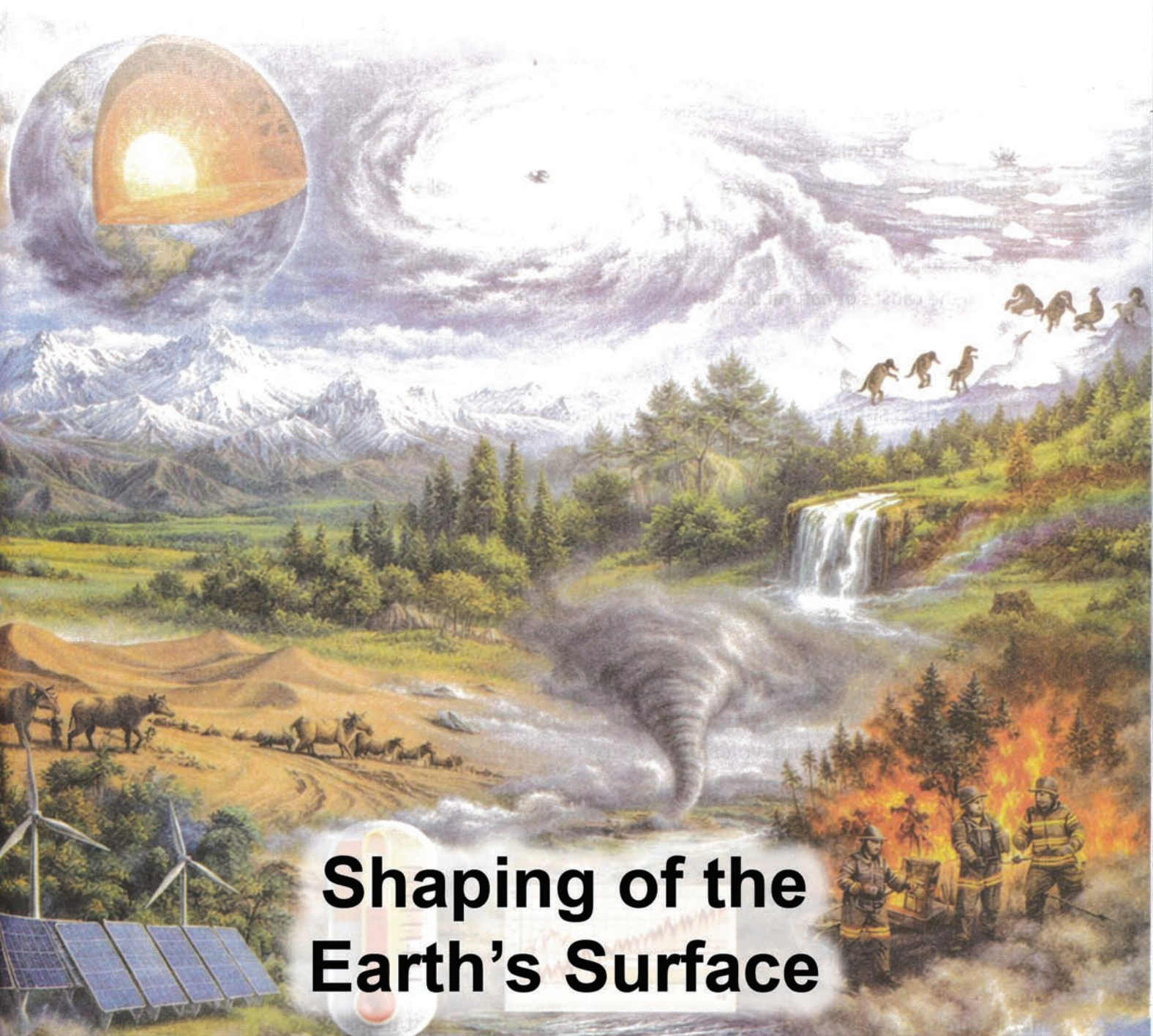


# SOCIAL SCIENCE

## Class IX



## Shaping of the Earth's Surface

### Erosion

Erosion is the process by which weathered rock materials are carried away from one place and transported to another by natural agents such as running water, wind, glaciers, waves and underground water. Unlike weathering, erosion involves movement of rock particles from their original place.

Erosion plays a major role in reshaping the earth's surface. It removes loose rock particles, transports them over short or long distances and deposits them in new locations. Over time, this continuous process leads to the formation of various landforms such as valleys, river plains, deltas and coastal features.

## Importance of Erosion

Erosion is important because:

- ◆ It helps in the formation of landforms such as valleys, canyons and beaches.
- ◆ It contributes to soil formation by breaking down rocks and transporting sediments.
- ◆ It helps in shaping river courses and floodplains, which are useful for agriculture.
- ◆ It transports minerals and nutrients from one place to another, enriching soil in different regions.
- ◆ It plays a role in the natural cycle of landscape development by wearing down highlands and filling lowlands.

**Table: Difference between Weathering and Erosion**

Basis	Weathering	Erosion
Meaning	Breaking down of rocks into smaller pieces in their original place.	Carrying away of weathered materials from one place to another.
Movement	No movement of rock material.	Involves movement of rock material.
Agents	Temperature, air, water, plants, and microorganisms.	Running water, wind, glaciers, waves, and underground water.
Process	Only breaks rocks into smaller pieces.	Removes, transports, and deposits materials.
Speed	Generally a slow process.	Can be slow or fast depending on the agent.
Example	Cracking of rocks due to freeze-thaw.	River carrying soil and depositing it as silt

## 2.4 AGENTS OF GRADATION

Gradation is the process by which the earth's surface is gradually levelled down through the combined action of weathering, erosion, transportation and deposition. The natural forces that carry out these processes are called the Agents of Gradation.

