

Disaster Management Unit-1

❖ Disaster comes from the French word 'des-bad & aster-star'.

Definition of Disaster

A disaster is an event, either natural or caused by humans, that happens suddenly or gradually and has a very serious impact. The impact is so great that the affected community needs to take extraordinary measures and get help from outside. A disaster causes widespread damage to the environment and poses a risk to people's lives, property, and health.

Types of Disaster

1. **Natural disasters:** These are caused by natural forces. Examples include:

- Earthquakes
- Tsunamis
- Droughts
- Floods
- Snowfall
- Landslides
- Thunderstorms
- Volcanic eruptions
- Forest fires

2. **Man-made disasters:** These are caused by human actions. Examples include:

- Global warming
- Chemical and industrial accidents
- Nuclear hazards
- Accidental disasters

IMPACT OF DISASTER

Disasters always have a significant impact and can cause:

1. **Threats to National Security:** Disasters can disrupt essential services, damage infrastructure, and create instability.
2. **Sudden socio-economic changes:** Communities can experience economic loss, displacement, and changes in social structures.
3. **Disruption to biodiversity:** Disasters can harm plants and animals, affecting food sources and ecosystems.
4. **Environmental degradation:** Problems like erosion and disease can arise in the aftermath of a disaster.

5. **Quality of life decline:** Disasters reduce access to resources, disrupt daily life, and cause psychological distress.
6. **Starvation:** Disasters can cause severe food shortages and force people into desperate situations.
7. **Family separation:** Disasters often lead to families being separated or fragmented.
8. **Increased poverty and aid dependence:** Disasters can increase poverty and the need for external aid.
9. **Social chaos:** Crime, unrest, and social tension can arise from the disruption caused by disasters.
10. **Awareness of inequalities:** Disasters can highlight economic and social injustices within a community.
11. **Insecurity:** Disasters can create feelings of insecurity at both national and local levels.
12. **Loss of faith in the nation:** Severe disasters can erode trust in institutions and national identity.
13. **Other dangerous consequences:** Disasters can have long-lasting and far-reaching effects on individuals, society, and the nation.

Earthquakes

An earthquake is the shaking of the Earth's surface caused by a sudden release of energy in the Earth's crust. This energy travels in waves, causing the ground to shake. Strong earthquakes can cause major damage to buildings and even whole cities.

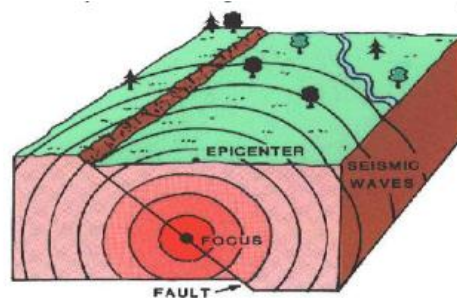
- **Seismicity:** This refers to how often earthquakes happen in a particular area, as well as their types and sizes.
- **How Earthquakes Are Measured:**
 - **Seismometers:** Instruments that record ground motion caused by earthquakes.
 - **Moment Magnitude Scale:** Used to measure the size of earthquakes larger than magnitude 5.
 - **Richter Magnitude Scale:** Used to measure smaller earthquakes. It is similar to the moment magnitude scale.
 - **Modified Mercalli Intensity Scale:** Measures the shaking at a specific location, using Roman numerals (I to XII, with XII being the most severe).
- **Magnitude of an Earthquake:**
 - This is a number that tells us how big the earthquake actually was.
 - Professor Charles Richter developed a scale (the Richter Scale) to measure magnitude.
 - Other scales are used to measure different aspects of earthquakes, like wave energy.

- **Intensity of an Earthquake:**

- Intensity describes how strong the shaking was at a particular place.
- The Modified Mercalli Intensity (MMI) Scale and the MSK Scale are used to measure intensity based on people's observations, building performance, and changes in the natural environment.

- **What Causes Earthquakes?**

- Earthquakes happen when stress builds up within the Earth's crust and is suddenly released.
- **Faults:** Cracks in the Earth's crust where rocks slip past each other, causing the ground to vibrate.
- **Focus:** The location on the fault where the slip begins.
- **Epicenter:** The point on the Earth's surface directly above the focus.X



Relationship between the focus of an earthquake and the epicentre.

