

CLASS 9 SOCIAL SCIENCE

PART 1 • CHAPTER 2

SHAPING OF THE EARTH'S SURFACE

Exam Preparation Notes

These notes summarise the chapter's key concepts, processes, landforms and disaster-related ideas for revision.

1. Shaping of the Earth's Surface

Main idea: The Earth's surface is constantly changing because of powerful forces acting from within the Earth and on its surface. These forces create, wear down and reshape landforms.

Landform: A landform is a natural feature of the Earth's surface formed by processes such as weathering, erosion, deposition and movement of the Earth's crust. Examples include mountains, valleys, plateaus, plains, deserts and coastal features.

2. Plate Tectonics

Theory of plate tectonics: The theory explains that the Earth's outer rigid layer is divided into large and small pieces called tectonic plates. These plates move slowly over the softer, mobile layer beneath them.

Layers of the Earth: Crust: the outermost layer. Mantle: the thick layer beneath the crust. Core: the innermost part of the Earth. The crust and uppermost mantle together form the lithosphere.

Lithosphere and asthenosphere: The lithosphere is the rigid outer layer made up of the crust and upper mantle. Beneath it lies the asthenosphere, a hot, mobile layer of partially molten rock that allows tectonic plates to move.

Types of plates: Continental plates carry continents; oceanic plates carry ocean floors; mixed plates carry both continents and oceans.

Movement of plates: Heat from the Earth's interior causes convection currents in the mantle. Hotter material rises and cooler material sinks. This movement helps push and pull tectonic plates.

Major plates: Major plates include the Pacific, Eurasian, African, North American, South American, Indo-Australian and Antarctic plates.

Convergent boundary: Two plates move towards each other. Collision between continental plates can form fold mountains such as the Himalaya. When an oceanic plate meets a continental plate, the oceanic plate may sink beneath it, contributing to earthquakes and volcanic activity.

Divergent boundary: Two plates move away from each other. Magma rises and forms new crust. Mid-ocean ridges, such as the Mid-Atlantic Ridge, are examples.

Transform boundary: Two plates slide past one another. Crust is not created or destroyed at the boundary, but the movement can cause earthquakes. The San Andreas Fault is an example.

Effects of plate movement: Plate movements help form mountains, valleys, ocean basins and volcanoes, and are associated with earthquakes. Many earthquakes and volcanoes occur near plate boundaries. The zone around the Pacific Ocean is known as the Ring of Fire.

3. Internal and External Forces

Internal (endogenic) forces: Forces originating inside the Earth, including tectonic movements, folding, faulting, earthquakes and volcanic activity. They can build or suddenly alter major landforms.

External (exogenic) processes: Processes acting on the Earth's surface, including weathering, erosion and deposition. They gradually break down, transport and lay down material, reshaping landforms.

Weathering: The breakdown of rocks at or near the Earth's surface. Physical weathering occurs through processes such as heating and cooling; chemical weathering changes minerals through reactions with water, air or acids; biological weathering results from plants, animals or micro-organisms.

Erosion: The wearing away and transport of soil, rocks and other surface materials by agents such as running water, wind, glaciers and waves. Unlike weathering, erosion involves the movement of material.

Deposition: The laying down of material carried by water, wind, ice or waves when the transporting agent loses energy.

4. Landforms Made by Running Water

Waterfalls: A waterfall forms where river water drops suddenly over a steep step or rock ledge. Waterfalls may attract tourists and can sometimes be used to generate hydroelectric power.

Meanders: A meander is a winding bend in a river, commonly found in its middle or lower course. The river erodes the outer bank and deposits sediment on the inner bank. These areas may support farming, settlements, irrigation and navigation.

Deltas: A delta forms at the mouth of a river where it enters a sea, ocean or lake and deposits sediment. Deltas often have fertile alluvial soil and support agriculture, fishing, settlements and transport, but they may be vulnerable to flooding. The Sundarbans is a well-known delta region.

5. Coastal Landforms Made by Waves and Currents

Beaches: A beach is an accumulation of sand, pebbles or rocks along the shore, formed by the deposition of material by waves. Beaches support tourism and fishing and can help reduce the impact of waves on the coast.

