

## **MODULE 36 - FLOOD**

### **OBJECTIVES**

By the end of the session, the students will be able to know:

1. Develop an understanding about Flood
2. Develop an awareness of the chronological phases of Flood disaster response and refugee relief operations.
3. Understand the relationship of disaster phases to each other and the linkage of activities from one phase to the next.
4. Identify the major Flood disaster types.
5. Understand the "relief system" and the "disaster victim."
6. Identify the regulatory controls used in hazard management.
7. Describe public awareness and economic incentive possibilities.
8. Understand the tools of post-disaster management.

### **SUMMARY**

Floods are common and mostly natural disasters. When rivers overflow their banks they cause damage to lives, property, infrastructure and crops. Floods are common and mostly natural disasters. Floods usually are local, short-lived events that can happen suddenly and sometimes with little or no warning. They usually are caused by intense storms that produce more runoff than an area can store or a stream can carry within its normal channel. On larger streams, floods usually last from several hours to a few days. A series of storms might keep a river above flood stage (the water level at which a river overflows its banks) for several weeks. The water in a flood moves at such a high velocity that it can move boulders, uproot trees, demolish buildings, and destroy bridges. The walls of water in such a flood can be anywhere from ten to twenty feet tall and usually carry a substantial amount of debris.

Floods can occur at any time, but weather patterns have a strong influence on when and where floods are likely to occur. The Irrigation Department, Indian Meteorological Department of Government of India is responsible for detecting, tracking and receiving warning and to disseminate information. Mitigation measures (Both structural and non structural measures) and Preparedness Plan are essential for saving the life and livelihood from flood. Awareness among the common people is also of great significance. Volunteered agencies and NGOs like FEMA helps in avoiding the ill effect of the Flood.

## TRANSCRIPTION

### 1. Introduction & Types of Flood

Flood is overflow of the huge amount of water onto the normally dry land. Flood occurs when the overflowing water submerges land and causes deluge. It is a cruel and violent expression of water. The word "flood" comes from the Old English flood, a word common to Germanic languages. The EU Floods directive defines a flood as a temporary covering by water of land not normally covered by water. In the sense of "flowing water", the word may also be applied to the inflow of the tide. Flooding is caused by the inadequate capacity within the banks of the rivers to contain the high flows brought down from the upper catchment due to heavy rainfall. Areas having poor drainage characteristic get flooded by accumulation of water from heavy rainfall. Floods are the most frequent natural calamity that India has to face almost every year in varying magnitudes in some or other parts of the country. According to the estimate of the National Commission on Flood, the area prone to floods in the country was of the order of 40 million hectares, out of which it is considered that 80%, i.e., 32 million hectares could be provided with reasonable degree of protection. Before coming to the protection measures we should know about the types and causes of flood.

Floods are of various types:

#### TYPES OF FLOOD

There are six main types of Floods namely:

- (1) Riverine (2) Estuarine: (3) Coastal: (4) Catastrophic (5) Human-induced  
(6) Muddy**

#### **(1) Riverine**

**(a) Slow kinds:** Runoff from sustained rainfall or rapid snow melt exceeding the capacity of a river's channel. Causes slow kind of flood.

**(b) Fast kinds:** include flash floods resulting from convective precipitation (intense thunderstorms, heavy rainfall, etc.

**(2) Estuarine:** Commonly caused by a combination of sea tidal surges caused by storm-force winds. A storm surge, either a tropical cyclone or an extra tropical cyclone, falls within this category.

**(3) Coastal:** Caused by severe sea storms, or as a result of another hazard (e.g. tsunami or hurricane).

**(4) Catastrophic:** Caused by a significant and unexpected event e.g. dam breakage, or as a result of another hazard (e.g. earthquake or volcanic eruption).

**(5) Human-induced:** Accidental damage by workmen to tunnels or pipes.

**(6) Muddy:** A muddy flood is generated by runoff on crop land.

A muddy flood is produced by an accumulation of runoff generated on cropland. Sediments are then detached by runoff and carried as suspended matter or bed load

Muddy floods are therefore a hill slope process and confusion with mudflows produced by mass movements.

## **2. Causes & effects of flood**

Many floods are directly related to changes in weather. The most common cause of flooding is due to rain falling at extremely high rates or for an unusually long period of time

Sometimes, floods occur as a result of a unique combination of factors that only indirectly involve weather conditions. For example, a low-lying coastal area may be prone to flooding whenever the ocean is at high tide.

Usually the causes of flood includes two types i.e., natural causes and anthropogenic causes of flood.

### **Natural Causes of Floods:**

#### **1. High rainfall**

Heavy rainfall raises the water level. When the water level is higher than the river bank the flood occurs.