The main agents of gradation are explained in detail below:

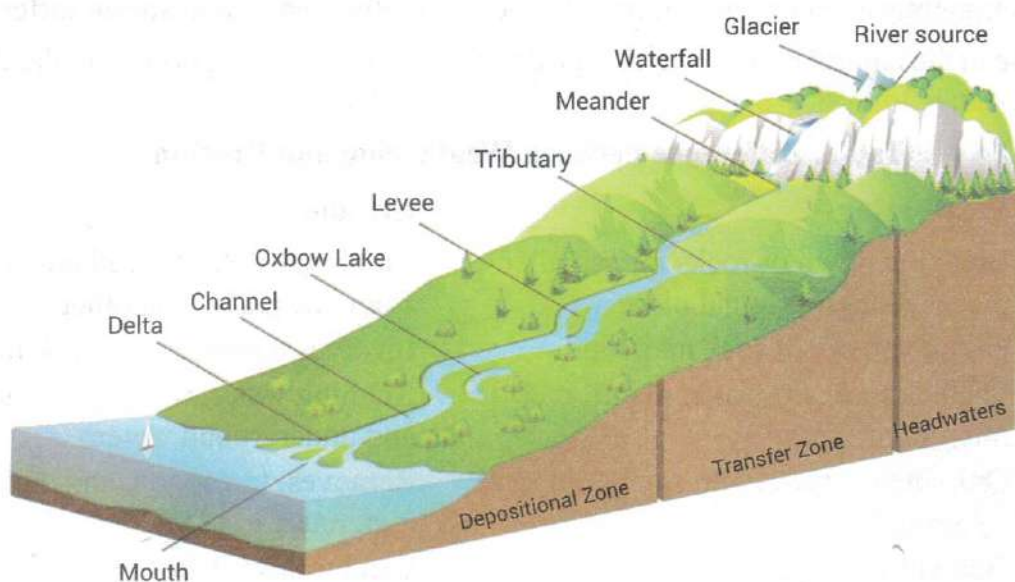
### Rivers

Rivers are one of the most powerful and important agents of gradation. As rivers flow from higher regions to lower regions, they perform three main functions—erosion, transportation and deposition.

In their upper course, rivers flow with great speed and energy, which enables them to erode the land

by cutting into rocks and soil. They pick up and carry eroded materials such as sand, silt, pebbles and rocks downstream. As the river reaches flatter areas in its middle and lower course, its speed decreases and it begins to deposit the materials it has been carrying.

Over long periods of time, this continuous process of erosion, transportation, and deposition shapes the landscape and leads to the formation of various landforms such as V-shaped valleys, waterfalls, floodplains, levees and river plains.



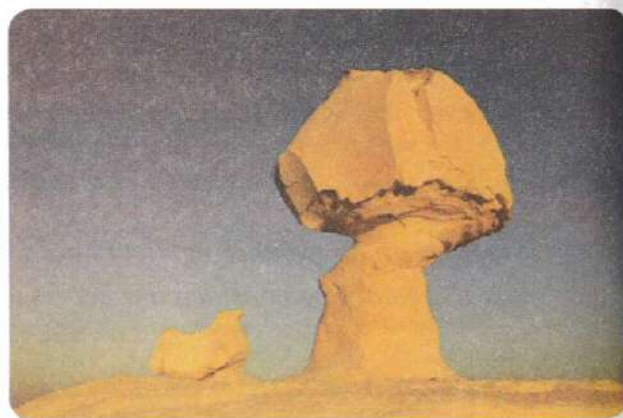
*River system*

## Wind

Wind acts as an important agent of gradation, especially in dry and desert regions where vegetation is sparse and the ground is largely exposed. In such areas, there is little plant cover to hold the soil together, making it easier for wind to erode the surface

Wind performs three main functions—erosion, transportation, and deposition. It lifts loose sand and fine dust particles from the ground and carries them over short or very long distances. This process of wind erosion is known as abrasion, in which moving sand particles strike and wear down rocks. When the speed of the wind decreases, it loses its carrying capacity and begins to deposit the materials it was transporting.

Wind erosion is most effective in regions where the land surface is dry, loose and devoid of vegetation, such as deserts and arid landscapes. Over time, this process leads to the formation of landforms like sand dunes and mushroom-shaped rocks.



*Mushroom-shaped rock*

## Waves and Ocean Currents

The action of waves and ocean currents plays an important role in shaping coastal regions. Waves continuously strike the shoreline with great force, exerting pressure on coastal rocks and cliffs. Over time, this repeated pounding gradually weakens and wears away the rocks along the coast.

Waves erode coastal landforms by hitting the shore with force, loosening rock material, and carrying away broken fragments. This process of coastal erosion can create features such as cliffs, caves, arches and sea stacks.

Ocean currents, which are continuous movements of ocean water, help in transporting the eroded material along the coastline. When the energy of waves and currents decreases, the carried material is deposited in new locations. This deposition leads to the formation of coastal features such as beaches, sandbars, spits and lagoons. Thus, waves and ocean currents work together in both erosion and deposition, continuously reshaping coastal landscapes.



*Cliff*



*Lagoon*

## **Glaciers**

Glaciers are large masses of ice that move very slowly over land. They are found mainly in extremely cold regions, such as high mountain areas and polar regions like Greenland and Antarctica. Although their movement is slow, glaciers are powerful agents of gradation because of their enormous weight and grinding action.

