

## Unit - I

- \* Hazard :- ✓ An event which can cause Little loss of Life & property & Environment.  
✓ it doesn't disrupt the normal function of a community.  
✓ Due to hazard, community can subsist without outside help.  
✓ The word hazard is originated from French word "Hasard"

Classification :- 1. Natural hazards.  
2. Man-made hazards.

① Natural hazards :- Hazards due to Natural phenomena. Again classified as

(i) Geological hazards :- Originated from inside the solid earth due to tectonic activities Ex :- Earthquake, Volcanic activity, Land slide (or) Mass movement [Dey], Tsunami.

(ii) Hydrological hazards :- Caused by imbalance in normal water cycle and/or overflow of water bodies due to wind set-up.  
Ex :- Floods, Land slide [wet]

(iii) Biological hazards :- Caused by the exposure of living organisms to germs & toxic substances Ex :- Epidemic, insect infestation, Animal stampede.

(iv) Climatological hazards :- Caused by variation in temperature (or) wind speed (or) rain fall for long period of time [from days to years]  
Ex :- Extreme temperature, Drought, forest fire (or) Wild fire

(v) Meteorological hazards :- Caused by variation in temperature (or) wind speed (or) rain fall for short period of time [minutes to days]  
Ex :- Storm, Lightning, cyclone, Hurricanes, Avalanche.

② Man-made hazards :- Hazards due to Human negligence.

Ex :- Explosions, Wars, Criminality, Terrorism, Pollution, Transport accidents, industrial accidents, De-forestation.

\* Disaster :- ✓ An event which can cause great loss of life & property & environment  
 ✓ Disaster disrupts the normal function of a community.  
 ✓ Due to disaster, community can't subsist without outside help  
 ✓ The word disaster is originated from French word "Disastre".  
 Disastre = Dis + astre = Bad star  
 ↓ ↓ (or)  
 means means evil star.  
 "Bad" "star"

Note :- Every disaster is a hazard.  
 But, every hazard is not a disaster.

\* Risk :- The effect of hazard is known as "Risk"  
Ex :- damage to property & environment, Loss of life  
 (or)

Situation of a community (or) individual which has the possibility to get damage.  
 Chance (or)

\* Coping Capacity :- A combination of all the strengths and resources available within a community which can reduce the level of risk.

Classification :-  
 1. Physical Capacity.  
 2. Social Capacity.  
 3. Economic Capacity.

① Physical capacity :- Capacity of a community which includes communication components available, infrastructure available, water sources available.

Ex :- Roads, Bridges, Hospitals, schools, rivers etc.

② Social capacity :- Capacity of a community which includes interpersonal & interpersonal links, relations, motivations among the people.

③ Economic capacity :- Capacity of a community which includes income, savings account, employment opportunities, Business activities.



\* Vulnerability :- situation [state] of a Community (or) Individual which has the chance to get hazared

Classification :-

1. Physical Vulnerability.
2. Social Vulnerability.
3. Economic Vulnerability.

① Physical Vulnerability :- Vulnerability of a Community (or) Individual which is determined based on its capacity & proximity to the source of hazared.

Ex :- ✓ Children, senior citizens have more vulnerability than youngsters.

✓ Communities which are located near the sea (or) river & at the base of hills have more vulnerability.

② Social Vulnerability :- Vulnerability of a Community which is determined based on its social capacity i.e. interpersonal & intrapersonal links, relations, motivations among the people.

③ Economic Vulnerability :- Vulnerability of a Community which is determined based on its economic capacity i.e. income, savings, employment opportunities, Business activities.

Ex :- More income helps the community to construct strong buildings, Hence Community has less vulnerability during cyclone than the community with tents having less income.

\* Impact :- change in a community (or) individual by means of Physically/Socially/economically (or) combination of these.

Ex :- Loss of life, Loss of property & environment.

\* Prevention :- Actions that are taken to avert the disaster from occurring.

\* Mitigation :- Actions that are taken to reduce the effects (or) impacts of disaster.