Earthquakes rarely take place at the surface of the Earth but at some depth within it. Though focal depths are usually shallow, earthquakes have been detected as deep as 720 km. Based on the depth of the focus earthquakes can be classified as:

- **Shallow:** when the depth of origin is less than 60 km.
- **Intermediate:** when the depth of origin is between 60 and 300 km.
- **Deep:** when the depth of origin is greater than 300 km.

- **Seismic Waves:**

- **Body waves:** Travel through the Earth's interior.
 - **Primary Waves (P-waves):** Fastest waves, travel through solids and liquids. Cause a push-and-pull motion.
 - **Secondary Waves (S-waves):** Slower than P-waves, travel only through solids. Cause a side-to-side motion.
- **Surface waves:** Travel along the Earth's surface. Cause the most damage.
 - **Love waves:** Cause side-to-side motion.
 - **Rayleigh waves:** Cause a rolling motion.

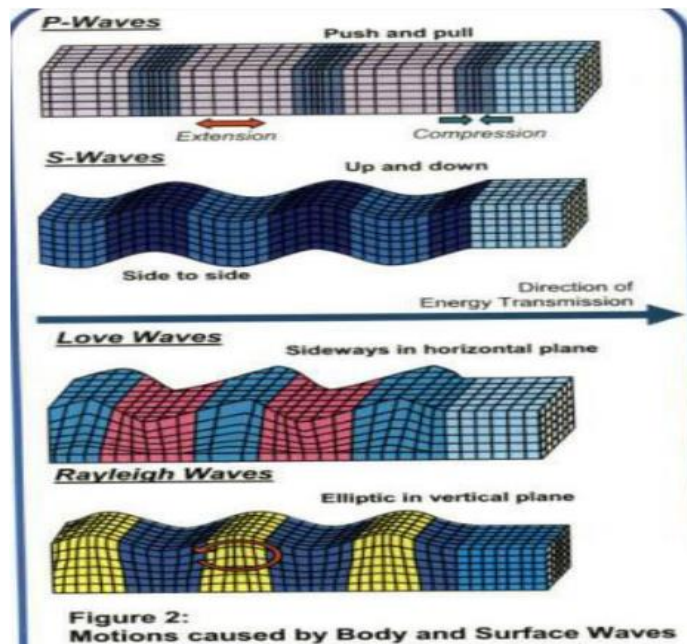


Figure 2: Motions caused by Body and Surface Waves

- **Seismic Zones:**

- Different areas have different levels of earthquake risk.
- Seismic zone maps show areas based on how strong past earthquakes have been.
- India has five seismic zones (I to V, with V being the highest risk).

Group	Magnitude
Great	8 and higher
Major	7 – 7.9
Strong	6 – 6.9
Moderate	5 – 5.9
Light	4 – 4.9
Minor	3 – 3.9
Very Minor	< 3.0

Floods

A flood occurs when land that is usually dry is covered with water. Floods can happen suddenly or take time to develop. They can cause extensive damage and pose a risk to human life.

- **Causes of Flooding:**

- **Heavy rains:** When rivers have more water than they can hold, they overflow their banks.
- **Strong winds:** Winds can push seawater onto land, causing coastal flooding.
- **Dam failures:** If a dam breaks, a large amount of water is suddenly released.