As glaciers move, they scrape and grind the land beneath them, a process known as abrasion. They also pick up rock fragments through a process called plucking, in which pieces of rock are pulled out and frozen into the ice. These rock materials are then carried over long distances as the glacier flows.

This continuous movement results in extensive erosion of the landscape, carving out deep valleys and reshaping the surface of the land. Over time, glaciers create distinctive landforms such as U-shaped valleys, cirques, aretes and moraines.



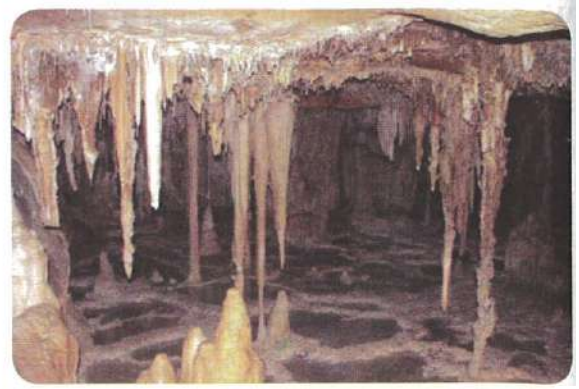
*Moraines*

## **Underground Water**

Underground water is another important agent of gradation. Rainwater seeps through tiny cracks and pores in the soil and rocks and gradually moves below the earth's surface. As it flows underground, this water dissolves soluble rocks such as limestone and slowly enlarges natural cracks and passages.

The action of underground water weakens rocks beneath the surface and creates hollow spaces or caves over time. In some areas, when these underground cavities become too large, the surface land may collapse, forming features such as sinkholes.

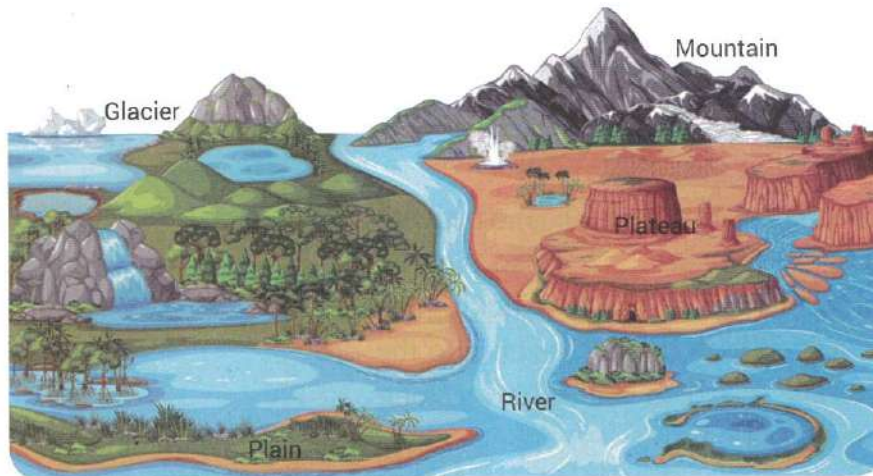
Through these processes, underground water slowly but continuously modifies and shapes the landscape from below, leading to the formation of landforms like caves, stalactites and stalagmites.



*Stalactites and stalagmites*

## **2.5 MAJOR LANDFORMS AND THEIR FORMATION**

The combined action of weathering, erosion, transportation and deposition results in the formation of major landforms on the earth's surface. These landforms do not appear suddenly; instead, they develop slowly over thousands and even millions of years through continuous natural processes.



*Major landforms*

Landforms are shaped by both internal forces (such as tectonic movements and volcanic activity) and external forces (such as weathering, erosion and deposition). Internal forces create major relief features like mountains and plateaus, while external forces modify and shape them further by breaking down, transporting and depositing materials.

Landforms are not permanent. They are continuously modified by natural forces. While some landforms are worn down, others are built up through deposition. This ongoing process maintains balance on the Earth's surface.

The major landforms and their formation are explained in detail below:

## **Mountains**

Mountains are very high landforms that rise steeply above the surrounding land. They usually have steep slopes, high ridges and sharp or rounded peaks. Mountains are formed mainly by powerful internal forces inside the earth, especially the movement of tectonic plates.

Mountains can be classified into three main types based on how they are formed: Fold Mountains, Volcanic Mountains and Block (Fault) Mountains.

**Fold Mountains:** They are formed when two tectonic plates move towards each other and collide at a convergent boundary. Due to immense pressure, the rock layers between the plates get compressed, bent and folded instead of breaking.

These folded rock layers are then pushed upward to form high mountain ranges. They often contain deep valleys and sharp peaks. The Himalayas (Asia), the Alps (Europe) and the Rocky Mountains (North America) are some common examples of fold mountains.

**Volcanic Mountains:** They are formed when molten material called magma rises from inside the Earth through cracks in the crust. When magma reaches the surface, it is called lava. The lava spreads over the surface, cools and hardens. Over time, repeated volcanic eruptions build up layers of lava and ash, forming a mountain.

Volcanic Mountains are often cone-shaped and may have a crater at the top. Some may remain active, while others become dormant or extinct. Mount Fuji (Japan), Mount Kilimanjaro (Africa) and Mount Vesuvius (Italy) are some common examples of volcanic mountains.

## **Plateaus**

Plateaus are high, flat-topped landforms that rise sharply above the surrounding area and usually have steep sides. They are sometimes called tablelands because their top surface is relatively level like a table. Plateaus can be very large and are often referred to as the Roofs of the World when they occur at very high elevations.