## Unit - II

### \* Classification of disasters :-

- ① Based on speed of onset :-
- (i) slow onset disasters.
  - (ii) Rapid onset disasters.
- ② Based on the <sup>(cause)</sup> reason by which it comes :-
- (i) Natural disasters.
  - (ii) Man-made disasters.

Slow onset disasters :- A disaster which onsets (or) starts slowly and continues for many days, months, years.

Ex :- Drought, famine, Pest infection

Rapid onset disasters :- A disaster which starts suddenly and continues for <sup>some</sup> minutes.

Ex :- Earthquake, flash floods, volcanic activity, cyclones,

Natural disasters :- A disaster, caused by natural phenomena.

Ex :- Tsunami, floods, drought, cyclones, volcanoes, landslide, earthquake, forest fires (or) wild fires,

Man-made disasters :- A disaster, caused by human negligence.

Ex :- Explosions, wars, Industrial pollution, Industrial accidents, Terrorism, criminality, Deforestation, Transport accidents

\* [DRR] Disaster Risk Reduction :- <sup>measures</sup> <sup>(or)</sup> actions that can be taken up before, during and after a disaster <sup>occurrence</sup> to reduce its impacts. The common DRR measures are prevention, preparedness, Response, Relief, Recovery, Mitigation.

\* Disaster Management (or) Disaster Risk Management :- A systematic process of implementing all DRR measures such as prevention, preparedness, Response, Relief & Recovery, Mitigation.

Prevention :- Actions that can be taken up to avert the disaster from occurring.

Preparedness :- Actions that can be taken up before a disaster occurrence.

Ex :- Emergency exercises, Training, Warning systems.

Response :- Actions that can be taken up during a disaster occurrence.

Ex :- Search and Rescue, evacuation, emergency operations.





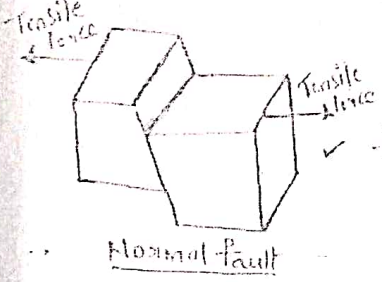
Relief & Recovery :- Actions that can be taken up after a disaster occurrence.

EX:- Temporary housing, claims processing, grants, Medical care, food supply.

Mitigation :- Actions that can be taken up to reduce the effects of disaster.

EX:- Building codes & zoning, vulnerability analysis, public education

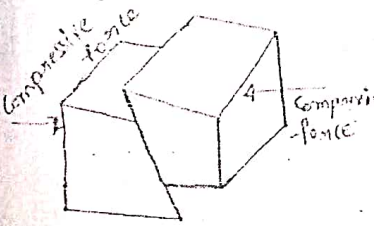
\* Earthquake :- Sudden occurring event that can be caused by the geological fault, resulting in shaking and displacement of the ground along with creation of seismic waves



Normal fault

✓ fault is a fracture that can be caused by the movement of tectonic plates one over another (or) away from each other (or) towards each other.

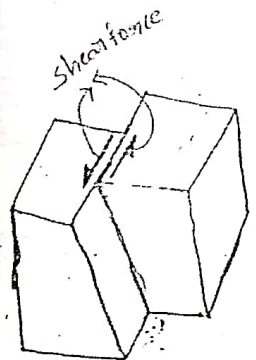
Normal fault :- fracture due to movement of tectonic plates ~~one over~~ away from each other. Under <sup>tensile</sup> forces.



Thrust fault

Thrust fault :- fracture due to movement of tectonic plates from each other Under Compressive forces

Strike slip fault :- fracture due to movement of tectonic plates one over another Under <sup>shear</sup> Compressive forces.



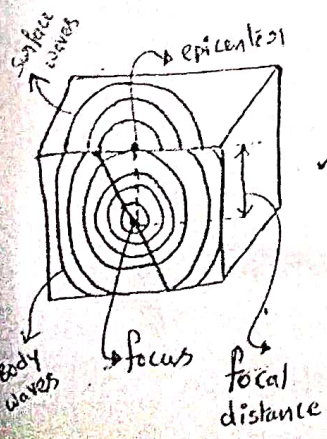
Strike slip fault

- ✓ The point where the plates (blocks) start to fracture is called :- "focus of an earthquake" (or) "Hypocenter of an earthquake".
- ✓ The point on earth's surface which is directly above the focus is called "Epicenter of earthquake".
- ✓ The distance b/w Epicenter & focus is called "focal distance". Based on focal distance, Earthquake can be of 3 types.

