Volcanoes

Forces and movements arising from the interior of the Earth and causing horizontal and vertical movements are known as endogenic forces. The two kinds of endogenic forces are diastrophic and sudden movements. Volcanoes are caused by sudden movements occurring in the Earth's interior.

Volcanoes – Eruption and Structure

Causes of Volcanic Eruption

A volcano is a vent or an opening in the Earth's crust from which hot magma erupts from the interior of the Earth. Volcanoes are generally caused because of the following reasons:

a. **Presence of heat and pressure in the Earth's interior**: The heat and pressure increase as one move towards the interior of the Earth. Because rocks are bad conductors of heat, the heat gets trapped inside and builds great pressure. This pressure forces the heat to come out to the surface of the Earth through fissures and cracks.
b. **Movement of tectonic plates**: The movement of tectonic plates causes volcanic eruption. Most volcanic eruptions take place near the plate margins.
c. **Magma chamber**: Every volcano has a magma chamber which consists of molten rock materials. Because magma contains silicate, gases and water vapour, the pressure always acts vertically upwards. When it finds a route, the volcano erupts resulting in the outpouring of lava on the surface of the Earth.

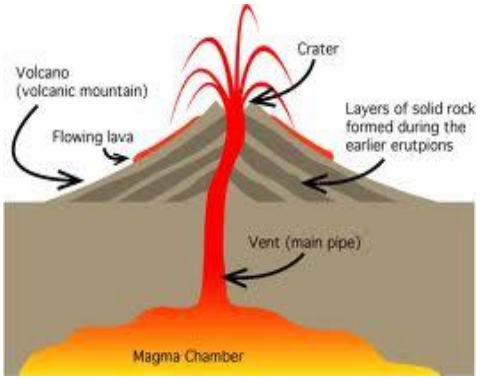
Structure of a Volcano

Vent: It is an opening from which hot magma flows out to the surface of the Earth. It is a circular pipe-like structure.

Crater: It is a circular depression in the ground caused by volcanic activity.

Magma chamber: It is here that the hot magma is stored beneath a volcano.

Volcanic cone: A volcanic cone is formed when erupted fluid and semi-fluid material begins to cool down and solidify around the vent. It is a landform caused by volcanic eruptions.



Products of a Volcano

- **Lava** is the magma (hot molten fluid) which comes out on to the surface of the Earth.
- **Pyroclasts** are the solid fragments of rock pieces which come out on the surface of the Earth during a volcanic eruption. The finest rock particles are known as **dust**.
- **Lapilli** are small stone-sized particles.
- **Gases** erupted are hydrogen sulphide, sulphur dioxide, carbon dioxide and hydrogen. A volcanic eruption is generally accompanied by steam.

Classification of Volcanoes

Classification of volcanoes based on frequency of eruptions:

Active Volcanoes

- Active volcanoes are those which have erupted in the recent past and are likely to erupt in the future.
- There are about 550 known active volcanoes.
- Some active volcanoes are Mt Etna in Italy and Mauna Loa in Hawaii.

Dormant Volcanoes

- Volcanoes which have not erupted in the recent past but can become active at any time are known as dormant volcanoes.
- Dormant volcanoes are also known as 'sleeping volcanoes'.
- Some dormant volcanoes are Mt Kilimanjaro in Africa and Mt Vesuvius in Italy.

Extinct Volcano

- Volcanoes which have not erupted in the present geological period and are not likely to erupt in the future are known as extinct volcanoes.
- Mt Aconcagua in South Africa and Mt Kenya in Africa are considered extinct volcanoes.

Classification of volcanoes based on shape:

Central volcano: This volcano is formed when debris and lava erupt out forming a symmetrical volcano.

A fissure-shaped volcano

Fissure volcano: This volcano throws out lava and fragments of rocks through fissures or cracks on the Earth's surface. Instead of building a cone, the cracks distribute lava over a vast area. The Columbian Plateau was formed by a fissure eruption.

A shield volcano

Shield volcano: When a volcano emits large quantities of hot lava, a large shield-like structure is spread over large parts of the Earth. Mauna Loa in Hawaii Islands is a shield volcano.