*The Himalayas*



*Mount Fuji*



*The Sierra Nevada*

## Formation of Plateaus

Plateaus are formed mainly in two ways:

**By Tectonic Uplift (Movement of Earth's Crust):** When tectonic plates move, they can push large areas of land upward without folding them much. Instead of forming mountains, the land is lifted as a broad, flat surface, creating a plateau. This type of plateau is usually surrounded by steep slopes or escarpments. For example, Tibetan Plateau.

**By Volcanic Activity (Lava Deposition):** Sometimes, huge amounts of molten lava spread over large areas through cracks in the earth's crust. This lava cools and solidifies layer by layer over time. Repeated eruptions build up thick layers of basalt rock, forming a lava plateau. For example, Deccan Plateau (India) – formed by extensive volcanic lava flows in the past.

## Plains

Plains are large, flat or gently sloping, and low-lying areas of land. They are among the most important landforms for human settlement because they are generally fertile, easy to cultivate, and suitable for building roads, houses and industries. Most of the world's population lives on plains.

Plains are mainly formed by deposition of sediments brought by different agents such as rivers, waves and glaciers over a very long period of time.

### River Plains

Rivers originate in high mountains and carry large amounts of eroded material such as sand, silt and clay. When the river reaches flatter land, its speed decreases and it starts depositing these materials. Over thousands of years, continuous deposition builds up thick layers of alluvium (fertile soil), forming broad, flat plains.



*Indo-Gangetic Plain*

River plains are very fertile due to nutrient-rich alluvial soil and highly suitable for agriculture. They are densely populated and economically important. For example, Indo-Gangetic Plain (India) – formed by the rivers Indus, Ganga, and Brahmaputra.

### Coastal Plains

Coastal plains are formed along sea coasts by the combined action of rivers and waves. Rivers bring sediments from inland areas and deposit them near the coast. Waves and ocean currents also deposit sand and other materials along the shoreline. Over time, these deposits create flat land along the coast. They are often suitable for fishing, ports and agriculture. Eastern Coastal Plain of India along the Bay of Bengal is an example of coastal plain.

### Glacial Plains

Glacial plains are formed when glaciers melt and leave behind large amounts of rock debris such as sand, gravel and clay. These materials are spread over large areas, forming gently rolling or flat plains. They are less fertile than river plains in many places and often found in cold or previously glaciated regions. Plains formed in parts of northern Europe and North America after the Ice Age is an example of glacial plain.

### Valleys

Valleys are low-lying areas of land found between hills or mountains. They are usually elongated and often have a river, stream or glacier flowing through them. Valleys are formed mainly by the processes of erosion caused by running water or moving ice over long periods of time.

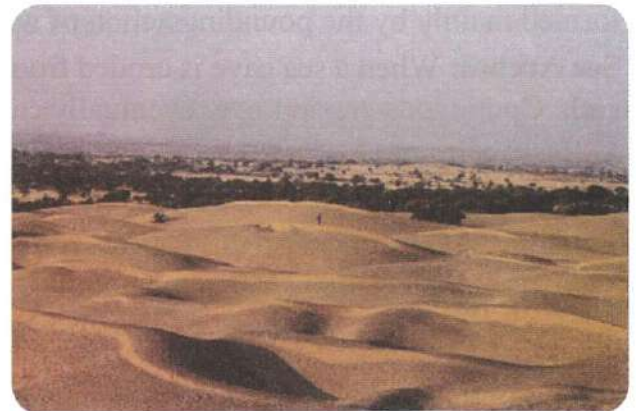
Valleys can be broadly classified into two main types based on how they are formed: V-shaped valleys (river valleys) and U-shaped valleys (glacial valleys).

**V-shaped Valleys (River Valleys):** These valleys are formed by river erosion, especially in mountainous or hilly regions. In the upper course of a river, the water flows swiftly and has great cutting power. The river erodes the land mainly downward (vertical erosion), cutting deep into the bedrock. Over time, this continuous downward erosion creates a narrow valley with steep sides.

**U-shaped Valleys (Glacial Valleys):** These valleys are formed by glacial erosion in cold mountainous regions. A glacier moves slowly down a pre-existing river valley. As it moves, the glacier scrapes, widens, and deepens the valley through processes like abrasion and plucking. This transforms the originally V-shaped valley into a broad U-shaped valley.

### Deserts

Deserts are very dry regions that receive very little rainfall, usually less than 25 cm per year. They are characterised by sparse vegetation, dry air and extreme temperature conditions. Sahara Desert (Africa) – the largest hot desert in the world and Thar Desert (India) are some common examples of deserts.



Thar desert

## Formation of Deserts

Deserts are formed mainly due to:

**Low Rainfall:** Some regions receive very little rain because they are far from oceans. In some cases, mountains block rain-bearing winds, creating rain-shadow deserts.

**Extreme Temperature Conditions:** Deserts may experience very high temperatures during the day and very low temperatures at night. High evaporation rates reduce moisture in the soil and air.

**Role of Wind in Shaping the Landscape:** Wind is the most important agent of gradation in deserts. It removes loose sand and dust through erosion and deposits them elsewhere, continuously reshaping the landscape.

## Coastal Landforms

Coastal landforms are formed along the shoreline by the combined action of waves and ocean currents. These agents shape the coast through erosion, transportation and deposition over long periods of time.

### Formation of Coastal Landforms

Coastal landforms are formed due to:

- ◆ Waves continuously strike the coast with force and erode rocks along the shoreline.
- ◆ Ocean currents transport the eroded material along the coast.
- ◆ When the energy of waves decreases, this material is deposited, forming new landforms.

### Major Coastal Features

**Cliffs:** They are steep, almost vertical rock faces along the coast. They are formed when powerful waves repeatedly erode the base of coastal rocks.