## **2. Snowmelt**

Because of the global warming, the temperature of this year is higher than the temperature of many years ago. The ice caps melt in spring, many water go into the sea. The water raises the sea level, and again it causes the flood.

## **3. Relief**

Flooding often occurs in lowland. This is because rivers flow more slowly in low-lying area. If the water volume increases suddenly, floods occurs.

## **4. Coastal flooding**

Flooding always occur in coastal areas. Because there have high tides or storms, the sea level will raise. If the sea level is higher than the level of the coastal lowland, automatically the flood occurs.

### **Anthropogenic Causes of Flood:**

#### **1. Deforestation**

Large areas of forests near the rivers have been cleaned because of human need demands.

#### **How deforestation lead to flooding:**

There are no trees to soak up water. There are no trees to build the soil together. Ultimately soil erosion takes place. Large amounts of soil are washed by rain into the rivers. Because of this water volume increases in the river and again it causes

#### **2. Poor farming**

Some farming practices can damage the vegetation cover, so the soil will be washed into the river easily. Poor farming includes two more factors **Overgrazing and Overcultivation.**

##### **(a) Overgrazing**

People want more food and money, they graze too many animals on the land and the pasture is eaten away quickly. Less vegetation cover, soil washed into the rivers easily. •

##### **(b) Overcultivation**

When a piece of land has been used for farming for a long period of time, the soil may became so infertile that no vegetation cover is left and the soil is washed into the rivers more easily and causes flood.

#### **3. Poor water management**

When the dams are poorly constructed or maintained, they can easily collapse and these results in flooding.

#### **4. Population pressure**

Because of large amount of people, everything in need and in demand more, like wood, land and food Soil erosion happen more often, it increases the risk of flooding.

## **EFFECTS OF FLOOD**

### **(1) Primary effects**

Physical damage – Can damage any type of structure, including bridges, cars, buildings, sewerage systems, roadways, and canals.

### **(2) Secondary effects**

- a. Water supplies – Contamination of water. Clean drinking water becomes scarce.
- b. Crops and food supplies – Shortage of food crops can be caused due to loss of entire harvest. However, lowlands near rivers depend upon river silt deposited by floods in order to add nutrients to the local soil.
- c. Trees – Non-tolerant species can die from suffocation.
- d. Diseases – Unhygienic conditions. Spread of water-borne diseases.

**(3) Tertiary/long-term effects Economic** – Economic hardship, due to: temporary decline in tourism, rebuilding costs, food shortage leading to price increase in many countries.

### **Diseases related to Flood:**

#### **(a) water- and food-borne**

- I. cholera
- II. typhoid
- III. hepatitis a
- IV. diarrhoea
- V. dysentery

#### **(b) vector-borne**

- I. malaria  
dengue/

#### **due to direct contact with contaminated water**

- I. dermatitis
- II. conjunctivitis diseases are caused.

#### **(c) due to exposure to water**

- I. hypothermia

II. respiratory tract infections are caused.

**(d) effects on mental health like**

I. sleep disorders

II. excessive grief and depression etc.

**Flood and economy**

Flood effects many areas of national economy. Following are some of the areas needing attention from government bodies:-

- (i) Agricultural Flood Water Damage
- (ii) Urban Flood Water Damage
- (iii) Flood damage Commercial and Industrial
- (iv) Flood damage Residential Properties
- (v) Flood damage Transportation and Utilities
- (vi) Crop and Pasture Damage
- (vii) Flat Land

**3. Flood Mitigation**

To avoid the severe effects of flood, flood mitigation measures are very necessary. Flood mitigation includes there are two main components of flood i.e.,

- Water that inundates
- Land that is inundated

Geographical Survey of India(GSI) studies the shape and material of the land getting inundated and generates data on area, shape, slope, infiltration and permeability of soil of the basin, drainage pattern, landform and longitudinal and cross profiles of the channels. On the basis of these studies GSI produces Flood Hazard maps indicating Prohibitive, Restricted, Cautionary and Flood Free Zones

**Flood Mitigation Strategies:**

There are two different ways to mitigate floods: -

1. Structural
2. Non- Structural

Structural measures are in the nature of physical measures and help in “modifying the floods”, while non- structural measures are in the nature of planning and help in “modifying the losses due to floods”. In the structural measures we keep the water away from people and in the non-structural measures to try to keep the people away from water.

### **Structural Measures:**

The structural measures of flood includes a) Water Shed Management b) Reservoirs Natural water retention Basins d) Buildings on elevated area

**a) Water Shed Management:** Timely cleaning, de-silting and deepening of natural water reservoir and drainage channels must be taken up.

