boats and fishing nets get damaged. There is huge loss to life and livestock caused by drowning. Lack of proper drinking water facilities, contamination of water (well, ground water piped water supply) leads to outbreak of epidemics, diarrhoea, viral infection, malaria and many other infectious diseases. Flooding also leads to a large area of agricultural land getting inundated as a result there is a huge crop loss. This results in shortage of food, and animal fodder. Floods may also affect the soil characteristics. The land may be rendered infertile due to erosion of top layer or may turn saline if sea water floods the area. Heavy flood damages had occurred in the country during the monsoons of the years 1955, 1971, 1973, 1977, 1978, 1980, 1984, 1988, 1989, 1998 and 2004.

## Flood damages

	Maximum	Average
Area affected (in lakh hectares)	175 (1978)	75.1
Crop area affected (in lakh hectares)	101.5 (1988)	35.1
Population affected (in crores)	7.045 (1978)	3.284
Houses damaged (in lakhs)	35.1 (1978)	12.2
Cattle heads lost	618248 (1979)	94830
Human lives lost	11316 (1977)	1587
Damage to public utilities (in Rs. crores)	5604.46 (1998)	820.67
Total damages (in Rs. crores)	8864.54 (1998)	1805.18



# Flood Prevention, Preparedness and Mitigation

Since ages, people have coped and learned to live with floods. They have generally settled in areas away from flood and have adapted agricultural practices which can sustain in flood waters. Traditional methods based on locally available resources have been used to minimize the damages during flood. With the increase in population, flood prone areas have been occupied and this is a principal factor in the huge losses presently seen. The various mitigation measures for flood can be categorized into structural and non structural measures.

## **Regulation and Enforcement**

Unplanned and unregulated developmental activities in the flood plains of the rivers and encroachments into the waterways have led to increase in flood losses as well as flood risk. The colossal loss of lives and property due to the flooding of the towns and cities and the areas which get flooded almost every alternate year is a recent phenomenon and effective steps are required for regulating unplanned growth in the flood plains and preventing encroachment in the waterways.

## **Capacity Development:**

The central government and the state governments are required to take steps for capacity development for taking effective and sustainable preventive, preparatory and mitigative measures in pre-floods stage and effective and prompt response during- and post-floods stages.

## **Flood Response**

An effective and prompt response to floods is very important for minimising the loss of lives and properties and providing immediate relief to the affected people. The role of communities and NGOs is vital in search, rescue and relief operations. Immediate medical assistance to the affected people and steps for prevention of outbreak of epidemics after the floods are essential components of flood response. As per provisions of the Disaster Management Act, 2005, the GOI has constituted National Disaster Response Force (NDRF) for the purpose of specialised response to disasters.

# Embankments

This has been one of the major structural approaches in which the river is restricted to its existing course and prevented from overflowing the banks. Usually embankments are constructed with earth but at some places masonry and concrete walls are also used. However what is important is to note here that embankments are designed to provide a degree of protection against flood of a certain frequency and intensity or a maximum recorded flood depending on the location and economic justification. During recent times, divergent views have emerged concerning effectiveness of embankment. While there are serious concerns over their usefulness over a long time frame, there have also been arguments in favor such as providing only road communication during flood seasons and shelter in low lying areas. Studies on effectiveness of embankments conducted around the world, have pointed out some of the problems such as poor congestion in protected areas, silting of rivers which not only means rising river bed level and consequent decrease in carrying capacity but also depriving neighbouring agricultural land from fertile soil and ground water recharge. There have also been concerns on the issue of embankment capacity to withstand erosion.

## **Dams, Reservoirs and other Water Storage Mechanism**

Dams, reservoirs and other water storages, both natural and man-made, are an effective means for reducing the flood peaks in the rivers. The important role played by them in flood moderation and comprehensive mechanism for the operation and regulation of reservoirs, which takes into account the international, inter-state and inter-regional aspects. As large dams and reservoirs have potential for huge damage guidelines for ensuring safety thereof have also been detailed therein.

## **Channel Improvements**

The aim of Channel Improvements is to increase the area of flow or velocity of flow or both to increase carrying capacity. Normally this measure involves high cost and there are also problems of topographical constraints to execute such a measure.

