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Our Changing Earth -2

Lesson Plan

Contents

- ▶ An overview of the forces that structure the Earth's crust
- ▶ To understand the exogenic forces that change the structure and features of the Earth's crust

Objectives

- ▶ To understand what exogenic forces operate on the Earth's crust
- ▶ To learn how they affect the Earth's lithosphere
- ▶ To know the agents of gradation
- ▶ To appreciate the impact they have on transforming the Earth's surface and landforms

■ Teacher's Aids

- ▶ Globe
- ▶ Charts of the Impact of the Agents of Gradation
- ▶ Pictures, atlas and wall maps
- ▶ Blackboard
- ▶ Internet

■ Tips for Teacher

- ▶ Explain the two forces of change—endogenic and exogenic. This chapter deals with the exogenic forces.
- ▶ Use role play by students to understand the various forces and their impact.
- ▶ Students should be encouraged to know places, locations and their placement on the maps.

■ Background and Reading

- ▶ Read the lesson aloud and explain, sharing the aids, etc., pausing to examine and explain the data in the boxes.
- ▶ Particularly focus on the agents of gradation as the tools that cause weathering.

Exogenic Forces

- ▶ Exogenic forces derive their energy from the Sun – act on the surface of the Earth through processes like weathering, mass wasting, erosion, transportation, deposition, etc.
- ▶ Weathering – depends on climatic elements involving degradation or decay of solid rocks – static process that does not involve removal of rocks – through physical, chemical or biological forces, etc. – prepares rock material for transportation by agents of gradation like rivers, glaciers, wind and sea waves.

River as an Agent of Change

- ▶ Rivers originate in mountains from glaciers or lakes – in Deccan Plateau streams combine in rainy season to form rivers.
- ▶ Origin is called source – where the river enters the sea is called the mouth – small streams joining river are tributaries.
- ▶ Three sections to a river: the upper, middle and lower course – young, mature and old stages.

The Upper Course

- ▶ Generally hilly area – steep slope causes swift flow – erodes the bed and banks
- ▶ Many types of landforms: hard, resistant rock on the course – forms a waterfall – Jog Falls, India; Angel Falls, Venezuela
- ▶ Steep-sided deep valley called gorge or canyon
- ▶ Areas of heavy rainfall, when rocks not very hard V-shaped valleys develop

The Middle Course

- ▶ Begins when river leaves hilly areas and enters plains – speed and energy decline – volume of water increases – broadening more than deepening the river
- ▶ River twists and turns – forms large bends and loops called meanders – caused by erosional and depositional work of river – on gentle slope and with enough water
- ▶ When this erosion and deposition continues – meander loop cut off from main river – forms an ox-bow lake
- ▶ During floods – river overflows – deposits sediment on surrounding areas creating flood plains
- ▶ Some sediment along banks – raised to level higher than the plain – raised banks called natural levees or levees

The Lower Course

- ▶ River approaches sea or large water body – speed decreases – capacity to transport sediment drastically reduced – hence, deposition on river bed – divides into many distributaries at the mouth
- ▶ Each distributary may have its own mouth – triangular formation called delta – Ganga and Brahmaputra together form the largest delta in the world

Ice as an Agent of Change

Glaciers

- ▶ River of ice called glacier–formed by accumulated snow–grows if annual accumulation more than its melting–moves under influence of gravity along a confined course from the place of accumulation–broadest at source and narrow where it ends
- ▶ Snowline–height above which there is permanent snow cover
- ▶ Snowfield–area of permanent snow cover
- ▶ Moves slowly in the beginning–speed more in middle than sides–average velocity: one metre per day–depending on the steepness of slope

Landforms

- ▶ Deep cracks on glacier’s surface when its movement is checked–called crevasses - movement causes erosional features in mountains or highlands and depositional features in lowlands
- ▶ Erodes landscape by bulldozing soil and stones–exposes solid rock below–armchair-shaped depressions called cirques–can fill with water when snow/ice melts to form lakes called tarns
- ▶ Glacial valley–U-shaped valley–because both sides of the valley are eroded
- ▶ Tributaries or smaller glaciers–when entering main valley–develop waterfalls–appear from the floor of main valley like a hanging valley
- ▶ Begins melting in lowlands–deposits sediments–debris and rock particles of varying sizes and shapes–called glacial moraine

Wind as an Agent of Change

- ▶ Wind–movement of air over Earth’s surface–its work as agent of change usually in arid and semi-arid regions
- ▶ Erosion and deposition
- ▶ Speed of wind important–strong wind can carry sand particles and gravel; slow wind–sediment deposited–continuous erosional work creates a variety of physical features in hot desert

Landforms

- ▶ Projecting rock in desert–can develop into a mushroom shape–wind erodes lower part more than top–wears away to make narrow base and wider top–make mushroom rocks
- ▶ Wind transports rock material–finer material like sand transported to a greater distance–coarser material in stages
- ▶ Depositional work starts when wind slows down or some obstruction comes up–sand dunes–sand in form of low hills composed of coarser material–formed in groups–sand dunes can migrate in direction of wind

- ▶ Fine dust deposited in big masses – beyond desert limits – loess deposits – massive formation with no beds or strata – about 10% of Earth’s surface covered with loess deposits – most extensive in North China

Sea Waves as an Agent of Change

- ▶ Erosion of sea mostly by waves – generated by friction of wind on water surface – radiate outward from their area of origin

Erosion and Deposition

- ▶ Modifies coastal areas – called marine erosion – ability to erode depends on the rock fragments carried by the waves – continuously strike rock masses in coastal areas – cracks widen as water forces in with great pressure – helps break rocks into smaller blocks

Landforms

- ▶ Some coasts – layer of soft rock between hard ones – joints widened into cavities – become larger and wider over time - hollowed out sea caves – frequent in limestone and chalk regions
- ▶ Over time, cavities enlarged to form sea arches
- ▶ Over time, upper portion of arch collapses – large pillars of rock left – called stacks
- ▶ Steady, slow depositional work – sea waves deposit it on offshore regions – beaches formed when sea waves reach diagonally and wind has low velocity – such as Goa, Mumbai, Chennai

Assessment Corner

Oral Assignment

- A. Ask for answers at random from the students. Confirm the right answers. Let them write down the correct answers if they like in their books.

Written Assignment

- B–G. The teacher has two options – (i) Either do these exercises orally first and then ask the students to write them down. OR (ii) Ask the students to write the answers on their own. Then the teacher can announce the correct answers to the students and ask their partners to cross-check them.

In either case, the answers can be written as homework and the teacher can check them in the class.

Think Tank

- G. **HOTS questions:** Discuss the questions in the class and let the students write the answers to H and I as homework. Teacher should assess individual work.