

GEOGRAPHY

MODULE - 3.1

SOILS AND LAKES IN INDIA

- Topmost layer of the continental crust.
- Have weathering particles or rocks.
- Product of physical factors as well as human factors.
- Defined as - mixture of small rocks particles or debris and organic materials or humus which develop on the earth's surface and support the growth of plants.

FACTORS INFLUENCING SOIL FORMATION

- Parental material.
- Relief or Topography
- Climate
- Natural Vegetation and Biological factors.
- Time

SOIL TYPES IN INDIA

- First scientific classification on soil - done by - Vasily Dokuchaev.
- In India - The Indian Council of Agricultural Research - ICAR - classified soils into eight categories.
- Classification based on the constitutional characteristics - colour and resource significance of the soil.

TYPES OF SOIL
Alluvial Soil
Black Soil
Red Soil
Laterite Soil
Mountainous or Forest Soil

Arid or Desert Soil
Saline and Alkaline Soil
Peaty and Marshy or Bog Soil

- ICAR - classified soils into eight categories based on the - nature and character as per the Union States Department of Agriculture - USDA - Soil Taxonomy.

Inceptisols	39.74
Entisols	28.08
Alfisols	13.55
Vertisols	8.52
Aridisols	4.28
Ultisols	2.51
Mollisols	0.40
Others	2.92
Total	100

ALLUVIAL SOIL

- Alluvial soils are widespread in the northern plains and river valleys.
- It covers about 46% of the total land area of the country.
- Largest soil group.
- 40% - agricultural land in India.
- 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.
- Formed due to silt deposition in Indus - Ganga - Brahmaputra rivers.
- In the coastal region - due to wave action.
- Parental material - rocks of Himalayas.

Characteristics:

- The colour of the alluvial soil varies from light grey to ash grey.

E ▶ ENTRI

- Varies - in nature from sandy loom to clay.
- Clayey soils are not uncommon.
- Pebbly and gravelly soil.
- Porous soil.
- 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 loamier and more clayey in the lower and middle Ganga plains and the Brahmaputra valley.
- Rainfall - above 100cm: suitable for paddy; between 50 - 100 cm: suitable for wheat, sugarcane, tobacco, cotton; below 50 cm: coarse grains or millets.

Chemical Compounds:

- They are rich in potash but poor in phosphorus.
- Nitrogen is generally low.
- Lime and iron oxide proportions vary within a wide range.

Distribution:

- lower and middle Ganga plains and the Brahmaputra valley.
- Alluvial soil - Narmada, Tapti valley, Northern part of Gujarat.
- Deltas of Mahanadi, Godavari, Krishna, Cauvery - deltaic alluvium or coastal alluvium.

Crops:

- Alluvial soils are intensely cultivated - wheat, maize, sugarcane, pulses, oilseed, tobacco, vegetables, fruits, jute, etc. are mainly cultivated.
- Best for agriculture.
- Suitable for - Canal and tube well irrigation.

Geological Division:

ENTRI

- The alluvium of the great plain is divided into newer or younger Khadar and older Bhangar soils.

Bhabar

- Bhabar belt - 8 to 16 km.
- Running along Shiwalik Foothills.
- Uniqueness - porous state.
- Northernmost stretch of Indo Gangetic plain.
- Alluvial fans merged together to form the belt.
- Not suitable for agriculture.
- Big trees with large roots thrive in this belt.

Terai

- Ill drained, marshy, thickly forested narrow tracts - south of Bhabar running parallel.
- Underground streams of Bhabar belt - reemerge.
- Swampy lowland with the silty soils.
- Rich in nitrogen and organic matters.
- Deficient in phosphate.
- Covered with tall grasses and forest.
- Wheat, rice, sugarcane, jute - crops.
- Shelter for variety of wildlife due to the thick forest.

Bhangar

- Oldest alluvium.
- Along with river beds forming terraces higher than floodplain.
- More clayey composition.
- Dark coloured.
- Few meters below the terrace of Bhangar - Beds of lime nodules - Kankar.

Khadar

- Newer alluvium.
- Forms flood plains along the river banks.

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- Banks are flooded almost every year.
- New layer of alluvium deposition emerges every year.
- Most fertile soils of Ganges.
- Sandy clay loams, drier and leached, less calcareous and carbonaceous.



RED SOIL

- Also known as the “omnibus group”.
- It covers about 18.5 % of the total land area of the country.
- Developed on Archean granite - second largest area of the country.
- The red colour is due to the presence of iron in crystalline and metamorphic rocks.
- Due to the presence of ferric oxide - red colour for soil.
- Thin coating soil particles.
- The fine-grained red and yellow soil is usually fertile while the coarse-grained soil is less fertile.
- Texture - sandy to clay and loamy.