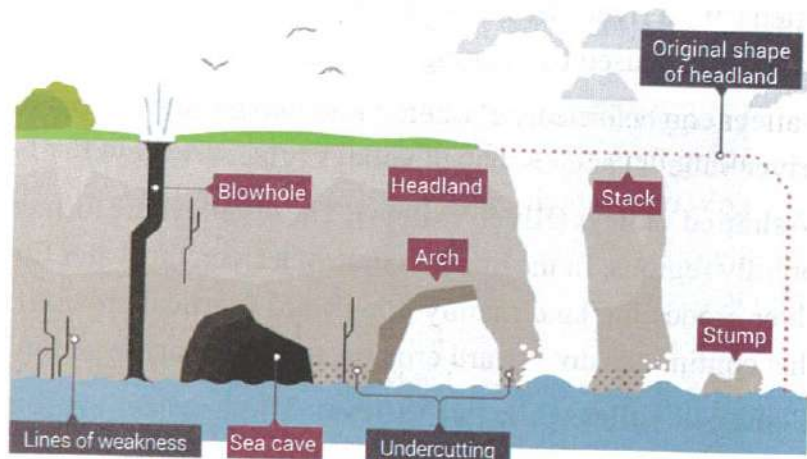
**Beaches:** Beaches are formed by the deposition of sand, pebbles and sediments brought by waves and currents. They are usually found along gently sloping coastlines.

**Sea Caves:** They are hollow spaces formed when waves erode weak or soft rocks along the coastline. They are formed mainly by the pounding action of waves and abrasion.

**Sea Arches:** When a sea cave is eroded from both sides and breaks through a headland, it forms a sea arch. Continuous erosion may eventually cause the arch to collapse.

**Spits:** A spit is a long, narrow stretch of sand or shingle that extends into the sea from the coast. It is formed by deposition of sediments due to longshore drift (movement of sand along the coast).

**Lagoons:** A lagoon is a shallow water body formed behind a spit or sandbar. It is separated from the open sea but may connect at some points.



Major Coastal Features

## 2.6 LANDFORMS AND NATURAL DISASTERS

Social Science is a composite subject that consists of several disciplines. Each discipline studies society from a different perspective and contributes to a better understanding of social life.

Natural disasters are sudden and often violent events that can cause widespread damage to life, property and the environment. Many of these disasters are closely linked to landforms and the natural processes occurring on and inside the earth. The shape of the land, its structure and the forces acting upon it determine the type and intensity of disasters that occur in a region.

According to the syllabus, the major natural disasters include:

- ◆ Earthquakes
- ◆ Landslides
- ◆ Avalanches
- ◆ Glacial Lake Outburst Floods (GLOF)
- ◆ Dust storms

These disasters are usually triggered by movements inside the earth, such as tectonic activity or by rapid changes on the earth's surface caused by weather, climate or human activities.

### Earthquakes

An earthquake is a sudden shaking or trembling of the Earth's surface caused by the release of energy within the Earth's crust. This energy is released when rocks inside the Earth break or shift along fault lines. The released energy travels in the form of seismic waves, which cause vibrations that are felt on the surface.

Earthquakes are closely linked to the movement of tectonic plates and the presence of faults in the Earth's crust. Most earthquakes occur along plate boundaries, where plates collide, move apart, or slide past each other. Therefore, regions located near plate boundaries, such as the Pacific Ring of Fire, are more prone to earthquakes.

Earthquakes can significantly alter landforms. They may create cracks in the ground, uplift land to form new ridges, or cause subsidence (sinking of land). In some cases, earthquakes can also trigger landslides, avalanches, and tsunamis, further changing the landscape.



*Earthquakes*

### Landslides

A landslide is the sudden downward movement of large masses of rock, soil, mud, or debris along a slope under the influence of gravity. Landslides are most common in hilly and mountainous regions where the land is steep and unstable.

Several natural and human factors contribute to landslides. Steep slopes make it easier for materials to slide downwards. Loose or weak soil and rock layers reduce stability and increase the chances of movement. Heavy rainfall adds water to the soil, making it



*Landslides*

slippery and heavier, which can trigger a landslide. Earthquakes can also shake the ground and loosen materials, causing them to collapse.

Landslides can significantly reshape the landscape by removing material from one place and depositing it in another. They can block rivers, leading to flooding upstream, and may cause the formation of temporary lakes. Landslides also cause serious damage to settlements, roads, bridges, and other infrastructure, and can result in loss of life and property.

## **Avalanches**

An avalanche is the rapid and sudden movement of a large mass of snow, ice, and sometimes rock debris down a mountain slope. Avalanches mainly occur in high mountain regions that receive heavy snowfall and have steep slopes.

Several factors can trigger avalanches, including fresh snowfall, changes in temperature, vibrations from earthquakes, strong winds, or human activities such as skiing and blasting. When the snow layer becomes unstable, it can break loose and slide downward with great speed and force.

Although avalanches are made up mainly of snow, they behave much like landslides and can cause severe destruction. They can uproot and destroy vegetation, damage or bury houses and infrastructure, and block roads and mountain passes. Avalanches can also alter mountain slopes by removing large amounts of snow and rock material from one area and depositing it in another.



*Avalanches*

## **Glacial Lake Outburst Floods (GLOF)**

Glacial lakes are formed when glaciers melt and the melted water accumulates in depressions or behind natural barriers made of ice, rock, or loose debris (called moraines). In some cases, these natural barriers become weak due to melting, heavy rainfall, or earthquakes and suddenly collapse. When this happens, a huge volume of water rushes out rapidly, resulting in a Glacial Lake Outburst Flood (GLOF).