- **Melting ice and snow:** When temperatures rise, snow and ice melt, potentially causing flooding.
- **Types of Floods:**
 - **Flash floods:** Occur very quickly, often with little warning. They are usually caused by heavy rain.
 - **Rapid-onset floods:** Take longer to develop than flash floods, but still happen relatively quickly.
 - **Slow-onset floods:** Develop gradually and can last for days or weeks. Often caused by rivers overflowing.
- **Areas at Risk:**
 - Low-lying areas are most at risk of flooding, especially those near rivers, lakes, or the coast.
- **Impacts of Floods:**
 - **Loss of life**
 - **Damage to buildings and infrastructure** (bridges, roads, etc.)
 - **Disruption of services** (power, water, etc.)
 - **Water contamination and health risks**
 - **Damage to crops and food shortages**
- **Flood Safety Planning:**
 - **Observing past floods:** Studying records of past flood events.
 - **Analyzing flood risk:** Using models and data to understand how floods might behave.
 - **Mapping flood areas:** Creating maps that show areas likely to be flooded.
 - **Land use planning:** Making decisions about how land is used to reduce flood risk.
 - **Building protective structures:** Constructing dams, levees, and other structures to manage water flow.
 - **Monitoring and forecasting:** Keeping track of weather conditions and water levels.
 - **Warning systems:** Alerting people about potential floods.
 - **Emergency response:** Having plans in place to respond to floods.
 - **Coastal defenses:** Building sea walls and other structures to protect coastal areas.

Recent Floods in India:

- Bihar flood, 1987
- Assam floods, 2012

- Maharashtra flood, 2005
- Uttarakhand flood, 2013
- Gujarat floods, 2005
- Jammu & Kashmir floods, 2014

Drought

Drought is a prolonged period of below-average rainfall. It leads to a shortage of water and causes widespread problems for people and the environment.

- **Freshwater Availability:** Only a tiny fraction of Earth's water is freshwater that we can use.
- **Types of Droughts:**
 - **Meteorological drought:** Defined by a lack of rainfall.
 - **Hydrological drought:** Affects water resources like rivers and groundwater.
 - **Agricultural drought:** Occurs when there isn't enough moisture in the soil for crops to grow.
 - **Socio-economic drought:** Relates the supply and demand of goods and services to water availability.
- **Effects of Drought:**
 - **Deforestation**
 - **Global warming**
 - **Industrialization**
 - **Population growth and urbanization**
 - **Soil erosion**
 - **Poor water management**
- **Impact of Drought:**
 - **Increased food prices**
 - **Damage to ecosystems and wildlife habitat**
 - **Water shortages for wildlife**
 - **Migration of wildlife**
 - **Loss of income**
 - **Loss of human life**
 - **Health problems due to poor water quality**
- **Possible Measures to Reduce Drought Risk:**

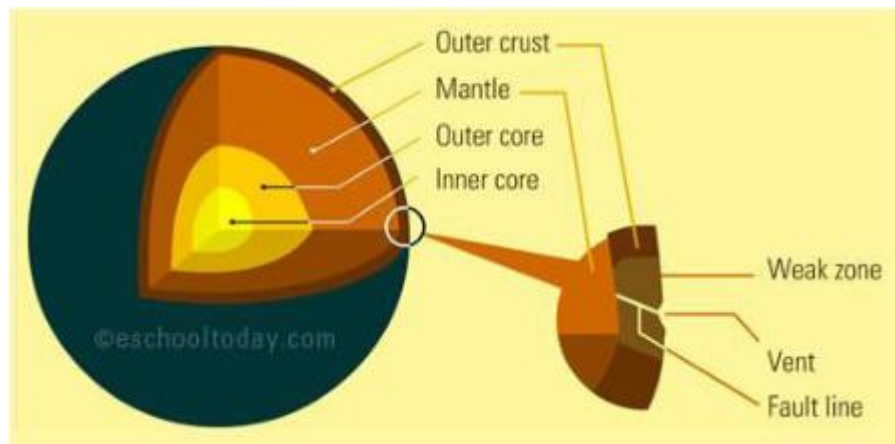
- **Public awareness and education:** Teaching people about drought and how to conserve water.
- **Drought monitoring:** Keeping track of rainfall and water levels.
- **Water conservation:** Using water wisely and efficiently.
- **Irrigation:** Developing irrigation systems to provide water for crops.
- **Drought planning:** Having plans in place to deal with drought conditions.

Volcanoes

A volcano is an opening in the Earth's crust that allows molten rock, ash, and gases to escape from below the surface.