Characteristics:

- Rainfall is highly variable.
- Soil has developed three subtypes - red and yellow soil, red sandy soil, red alluvial soil.
- Well drained soil and structure is sandy.
- The soil appears yellow when it is in hydrated form.
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Chemical compounds:

- Soil is generally deficient in nitrogen, phosphorus and humus.
- Distribution:

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- It is found in regions of low rainfall (eastern and southern parts of the Deccan Plateau).
- Found in the Peninsula from Tamil Nādu, south of Bundelkhand in the north, Rajmahal in the east to Kathiawad in the west.

Significance:

- Wheat, cotton, oilseeds, millets, tobacco, pulses are mainly cultivated in red and yellow soil.
- Once irrigated and added the humus - gives high yield.
- Mineral base is rich.
- Rice, sugarcane, cotton cultivation.
- Millet and pulses.
- Red alluvium in Kaveri and Vaigai basin - paddy cultivation.
- Rubber and coffee plantation - Kerala and Karnataka.



BLACK 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.
- The colour of these soils varies from deep black to grey.
- The black soils are generally clayey, deep and impermeable.
- Formation due to weathering of basaltic rocks.
- Emerged during fissure eruption.
- Parental materials are volcanic rocks.
- Formed in the Deccan plateau.
- Tamilnadu - gneisses and schists - parental material.
- High and low temperature.
- Black colour is ordained by the titani of ferrous magnetic compounds found in the basalt.

Characteristics:

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- Highly argillaceous.
- Large clay factor.
- Black soils are rich in iron, lime, aluminium, magnesium and also contain potassium.
- 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.
- Cracks permit oxygenation of the soil to sufficient depths and soil has extraordinary fertility.
- Black colour due to - presence of small proportion of titaniferous magnetite or iron and black constituents of the parent rocks.
- Andhra Pradesh - black colour formed due to - crystalline schists and gneisses.

Chemical compounds:

- Alumina - ten percentage, iron oxide - 9 to 10 percentage, lime and magnesium carbonate - 6 to 8 percentage, potash - less than 0.5 percentage.
- Humus, phosphates, nitrogen - low.
- Ric in iron and lime but deficient in humus, nitrogenous, phosphorus content.
- These soils are deficient in nitrogen, phosphorus and organic matter.
- Distribution:
- Covers most part of Deccan Plateau - i.e., parts of Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh and some parts of Tamil Nadu - 46 lakhs sq.km.
- Godavari and Krishna basins, north west part of Deccan - deep with black soil.
- Found in Deccan lava plateau region.

Significance

- Cotton, pulses, millets, castor, tobacco, sugarcane, citrus fruits, linseed, etc. are mainly cultivated in black soil.

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- Wheat, jowar, sunflower.
- Rice and sugarcane are equally important where irrigation facilities are available.



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.
- The type of soil suitable for monsoon climate.
- Characterised by seasonal rainfall.
- Soil is rich with iron oxide and aluminium.
- With the rainfall - lime and silica are leached away.
- Alternative dry and wet periods are more suitable for the development of laterite soil.

Characteristics:

- Brown in colour.
- Mixture of hydrated oxide of aluminium and iron.
- Laterite soil is deficient in organic matter, nitrogen, lime, magnesia, phosphate, potash and calcium.
- However, iron oxide is in abundance.
- Although low in fertility, they respond well to manures and fertilisers.
- Humus and water retaining capacities are moderate.

Distribution:

- Laterite soils are found in Karnataka, Tamil Nadu, Kerala, Madhya Pradesh - Amarkantak plateau 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.

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- Found in the patches in Western Ghats – Goa and Maharashtra.
- Panch mahal of Gujarat.
- Santhal Pangana of Jharkhand.

Significance:

- Famous for – crops: groundnut, cashew.
- Karnataka – coffee, rubber, spices.



MOUNTAIN SOIL OR FOREST SOIL

- Found in the 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 snow bound areas of the Himalayas, these soils undergo denudation and are acidic with low humus content. The soils found in the lower valleys are fertile.

Characteristics:

- Horizons are poorly developed.
- Vulnerable to soil erosion due to fast drainage.
- Rich in organic content.
- A loamy soil when sand, silt, clay is in mixed form.

Distribution:

- Generally found over 900m altitude.
- Himalayas, Himalayan foothills, mountain slopes of western ghats, Nilgiris, Annamalai, Cardamom hills.
- Used for rubber plantation, bamboo plantation, tea, coffee, fruit farming.