GLOFs are extremely dangerous and can cause sudden and devastating flooding in downstream areas. They lead to severe erosion of riverbanks and valleys, destroy bridges, roads, and settlements, and often result in loss of life and property. Such events are common in high mountain regions like the Himalayas where glaciers and glacial lakes are present.

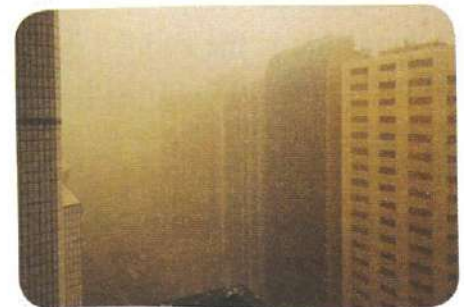


*Glacial Lake Outburst Floods (GLOF)*

## **Dust Storms**

Dust storms are strong winds that lift and carry large amounts of loose soil and sand into the air. They occur mainly in dry regions where the ground is barren and vegetation is sparse.

Dust storms reduce visibility, making travel difficult and dangerous. They also cause soil erosion by removing the fertile topsoil, which affects agriculture and the environment. Inhaling dust particles can also cause health problems for humans and animals.



*Dust Storms*

Dust storms are most common in arid and semi-arid regions, such as deserts and dry plains, where there is little plant cover to hold the soil in place. These storms clearly show how wind acts as a powerful agent of gradation, especially under extreme climatic conditions.

## **Importance of Disaster Mitigation**

Disaster mitigation refers to the measures and actions taken to reduce or minimize the harmful effects of natural disasters before they occur. It involves planning, preparedness, and preventive steps to lessen damage to life, property, and the environment.

Understanding landforms and Earth processes plays a very important role in disaster mitigation because it helps us:

**Identify disaster-prone areas:** Knowledge of tectonic plates, fault lines, mountains, floodplains, and coastal regions helps scientists and planners identify areas that are more likely to experience earthquakes, landslides, floods or cyclones.

**Reduce risks through planning:** Based on this understanding, governments can plan safer settlements, build earthquake-resistant buildings, construct dams and embankments, and create early warning systems for disasters like floods and cyclones.

**Protect human life and property:** Proper disaster preparedness, such as evacuation plans, disaster drills, and public awareness, can save lives and reduce economic losses during disasters.

**Promote sustainable development:** Mitigation helps in making development more environmentally safe by avoiding construction in high-risk zones and encouraging responsible use of natural resources. Thus, disaster mitigation is essential for creating safer communities and reducing the long-term impact of natural disasters on society and the environment.

# TERMS

<b>Crust</b>	: the outermost and thinnest layer of the Earth where we live, made of rocks and minerals
<b>Mantle</b>	: the thick layer beneath the crust, made of molten and semi-molten material called magma
<b>Core</b>	: the innermost layer of the Earth, extremely hot and dense, mainly composed of iron and nickel
<b>Magma</b>	: molten rock material found beneath the Earth's surface inside the mantle
<b>Tectonic Plates</b>	: large, rigid pieces of the Earth's crust that move slowly over the semi-molten mantle

<b>Plate Tectonics</b>	: a scientific theory that explains the movement of tectonic plates and how they shape the Earth's surface
<b>Divergent Boundary</b>	: a plate boundary where two tectonic plates move away from each other, forming new crust
<b>Convergent Boundary</b>	: a plate boundary where two tectonic plates move towards each other and collide, forming mountains or volcanoes
<b>Transform Boundary</b>	: a plate boundary where two tectonic plates slide past each other, causing earthquakes
<b>Weathering</b>	: the process by which rocks break down into smaller pieces at the same place without being moved
<b>Erosion</b>	: the process by which weathered rock material is carried away from one place to another by natural agents
<b>Physical Weathering</b>	: the breaking of rocks into smaller pieces without any change in their chemical composition
<b>Chemical Weathering</b>	: the breakdown of rocks due to chemical reactions that change their composition
<b>Biological Weathering</b>	: the breakdown of rocks caused by plants, animals, and microorganisms
<b>Gradation</b>	: the process by which the Earth's surface is levelled through weathering, erosion, transportation, and deposition
<b>Agents of Gradation</b>	: natural forces such as rivers, wind, glaciers, waves, and underground water that shape the land
<b>Alluvium</b>	: fine and fertile soil deposited by rivers on plains and floodplains
<b>Glacier</b>	: a large mass of ice that moves slowly over land and reshapes the landscape through erosion
<b>Landform</b>	: a natural feature of the Earth's surface such as mountains, plains, plateaus, or valleys
<b>Earthquake</b>	: a sudden shaking of the Earth's surface caused by the movement of rocks along faults in the Earth's crust

# Structure

- The Earth's surface is uneven and constantly changing due to natural forces.
- Internal forces originate inside the Earth and include earthquakes, volcanoes, and plate movements.
- External forces act on the Earth's surface and include wind, water, ice, waves, and underground water.
- The Earth is made up of three main layers: crust, mantle, and core.
- The crust is the outermost and thinnest layer of the Earth.
- The crust includes both continents and ocean floors.
- The mantle lies below the crust and is much thicker than it.
- The mantle contains molten and semi-molten material called magma.
- The core is the innermost, hottest, and densest layer of the Earth.
- The core is mainly composed of iron and nickel.
- The core is divided into the outer core (liquid) and inner core (solid).
- Seismic waves help scientists study the Earth's interior.
- The Earth's crust is broken into several large and small tectonic plates.
- Tectonic plates float on the semi-molten mantle.
- Tectonic plates move very slowly but continuously.