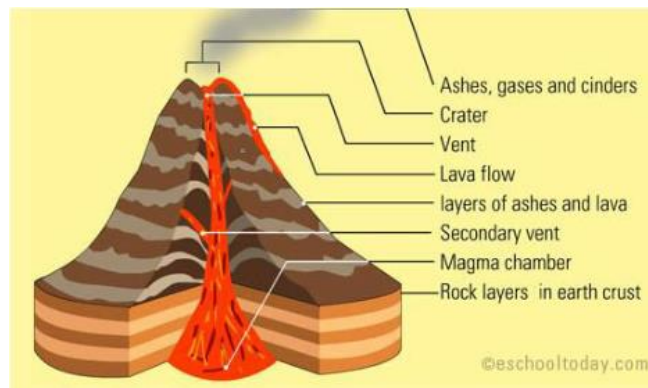
- **Why Volcanoes Erupt:**

- **Earth's layers:** The Earth has layers – the crust, mantle, and core.
- **Magma:** Molten rock and gases in the mantle.
- **Pressure and fault lines:** When pressure builds up in the mantle, it can cause magma to escape through weak spots in the crust.



- **Parts of a Volcano:**

- **Magma chamber:** A pool of magma beneath the volcano.
- **Crater:** A depression at the top of the volcano.
- **Main vent:** The main opening through which magma erupts.
- **Secondary vents:** Smaller openings that also release magma, ash, and gases.



- **Types of Volcanoes:**

- **Shield volcanoes:** Broad, gently sloping volcanoes formed by fluid lava flows (e.g., Mauna Loa in Hawaii).
- **Lava domes:** Steep-sided domes formed by less fluid lava that piles up around the vent.
- **Cinder cones:** Cone-shaped volcanoes formed by fragments of lava ejected into the air.
- **Composite volcanoes:** Large, cone-shaped volcanoes formed by layers of lava, ash, and rock.

- **Effects of Volcanic Eruptions:**

- **Damage to life and property:** Eruptions can be very dangerous for people and infrastructure.
- **Impact on the ozone layer:** Volcanic ash can damage the ozone layer.
- **Destruction of landscapes:** Eruptions can reshape landscapes.
- **Lahars:** Mudflows caused by the mixing of volcanic ash with water.

Wildfires

A wildfire is an uncontrolled fire that burns in wildland areas, such as forests, grasslands, and shrublands.

- **How Wildfires Start:**

- **Campfires:** Unattended or improperly extinguished campfires can easily start wildfires.
- **Smoking:** Discarded cigarette butts are a common cause of wildfires.
- **Lightning:** Lightning strikes can ignite dry vegetation.
- **Burning debris:** Burning yard waste or trash can spread and become wildfires.
- **Accidents and equipment failure:** Sparks from vehicles or machinery can ignite fires.

- **Fireworks:** Improper use of fireworks can start wildfires.
- **Factors that Make Wildfires Burn More Intensely:**
 - **Wind:** Wind carries embers, spreads the fire, and provides more oxygen.
 - **Slope:** Fires burn faster uphill.
 - **Temperature:** Higher temperatures dry out vegetation.
 - **Humidity:** Dry conditions make it easier for fires to ignite and spread.
 - **Times and seasons:** Some seasons are more prone to wildfires due to weather conditions.
- **Effects of Wildfires:**
 - **Loss of homes and wildlife**
 - **Damage to soil**
 - **Death of animals**
 - **Reduced oxygen production due to loss of trees**
 - **Air pollution**
 - **Economic losses**
- **Preventive Measures:**
 - **Following fire regulations**
 - **Monitoring weather forecasts**
 - **Avoiding burning combustible materials**
 - **Public awareness**

Tsunami

A tsunami is a series of ocean waves caused by the displacement of a large volume of water.

- **Causes of Tsunamis:**
 - **Earthquakes**
 - **Landslides**
 - **Volcanic eruptions**
 - **Large meteoroid impacts**
- **Characteristics of Tsunamis:**
 - Travel much faster than normal ocean waves.
 - Can have very long wavelengths.

- **Tsunami Prediction:**
 - **Warning systems:** Systems that monitor seismic activity and ocean conditions to provide warnings.
- **Risk Reduction Measures:**
 - **Tsunami walls:** Barriers built to protect coastal areas.
 - **Land management:** Careful planning to reduce risk in coastal zones.
 - **Engineering structures:** Building structures in ways that make them more resistant to tsunami damage.