E ▶ ENTRI

- Large areas also given to shifting agriculture where the soil fertility deterioration after two to three years.
- Due to low scope of agriculture - silvi pastoral farming can be sustained.



DESERT SOIL

- Desert soils are sandy to gravelly in texture, have low moisture content and low water retaining capacity. Soil is deposited by the wind action.
- Found in arid, semi-arid areas - Rajasthan, West of Aravalli, Northern Gujarat, Saurashtra, Kachchh, Western parts of Haryana, Southern parts of Punjab.
- Lack moisture content.
- Humus content is less.
- Nitrogen is low.
- Sandy with low organic matters.
- Rich in iron content.
- Adequate phosphorous content.
- Rich in lime and bases.
- Low soluble salts.
- Moisture with low retaining capacity.
- If there is irrigation - the production will be high.
- Suitable for less water intensive crops like Bajra, pulses, fodder, guar.
- contain little humus and organic matter.
- 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.

Distribution:

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- Western Rajasthan, Rann of Kachchh, patches in south Haryana, South Punjab.



SALINE AND ALKALINE SOILS

- Soils have high percentages of sodium, magnesium and potassium.
- Infertile.
- Also called Reh, Usar, Kallar, Rakar, Thur, and Chopan.
- Mainly found in Rajasthan, Haryana, Punjab, Uttar Pradesh, Bihar, and Maharashtra.
- Sodium chloride and sodium sulphate are present in this soil.
- Suitable for leguminous crops.
- The high salt content is mainly because of the dry climate and poor drainage.
- Found in arid and semi-arid areas.
- Also, in waterlogged and swampy regions.
- These soils are deficient in calcium and nitrogen.

Formation:

- Both natural and anthropogenic.
- Natural - include dried up lakes of Rajasthan and Rann of Kutch.
- Emerged in the Palaya basin.
- Anthropogenic - developed in western Uttar Pradesh and Punjab due to the faulty agriculture.

Characteristics:

- Lack of moisture.
- Humus, living organisms.

- Humus formation is almost absent.



PEATY AND MARSHY SOIL

- Originates from the areas where adequate drainage is not possible.
- Rich in organic matters.
- High salinity.
- Deficit in potash and phosphate.

Characteristics:

- Dominance of clay and mud which make it heavy.
- Rich in moisture.
- Greater content of salt.
- High tide has made it infertile soil.
- No organic activity.

Distribution:

- Delta region of India.
- Alleppey - Kerala - known as Karri along with backwaters or kayals of Kerala.
- Almora - Uttaranchal.

Significance:

- Over Bengal delta - suitable for jute, rice.
- Over Malabar - suitable for spices, rubber, big sized rice.
- Favourable for mangrove forest in India.