1. Deep earthquake :- 300 - 700 km from the earth's surface.
2. Medium earthquake :- 60 - 300 km from the earth's surface.
3. Shallow earthquake :- < 60 km from the earth's surface.

✓ Seismic wave is defined as the wave which possess energy to vibrate the ground (or) earth vertically and horizontally. Again it is divided into 2 types :-

1. Body wave :- Seismic wave that can travel through the body of the earth. Again classified into 2 types.
  - (i) P-waves :- Can travel through any media
  - (ii) S-waves :- Can't travel through liquids





2. Surface wave :- Seismic wave that can travel on the outer surface of earth to cause horizontal vibration of earth.

Effects of earthquake :- (i) primary effects (ii) secondary effects.

(i) primary effects :-

- ✓ Destruction of buildings, roads, bridges & poles.
- ✓ Major & minor injury
- ✓ Loss of life
- ✓ Breakage of pipelines
- ✓ Rock falls & Land slides

(ii) Secondary effects :-

- ✓ Fires & Tsunamis & floods
- ✓ Diseases
- ✓ Food shortages
- ✓ Homeless and displaced people
- ✓ population decline
- ✓ Businesses destroyed (or) damaged.

Earthquake Risk reduction measures :-

- Preparedness :-
- ✓ Make sure you have a fire extinguisher, first aid kit, a battery-powered radio, a flash light & extra batteries at home.
  - ✓ Learn first aid.
  - ✓ Learn how to turn off the gas, water & electricity
  - ✓ Make up a plan of where to meet your family after an earthquake.
  - ✓ Don't leave heavy objects on shelves because they will fall during an earthquake.
  - ✓ Anchor heavy furniture, cupboards and appliances to the walls (or) floor.
  - ✓ Learn the earthquake plan at your school (or) workplace.

Response :-

- ✓ Stay calm because if you run heavy objects may fall.
- ✓ If you are indoors, Drop to the ground (or) floor and take COVER by getting under a sturdy table and HOLD on until the shaking stops. If there is not a table, cover your face and head with your arms and crouch in an inside corner of the building.
- ✓ If you are outdoors, move to open area which is away from power lines (or) anything that might fall.
- ✓ If you are in a car, stop the car and stay inside the car until the earthquake stops.
- ✓ Don't use elevators because they may get stuck anyway.



Relief & Recovery :- ✓ check yourself and others for injuries. provide first aid for anyone who needs it.

✓ check water, gas and electric lines for damage. if any are damaged, report it to the authorities.

✓ stay out of damaged buildings & chimneys.

✓ stay away from beaches because Tsunamis sometimes hit after the earthquake ~~has~~ <sup>is</sup> stopped.

✓ if you are at the school or workplace, follow the emergency plan or the instructions of the person in charge.

✓ expect aftershocks.

\* Earthquake measurement :- → This type of scale is based on Earthquake magnitude, which is called as Richter scale.

① Earthquake Magnitude (or) amount of energy released is determined by use of seismograph which is an instrument that continuously records ground vibration.

An earthquake of magnitude "3" is smallest, normally felt by humans. The largest earthquake that has been recorded in this system is 9.25 at Alaska & Chile.

② The second type of scale is based on Earthquake intensity. it is called Mercalli scale which expresses the intensity of earthquake effect on a people, structure & Earth's surface in the form of values from I to XII. there is "general panic with buildings collapsing totally & there is a total disruption in normal life with an intensity of ~~XII~~ <sup>XII</sup> ~~or below~~ And with an intensity of VI or below most of the people can feel the shake.

\* Tsunami :- ✓ Tsunami is a <sup>series of</sup> giant (or) massive <sup>wave</sup> caused by earthquake (or) volcanic eruption (or) landside under the sea, resulting in the displacement of a large volume of water.