Landslides

A landslide is the movement of rock, earth, or debris down a slope.

- **Causes of Landslides:**
 - **Rainfall:** Water weakens the soil and increases weight.
 - **Snowmelt:** Similar to rainfall, snowmelt adds water to the slope.
 - **Changes in water level:** Fluctuations in water levels can affect slope stability.
 - **Erosion:** The gradual wearing away of soil and rock can destabilize slopes.
 - **Groundwater changes:** Changes in groundwater levels can impact soil stability.
 - **Earthquakes:** Earthquakes can trigger landslides.
 - **Volcanic activity:** Volcanoes can cause lahars (mudflows) and landslides.
 - **Human activities:** Construction, deforestation, and other human actions can make slopes unstable.
- **Types of Landslides:**
 - **Rotational slides:** Landslides where the soil mass rotates along a curved surface.
 - **Translational slides:** Movement along a flat surface.
 - **Block slides:** A large block of rock or soil slides downhill.
 - **Rock falls:** Rocks fall freely from a cliff or steep slope.
 - **Rock toppling:** Rocks rotate and fall over.
 - **Lateral spreading:** Soil spreads horizontally, often due to liquefaction during earthquakes.
 - **Debris flows:** A mixture of soil, rock, and water flowing down a slope.
- **Natural Causes of Landslides:**
 - **Saturation of slope material from intense rain**
 - **Earthquakes**

- Erosion
- Volcanic eruptions
- **Human Causes of Landslides:**
 - Deforestation
 - Changes to drainage
 - Construction
 - Mining
- **Effects of Landslides:**
 - Disruption of transport
 - Flooding
 - Damage to infrastructure
 - Damage to buildings
- **Preventive Measures:**
 - Retaining walls
 - Drainage systems
 - Stabilizing slopes
 - Vegetation

Nuclear Hazards

- **Nuclear Energy:**
 - Energy stored in the nucleus of an atom.
 - Used to generate electricity through nuclear fission.
- **Nuclear Power Plants in India:**
 - Kudankulam (Tamil Nadu)
 - Kaiga (Karnataka)
 - Kakrapar (Gujarat)
 - Narora (Uttar Pradesh)
 - Rajasthan (Rajasthan)
 - Tarapur (Maharashtra)
- **Effects of Nuclear Hazards:**
 - **Somatic effects:** Affect the exposed individual (e.g., cancer).
 - **Genetic effects:** Affect future generations.

- **Control Measures:**
 - Prevent leaks and accidents.
 - Enforce safety regulations.
 - Dispose of waste properly.
 - Monitor radiation levels.
 - Protect workers.
- **Disposal of Nuclear Waste:**
 - **High-level waste:** Requires special handling and storage due to high radioactivity.
 - **Medium-level waste:** Solidified and disposed of in mines or underwater.
 - **Low-level waste:** Disposed of in designated sites.
- **Nuclear Accidents:**

Year	Location	Accident	Severity (INES)
1952	Chalk River, Canada	NRX reactor accident	Not specified
1957	Windscale Pile, UK	Windscale fire	Level 5
1979	Three Mile Island, USA	Partial meltdown	Level 5
1980	Saint Laurent des Eaux, France	Fuel channel meltdown	Level 4
1986	Chernobyl, Ukraine	Chernobyl disaster	Level 7 (Worst)
1987	Goiânia, Brazil	Radioactive contamination	Level 5
1999	Tokaimura, Japan	Nuclear accident at fuel plant	Level 4
2011	Fukushima, Japan	Nuclear disaster	Level 7 (Second Worst)

Chemical and Industrial Hazards

- **Chemical Accident:** An unintentional release of hazardous substances that can harm people or the environment.
- **Factors Leading to Chemical Disasters:**
 - Fire
 - Explosion
 - Toxic releases
 - Poisoning
- **Sources of Chemical Disasters:**

- Manufacturing plants
 - Storage facilities
 - Transportation
- **Initiators of Chemical Accidents:**
 - Equipment failures
 - Human error
 - Lack of information
 - Organizational errors
 - Natural calamities
 - Terrorist attacks
- **Accident Reduction:**
 - Follow regulations.
 - Provide safety equipment (fire extinguishers, etc.).
 - Training on safety procedures.
 - Regular safety checks.
- **Types of Industrial Hazards:**
 - **Chemical hazards:** Exposure to harmful chemicals.
 - **Physical hazards:** Hazards that can cause physical stress (noise, machinery, etc.).
 - **Biological hazards:** Hazards from working with people, animals, or infectious materials.

