



1. The Big Questions

- ① What shapes the Earth's surface?
- ② What is plate tectonics? Effects of plate movement?
- ③ How are landforms formed & classified?
- ④ How are humans & living beings connected to landforms?
- ⑤ How do disasters from landforms impact human lives?

2. Plate Tectonics

LANDFORM → A **natural feature** on Earth's surface formed by weathering, erosion, deposition & crustal movement

→ Theory given by **W.J. Morgan** — explains movement of Earth's crust

TECTONIC PLATES → Large & small pieces into which Earth's **outermost layer** is broken

Earth's Layers

Layer	Description
Crust	Outermost layer we live on (5–40 km thick)
Mantle	Thick, very hot layer below the crust
Core	Innermost layer — extremely hot & heavy

★ Crust + upper mantle = Lithosphere; below it lies the semi-molten Asthenosphere that lets plates move



3. Types of Tectonic Plates

Type	Carries
Continental plates	Continents
Oceanic plates	Ocean floors
Mixed plates	Both continents & oceans

- Major plates: **Pacific, Eurasian, African, N. American, S. American, Indo-Australian, Antarctic**
- Movement caused by **convection currents** in the mantle — hot material rises, cool material sinks

4. Plate Boundaries

Boundary	Movement & Effect
Convergent	Plates move towards each other → fold mountains (Himalaya); oceanic-continental collision → volcanoes & earthquakes
Divergent	Plates move apart → new crust forms, mid-ocean ridges (Mid-Atlantic Ridge)
Transform	Plates slide past each other → earthquakes only (San Andreas Fault)

★ Most earthquakes & volcanoes occur along plate boundaries — the "Ring of Fire" around the Pacific Ocean

- Ancient India called earthquakes '**bhūkampa**' — Varāhamihira's **Br̥hatsamhitā** linked them to Vāyu, Agni, Indra & Varuṇa

5. Process of Weathering and Erosion

WEATHERING → Breaking down of rocks **in place** — no movement of material involved

Type	Cause
Physical	Temperature change, frost, wind
Chemical	Reaction with water, air or acids
Biological	Plant roots, animals, micro-organisms

EROSION → Wearing away & **carrying** of material to another place — movement involved

- Types: **water, wind, glacial, coastal** erosion
- Impact: removes fertile topsoil (farmers), damages land near rivers/coasts, destabilises construction & mining sites

★ Sindhu-Sarasvatī civilisation used contouring, bunding, terracing, dams & canals for soil & water conservation

6. Agents of Gradation

AGENTS OF GRADATION → Natural forces — **running water, glaciers, wind, waves, groundwater** — that wear down, transport & deposit material

7. Running Water — River Landforms

River Course	Landforms
Upper course	V-shaped valleys, waterfalls, rapids
Middle course	Meanders, oxbow lakes, floodplains
Lower course	Deltas, levees, alluvial fans

WATERFALL → River flows over a steep cliff; forms where **hard rock** resists erosion above softer rock

MEANDER → Winding river bend from lateral erosion (outer bank) & deposition (inner bank)

DELTA → Fan-shaped landform at a river's mouth from sediment deposition; fertile — supports farming & fishing

★ Grand Anicut (Kallanai), Tamil Nadu — ancient use of a river for irrigation



8. Waves and Currents

→ Shape the coastline — beaches, sand bars, cliffs, caves, arches, stacks

BEACH → Sand/pebble/rock landform along the shoreline, built by **wave deposition**

Coastal Erosion Landform	Formed By
Cliff	Waves undercutting the base of the coast
Wave-cut platform	Flat area left behind as cliffs retreat
Cave → Arch → Stack	Progressive erosion of a headland

9. Glaciers

Landform	Description
U-shaped valley	Widened & deepened by a glacier
Cirque	Bowl-shaped hollow at the head of a glacier
Arete	Sharp ridge between two valleys
Fjord	Sea-flooded glacial valley

MORAINE → Rock, soil & debris (**till**) deposited by glaciers — lateral, terminal & medial types

10. Wind

Landform	Description
Yardang	Streamlined rock ridge carved by wind
Ventifact	Rock polished & shaped by sandblasting
Deflation hollow	Depression formed where loose material is removed
Desert pavement	Flat surface left after fine particles blown away

DUNES → Sand hills/ridges shaped by wind — **barchan** (crescent), **longitudinal**, **star** & **parabolic** types

11. Underground Water — Karst Topography

KARST TOPOGRAPHY → Landforms from chemical weathering & erosion by underground water, mainly in **limestone** areas

→ Caves, **stalactites** (hang from ceiling), **stalagmites** (rise from floor), sinkholes/dolines, underground rivers



12. Landforms and Disasters

LANDSLIDE → Slope failure from heavy rainfall, earthquakes, steep slopes, deforestation & unplanned construction

AVALANCHE → Sudden snow instability on steep slopes from heavy snowfall, rising temperature & wind-piled fragile layers

GLOF → **Glacial Lake Outburst Flood** — sudden release of water when a glacial lake's ice/moraine dam collapses

DUST STORM → Strong winds lifting dry, loose soil & sand; worsened by drought, deforestation & overgrazing

★ Chamoli flood, Uttarakhand (Feb 2021) — a landform-linked disaster with severe human impact



13. Before We Move On — Key Takeaways

- ① Earth = **crust + mantle + core**
- ② Interior forces (earthquakes, volcanoes, folding, faulting) move the crust
- ③ External forces (weathering, erosion) carve smaller landforms
- ④ Agents of gradation: running water, waves/tides, glaciers, wind, underground water
- ⑤ Disasters — landslides, avalanches, GLOFs, dust storms — linked to specific landforms

★ Landforms shaped human history too — rivers (Ganga, Nile, Indus) built civilisations; mountains acted as barriers & protectors; deserts (Thar) limited settlement but fostered trade routes like the Silk Route