27 February 2024 20:02

Alluvial Soil.

↳ 40%.

Light grey
ash grey

potash.

deficient in phosphorus.

wheat
maize
sugarcane
oilseeds...

Red and Yellow Soil. → coarse grained — less fertile
→ fine grained — more fertile.

fine grained. 'omnibus group'

18.5% of the total land area of the country.

↳ (eastern + southern parts of the Deccan plateau).

oilseeds, wheat, cotton, millets, tobacco, pulses.

Black/ Regur Soil.

15% of the total area.

Maharashtra, M.P., Gujarat, A.P, T.N

the Godavari and Krishna (deep).

↳ clayey, deep and impermeable.

iron, lime, aluminium, magnesium, potassium.

Cotton, pulses, millets, castor, tobacco, sugarcane, citrus fruits, linseed....

Desert Soil.

↳ arid soil.

↳ 4.42% of land.

↳ red to brown.

↳ sandy

↳ sandy

↳ gravelly

↳ low moisture content

↳ " water retaining capacity.

↳ saline in nature

↳ salt, phosphate content

↳ 'kankar layeres' ✓

↳ little humus.

↳ little organic matter.

Laterite Soil.

↳ later → brick.

↳ 3.7 %.

↳ due to rainfall.
lime and silica are leached away

↳ leftover soil rich in iron oxide and aluminium → laterite soil.

potash.

↳ low fertility

↳ Karnataka, T.N, Kerala, M.P, Assam, Odisha.

Red laterite soil is found in Kerala, T.N., A.P

crop of cashew nuts.

Mountain Soil.

↳ coarse grained in the upper slopes

↳ loamy and silty (river valleys)

↳ low humus content

↳ low valleys have the most fertile soils.

Peaty and Marshy Soils.

↳ high humidity and heavy rainfall.

↳ high humidity and heavy rainfall.
↳ Rich in humus + organic matter
↳ Black in colour (heavy).
↳ Uttarakhand, Bihar, West Bengal, Odisha, T.N.

Saline Soils

↳ sodium, magnesium, potassium.
→ infertility.

↳ sandy to loamy
↳ arid - and semi arid areas.
↳ waterlogged + swampy
↳ western Gujarat, deltas of the eastern coast, Sunderban areas of West Bengal.
Rajasthan, Haryana, Punjab, U.P, Bihar, Maharashtra.
lime.
salt. resistant crops.

Rajasthan, Haryana, Punjab, U.P, Bihar, Maharashtra.

lime

salt resistant crops.

↳ Reh, Usar, Kallar, Rakar, Thur, Chopan

Exogenic

↳ Mass wasting, weathering, deposition, erosion.

Endogenic

↳ Volcanism, Diatropism.

Geomorphic Agent - running water, wind, current, waves,

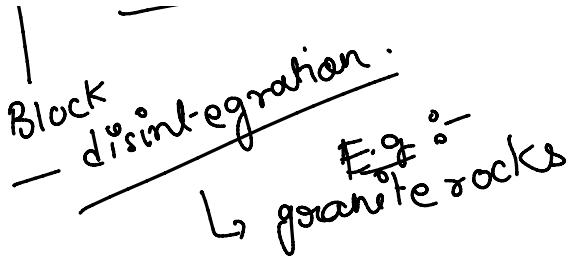
Diatrophism

- Orogenic process [mountain building]
- Epeirogenic processes. [continent building processes]
- Plate Tectonics
- Earthquakes

Weathering.

↳ Physical Weathering / Mechanical Weathering

- Thermal Weathering
  - Elements of weather
    - pressure
    - temp.
    - wind
    - water
  - Granular Disintegration
- Exfoliation
  - arid regions
- frost weathering / wedging



What is Soil?

The loose material or the upper layer of the mantle rock (regolith – a layer of loose, heterogeneous material covering solid rock) consisting mainly of very small particles and humus which can support the growth of plants is known as “soil”. Soil mainly consists of mineral/rock particles, portions of decayed organic matter, soil water, soil air and living organisms. The major factors that influence the formation of soil are parent material, relief, climate, vegetation, life forms and time.