Industrial Disasters Case Study:

Bhopal Gas Tragedy (India, 1984)

- A catastrophic release of toxic gas from a Union Carbide pesticide plant killed thousands and injured hundreds of thousands more. The incident highlighted the dangers of industrial negligence and inadequate safety measures.
- **Benxihu Colliery Explosion (China, 1942)**
- One of the deadliest coal mine disasters in history, the explosion claimed over 1500 lives. The incident underscored the perilous working conditions in the mining industry and the importance of safety protocols.
- **Halifax Explosion (Canada, 1917)**

- A massive explosion caused by a ship collision devastated the city of Halifax, resulting in widespread destruction and loss of life. The disaster emphasized the potential hazards of transporting hazardous materials.
- **Chernobyl Disaster (Ukraine, 1986)**
- The world's worst nuclear power plant accident released large amounts of radiation into the environment, causing widespread contamination and long-term health effects. The incident highlighted the risks associated with nuclear power and the need for robust safety measures.

What is a Fire Hazard?

A fire hazard is anything that can start a fire or make a fire worse. This includes things like:

- **Open flames:** candles, matches, lighters
- **Heat sources:** stoves, ovens, heaters
- **Sparks:** electrical equipment, welding
- **Flammable materials:** gasoline, paint, paper
- **Electrical problems:** faulty wiring, overloaded outlets

Common Fire Hazards

Fire hazards can be found in many places, including:

- **Homes:** kitchen appliances, electrical cords, fireplaces
- **Workplaces:** machinery, chemicals, electrical equipment
- **Public places:** buildings, transportation

How Fires Start

For a fire to start, you need three things:

- **Heat:** a source of heat, like a flame or spark
- **Fuel:** something that can burn, like wood or paper
- **Oxygen:** the air we breathe

Types of Fires

Fires are classified based on what is burning:

- **Class A:** Ordinary combustibles like paper, wood, and cloth
- **Class B:** Flammable liquids like gasoline and oil
- **Class C:** Electrical equipment
- **Class D:** Combustible metals
- **Class K:** Cooking oils and fats

Fire Safety

To prevent fires:

- Keep flammable materials away from heat sources.
- Unplug appliances when not in use.
- Have smoke alarms and test them regularly.
- Create a fire escape plan.
- Know how to use a fire extinguisher.

Climate Change

Climate change refers to the long-term changes in Earth's climate, including variations in temperature, precipitation, wind patterns, and other factors. These changes are influenced by both natural processes and human activities.

Humans are accelerating climate change by releasing greenhouse gases into the atmosphere, mainly through the burning of fossil fuels.

Main Causes of Climate Change

- **Greenhouse gas emissions:** These gases trap heat in the atmosphere, causing the planet to warm.
- **Deforestation:** Cutting down forests reduces the Earth's ability to absorb carbon dioxide.
- **Overuse of natural resources:** Excessive consumption and resource depletion contribute to climate change.
- **Pollution:** Air, water, and land pollution all play a role in altering the climate.
- **Solar output changes:** Variations in the sun's energy output can influence climate.
- **Volcanic eruptions:** Eruptions release aerosols that can affect the climate.

Factors Affecting Climate Change

- **Natural factors** (take a very long time to cause climate change):
 - **Continental drift:** The slow movement of continents over millions of years changes the Earth's landmass and ocean currents, impacting climate patterns.
 - **Volcanic eruptions:** Eruptions release gases and ash that can block sunlight and cause temporary cooling.
 - **Changes in Earth's orbit:** Variations in Earth's orbit can affect the amount and distribution of solar energy reaching the Earth, leading to long-term climate cycles.
- **Anthropogenic factors** (mainly caused by humans):
 - **Greenhouse gases:** Gases like carbon dioxide, methane, and nitrous oxide trap heat in the atmosphere, leading to global warming.
 - **Atmospheric aerosols:** Tiny particles in the atmosphere that can affect temperature and cloud formation.

