

# Causes, Impact and Distribution of Earthquake

Earthquakes are powerful natural phenomena that occur when the Earth's tectonic plates suddenly shift, releasing immense amounts of energy. These shaking ground movements can have devastating effects on the surrounding area.



**Dr. Jagdish Chand**  
Asst. Prof, Geography  
Govt. College Sangrah



# Causes of Earthquakes



## Tectonic Plate Movement

Earthquakes are primarily caused by the movement and collision of Earth's tectonic plates. Plate boundaries are regions of high seismic activity.



## Fault Lines

Earthquakes often occur along fault lines, which are cracks or fractures in the Earth's crust where tectonic plates meet and grind against each other.



## Volcanic Activity

Volcanic activity can also trigger earthquakes as magma movement and eruptions put stress on the surrounding tectonic plates and fault lines.



# Tectonic Plate Movements

The Earth's surface is composed of massive tectonic plates that are constantly shifting and colliding. This movement creates powerful forces that can trigger earthquakes, volcanic eruptions, and other geological events. The gradual, imperceptible motion of these plates over millions of years is a primary driver of seismic activity around the world.



# Fault Lines and Fault Types

1

## Fault Lines

Fractures in the Earth's crust where tectonic plates meet and move.

---

2

## Strike-Slip Faults

Plates slide past each other horizontally.

---

3

## Normal Faults

Plates move apart, causing the upper plate to drop down.

---

4

## Reverse Faults

Plates move towards each other, causing the upper plate to be pushed up.

Fault lines are the fractures in the Earth's crust where tectonic plates meet and move. The main fault types are strike-slip, normal, and reverse faults, each with distinct plate movement patterns that impact the resulting earthquakes.

# Magnitude and Intensity Scales

Earthquakes are measured using two main scales: magnitude and intensity. **Magnitude** measures the total amount of energy released by the earthquake, while **intensity** measures the shaking and damage at a specific location.

Magnitude	Measures the total energy released
Intensity	Measures the local shaking and damage

The **Richter scale** is the most commonly used magnitude scale, ranging from 1 to 10. Each whole number increase represents a 10-fold increase in energy release. The **Modified Mercalli Intensity (MMI)** scale ranges from I (no shaking) to XII (total destruction), based on observed effects.



# Impact of Earthquakes



## Structural Damage

Earthquakes can cause catastrophic damage to buildings, roads, bridges, and other critical infrastructure, leaving a trail of destruction in their wake.



## Loss of Life and Injuries

Earthquakes can result in significant loss of life and countless injuries, as buildings collapse and debris traps or injures people.



## Economic Consequences

The financial impact of earthquakes can be devastating, with billions of dollars in property damage, disruption of business operations, and long-term economic recovery efforts.

# Structural Damage

## Building Collapse

Earthquakes can cause catastrophic failure of buildings and infrastructure, leading to the complete collapse of structures. This can result in massive property damage and loss of life.

## Cracked Foundations

The intense shaking of an earthquake can crack and destabilize building foundations, compromising the structural integrity and making the structure unsafe.

## Damaged Utilities

Earthquakes often disrupt critical utilities like water, electricity, and gas lines, compounding the damage and hampering emergency response efforts.

## Bridge Failures

Bridges and overpasses are especially vulnerable to earthquake damage, with many collapsing or becoming impassable, isolating communities and disrupting transportation.



# Loss of Life and Injuries

## Catastrophic Impacts

Earthquakes can lead to catastrophic loss of life, with entire buildings collapsing and trapping occupants. Powerful tremors can also cause severe injuries, from broken bones to traumatic brain injuries.

## Vulnerable Populations

The elderly, children, and those with disabilities are particularly vulnerable during earthquakes, as they may have difficulty evacuating or seeking shelter in time.

## Long-Term Effects

Survivors of major earthquakes often suffer from long-term psychological trauma, PTSD, and other mental health issues in the aftermath of such devastating events.



# Economic Consequences

1

## Massive Financial Losses

Earthquakes can cause immense economic damage, with costs for rebuilding infrastructure, repairing property, and compensating for business interruptions often reaching into the billions of dollars.

2

## Disruption of Supply Chains

Damaged transportation networks, power grids, and distribution channels can disrupt the flow of goods and services, leading to supply shortages and further economic hardship.

3

## Decreased Tourism and Investment

The aftermath of a major earthquake can deter tourists and discourage new businesses and investments, hampering long-term economic recovery.



# Earthquake Preparedness

1

## Identifying Risks

Assess the earthquake hazards in your local area and develop a personalized preparedness plan tailored to the specific risks you face.

2

## Securing Your Home

Ensure your home and its contents are properly secured to withstand earthquake shaking, including anchoring furniture, water heaters, and heavy appliances.

3

## Stockpiling Supplies

Assemble an emergency kit with essential items like water, non-perishable food, flashlights, batteries, first aid kit, and other necessary supplies.



# Earthquake Early Warning Systems



## Early Warning

Earthquake early warning systems detect the initial seismic waves and send alerts before the destructive waves arrive, allowing people to take protective measures.



## Sensor Networks

These systems rely on dense networks of seismic sensors that quickly transmit data to central processing centers to analyze and issue alerts.



## Alerts

Alerts can be delivered through various channels, including mobile apps, public alarm systems, and notifications to critical infrastructure like transportation and utility providers.



# Earthquake Risk Mitigation Strategies

## Building Codes

Enforcing strict building codes that require earthquake-resistant construction is crucial to minimize structural damage during quakes.

## Retrofitting Structures

Retrofitting existing buildings and infrastructure with bracing, dampers, and base isolators can significantly improve their seismic resilience.

## Early Warning Systems

Earthquake early warning systems can provide crucial seconds of advance notice, allowing people to take protective actions before shaking arrives.

## Community Preparedness

Educating the public on earthquake risks and preparedness, as well as coordinating emergency response plans, can save lives and reduce losses.