**b) Reservoirs:** The entire natural water storage place should be cleaned on a regular basis.

**c) Natural water retention Basins:** Construction and protection of all the flood protection embankments, ring bunds and other bunds. Dams building should be taken into account.

**d) Buildings on elevated area:** The buildings in flood prone areas should be constructed on an elevated area and if necessary on stilts and platform.

### **Non Structural Measures:**

Flood Plain Zoning, Flood Forecasting and warning

**a) Flood Plain Zoning:** Flood plain zoning, which places restrictions on the use of land on flood plains, can reduce the cost of flood damage. Local governments may pass laws that prevent uncontrolled building or development on flood plains to limit flood risks and to protect nearby property

**b) Flood Forecasting and warning:** These specially in India are issued for different areas costly by the Central water Commission/ Meteorological department and by the State Irrigation/ Flood Department.

### **Predictability**

Predictability of a disaster is the key to understand its nature and thereby to assess the chances of its occurrence and the fury of the event. Predictability is an attribute really applicable to natural disasters.

## **Forecasting**

For natural disasters that have a fair amount of inherent predictability, forecasting is the next step in disaster management. Forecasting has to be based on sound scientific principles and operationally proven techniques. It has to be done by authorized agency or individual who, besides being competent, responsible and accountable.

## **Warning**

Once a forecast is available regarding an anticipated disaster event, it has to be converted quickly into an area-specific and time-specific warning. The general warnings for the public would be different from those required specifically for the safety of a railway bridge during cyclone conditions etc.

Therefore, quick communication is very important at the warning stage.

## **Inter-relationship**

The inter-relationship between predictability, forecasting and warning is self-evident and should have been clear from the discussion in the preceding paragraphs. To repeat, a warning can-only be issued on the basis of a useful and reliable forecast and a disaster can be forecast only if it has an inherent predictability about it.

## **Disaster preparedness for floods**

Disaster preparedness could be defined as the detailed planning for the prompt and efficient response immediately as soon as the anticipated event materializes. Time effort has to be very comprehensive inclusive of public education and awareness campaign ahead, provisions for the issuance of timely warnings, development of orderly evacuation plans, and preparations for providing the evacuees with food, clothing and shelter on emergency basis. The speed and efficiency of the community reaction to save lives and mitigate suffering and losses is determined by adequate planning, training and rehearsals.

The vary basic step in vulnerability reduction will be to identify such high risk areas, prepare risk maps showing the likely risks at different probability levels of flooding and make this knowledge available widely.

## **4. Framework for Flood Risk Assessment and Risk Management**

### **Flood Preparedness**

- 1) Organize to prepare the plan.
- 2) Involve the public.



- 3) Coordinate with other agencies.
- 4) Assess the hazard.
- 5) Evaluate the problem.
- 6) Set goals.
- 7) Review possible strategies and measures.
- 8) Draft an action plan.
- 9) Adopt the plan.
- 10) Implement, evaluate, and revise the plan.

You can be prepared for flooding and other disasters by assembling a disaster supplies kit. Take this kit with you if evacuating:

- A portable, battery-operated radio and extra batteries
- Flashlights and extra batteries.
- First aid kit and manual.
- Emergency food and water.
- Nonelectric can opener
- Essential and prescription medications.
- Cash and credit cards.
- Sturdy shoes.
- Extra clothes and bedding.
- Food and supplies for pets.

## **5. Management Practices**

### **BEFORE A FLOOD**

To prepare for a flood, you should:

- Avoid building in a floodplain unless you elevate and reinforce your home.
- Elevate the furnace, water heater, and electric panel if susceptible to flooding.
- Install "check valves" in sewer traps to prevent flood water from backing up into the drains of your home.
- Construct barriers to stop floodwater from entering the building.
- Seal walls in basements with waterproofing compounds to avoid seepage.

### **DURING A FLOOD**

If a flood is likely in your area, you should:

- Listen to the radio or television for information.
- Be aware that flash flooding can occur. If there is any possibility of a flash flood, move immediately to higher ground. Do not wait for instructions to move.
- Be aware of streams, drainage channels, canyons, and other areas. If you must prepare to evacuate, you should do the following:

- Secure your home. If you have time, bring in outdoor furniture. Move essential items to an upper floor.
- Turn off utilities at the main switches or valves if instructed to do so. Disconnect electrical appliances. Do not touch electrical equipment if you are wet or standing in water.

If you have to leave your home, remember these evacuation tips:

- Do not walk through moving water. Six inches of moving water can make you fall. If you have to walk in water, walk where the water is not moving. Use a stick to check the firmness of the ground in front of you.
- Do not drive into flooded areas. If floodwaters rise around your car, abandon the car and move to higher ground if you can do so safely. You and the vehicle can be quickly swept away.