- **Shift in land-use patterns:** Deforestation and changes in land use alter how the Earth absorbs and reflects solar energy.

Potential Effects of Climate Change in India

- **Extreme heat:** More frequent and intense heat waves, particularly affecting agriculture and human health.
- **Changing rainfall patterns:** Increased variability in monsoons, with drier dry years and wetter wet years.
- **Droughts:** More frequent and severe droughts, impacting water resources and agriculture.
- **Groundwater depletion:** Increased stress on groundwater resources due to higher demand and changing rainfall.
- **Glacier melt:** Melting Himalayan glaciers threaten water resources in northern India.
- **Sea-level rise:** Higher sea levels increase the risk of flooding in coastal areas, and can cause saltwater contamination.

India's Response to Climate Change

- **National Action Plan on Climate Change (NAPCC):** A plan outlining policies and programs to address climate change.
- **National Clean Energy Fund:** Funding to support clean energy initiatives and research.
- **Paris Agreement:** India has committed to reduce emissions intensity and increase renewable energy.
- **International Solar Alliance:** A partnership to promote solar energy.
- **Bharat Stage (BS) Emission Norms:** Regulations to reduce air pollution from vehicles.

What is Greenhouse Gas?

Greenhouse gases trap heat in the Earth's atmosphere, causing a warming effect.

Examples of Greenhouse Gases

- Water vapor
- Carbon dioxide
- Methane
- Nitrous oxide
- Ozone

Global Warming Definition

Global warming refers to the gradual increase in Earth's average surface temperature, primarily due to the increase of greenhouse gases in the atmosphere.

What is Global Warming?

Global warming is a significant increase in the Earth's temperature over a relatively short period (a century or two). While the concept has been controversial, scientific data strongly supports that the Earth's temperature is rising. This rise has various negative impacts on the environment and human life.

Causes of Global Warming

- **Man-made Causes:**
 - Deforestation
 - Use of Vehicles
 - Chlorofluorocarbons (CFCs)
 - Industrial Development
 - Agriculture
 - Overpopulation
- **Natural Causes:**
 - Volcanoes
 - Water Vapor
 - Melting Permafrost
 - Forest Fires

Effects of Global Warming

- **Rising Temperatures:** Increasing global temperatures cause melting glaciers, rising sea levels, and extreme weather events.
- **Threats to ecosystems:** Damage to coral reefs, changes in plant and animal life.
- **Climate Change:** Increased droughts, floods, and overall climate instability.
- **Spread of Diseases:** Changes in temperature and humidity can facilitate the spread of diseases.
- **High mortality rates:** Extreme weather events and disease outbreaks can lead to increased death rates.
- **Loss of Natural Habitat:** Animals and plants lose their habitats due to changes in climate, leading to migration and even extinction.

Global Goals

The Paris Agreement is an international agreement aiming to limit global warming to well below 2 degrees Celsius above pre-industrial levels. It emphasizes the need for countries to reduce greenhouse gas emissions.

Key takeaway: Climate change is a serious challenge with global implications. Both natural and human-caused factors contribute to climate change. The effects of climate change are already being felt, and actions are needed to mitigate its impacts.

What is Vulnerability?

Vulnerability is the degree to which a community, building, service, or area is at risk of being harmed or disrupted by a hazardous event. It depends on factors like the design and strength of buildings, protection of valuable things, public knowledge about risks, and how seriously officials take the risks. Ignoring good environmental practices can also increase vulnerability.

There are different types of vulnerability:

- **Physical Vulnerability:** How easily physical things like buildings and infrastructure are damaged by a hazard (earthquakes, floods, etc.). Location and design play a role here.
- **Economic Vulnerability:** The impact a hazard has on economic activities, including business disruption, job loss, and poverty. Different sectors of the economy have different vulnerabilities.
- **Social Vulnerability:** How hazards affect vulnerable groups, such as the poor, the elderly, children, people with disabilities, and pregnant women. Access to information and support networks influence this.
- **Environmental Vulnerability:** The impact a hazard has on the natural environment. Resource depletion and environmental degradation (like pollution or increasing salt in water) make the environment more vulnerable.