✓ it is taken (or) originated from the Japanese word "Tsunami"

Tsunami = Tsu + nami  
          ↓                  ↓  
          means          means  
          "harbour"      "waves"

✓ Tsunami <sup>wave</sup> can travel at a speed of 970 km/h as fast as jet flies

✓ Regular wave can travel at a speed of 90 km/h



## Effects of Tsunami:-

- ✓ Loss of life & property
- ✓ Environmental impacts such as solid waste & disaster debris
- ✓ Flooding & contamination of drinking water
- ✓ Diseases

## Tsunami Risk Reduction measures:-

### Preparedness:-

- ✓ Find out if your home is in a danger area. Know the height of your street above sea level and the distance to your street from the coast
- ✓ Be familiar with the tsunami warning signs.
- ✓ Make sure all family members know how to respond to a tsunami
- ✓ Make evacuation plans.
- ✓ Teach family members how and when to turn off gas, electricity and water
- ✓ Teach children how and when to call police (or) fire department and which radio station to listen for official information.

### Response:-

- ✓ Climb to higher ground as soon as warning of a tsunami is released.
- ✓ Stay away from the beach.
- ✓ Do not assume that one wave means the danger is over.
- ✓ Stay out of the area and don't return until authorities say it is safe.

### Relief & Recover:-

- ✓ Help injured (or) trapped persons and give first aid where it is need.
- ✓ Stay out of damaged buildings.
- ✓ Check the home whether it ~~makes~~ <sup>causes</sup> danger (or) not.
- ✓ Check the electricity of home.

## Warning signs of Tsunami:-

- ✓ Earthquake
- ✓ Rise (or) fall of water level
- ✓ Fleeing animals
- ✓ Sudden flooding
- ✓ Series of giant wave appearance
- ✓ Loud jet engine sound



\* Floods :- it is an overflow of water on land which is usually dry, caused by means of Natural phenomena (or) human negligence.

Natural causes :- heavy rains, melting of ice during volcano eruption, Undersea earthquake, Marine Landslide (or) Landslip.

Man made causes :- Drainage system failure, Dam/Barrage/embankment failure.

Classification :- (1) Riverine floods (2) Flash floods (3) Urban floods

(1) Riverine flood :- it is caused by heavy rain-fall <sup>exceeds the river's capacity</sup> ~~over large area~~ (or) by melting of the winter's snow accumulation (or) by both.

(2) Flash flood :- it occurs within six hours of heavy rain-fall beginning along with storms, cyclone, cloud bursts.

Effects of floods :-

- ✓ Loss of life & property
- ✓ damage to crops.
- ✓ Destruction of Major roads
- ✓ Disruption of Air/Train/Bus services.
- ✓ Spread of Water-borne diseases.
- ✓ Communication breakdown
- ✓ Electricity supply cut off
- ✓ Economic & Social disruption
- ✓ Pollution of Air/water

(3) Urban flood :- it occurs particularly in more populated areas when rain-fall exceeds the capacity of drainage systems such as storm sewers.

(Flood)

Disaster Risk reduction measures :-

Preparedness :-

- ✓ Make an inventory of valuable things.
- ✓ Create a household emergency plan & emergency kit
- ✓ Have a copy of your insurance policy and contact information on hand.

Response :-

- ✓ Avoid walking (or) driving through flood water
- ✓ Turn off your gas & electricity
- ✓ Find higher ground.



Relief & Recovery :- ✓ Return home after getting information from officials.

✓ Drink boil water

✓ Avoid downed powerlines and standing water that could be electrically charged.

✓ Take pictures of any damaged items (or) property and contact your agent.

\* Drought :- It is either absence (or) deficiency of rainfall from its normal pattern in a region for an extended period of time leading to general suffering in the society.

Causes :- Rainfall deficiency, soil erosion, overpopulation, overgrazing, deforestation, excessive use of ground.

Classification :-

1. Meteorological drought
2. Hydrological drought
3. Agricultural drought
4. Socio-economic drought

1. Meteorological drought :- It is simple absence (or) deficiency of rainfall from the normal.

2. Hydrological drought :- It is prolonged meteorological drought and drying of reservoirs, lakes, streams, rivers and fall in groundwater levels.