Conical volcano: Because of repeated eruptions, a volcano may acquire a cone-shaped structure. These volcanoes usually have steep slopes. A conical volcano is also known as a composite volcano. Mt Fuji in Japan is an example of a conical volcano.

A conical volcano

Landforms Created by Volcanic Eruption

Two types of landforms are created by volcanic eruptions. Extrusive landforms are formed on the surface of the Earth, while intrusive landforms are formed in the Earth's interior.

Extrusive Landforms

Extrusive landforms formed due to volcanic eruptions are

Conical hill: A cone-shaped hill is a typical example of an extrusive landform.

Cone: A cone is formed when rock materials and debris are thrown away by a volcanic eruption.

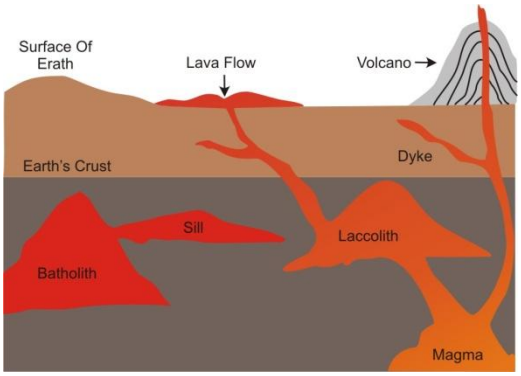
Crater: It is a bowl-shaped depression formed at the mouth of a volcano. It is formed due to the repeated eruption of a volcano.

Caldera: Because of the repeated eruption of a volcano, its summit may be blown away a number of times. In its place a large depression called caldera is formed.

Composite cone: When a volcano throws away both lava and large fragments of rocks during eruption, multiple layers of these two materials build up, resulting in the formation of a composite cone.
Volcanic shield: When lava gets solidified after flowing away from the vent, it forms a broad summit with a gentle base leading to the formation of a volcanic shield.
Lava plateau: A plateau is formed when a volcano constantly erupts over a long time at frequent intervals over a large area throwing away lava and fragments of rocks (pyroclasts). The Deccan Plateau is one such example.

Intrusive Landforms

Intrusive landforms formed due to volcanic eruptions are
Dykes: These are vertical intrusions of igneous rocks. They are formed when magma force the rock apart under the surface of the Earth.
Lopoliths: These are saucer-shaped intrusions which occur between the layers of sedimentary rocks.
Sill: A sill is a terrace-like feature which is formed between the beds of sedimentary or igneous rocks.
Batholiths: It is the large-sized intrusions in igneous rocks at great depths. They come out to the surface of the Earth during the mountain-building activity.



Various intrusive landforms built as a result of volcanic eruption

Laccoliths: These are dome-shaped intrusive landforms which forces the upper part of the rock to bulge upwards. The erosion and denudation of the Earth's surface bring laccoliths to the surface of the Earth.
Phacolith: These are small structures which cool down and solidify near the crest of an anticlinal fold.

Other Features Formed as a Result of Volcanic Eruptions

Hot springs: Hot springs are formed when the water around the magma chamber gets heated because of the movement of magma in the Earth's interiors. Heated water then turns into steam spurting out to the Earth's surface in the form of hot springs.
Geyser: A geyser is a fountain of hot water and superheated steam which occurs when water comes into contact with hot volcanic rocks.

Constructive and Destructive Effects of Volcanoes

Constructive Effects

- Volcanic soils are very fertile.
- Solidified lava is a source of precious diamonds and minerals.
- Hot springs are now used for the generation of electricity.