5. Tectonic plates float on the:
- (a) Core (b) Crust  
(c) Semi-molten mantle (d) Ocean floor
6. Which type of plate movement forms rift valleys?
- (a) Convergent (b) Transform (c) Vertical (d) Divergent
7. The Himalayas were formed due to:
- (a) Divergent plate movement (b) Transform plate movement  
(c) Convergent plate movement (d) Volcanic eruption
8. Which plate movement mainly causes earthquakes without forming mountains?
- (a) Convergent (b) Divergent (c) Transform (d) Vertical
9. Weathering refers to:
- (a) Transportation of rocks (b) Deposition of sediments  
(c) Breaking of rocks in the same place (d) Movement of soil by wind
10. Which process does NOT involve movement of rock material?
- (a) Erosion (b) Deposition  
(c) Transportation (d) Weathering
11. Match the following values with their meanings and choose the correct option.

Column A	Column B
(i) Crust	(a) Innermost layer
(ii) Mantle	(b) Made of magma
(iii) Outer Core	(c) Outermost layer
(iv) Inner Core	(d) Liquid in nature

**Options:**

- (a) (i)–(c), (ii)–(b), (iii)–(d), (iv)–(a) (b) (i)–(b), (ii)–(c), (iii)–(a), (iv)–(d)  
(c) (i)–(c), (ii)–(d), (iii)–(b), (iv)–(a) (d) (i)–(a), (ii)–(b), (iii)–(c), (iv)–(d)

12. Match the following values with their meanings and choose the correct option.

Column A	Column B
(i) Divergent	(a) Earthquakes
(ii) Convergent	(b) Rift valleys
(iii) Transform	(c) Mountains
(iv) Volcanic	(d) Lava plateau

**Options:**

- (a) (i)–(b), (ii)–(c), (iii)–(a), (iv)–(d) (b) (i)–(c), (ii)–(a), (iii)–(b), (iv)–(d)  
(c) (i)–(a), (ii)–(b), (iii)–(c), (iv)–(d) (d) (i)–(d), (ii)–(c), (iii)–(b), (iv)–(a)

- Answers:** 1. (c) 2. (d) 3. (c) 4. (b) 5. (c) 6. (d)  
7. (c) 8. (c) 9. (c) 10. (d) 11. (a) 12. (a)

## II. Assertion-Reason Questions

Two statements are given as Assertion (A) and Reason (R). Study the statements carefully and identify the correct alternative:

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
- (c) (A) is true but (R) is false.
- (d) (A) is false but (R) is true.

1. **Assertion (A):** The Earth's surface is constantly changing.

**Reason (R):** Internal and external forces continuously act on the Earth.

2. **Assertion (A):** The mantle plays an important role in plate movement.

**Reason (R):** Heat from the core creates convection currents in the mantle.

3. **Assertion (A):** Weathering is necessary before erosion can occur.

**Reason (R):** Weathering breaks rocks into smaller pieces.

4. **Assertion (A):** Transform plate boundaries mainly cause earthquakes.

**Reason (R):** Plates slide past each other without creating new landforms.

5. **Assertion (A):** Rivers create fertile plains.

**Reason (R):** Rivers deposit nutrient-rich alluvium on plains.

**Answers:** 1. (a)                      2. (a)                      3. (a)                      4. (a)                      5. (a)

## III. Fill in the blanks

1. The outermost layer of the Earth is called the .....
2. The layer of the Earth that lies directly below the crust is the .....
3. The innermost layer of the Earth is known as the .....
4. Molten rock material found beneath the Earth's surface is called .....
5. The Earth's crust is divided into large pieces called .....

**Answers:** 1. Crust                      2. Mantle                      3. Core                      4. Magma                      5. Tectonic Plates

## IV. Write True or False for the below statements

1. The Earth's surface is constantly changing due to natural processes.
2. The crust is the thickest layer of the Earth.
3. The mantle lies directly below the crust.
4. The core is mainly composed of iron and nickel.
5. Seismic waves help scientists study the Earth's interior.

**Answers:** 1. True                      2. False                      3. True                      4. True                      5. True

## V. Very short answer type questions

1. Name the outermost layer of the Earth.
2. Which layer of the Earth lies directly below the crust?
3. What is the innermost layer of the Earth called?
4. Name the molten material found inside the mantle.
5. What are the large pieces of the Earth's crust called?

## VI. Short answer type questions

1. Describe the three main layers of the Earth.
2. Explain why direct observation of the Earth's interior is not possible.

3. What are tectonic plates? Why are they important?
4. Describe any two types of plate movements.
5. Explain how convection currents in the mantle influence plate movement.

## VII. Long answer type questions

1. Explain the structure of the Earth with the help of a neat, labelled diagram.
2. Describe the composition, characteristics, and significance of the crust, mantle, and core.
3. Explain the Theory of Plate Tectonics and discuss its importance in shaping the Earth's surface.
4. Describe the different types of tectonic plates and locate major plates on a world map.
5. Explain the three types of plate movements with suitable diagrams and examples.

## COMPETENCY-FOCUSED PRACTICE QUESTIONS WITH ANSWERS

### I. Multiple Choice Questions

1. Cracking of rocks due to temperature changes is an example of:
 

(a) Chemical weathering	(b) Biological weathering
(c) Physical weathering	(d) Erosion
2. Plant roots breaking rocks is an example of:
 

(a) Physical weathering	(b) Chemical weathering
(c) Biological weathering	(d) Erosion
3. Erosion differs from weathering because erosion:
 

(a) Breaks rocks chemically	(b) Does not involve agents
(c) Involves movement of materials	(d) Occurs only in deserts
4. Which of the following is NOT an agent of erosion?
 