## **De-silting and Dredging of Rivers**

The de silting approach is still to be perfected in the sense that various committees and expert groups appointed by Government of India are yet to recommend this measure as an effective mitigation strategy. However, selective de silting and dredging of rivers at outfalls/confluences or local reaches can be adopted.

## **Drainage Improvement**

This aims at construction of new channels or improving capacity of existing channels to decongest and prevent flooding. However, what is important is to ensure that such an approach do not cause congestion and flooding in downstream areas.

## **Diversion of Flood Water**

This involves diverting all or part of flood water into natural or artificial constructed channels which may be within or outside the flood plain. The diverted water may or may not be returned to the river at a down stream. Usually effective to prevent flooding around cities, the flood spill channel for Srinagar and the supplementary drain in Delhi are examples of this approach.

## **Catchments Area Treatment**

The aim in this approach is to provide protection to catchment areas through measures such as afforestation which minimize siltation of reservoirs and silt load in the rivers. This can be a very useful approach to control flood peaks and suddenness of run offs.

## **Sea Walls/Coastal Protection Works**

The construction of Sea walls and other such work, try to prevent flooding from Sea water. These are highly cost intensive apart from the fact that complexity of sea behavior and other environmental aspects should also be considered.

# Non-Structural Measures

## Flood Plain Zoning

The basic idea here is to regulate land use in the flood plain in order to restrict the damages. It aims at determining the location and extent of areas for developmental activities so that damage is minimized. It lays down guidelines for various types of development so that adequate mitigation is built for the worst flood scenario. There can be different consideration for preparing flood plain zoning for example, one can locate parks, playgrounds etc. for area which have a up to 10 year frequency while prohibiting residential colonies, industries, etc. and allowing residential and other public utilities with specific design guidelines in areas which have a 25 year frequency.

## Flood Forecasting and Warning

With the advancement of technology such as satellite and remote-sensing equipments flood waves can be tracked as the water and Water Resources Department. CWC maintains close liaison with the administrative and state engineering agencies, local civil authorities to communicate advance warning for appropriate mitigation and preparedness measures. The forecasts can be of different types such as forecast for water level (stage forecast), discharge (flow forecast) and area to be submerged (inundation forecast). The forecast when carries definite risk information is called warning. The flood forecasting services involve collection of hydrological data (gauge, discharge), meteorological data such as rainfall.



## **Flood Proofing**

These are measures designed to minimize the impact when flood water comes such as raised platform for shelter to population, cattle etc., raised platform for drinking water hand pumps, bore wells above flood level, house/building architecture, provision for relocating vial installation such as communication, power etc.

## **Government Initiatives for flood management:**

Recognising the gravity of the risk and vulnerability of India to floods, the NDMA, initiated a series of consultations with the various stakeholders to develop guidelines for strengthening the existing arrangements for flood preparedness, mitigation, and post-flood emergency response, relief, rehabilitation and reconstruction. The state governments are to set up State Disaster Management Authorities (SDMAs) and State Executive Committees (SECs) to perform similar functions at the state level.

**Flood Management Programme (FMP):** The Government of India, under the aegis of Ministry of Water Resources launched the “Flood Management Programme (FMP)” at a total cost of 8000 crores for the 11th Plan period (2007-12). The scheme provides financial assistance to the state governments for undertaking flood management works in critical areas. Critical flood control and river management works in the entire country (includes river management, flood control, anti-erosion, drainage development, anti-sea erosion, and flood proofing works besides flood prone area development programme in critical regions and restoration of damaged flood control/ management works). The FMP scheme has been implemented by Flood Control, Water Resources/ Irrigation Departments of the state governments.

**National Flood Risk Mitigation Project (NFRMP):** NFRMP has been visualized for mitigation or reduction in risk, severity or consequences of floods.

**Study of Land Contour by GSI:** Geological Survey of India (GSI) produces flood hazard maps indicating prohibitive, Restricted, Cautionary and Flood Free Zones. GSI’s flood related studies are used by Central Water Commission, Water Resource Development Project Authorities, Urban and Rural Planning Authorities, Ministry of Environment and Forest and Ministry of Agriculture etc.