Destructive Effects

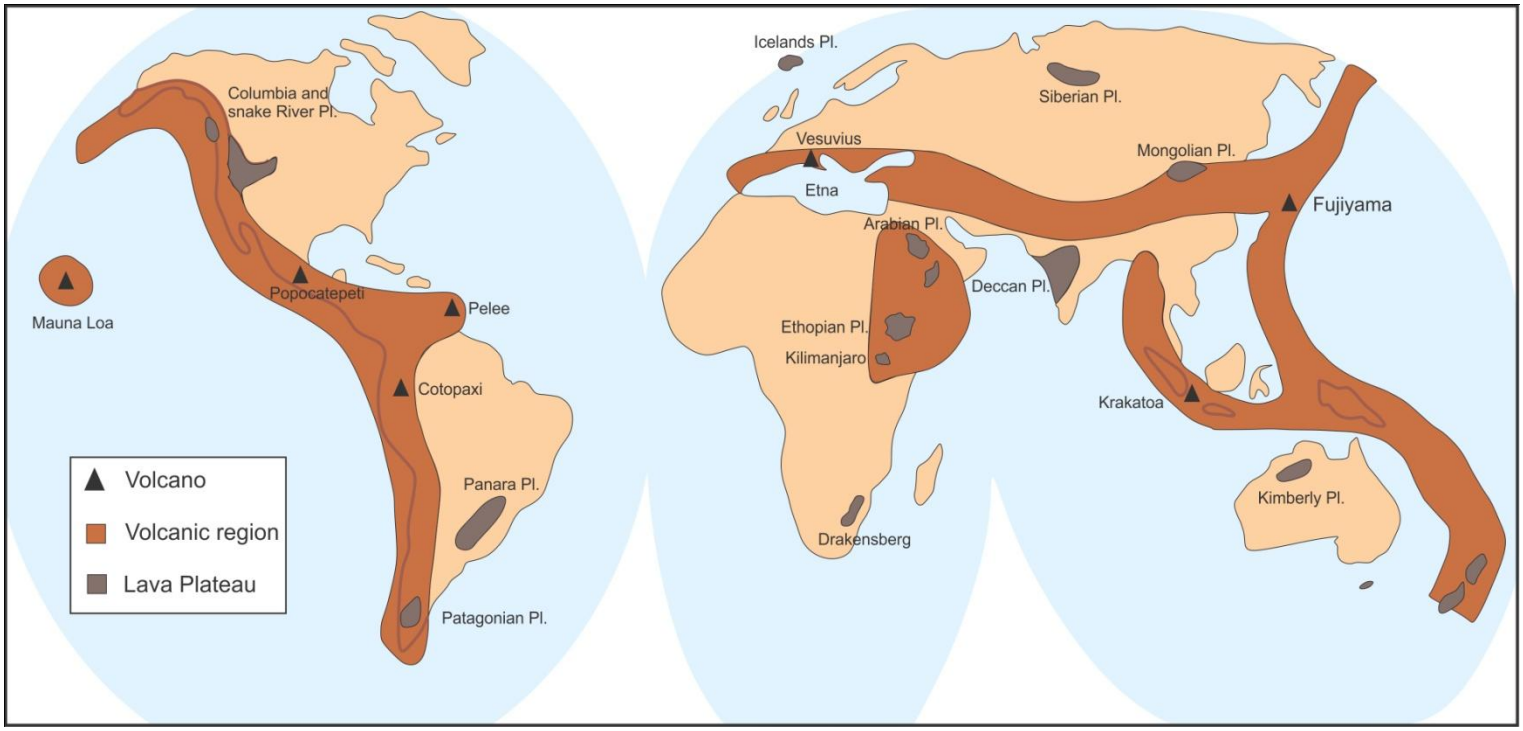
- Loss of life and property: The eruption of volcanoes can result in huge loss of lives and property.
- Harmful to the natural environment: Volcanic eruption releases dust and many gases in the atmosphere. The solidification of lava into lava sheets also destructs the natural vegetation of nearby areas.

Distribution of Volcanoes in the World

Most of the volcanoes occur near earthquake belts around the young fold mountains. The Circum Pacific Belt also known as the Ring of Fire contains more than 80% of the total active volcanoes. Regions included in this belt are the Andes Mountains in South Africa and Rockies in North America.

There are a series of islands along the east coast of Asia where many volcanoes are located. Some islands are Kurile Islands, Japanese islands, Taiwan, the Philippines and Indonesian islands. Many volcanoes are also found in New Zealand. Some famous volcanoes in this belt are Mt Fujiyama in Japan, Mt Mayon in the Philippines and Mt Krakatoa in Indonesia.
According to estimated figures, there are about 40 active volcanoes in the Andes, 35 in Japan, 100 in the Philippines and 70 in Indonesia.

Map



Map showing major volcanoes and volcanic regions in the world