In general, soil is composed of four elements:

1. Inorganic or mineral fractions derived from the parent material
2. Organic matter (decayed and decomposed plants and animals)
3. Air
4. Water

Soil is formed under specific natural conditions and each of the elements of the natural environment contributes to this complex process of soil formation known as “pedogenesis”.

Soil Profile

The soil profile is a vertical cross-section of the soil, made of layers parallel to the surface. Each layer of soil has a different texture and is known as the horizon.

- Horizon A (Topsoil) – It is the topmost layer where the organic materials have got incorporated with the mineral matter, nutrients and water – elements necessary for the growth of plants.
- Horizon B (Subsoil) – This zone has a greater content of minerals and humus is present in smaller quantities. It represents a transition between Horizon A and Horizon C and contains matter derived from below as well as above.
- Horizon C (weathered and decomposed rock) – This zone is composed of the loose parent/rock material. This layer is the first stage in the soil formation process and eventually forms the above two layers.

Underneath these three horizons is the rock which is known as the parent rock or the bedrock.

Different Types of Soil in India

In the ancient period, soils were mainly classified into two – Urvara (fertile) and Usara (sterile).

The first scientific classification of soil was done by Vasily Dokuchaev. In India, the **Indian Council of Agricultural Research (ICAR)** has classified soils into 8 categories. The types of soil in India according to this are:

1. Alluvial Soil
2. Black Cotton Soil
3. Red & Yellow Soil
4. Laterite Soil
5. Mountainous or Forest Soil
6. Arid or Desert Soil
7. Saline and Alkaline Soil
8. Peaty and Marshy Soil

Types of Soil in India – Alluvial Soil

- Alluvial soils are widespread in the northern plains and river valleys.
- It covers about 40% of the total land area of the country.
- These soils are mainly derived from the debris brought down from the Himalayas.
- In the Peninsular region, they are found in deltas of the east coast and in the river valleys.
- The colour of the alluvial soil varies from light grey to ash grey.
- The alluvial soil varies in nature from sandy loam to clay.
- They are rich in potash but poor in phosphorus.
- Two different types of alluvial soils have developed in the Upper and Middle Ganga plains – Khadar and Bhangar.
    - Khadar is the new alluvium and occupies the flood plains of the rivers. Khadar is enriched with fresh silt deposits every year.
    - Bhangar is the old alluvium, deposited away from the flood plains.
- Both Khadar and Bhangar soils contain concretion (kankars) of impure calcium carbonate.
- These soils are more loamy and clayey in the lower and middle Ganga plains and the Brahmaputra valley.
- Alluvial soils are intensely cultivated – wheat, maize, sugarcane, pulses, oilseed, etc. are mainly cultivated.

Types of Soil in India – Red & Yellow Soil

- Also known as the “omnibus group”.

- It covers about 18.5 % of the total land area of the country.
- It is found in regions of low rainfall (eastern and southern parts of the Deccan Plateau). Along the piedmont zone of the Western Ghats, a long stretch of area is occupied by red loamy soil. This soil is also present in parts of Odisha and Chattisgarh and in the southern parts of the Middle Ganga Plain.
- The red colour is due to the presence of iron in crystalline and metamorphic rocks. The soil appears yellow when it is in hydrated form.
- The fine-grained red and yellow soil is usually fertile while the coarse-grained soil is less fertile.
- This type of soil is generally deficient in nitrogen, phosphorus and humus.
- Wheat, cotton, oilseeds, millets, tobacco, and pulses are mainly cultivated in red and yellow soil.

Types of Soil in India – Black or Regur Soil

- Black soil is also known as “Regur Soil” or the “Black Cotton Soil”.
- It covers about 15% of the total land area of the country.
- It covers most of the Deccan Plateau – parts of Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh and some parts of Tamil Nadu. In the upper reaches of the Godavari and Krishna, and the north-western part of the Deccan Plateau, the black soil is very deep.
- The colour of these soils varies from deep black to grey.
- The black soils are generally clayey, deep and impermeable. They swell greatly and become sticky when wet in the rainy season. In the dry season, the moisture evaporates, the soil shrinks and develops wide cracks.
- Black soils are rich in iron, lime, aluminium, magnesium and also contain potassium. However, these soils are deficient in nitrogen, phosphorus and organic matter.
- Cotton, pulses, millets, castor, tobacco, sugarcane, citrus fruits, linseed, etc. are mainly cultivated in black soil.