Capacity:

Capacity is the combination of resources, skills, and strengths within a community or organization that helps reduce the risk of disasters or lessen their effects.

Examples of things that improve capacity:

- Strong, permanent houses
- Land ownership
- Enough food and income
- Family and community support in emergencies
- Knowledge of local risks
- Effective leaders and good management

DISASTER MANAGEMENT CYCLE

The disaster management cycle outlines the steps to manage and reduce the impacts of disasters.

- **Mitigation:** Taking actions to prevent disasters or minimize their damage *before* they happen (examples: buying insurance, strengthening buildings, and early warning systems). It's also important to continue mitigation *after* disasters.
- **Preparedness:** Planning and getting ready to handle an emergency *before* it occurs (examples: making evacuation plans, stockpiling food and water, and training people).
- **Response:** Taking action to protect lives and property *during* an emergency. It's about putting preparedness plans into action (examples: seeking shelter and evacuating).

- **Recovery:** Actions taken to return to a normal or even safer situation *after* an emergency (examples: financial aid, repairing buildings, and rebuilding infrastructure).
[Image of a disaster management cycle chart, moving from pre-disaster phase through disaster response and post-disaster recovery.]



What is Risk?

Risk is the possibility of suffering harm or loss because of a disaster. It's usually calculated by combining how likely the disaster is to happen and how severe the consequences would be.

1. Risk Assessment

Before taking steps to reduce risk, we need to assess it. This involves:

- **Hazard Identification:** Figuring out what types of disasters could occur in a given area (e.g., floods, earthquakes).
- **Vulnerability Assessment:** Evaluating which parts of the community (people, infrastructure, systems) are most likely to be damaged by those hazards.
- **Exposure Analysis:** Determining how many people and assets are in the path of potential hazards.
- **Impact Analysis:** Estimating how much damage and disruption a disaster could cause.

2. Risk Reduction

Once risks are understood, strategies are implemented to reduce them:

- **Mitigation Strategies:** These are long-term actions to prevent disasters or lessen their impact (examples: building codes for safer structures, land-use planning to avoid high-risk areas, and retrofitting existing buildings to make them stronger).
- **Preparedness Plans:** Developing and practicing emergency response plans so that communities are ready when a disaster happens. This includes evacuation procedures and making sure emergency services are prepared.

Resilience in Disaster Management

Resilience is more than just surviving a disaster; it's about bouncing back and even thriving afterward. A resilient community can absorb the shock of a disaster, adapt to the new conditions, and recover quickly.

1. Building Resilience

Here's how to make communities more resilient:

- **Strengthening Infrastructure:** Building things like homes, bridges, and power lines to withstand disasters (examples: flood defenses, earthquake-resistant buildings).
- **Community Engagement:** Involving local people in the planning and response process. This uses their knowledge and addresses their specific needs.
- **Strong Economic and Social Systems:** A diverse economy and strong social support networks make it easier to recover from disruptions and adapt to change.

2. Resilience Measures:

Actions that directly increase resilience include:

- **Adaptive Capacity:** Giving people and systems the tools they need to adjust to new conditions and recover quickly.
- **Recovery Planning:** Making plans ahead of time for how to quickly rebuild and recover after a disaster. This might include financial assistance, temporary housing, and other forms of support.

Interrelation of Risk and Resilience

Risk and resilience are connected.

- **Risk-Informed Resilience Planning:** We must understand the risks to make effective plans to increase resilience. If we know the hazards and vulnerabilities, we can focus resilience measures on the most important areas.
- **Feedback Loops:** By making communities more resilient, we often reduce future risks. For instance, stronger buildings mean less damage and fewer injuries in future disasters.
- **Dynamic Approach:** Because hazards change (new ones emerge, others get worse) and communities also change, risk and resilience planning must be an ongoing process. Assessments and strategies need regular updates.