3. Agricultural drought :- It is the depletion of soil moisture during the growing season.

4. Socio-economic drought :- drought which correlates the supply and demand of goods and services with the three above mentioned types of drought.

Ex :- Shortage in supply of economic goods.



## Drought Risk Reduction measures :-

### Mitigation strategies :-

- ✓ cloud seeding :- Dropping of crystals into clouds to cause rain.
- ✓ Land use :- Carefully planned crop rotation can help to minimize erosion.
- ✓ Recycled water :- Farmer wastewater that has been treated and purified for reuse.
- ✓ Rain harvesting :- The collection of water from surfaces on which rain falls.
- ✓ Drought monitoring :- Continuous observation of rain-fall levels.
- ✓ Desalination of sea water for irrigation.
- ✓ Implementation of water restriction processes.

### Effects of Drought :-

Economical effects :-

- ✓ Farms are affected
- ✓ Damage to crop
- ✓ Less food production

Environmental effects :-

- ✓ Diseases
- ✓ Damage to plants
- ✓ Soil erosion.
- ✓ Reduction of fish habitat.

social effects :-

- ✓ food shortage
- ✓ Human deaths.
- ✓ Mental stress
- ✓ Water user conflict.

\* Land slide :- it is a downward and outward movement of slope forming materials composed of rocks, soils, artificial fills or combination of all these materials along surfaces of separation by falling, sliding and flowing, either slowly (or) quickly from one place to another.



- Causes :-
- ✓ Geological weak material.
  - ✓ Erosion of soil.
  - ✓ Intense rain-fall.
  - ✓ Human Excavation.
  - ✓ Earthquake shaking.
  - ✓ Volcanic Eruption.

Types of Land slides :-

① Falls :- Abrupt movements of materials that become detached from steep slopes (or) cliffs, moving by free fall, bouncing and rolling.

② Flows :- A general term including many types of mass movement such as debris flow, debris avalanche, Lahari and mud-flow

debris flow :- Rapid mass movement in which loose soils, rocks combine with ~~water~~ entrained air and water to form slurry which can flow down slope.

debris avalanche :- A very rapid mass movement of loose soils, rocks. Combine with air and water to form slurry.

Mud-flow :- Rapid mass movement of wet material that contains at least 50% of sand, silt and clay sized particles.

Lahari :- Mud flow or debris flow that originates on the slope of a volcano, usually triggered by heavy rain fall eroding volcanic deposits, sudden melting of snow & ice due to heat from volcanic events.

③ Topple :- A block of rock that tilts (or) rotates forward and falls, bounces & rolls down the slope.

Effects of land slide :-

Land slide destroys everything and anything that comes in its path

- ✓ Roads
- ✓ Rail Lines
- ✓ Lines of Communication
- ✓ power Lines
- ✓ settlements
- ✓ River flows
- ✓ Agricultural production
- ✓ Flooding
- ✓ Water availability, quality & quantity
- ✓ flora & fauna.



## Landslide

### Risk Reduction measures:-

Hazard mapping:- Locates the areas prone to slope failures. So this will help to avoid building settlements in such areas. So hazard mapping serves as a tool for mitigation measures.

Land use:- Carefully planned construction of roads, irrigation canals etc.

Retaining walls:- Can be built to stop land from slipping

Engineered structures:- Strong foundations can withstand (or) take the ground movement forces.

Increasing vegetation cover:- Planting the trees is the effective & cheapest way of arresting landslides.

Insurance:- It will assist individuals whose homes are likely to be damaged by landslides.

\* Cyclones:- It is a region of low atmospheric pressure surrounded by high atmospheric pressure resulting in swirling of powerful winds blowing in anticlockwise direction in the northern hemisphere and clockwise direction in the southern hemisphere.

✓ Cyclones are known by different names in different parts of India.

(a) Tornado:- in South America

(b) Willie-willie:- in Australia

(c) Hurricanes:- in the North Atlantic Ocean.

(d) Typhoons:- in the Northwest Pacific Ocean.

(e) Severe cyclonic storm:- in the North Indian Ocean.