Types of Soil in India – Desert Soil

- Also known as arid soil, it accounts for over 4.42 % of the total land area of the country.
- The colour ranges from red to brown.
- Desert soils are sandy to gravelly in texture, have low moisture content and low water-retaining capacity.
- These soils are saline in nature and in certain regions, the salt content is so high that common salt is obtained by evaporating water.

- These soils have normal phosphate content but are deficient in nitrogen.
- Due to increased calcium content in the lower horizons of the soil, there is the formation of ‘kankar’ layers. These kankar layers restrict the penetration of water and as such when water is made available through irrigation, the soil moisture is readily available for sustainable plant growth.
- Desert soils are profoundly found in western Rajasthan and contain little humus and organic matter.

Types of Soil in India – Laterite Soil

- The name has been derived from the Latin word “later” which means brick.
- It accounts for about 3.7% of the total area of the country.
- These are typical soils of the monsoon climate which is characterised by seasonal rainfall. With rain, lime and silica are leached away, and soil rich in iron oxide and aluminium are left leading to the formation of laterite soil.
- Laterite soil is deficient in organic matter, nitrogen, phosphate and calcium, however, iron oxide and potash are in abundance.
- Although low in fertility, they respond well to manures and fertilisers.
- Laterite soils are found in Karnataka, Tamil Nadu, Kerala, Madhya Pradesh and hilly regions of Assam and Odisha.
- Red laterite soil in Kerala, Tamil Nadu and Andhra Pradesh are well suited for tree crop cultivation like cashew nuts.
- Laterite soil hardens rapidly and irreversibly on exposure to the air, a property that leads to its use as building bricks in southern India.

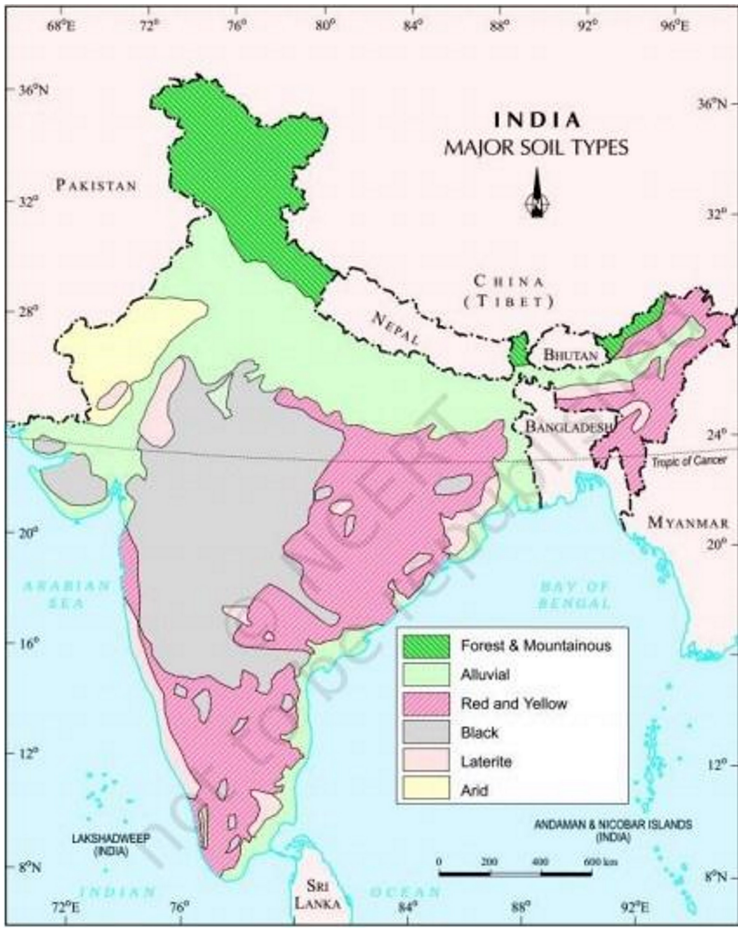
Types of Soil in India – Mountain Soil

- This type of soil is found in forest regions where rainfall is sufficient.
- The texture of the soil depends on the mountain environment where they are found.
- These soils are coarse-grained in the upper slopes and loamy and silty on valley sides.
- In the snowbound areas of the Himalayas, these soils undergo denudation and are acidic with low humus content. The soils found in the lower valleys are fertile.
- Also called forest soil.

