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Our Changing Earth – 1

Lesson Plan

Contents

- ▶ An overview of the forces that move and shape the lithosphere the Earth
- ▶ To understand the manner in which the Earth's crust was shaped and continues to be formed by endogenic forces

Objectives

- ▶ To understand the role of the movement of the lithospheric plates
- ▶ To learn how the surface of the Earth is formed by tectonic activity
- ▶ To know about endogenic and exogenic forces that create landforms
- ▶ To appreciate how to forecast seismic activity, its distribution and the precautions to be taken by us

Teacher's Aids

- ▶ Globe
- ▶ Clay models or charts showing the disturbances of volcanoes, the movement of plates, etc.
- ▶ Pictures, atlas and wall maps
- ▶ Blackboard
- ▶ Internet

Tips for Teacher

- ▶ Explain the crust and its plates and their movement.
- ▶ Use diagrams, charts and the blackboard to show how various forces move plates to create new landforms.
- ▶ 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 how landforms were created and continue to be formed, how they are distributed and how we can predict their movement.

The Forces Forming the Earth's Crust

- ▶ Crust broken into many small and large plates called lithospheric plates—floating on a semi-molten layer of asthenosphere - very slow movement, about a few millimetres a year—results in development of landforms.
- ▶ Surface area of a lithospheric or tectonic plate is very large in comparison to its thickness—margins are very important because tectonic activities like volcanoes, earthquakes, faulting, mountain-building, etc. all occur along the margins.
- ▶ Two types of forces:
- ▶ Endogenic: Originate from interior of the Earth—cause movements causing landforms—can be slow or sudden—latter cause earthquakes and volcanic eruptions. This chapter deals with the endogenic forces.
- ▶ Exogenic: originate and work on the surface of the Earth—cause widespread destruction through weathering and erosion of landforms [rivers, glaciers, wind, sea waves, etc.]

Volcanoes

- ▶ Caused by sudden movement within the Earth—called mountain of fire in ancient times—not a mountain, but a vent in the Earth's crust through which hot molten magma erupts—called lava when it reaches the surface—consists of liquid lava, fragments of rock, water, gases, etc.
- ▶ Lava collects around vent and begins to cool—successive eruptions and deposition create a conical mountain called mountain of fire in ancient times—various shapes and sizes—mouth of the vent a funnel-shaped depression called a crater.
 - (a) Active—erupt frequently, eject volcanic material—Mt Etna and Stromboli in Italy; about 550 active volcanoes in the world, mostly around the Pacific Ocean known as the Pacific Ring of Fire.
 - (b) Dormant—have not erupted in recent times, sleeping volcanoes—Mt Vesuvius in Europe and Mt Kilimanjaro in Africa.
 - (c) Extinct—have not erupted in known historical period and not likely to—Mt Kenya in Africa and Mt Aconcagua in South America.

Distribution of Volcanoes

- ▶ Usually near young fold mountains; eruption causes heavy damage to human life and property.
 - (i) Circum-Pacific Belt—most of the active volcanoes and high volcanic cones
 - (ii) Mid-world Mountain Belt—not continuous; has volcanic zones like the Alps and the Himalayas

Earthquakes

- ▶ Tectonic forces—lithographic or tectonic plate movement—cause vibrations or tremors in the Earth's crust—travel all around the world—called earthquakes.

- ▶ Focus of the earthquake—the place from which the sudden movements start—the place above the focus is called the epicentre—seismic waves travel outwards in concentric waves from here.

Types of Earthquakes

- (i) P-waves: Primary or push waves—fastest and first to be recorded on seismograph—particles move along with the waves and thus cause comparatively less damage.
- (ii) S-waves: Secondary or shake waves—particles move at right angles to the direction of movement of the waves—cannot be transmitted by liquids.
- (iii) L-waves: Surface or long waves—last to arrive—travel over Earth's surface—cause maximum damage—recorded by seismograph after P and S waves.

Causes of Earthquakes

- ▶ Those regions where rock strata is under tremendous strain—caused by tectonic forces—sudden movement of crustal blocks—in which imbalance is caused by volcanic eruptions, folding and faulting, plate movement, expansion of gases and pressure of water in man-made reservoirs.

Measurement of Earthquake Waves

- ▶ Seismograph—Records direction of movement of earthquake waves and their passage at a particular point—shows the difference in the arrival of P-waves and S-waves. Helps calculate distance of recording centre from epicentre.
- ▶ Richter Scale—Used to measure the power of an earthquake on a scale of 2 to 9—number indicates intensity or magnitude—upward shows increase in amplitude of energy released—less than 4.0 is minor and less destructive; above 6.0 can cause severe damage.

Distribution of Earthquake Belts

- ▶ Over 1 million earthquakes on Earth every year - most are minor and less destructive
- ▶ Earthquake belts:
 - (i) Circum-Pacific Belt: Includes Rockies, Andes mountains, Japan, Philippines, Indonesia, etc. These account for about 70% of all earthquakes.
 - (ii) Mid-World Mountain Belt: From Eastern Europe to Alpine—Himalaya ranges in Account for 20% of all earthquakes.
 - (iii) Remaining 10%—in the Mid Atlantic Ridge and smaller submarine ranges.

Predicting Earthquakes

- ▶ Not possible to predict—some people link it to animal behaviour: fishes agitated; snakes come out; Japanese predict by measuring changes in sea level.

Precautions During and After Earthquakes

- (i) Leave building and come into open area.
- (ii) Safe places inside—under table, desk; against an inside corner or wall; protect head with arms.

- (iii) Keep away from fire places, areas around chimneys, windows, hanging pots, mirrors, bookcases, picture frames, etc.
- (iv) Outside: Keep away from electric or telephone poles, trees, signboards, tall buildings, etc.
- (v) Public awareness – through programmes for architects, engineers, builders, house owners, government officials, etc.

Assessment Corner

Oral Assignment

- A. Ask for answers at random from the students. Confirm the right answers. It is possible some students may have learnt different stories about the beginning of the Universe. Tell them the scientific explanation. 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

- H. **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.