

What is Inside Our Earth?

- The Structure of the Earth:

Crust: The outermost layer, thin and solid.

Mantle: A semi-fluid layer beneath the crust, convection currents here drive tectonic movement.

Outer Core: Liquid iron and nickel, generating Earth's magnetic field.

Inner Core: Solid, composed of iron and nickel, extremely hot.

Convection Currents: Heat from the Earth's core causes the mantle to move, driving tectonic plates.

What Are Tectonic Plates?

Tectonic Plates: Large, rigid pieces of the Earth's crust that float on the semi-fluid mantle below.

Major Plates: African Plate, North American Plate, Eurasian Plate, Indo-Australian Plate, Pacific Plate, South American Plate.

Plate Boundaries: Plates interact at boundaries, causing geological events (volcanoes, earthquakes, mountain formation).

- Types of Boundaries:

Constructive: Plates move apart (e.g. Mid-Atlantic Ridge).

Destructive: Plates move towards each other (e.g. Himalayas).

Conservative: Plates slide past each other (e.g. San Andreas Fault).

Where Do Volcanoes and Earthquakes Happen?

Volcanoes: Typically occur at convergent or divergent boundaries.

Earthquakes: Most common at transform or convergent boundaries, where plates grind or collide.

- Plate Boundaries in Europe:

Iceland: Divergent boundary, frequent volcanic activity.

Italy: Convergent boundary, prone to both earthquakes and volcanoes (e.g. Mount Vesuvius).

Why Do Volcanoes Erupt?

Magma Movement: As magma rises towards the Earth's surface, pressure builds up. When pressure is released, it causes an eruption.

- Types of Magma:

Basaltic: Low viscosity, non-explosive eruptions.

Andesitic/Rhyolitic: High viscosity, more explosive eruptions.

Volcanic Hot Spots: Areas where magma rises through the Earth's crust (e.g. Hawaii, Iceland).

What Happens When a Volcano Erupts?

- Eruption Types:

Effusive: Lava flows steadily (e.g. Kilauea in Hawaii).

Explosive: Violent eruptions, producing ash, pyroclastic flows (e.g. Mount St. Helens).

Primary Hazards: Lava flows, ash clouds, pyroclastic flows, gas emissions.

Secondary Hazards: Lahars (volcanic mudflows), tsunamis (if undersea), climate effects (e.g. cooling due to ash in the atmosphere).

What is a Supervolcano?

Supervolcanoes: Volcanoes that have erupted with a magnitude far greater than normal volcanoes, capable of changing global climate.

Example: Yellowstone (USA), Campi Flegrei (Italy).

Potential Impact: Can cause massive loss of life, long-term climate disruption (e.g. volcanic winter).

What Happens During an Earthquake?

Tectonic Plate Movement: Earthquakes are caused by sudden movements of tectonic plates.

Focus: The point beneath the Earth's surface where the earthquake starts.

Epicentre: The point on the Earth's surface directly above the focus.

Seismic Waves: Waves that travel through the Earth (Primary Waves, Secondary Waves, Surface Waves).
Effects: Ground shaking, surface rupture, landslides, tsunamis.

Why Do People Live in Dangerous Places?

Economic Opportunities: Areas with volcanic soil are fertile for agriculture.

Geothermal Energy: Volcanic regions (e.g. Iceland) use geothermal energy for heating and power.

Tourism: Some volcanoes and earthquake-prone regions are popular tourist destinations.

Cultural or Historical Significance: Many major cities (e.g. Naples, Rome) are located near tectonic hazard zones for their historical or economic importance.

Are All Tectonic Hazards the Same?

- Differences:

Volcanoes: Can provide fertile soil, geothermal energy, but pose eruption hazards.

Earthquakes: No benefits, just destruction, but can also result in the formation of mountains and new landforms over time.

Tsunamis: Result from undersea earthquakes, not directly linked to plate boundaries but associated with tectonic activity.

How Can the Danger Be Reduced?

Prediction: Studying seismic activity, monitoring volcanoes, and using technology to predict eruptions and earthquakes.

Preparedness: Educating people on evacuation procedures, strengthening buildings.

Mitigation: Engineering solutions like earthquake-resistant structures, lava diversion channels, and controlled volcanic eruptions.

Government Policies: Zoning laws to limit construction in high-risk areas.

What Happens During a Tsunami?

Causes: Tsunamis are usually caused by underwater earthquakes, volcanic eruptions, or landslides.

How Tsunamis Work:

- Underwater tectonic shifts displace large amounts of water, sending waves across the ocean.
- These waves can travel across entire oceans, building up in height as they reach shallow coastal waters.

Impact: Flooding, destruction of infrastructure, loss of life, and damage to ecosystems.

Key Terms

Tectonic Plates: Large pieces of the Earth's surface that move and can cause earthquakes and volcanoes.

Volcanic Eruption: When a volcano erupts, releasing hot lava, ash, and gases from below the Earth's surface.

Epicentre: The point on the Earth's surface directly above where an earthquake starts.

Seismic Waves: Waves of energy that travel through the Earth during an earthquake or volcanic eruption.

Tsunami: Large ocean waves caused by underwater earthquakes or volcanic eruptions that can flood coastal areas.

Revision Questions

- 1) What are the main layers of the Earth, and what is their role in tectonic processes?
- 2) Explain the difference between divergent, convergent, and transform plate boundaries.
- 3) Where are most volcanoes and earthquakes found, and why?
- 4) What factors determine whether a volcanic eruption is explosive or effusive?
- 5) Describe the primary and secondary hazards associated with a volcanic eruption.
- 6) What is a supervolcano, and how does it differ from a regular volcano?
- 7) How do earthquakes occur, and what is the difference between the focus and epicentre of an earthquake?
- 8) Why do people choose to live in areas that are prone to volcanic eruptions and earthquakes?
- 9) In what ways can the risks of tectonic hazards be reduced or managed?
- 10) What causes a tsunami, and how does its impact differ from other tectonic hazards?