Types of Soil in India – Peaty and Marshy Soils

- These soils are found in regions of heavy rainfall and high humidity, and it supports the good growth of vegetation.
- Peaty soils are rich in humus and organic matter.
- These soils are generally heavy and black in colour. In many places, these soils are alkaline.
- These are found in southern Uttarakhand, the northern part of Bihar, and the coastal areas of West Bengal, Odisha and Tamil Nadu.

Types of Soil in India – Saline and Alkaline Soils



- These soils have high percentages of sodium, magnesium and potassium, and hence are infertile. The high salt content is mainly because of the dry climate and poor drainage.
- The texture ranges from sandy to loamy.
- These soils are found in arid and semi-arid areas, and in waterlogged and swampy regions.
- These soils are deficient in calcium and nitrogen.

- These soils are mostly found in western Gujarat, deltas of the eastern coast and in Sundarban areas of West Bengal. In the Rann of Kutch, the south-western monsoon brings salt particles and deposits there as a crust. Seawater near deltas also increases the salinity of the soil.
- These soils can be reclaimed by improving drainage, by applying gypsum or lime and by cultivating salt-resistant crops like berseem, dhaincha, etc.
- These are also called Reh, Usar, Kallar, Rakar, Thur, and Chopan. These are mainly found in Rajasthan, Haryana, Punjab, Uttar Pradesh, Bihar, and Maharashtra. Sodium chloride and sodium sulphate are present in this soil. It is suitable for leguminous crops.

Types of Soil in India – Red and Black Soil

These are developed over the granite, gneiss, and quartzite of the Precambrian and Archean eras. This soil performs well if irrigated. Generally, this soil has very little productivity.

Types of Soil in India – Grey and Brown Soil

These soils are found in Rajasthan and Gujarat. It is formed by the weathering of granite, quartzite and gneiss. These loose, friable soils contain iron oxide (haematite and limonite).

Types of Soil in India – Submontane Soil

These are formed by the deposition of eroded material from Shiwaliks and the lesser Himalayas. These are found in the Tarai region of the submontane stretching from Jammu and Kashmir to Assam. The soil supports a luxuriant growth of forest and is more prone to soil erosion.

Types of Soil in India – Snowfields

This soil was found under the snow and glaciers at the highest peak of the greater Himalayas, Karakoram, Ladakh, and Zaskar. This soil is immature and unsuitable for crops.

Types of Soil in India – Karewa Soil

Karewa soils are the lacustrine deposits in the Kashmir Valley and the Bhadarwah Valley. Fine silt, clay, and boulder gravels are the composition of Karewa soil. They are characterized by fossils. These soils are mainly devoted to the cultivation of saffron, almonds, apple, walnut, etc.

Geomorphic Processes – The earth's surface is being continuously reshaped by both internal (endogenic) and external forces (exogenic). The changes that the endogenic and exogenic forces bring about in the appearance of the surface of the earth are collectively known as geomorphic processes.

- Geomorphological processes are natural mechanisms of erosion, weathering, and deposition that result in the alteration of the surficial materials and landforms at the surface of the earth.
- The exogenic and endogenic forces cause chemical actions and physical pressures on earth materials.
- This brings about changes in the shape of the surface of the earth which is known as geomorphic processes.
- **The endogenic processes are mainly land building forces while exogenic forces are mainly land wearing forces.**
    - Mass wasting, weathering, deposition, and erosion are exogenic geomorphic processes.
    - Volcanism and Diastrophism are endogenic geomorphic processes. Radioactivity, rotational and tidal friction and primordial heat generating from the interior of the earth are the main sources of energy responsible for the endogenic geomorphic processes.
- **Geomorphic Agent** – It is a mobile medium, running water, wind, currents, waves, etc. which removes, transports and deposits earth materials. All the movements, within the earth or on the surface of the earth occur due to gradients from high pressure to low pressure regions, from higher to lower levels, etc.
- When these elements of nature become portable due to gradients, they remove the materials and transport them over slopes and deposit them at a lower level.
- The gravitational stresses are as vital as the other geomorphic processes.
- Gravity is the force that is keeping us in contact with the surface and it is the force that switches on the movement of all surface material on earth.
- It is the directional force stimulating all downslope movements of matter and it also causes stresses on the earth's materials.
- Indirect gravitational stresses stimulate tide and wave-induced winds and currents.
- Without gradients and gravity, there would be no movement and therefore no transportation, erosion, and deposition are possible.
- All the movements either on the surface of the earth or within the earth happen due to gradients —from high pressure to low pressure areas, from higher levels to lower levels, etc.