(a) Wind	(b) Rivers	(c) Glaciers	(d) Sunlight
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5. Gradation includes all EXCEPT:
 

(a) Weathering	(b) Erosion	(c) Transportation	(d) Volcanism
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6. Which agent of gradation is most active in deserts?
 

(a) River	(b) Wind	(c) Glacier	(d) Underground water
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7. Mushroom-shaped rocks are formed mainly due to:
 

(a) River erosion	(b) Wind erosion	(c) Glacial erosion	(d) Volcanic activity
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8. U-shaped valleys are formed by:
 

(a) Rivers	(b) Wind	(c) Glaciers	(d) Waves
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9. Which landform is formed by river deposition?
 

(a) V-shaped valley	(b) Plateau	(a) Floodplain	(d) Cliff
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10. Which landform is best suited for agriculture?
 

(a) Mountains	(b) Plateaus	(c) Plains	(d) Deserts
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11. Match the following values with their meanings and choose the correct option.

Column A	Column B
(i) Physical	(a) Roots breaking rocks
(ii) Chemical	(b) Freeze-thaw action
(iii) Biological	(c) Rusting of rocks
(iv) In weathering	(d) No movement of rocks

**Options:**

- (a) (i)-(b), (ii)-(c), (iii)-(a), (iv)-(d)                      (b) (i)-(c), (ii)-(a), (iii)-(b), (iv)-(d)  
 (c) (i)-(a), (ii)-(b), (iii)-(c), (iv)-(d)                      (d) (i)-(d), (ii)-(c), (iii)-(a), (iv)-(b)

12. Match the following values with their meanings and choose the correct option.

Column A	Column B
(i) River	(a) Sand dunes
(ii) Wind	(b) U-shaped valley
(iii) Glacier	(c) Floodplain
(iv) Waves	(d) Sea arch

**Options:**

- (a) (i)-(c), (ii)-(a), (iii)-(b), (iv)-(d)                      (b) (i)-(a), (ii)-(b), (iii)-(c), (iv)-(d)  
 (c) (i)-(d), (ii)-(c), (iii)-(a), (iv)-(b)                      (d) (i)-(b), (ii)-(d), (iii)-(a), (iv)-(c)

- Answers:** 1. (a)                      2. (c)                      3. (c)                      4. (d)                      5. (d)                      6. (b)  
 7. (b)                      8. (c)                      9. (c)                      10. (c)                      11. (a)                      12. (a)

## II. Assertion-Reason Questions

Two statements are given as Assertion (A) and Reason(R). Study the statements carefully and identify the correct alternative:

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).  
 (b) Both (A) and (R) are true but (R) is not the correct explanation of (A).  
 (c) (A) is true but (R) is false.                      (d) (A) is false but (R) is true.

- Assertion (A):** Wind erosion is more common in deserts.  
**Reason (R):** Deserts have little vegetation to hold soil together.
- Assertion (A):** U-shaped valleys are formed by glaciers.  
**Reason (R):** Glaciers erode land through plucking and abrasion.
- Assertion (A):** Coastal areas have features like caves and arches.  
**Reason (R):** Waves continuously erode the coastline.
- Assertion (A):** Plains are densely populated regions.  
**Reason (R):** Plains are fertile and suitable for agriculture and transport.
- Assertion (A):** Glaciers move very fast.  
**Reason (R):** Glaciers are heavy masses of ice.

- Answers:** 1. (a)                      2. (a)                      3. (a)                      4. (a)                      5. (a)

### III. Fill in the blanks

1. When tectonic plates move away from each other, the movement is called ..... movement.
2. Mountains like the Himalayas are formed due to ..... plate movement. Answer: Convergent
3. The breaking down of rocks in their original place is known as .....
4. The movement of weathered material from one place to another is called .....
5. Weathering that involves plant roots breaking rocks is called ..... weathering.
6. The combined process of weathering, erosion, transportation, and deposition is known as .....

**Answers:** 1. Divergent    2. Convergent    3. Weathering    4. Erosion    5. Biological    6. Gradation

### IV. Write True or False for the below statements

1. Tectonic plates move rapidly and change position within a few years.
2. Convergent plate movement results in the formation of rift valleys.
3. Transform plate boundaries mainly cause earthquakes.
4. Weathering involves the transportation of rock material.
5. Physical weathering changes the chemical composition of rocks.

**Answers:** 1. False    2. False    3. True    4. False    5. False

### V. Very short answer type questions

1. Name any one major tectonic plate.
2. Which type of plate movement forms fold mountains?
3. What is the process of breaking rocks in the same place called?
4. Name any one agent of erosion.
5. What is the combined process of weathering, erosion, transportation, and deposition known as?

### VI. Short answer type questions

1. Differentiate between weathering and erosion.
2. Describe any two types of weathering with examples.
3. Explain the importance of weathering in soil formation.
4. What is gradation? Name any two agents of gradation.
5. Explain the role of rivers as agents of gradation.

### VII. Long answer type questions

1. Describe the processes of weathering and erosion and explain how they differ from each other.
2. Explain the types of weathering with suitable examples.
3. Discuss the role of rivers as agents of gradation and the landforms formed by them.
4. Explain how wind acts as an agent of gradation and describe the landforms formed by wind action.
5. Describe the role of glaciers in shaping the Earth's surface and explain the landforms formed by glacial erosion and deposition.