## **DRIVING FLOOD FACTS**

The following are points to remember when driving in flood conditions:

- Six inches of water will reach the bottom of most passenger cars causing loss of control and possible stalling.
- A foot of water will float many vehicles.
- Two feet of rushing water can carry away most vehicles including sport utility vehicles (SUV's) and pick-ups.

## **AFTER A FLOOD**

The following are guidelines for the period following a flood:

- Listen for news reports to learn whether the community's water supply is safe to drink.
- Avoid floodwaters; water may be contaminated by oil, gasoline, etc.,.
- Avoid moving water.
- Be aware of areas where floodwaters have receded.
- Stay away from downed power lines, and report them to the power company.
- Return home only when authorities indicate it is safe.
- Stay out of any building if it is surrounded by floodwaters.
- Use extreme caution when entering buildings; there may be hidden damage, particularly in foundations.
- Clean and disinfect everything that got wet. Mud left from floodwater can contain sewage and chemicals

## **LEARNING HOW TO REACH OUT AND HELP SURVIVORS**

Now if you find any survivor then how reach out and help survivors in that case

1. Allow the survivor to talk about the experience.
2. Reassure that the 'symptoms' are normal.

3. Don't take that individual's anger personally.
4. Continue to reach out to any survivor who may reject help and isolate himself.
5. Be understanding of children who cling, suck their thumbs, wet their beds, cry, scream, withdraw, and act out.
6. If you are unable to help personally, encourage the survivor to accept help from someone who is more expert.

## **6. Flood prone areas & Conclusion**

12.5% of the country's total area is flood prone. Flood plains and delta of Ravi, Sutlej, Yamuna-Sahibi, Ganga, Gandak, Ghaggar, Teesta, Kosi, Brahmaputra, Mahananda, Mahanadi, Damodar, Mayurakshi, Godavari and Sabarmati and their tributaries and distributaries are the Flood prone areas in India

Though the north-Indian plains prone to flood more, the "India flood prone areas" can be broadly categorized in three divisions:

- **Ganga Basin**
- **Brahmaputra and Barak Basin**
- **Central India and Deccan Rivers Basin**

### **Flood prone area in World –**

The most flood prone country in the entire world is Bangladesh, suffering from heavy monsoon rain every year.

Floods are common and mostly natural disasters. When rivers overflow their banks they cause damage to lives, property, infrastructure and crops etc Floods can occur at any time, but weather patterns have a strong influence on when and where floods are likely to occur. Mitigation measures (Both structural and non structural measures) and Preparedness Plan are essential for saving the life and livelihood from flood. Awareness among the common people is also of great significance. Volunteered agencies and NGOs like FEMA helps in avoiding the ill effect of the Flood.

## **GLOSSARY**

1. **Flash Flood:** A sudden and extreme volume of water that flows rapidly and causes inundation, and because of its nature is difficult to forecast.

2. **Flood Alarm Level:** Water level which is considered to be dangerous and at which warning should be commenced.
3. **Flood Control:** the management of water resources through construction of dams, reservoirs, embankments, etc. to avoid floods.
4. **Flood Forecasting:** procedure for estimation of stage, its discharge value, time of occurrence, and duration of a flood, especially of its peak discharge.
5. **Flood Proofing:** techniques for preventing flood damage to the structure and contents of buildings in a flood hazard area.
6. **Flood:** significant rise of water level in a stream, lake, reservoir or a coastal region.
7. **Floodplain zoning:** a plan that defines the main zones of a potential flood area, usually accompanied by housing restrictions or other recommendations to prevent flood damages.
8. **Floodplain:** an area adjacent to a river, formed by the repeated overflow of the natural channel bed.
9. **Non Structural Flood Mitigation:** system for reduction of the effects of floods using non structural means e.g. Land use planning (flood plain zoning), advance warning systems, flood insurance.

## **FAQs**

### **Q 1: What is flooding?**

Ans: Flooding is an overflowing of water onto land that is normally dry. It can happen during heavy rains, when ocean waves come onshore, when snow melts too fast, or when dams or levees break. Flooding may happen with only a few inches of water, or it may cover a house to the rooftop. The most dangerous flood event, the **flash flood**, happens quickly with little or no warning; other flooding events occur over a long period and may last days, weeks, or longer.

### **Q 2: What is a river flood?**

Ans: A river flood occurs when water levels rise in a river due to excessive rain from tropical systems making landfall, persistent thunderstorms over the same area for extended periods of time, combined rainfall and snowmelt, or an ice jam.