Diastrophism – The process by which the earth's surface is reshaped through rock movements and displacement is termed diastrophism. Diastrophism includes –

1. Orogenic processes (mountain building) – which involves mountain building through severe folding and affecting long and narrow belts of the earth's crust.
2. Epeirogenic processes (continent building) – which involves uplifting or warping of

large parts of the earth's crust.

3. Earthquakes involving local relatively minor movements.
4. Plate tectonics involving horizontal movements of crustal plates.

All the above processes cause pressure, volume and temperature (PVT) changes which result in the metamorphism of rocks.

The geomorphic process means bringing about changes in the configuration of the Earth's surface, due to physical stresses and chemical actions on materials present on earth. The physical and chemical actions are due to endogenic and exogenic forces. There are 2 main geomorphic processes.

Exogenic Process	Endogenic Process
1. Weathering – Physical, Chemical, Biological	1. Volcanism
2. Erosion/Degradation	2. Diastrophism
3. Transportation	3. Metamorphism
4. Deposition	4. Earthquake
	5. Landslides
	6. Faulting and Folding

Which Process is an Internal Geomorphic Process?

The endogenic process is an internal geomorphic process.

The main force behind this process is the energy emanating from inside the earth. This energy is mainly generated through the 3 processes given below.

1. Primordial heat that existed right from the time earth was created.
2. Rotational and tidal friction
3. Radioactivity

What are the Geomorphic Agents?

A geomorphic agent is a mobile medium which removes, transports and deposits earth materials. The examples of geomorphic agents are running water, glaciers, wind, waves, ocean currents, groundwater etc. All the movements occur due to gradients, from higher levels to lower levels or from high-pressure areas to low-pressure areas.

Exogenic Processes

The general term "denudation" includes all the exogenic geomorphic processes. The word "denude" means to uncover or strip off. All the exogenic processes – erosion, weathering, mass movements/wasting and

transportation are included in denudation. For each process, there exists a distinct driving force or energy.

Weathering is the process of disintegration and decomposition of rocks through the actions of various elements of weather and climate. It involves very little or no motion of materials, so it is an in-situ or on-site process.

There are three types of weathering processes: physical weathering, chemical weathering and biological weathering.

1. **Physical Weathering** – Physical or mechanical weathering is the disintegration of rocks mainly induced by elements of weather. It is caused by the change in pressure, temperature, wind and water. It is further categorised into thermal weathering, frost weathering and exfoliation.
2.

   Thermal weathering – Due to high temperature in arid and semi-arid areas, rocks expand during the day and contract at night due to the fall of temperature. Under extreme temperature conditions, the rocks crack and eventually split due to alternate expansion and contraction. Thermal weathering is of two types – granular disintegration and block disintegration.

      i. Granular disintegration – The alternate expansion and contraction of minerals in the rocks due to temperature variations makes the rocks break down into small pieces. Due to this, the break up of rocks occurs, grain by grain. This is known as granular disintegration.
      ii. Block disintegration – Due to the great diurnal range of temperature, the rocks may break up along the joints and crack into large rectangular shaped blocks. It occurs in rocks like granite rocks.

   a. Frost wedging – Frozen water takes up more space. When water enters into the cracks of rocks and freezes, the pressure of the frozen water becomes sufficient to expand and further deepen the crack.
   b. Exfoliation – Due to weather variations, rocks generally heat or cool more on the surface layers. These alternate changes in temperature cause the outer layers to peel off from the main mass of the rock in concentric layers just as the skin of an onion. This process of breaking away curved layers of a rock from the rock beneath and leaving behind a dome-shaped monolith is called exfoliation. Exfoliation usually occurs in arid areas and is also called onion weathering.