Coastal erosion: Waves, tides and currents wear away coastal land. Erosion creates cliffs, wave-cut or shore platforms, caves, arches and stacks.

Sequence of coastal features: Waves erode weak rock to form a sea cave. Continued erosion may enlarge the cave into an arch. When the arch collapses, an isolated pillar of rock called a sea stack may remain.

6. Landforms Made by Glaciers

Glacial erosion: Moving glaciers scrape, widen and deepen the land. They form U-shaped valleys, cirques, arêtes, hanging valleys and fjords.

U-shaped valley: A valley widened and deepened by a moving glacier, giving it a broad U-shaped cross-section.

Cirque: A bowl-shaped depression at the head of a glacier.

Arête: A sharp ridge between glacial valleys.

Hanging valley: A smaller glacial valley that joins a deeper main valley at a higher level.

Fjord: A deep, narrow glacial valley flooded by the sea.

Moraines: Deposits of rock, soil and debris (till) carried and left behind by glaciers. Lateral moraines form along the sides; terminal moraines mark the farthest advance of a glacier; medial moraines form where the side deposits of two glaciers join. Moraines can influence soil, lakes and water resources.

Importance of glaciers: Glaciers feed rivers with freshwater and support downstream communities. Glacial landscapes also support tourism, trekking, skiing, mountaineering and, in some places, fishing and agriculture.

7. Landforms Made by Wind

Wind erosion: Strong winds lift and carry loose sand and soil, especially in dry regions with sparse vegetation.

Yardangs: Streamlined ridges of rock carved by wind erosion.

Ventifacts: Rocks polished or shaped by wind-blown sand.

Deflation hollows: Shallow depressions formed when wind removes loose surface material.

Desert pavement: A surface of coarse material left behind after finer particles are blown away.

Sand dunes: Hills or ridges of sand formed by wind. Barchan dunes are crescent-shaped; longitudinal dunes are long ridges generally parallel to the prevailing wind; star dunes have several arms and form where winds come from different directions; parabolic dunes are U-shaped and are often stabilised by vegetation.

Importance of dunes: Dunes can help protect settlements from wind and waves, influence land use, and support tourism and adventure activities.

8. Landforms Made by Underground Water

Karst topography: A landscape formed when underground water chemically weathers and dissolves soluble rocks, especially limestone.

Caves: Hollow spaces formed when water dissolves rock.

Stalactites and stalagmites: Stalactites hang down from cave ceilings; stalagmites grow upwards from cave floors. If they join, they may form a pillar.

Sinkholes or dolines: Depressions formed when the ground collapses into an underground cavity.

Underground rivers: Streams that flow through underground cave systems.

Importance: Caves and underground rivers may provide freshwater, attract tourists and researchers, and hold cultural or religious significance.

9. Landform-Related Disasters

Landslides: The sudden movement of rock, soil or debris down a slope. Causes include heavy or continuous rainfall, earthquakes, volcanic activity, steep slopes, loose or weathered rocks, deforestation, mining, road construction, unplanned hillside construction and poor drainage.

Avalanches: The sudden movement of snow down a mountain slope. Triggers include heavy snowfall, weak layers in the snowpack, sudden warming, strong winds, earthquakes and human disturbance such as skiing or construction.

Glacial Lake Outburst Floods (GLOFs): Floods caused by the sudden release of water from a glacial lake. Rapid glacier melt, heavy rain or snowfall, earthquakes, avalanches or landslides may weaken or breach the natural dam holding the lake.

Dust storms: Strong winds lift loose, dry soil and sand into the air. Drought, low rainfall, sparse vegetation, deforestation, overgrazing and poor farming practices can increase the risk.

Disaster risk reduction: Identify hazard-prone areas; use reliable warnings and local authorities' advice; improve drainage where appropriate; protect vegetation; avoid unsafe construction on slopes or flood paths; and follow evacuation instructions during an emergency.

10. How Landforms Affect Human Life

Resources and livelihoods: Landforms influence water availability, soil fertility, farming, fishing, transport, tourism and access to resources.

Settlements: People often settle in plains and river valleys because of relatively accessible land, water and fertile soils. Mountainous, desert and flood-prone areas may present different opportunities and challenges.