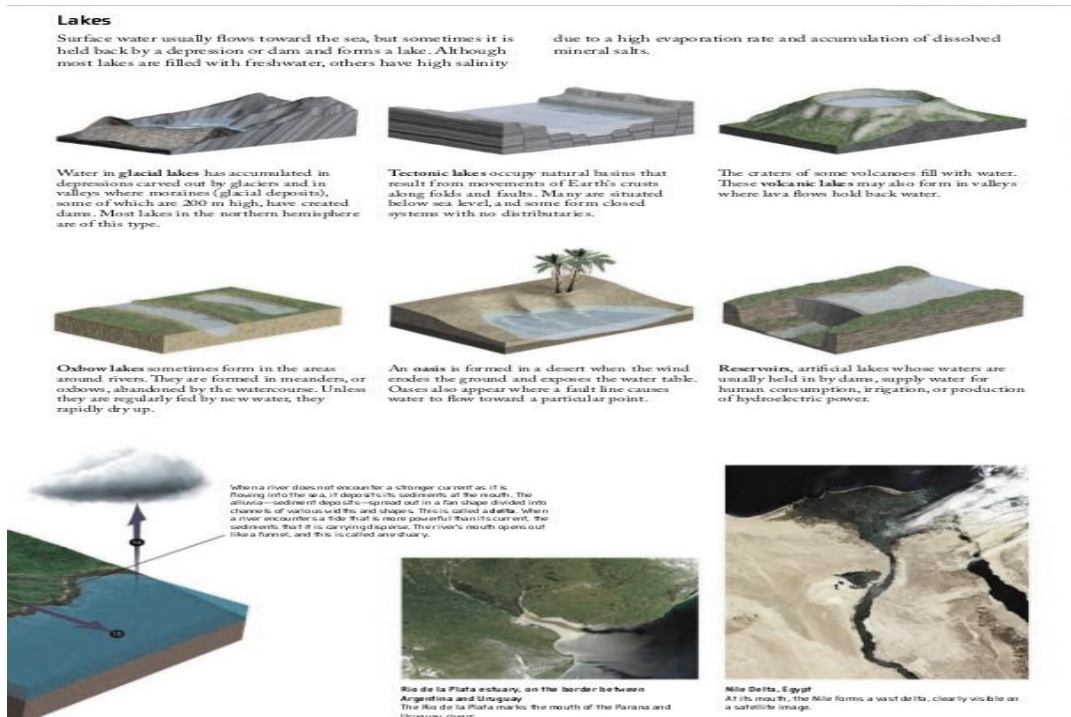
CHARACTERISTICS OF INDIAN SOIL

- Moist soils are old and mature.
- Soils of perennial [plateau - older than the soils of greater mountain plain.
- Indian soils are - largely deficient in nitrogen, mineral salts, humus, other organic matters.
- Plain and valleys - thick layers of soils.
- Hilly and plateau area - depict soil cover.
- Soils like - alluvial and black soil are fertile.
- Laterite, desert, alkaline soils - lack in fertility and do not yield good harvest.
- Used for cultivation of hundreds of years and have lost much of their fertility.

LAKES IN INDIA

- Lakes are the permanent body of water on the land surface, surrounded by the land on all sided.
- Lakes differ from each other in size and features.
- Most of them are permanent; whereas, some contain water only during the rainy season.
- The fresh water lakes in India are originated from Himalayas. They are formed when glaciers dug out a basin.
- A lake is any reasonably big body of slowly flowing or stagnant water that fills a significant inland basis.

- Lakes are categorized into several types, including temporary lakes, permanent lakes, freshwater lakes, saline lakes, tectonic lakes, and so on.



LAKES	FEATURES	EXAMPLE
Tectonic Lake	Lakes generated by the deformation of the Earth's crust and the subsequent lateral and vertical displacement. Tectonic depressions are caused by the earth's crust warping, subsidence, bending, and fracturing (splitting).	Naintial, Bhimtal, Wular, Dal Lake.
Crater or Caldera lakes	The top of the cone may be blasted off during a	Lonar Lake

	<p>volcanic eruption, leaving behind a natural hole known as a crater. Rain falls directly into a dormant or extinct volcano's crater or caldera - produces a crater or caldera lake.</p>	
Landslides Lakes	<p>Landslides can obstruct valleys, causing rivers to be dammed and temporary lakes to develop. Lakes developed as a result of these processes are referred to as barrier lakes.</p>	<p>Lakes that are formed in Shiwaliks (Outer Himalayas), Gohna Lake of Garhwal.</p>
Glacial Lakes or Tarns	<p>Lakes that formed as a result of glacial erosion.</p>	<p>Gangabal Lake in Kashmir.</p>
Dissolution Lakes	<p>Lakes formed due to a depression of the surface by underground dissolution.</p>	<p>Cherrapunji, Bhimtal, Garhwal, Shillong.</p>
Lagoons	<p>Deposition of sand bars along the sea coast.</p>	<p>Vembanad, Ashtamudi, Kayals of Kerala, Chilka of Odisha.</p>

Aeolian Lakes	Small depression lying on the windblown sand surface.	Sambhar, Panchbhadra lakes.
Fluvial Lakes	Lakes formed through their erosional and depositional work like ox bow lakes.	Upper, middle and lower Ganga, Brahmaputra River, Kolleru Lake.



Tectonic Lake



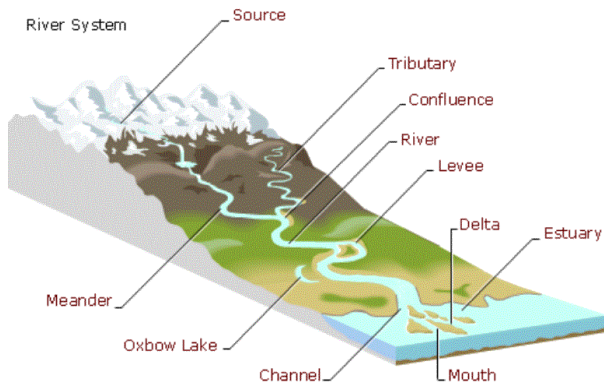
Crater Lake



Glacial Lake



Aeolian Lake



Fluvial Lake

Lagoons



Landslide Lake