### **Q 3: What is coastal flooding?**

Ans: Coastal flooding occurs when a hurricane, tropical storm, or tropical depression produces a deadly storm surge that overwhelms coastal areas as it makes landfall. Storm surge is water pushed on shore by the force of the winds swirling around the storm. This advancing surge combines with the normal tides to create the hurricane storm tide, which can increase the average water level 15 feet or more. The greatest natural disaster in the United States, in terms of loss of life, was caused by a storm surge and associated coastal flooding from the great Galveston, Texas, hurricane of 1900. At least 8,000 people lost their lives.

### **Q 4: What is inland flooding?**

Ans: When tropical cyclones move inland, they are typically accompanied by torrential rain. If the decaying storm moves slowly over land, it can produce rainfall amounts of 20 to 40 inches over several days. Widespread flash flooding and river flooding can result.

### **Q 5: What is a flash flood?**

Ans: A flash flood is **a rapid rise of water** along a stream or low-lying urban area. Flash flooding occurs within six hours of a significant rain event and is usually caused by intense storms that produce heavy rainfall in a short amount of time. Excessive rainfall that causes rivers and streams to swell rapidly and overflow their banks is frequently associated with hurricanes and tropical storms, large clusters of thunderstorms, supercells, or squall lines. Other types of flash floods can occur from dam or levee failures, or a sudden release of water held by an ice jam. Heavy rainfall in the mountains can cause downstream canyon flooding.

### **Q 6: Why is a flash flood so dangerous?**

Ans: Flash floods can occur with little or no warning. Flash flood damage and most fatalities tend to occur in areas immediately adjacent to a stream or arroyo. Flash floods are very strong -- they can roll boulders, tear out trees, destroy buildings and bridges, and scour out new channels. Rapidly rising water can reach heights of 30 feet or more. Flash flood-producing rains falling on steep terrain can weaken soil and trigger catastrophic mud slides that damage homes, roads, and property.

**Q 7: How do hydrologists measure flood potential?**

Ans: Hydrologists - people who study the effects of water on the earth's surface and in the atmosphere - use gauges to measure the water levels in streams, rivers and lakes. They also measure the water content of snow using snow gauges. They take into account recent precipitation amounts (because soil moisture affects how much rain will soak in and how much will run off), and how much more precipitation forecasters expect. The data are sent to a river forecast center where computers analyze the information to predict river and stream levels in their area. When local forecasters receive the data they compare it with charts for their area and issue a flood warning if necessary.

Forecasters can usually tell in advance when conditions are right for flash floods to occur, but there is often little lead-time for an actual warning. (By contrast, flooding on large rivers can sometimes be predicted days ahead.)

Scientists are working to understand the types of storms that have high precipitation rates and long duration, and to determine what factors can be used in forecast models and in forecast operations to help forecast floods.

**Q 8: What are the various approach to deal with Flood**

Ans: Various approaches to deal with floods are available. As each situation is different, different adjustments or combination thereof are chosen. However, these approaches fall under the following three groups:-

1. Modify the floods i.e. don't allow water to accumulate;
2. Modify the susceptibility of the people to flood damages;
3. Modify the loss burden inflicted by floods.

Modification of floods would involve such measures as weather modification, catchment and land use modification, physical control works such as reservoirs, embankments etc. Modification of the susceptibility of the people to floods would involve steps like flood forecasting and warning, flood proofing, and floodplain management. Modifying the loss burden would involve steps like emergency evacuation, flood fighting, public health aspects as also flood insurance, and disaster relief.

**Q 9: What is Flood Mitigation Assistance**

Ans: FEMA's Flood Mitigation Assistance (FMA) provides funding to assist States and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program (NFIP). FMA was created as part of the National Flood

Insurance Reform Act of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP. The FMA is a *pre-disaster* grant program.

**Q 10: How Does National Flood Insurance Program work?**

Ans: National Flood Insurance Program (NFIP) was established by the United States Congress in the National Flood Insurance Act of 1968 and is administered by the Federal Insurance Administration (FIA) and the Mitigation Directorate, components of the Federal Emergency Management Agency (FEMA). The NFIP is designed so that floodplain management and flood insurance complement and reinforce each other. The partnership is established on the provision that FEMA will make flood insurance available, provided that a community implements adequate floodplain management regulations that mitigate flood risk. Most homeowners insurance does not cover flood damage to the structure or to contents and it is necessary for the homeowner to have a separate flood insurance policy. And insurance companies can only provide flood insurance policies to homeowners residing in communities participating in the NFIP. Effective implementation of local floodplain management regulations helps keep flood insurance rates affordable.