✓ Cyclone becomes Super cyclone when ~~wind~~ wind speed varies from 260 - 300 km/hour. It is occurred in Odisha 1999, Oct 29<sup>th</sup>.

### Effects of Cyclone:-

1) Storm Surge:-

- flooding in coastal areas
- Beach erosion
- soil fertility loss from saline intrusion
- Damage to structure



2) Wind :-

- Damage to structures
- Loss of power lines & communication lines
- injuries & loss of life
- destruction of crops & vegetation.

3) Torrential rain :-

- destruction of crops & vegetation
- Contamination of water supply system
- Land slides
- Flooding of inland area.

Cyclone Risk Reduction measures :-

Coastal belt-plantation :- planting trees near by coastal areas.

Hazard mapping :- it serves as a tool for locating the areas prone to cyclones.

Land use :- Carefully planned construction of roads, irrigation canals etc.

Engineered structures :- Strong foundations can withstand (or) take the ground movement forces and wind forces.

Increasing vegetation cover :- planting trees every where is the best & cheapest way of arresting cyclones.

\* Coastal erosion :- it is the wearing away of land and the removal of beach (or) dune sediments by wave action, tidal currents, wave currents, drainage (or) high winds.

causes :- Natural processes :-

- 1) <sup>while</sup> wave strikes the beaches and break ~~the beach~~ the fragments of ground, the wind blows away the sand.
- 2) Loss of inland sand due to breaking and wash-over of a sand berm.
- 3) offshore loss during extreme wave and storm surge conditions.
- 4) increase of coral eating organisms.
- 5) High rainfall and floods.



b) Natural Variation in Sand Supply to the Coast from rivers.

Manmade Causes:-

- 1) Beach Sand mining
- 2) River sand mining
- 3) Inland coral mining

[∴ Coral reef :- it is tiny soft bodied organism]

Effects of coastal erosion:-

- ✓ Loss of habitat/beach
- ✓ Loss of buildings, infrastructure facilities such as roads & power lines
- ✓ Degradation of coral reefs due to deposition of silt
- ✓ increased turbidity of water
- ✓ collapse the tourism in the area.
- ✓ Loss of boat anchorage sites
- ✓ increase the frequency of flooding in the lowland areas

Coastal erosion risk reduction measures:-

Prevention:-

- ✓ Beach replenishment :- importing sand and piling it on top of the existing sand.
- ✓ Construction of Groyne<sup>(or)</sup>s :- Construction a protective concrete structures along the shores.
- ✓ Construction of Revetment<sup>s</sup> :- Construction of wooden blockade structures ~~with~~ along the shores.
- ✓ Construction of armour :- Construction of Rocky Layers along the shores.

\* Soil erosion :- The process by which soil is removed by wind (or) running water

Types of erosion:-

- 1) Sheet erosion
- 2) Gully erosion
- 3) Rill erosion

4) Stream bank erosion  
(or)  
Liparian erosion.



- ① Sheet erosion: removal of the thin layer of top soil by water runoff.
- ② Gully erosion: removal of soil by forming gullies (or) ditches with the width & depth of 10m due to heavy water runoff.
- ③ Rill erosion: <sup>cutting (or)</sup> removal of soil by forming low cutting finger shaped groove like structures as thin channels (or) streams.
- ④ Riparian erosion: removal (or) cutting of river bank soil by during floods.

Effects of soil erosion:-

- ✓ Reduction in the crop production
- ✓ declassification in the plant productivity
- ✓ desertification.

Soil erosion Risk reduction measures:-

- ① Cover crop: a crop is planted <sup>that</sup> in between harvests to reduce erosion and replace nutrients. Ex: soybean & clover.
- ② Crop rotation: change the crops from year to year so that nutrients don't get depleted.
- ③ Contour ploughing: ploughing rows in a field are ploughed in curves instead of straight lines.
- ④ Terracing: one steep field is changed into a series of smaller fields.
- ⑤ wind break: planting trees around a field to prevent wind erosion.

Causes of soil erosion:-

- ① Overgrazing: Too many animals eat all the grass & leads to soil erosion.
- ② Deforestation: which increases the surface runoff & leads to soil erosion.