Culture and traditions: Landforms can shape local occupations, settlement patterns, cultural practices and stories. Some mountains, rivers, caves and other natural features are regarded as sacred.

Disaster preparedness: Understanding landforms and the processes that shape them helps people identify hazards, plan settlements more safely and prepare for disasters.

11. Quick Flowchart: How the Earth's Surface Changes

Internal forces → plate movement, folding, faulting, earthquakes and volcanic activity → major changes and new landforms.

External processes → weathering (breakdown) → erosion (wearing away and transport) → deposition (laying down material) → landforms reshaped over time.

Main agents → running water • waves and currents • glaciers • wind • underground water.

12. Important Questions with Answers

1. What is a landform? Give four examples.

Answer: A landform is a natural feature of the Earth's surface. Examples include mountains, valleys, plateaus and plains.

2. What is plate tectonics?

Answer: It is the theory that the Earth's rigid outer layer is divided into tectonic plates that move slowly over the mobile layer beneath them.

3. How are tectonic plates moved?

Answer: Heat from the Earth's interior causes convection currents in the mantle; rising and sinking material helps move the plates.

4. Differentiate between convergent, divergent and transform boundaries.

Answer: At convergent boundaries, plates move towards each other; at divergent boundaries, they move apart; at transform boundaries, they slide past one another.

5. How are plate movements related to earthquakes and volcanoes?

Answer: Plate movement and interaction build stress and can cause earthquakes. Subduction and the rise of magma at some boundaries also produce volcanic activity. Many earthquakes and volcanoes occur near plate boundaries.

6. Differentiate between weathering and erosion.

Answer: Weathering breaks down rock in place. Erosion wears away and transports rock, soil or other material.

7. What is deposition?

Answer: Deposition is the laying down of material carried by water, wind, ice or waves.

8. How is a delta formed? Why is it useful to people?

Answer: A delta forms when a river deposits sediment at its mouth. Its often-fertile alluvial soil supports farming, and delta regions may support fishing, settlements and transport.

9. How are meanders formed?

Answer: A river erodes its outer bank and deposits sediment on its inner bank, gradually forming winding bends.

10. Name four landforms formed by glacial erosion.

Answer: U-shaped valleys, cirques, arêtes and hanging valleys. Fjords are another example.

11. What are moraines?

Answer: Moraines are deposits of rock, soil and debris carried and left behind by glaciers.

12. Name three landforms produced by coastal erosion.

Answer: Sea cliffs, caves and arches; stacks and shore platforms are also examples.

13. What is Karst topography?

Answer: It is a landscape formed by the chemical weathering and dissolution of soluble rocks, especially limestone, by underground water.

14. Differentiate between stalactites and stalagmites.

Answer: Stalactites hang from cave ceilings; stalagmites rise from cave floors.

15. Mention four causes of landslides.

Answer: Heavy rainfall, earthquakes, deforestation and unplanned road or building construction on slopes. Other causes include loose rock, mining and poor drainage.

16. What is a GLOF? State two possible triggers.

Answer: A Glacial Lake Outburst Flood is caused by the sudden release of water from a glacial lake. Triggers may include failure of the natural dam, heavy rainfall, rapid glacier melt, earthquakes, avalanches or landslides.

17. How can vegetation help reduce erosion and dust storms?

Answer: Plant roots help hold soil together, while vegetation reduces the amount of loose soil exposed to wind and water.

18. Why is the study of landforms important for disaster management?

Answer: It helps identify hazard-prone regions, understand processes such as landslides and floods, plan safer settlements and prepare mitigation measures.

13. One-Minute Revision

- The lithosphere consists of the crust and the uppermost mantle.
- Convergent = plates move towards each other; divergent = plates move apart; transform = plates slide past each other.
- Weathering breaks down rock; erosion transports material; deposition lays it down.
- Running water forms waterfalls, meanders and deltas.
- Waves shape beaches, cliffs, caves, arches and stacks.
- Glaciers form U-shaped valleys, cirques, arêtes, hanging valleys, fjords and moraines.
- Wind forms yardangs, ventifacts, deflation hollows and sand dunes.
- Underground water can form caves, stalactites, stalagmites, sinkholes and underground rivers.
- The chapter discusses landslides, avalanches, GLOFs and dust storms.