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Indian & World Geography

Chapter 2

Short Answers

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- Types of Discordant Drainage Pattern
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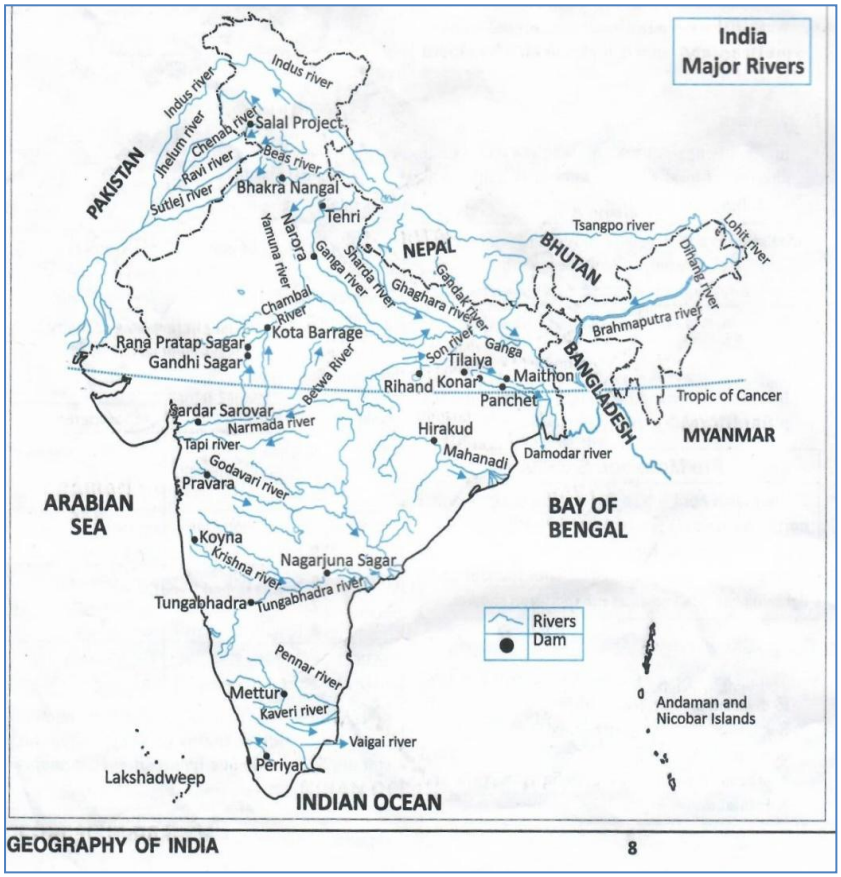
Contents

1. Drainage System of India

The flow of water through well-defined channels is known as drainage and the network of such channels is called a “drainage system”. The drainage system of an area is the outcome of the geological time period, nature and structure of rocks, slope, topography, amount of water flowing and the periodicity of flow. The area drained by a single river system (river and its tributaries) is called its drainage basin. An elevated area (mountain or upland) that separates two drainage basins is called a “water divide”. The world’s largest drainage basin is of the Amazon river and in India, the river Ganga has the largest river basin.

1.1 Important Points

- An area drained by a river and its tributaries is called a drainage basin. The boundary line separating one drainage basin from the other is known as the watershed.
- The flow of water through well defined channels is known as drainage and the network of such channel drainage system.
- The catchments of large rivers are called river basins while those of small rivulets and rills are often referred to as watersheds.
- On the basis of the mode of origin, nature and characteristics, the Indian drainage may also be classified into the Himalayan drainage and the peninsular drainage.
- There are more than 4, 000 small and big rivers in India which are divided into 23 large and 200 small river basins.



2. Types of Discordant Drainage Pattern

2.1 Antecedent Drainage

The drainage pattern formed by the rivers that maintain their original course and pattern despite the changes in underlying rock topography is known as Antecedent Drainage. The soil formed is weak and is easily eroded by the rivers. Example: Indus and Ganga drainage river.

2.2 Superimposed Drainage

This type of drainage pattern cuts deeper through the existing landform and maintains its original course. Some medium scale rivers of the northern and eastern peninsular India are its examples.

2.3 Concordant Drainage Pattern

In a concordant drainage pattern, the path of the river is highly dependent on the slope of the river and topography.

2.4 Dendritic or Pinnate Drainage Pattern

The drainage pattern resembling the branches of a tree is known as dendritic, the examples of which are the rivers of northern plains.

Example: Indus, Godavari, Mahanadi, Cauvery, Krishna.

2.5 Trellis Drainage Pattern

In this type of pattern the short subsequent streams meet the main stream at right angles and differential erosion through soft rocks paves the way for tributaries.

Examples: The old fold mountains of the Singhbhum (Chotanagpur Plateau).

2.6 Angular Drainage Pattern

- The tributaries join the main stream at acute angels.
- This pattern is common in Himalayan Foothill Regions**.**

2.7 Rectangular Drainage Pattern

- The main stream bends at right angles and the tributaries join at right angles creating rectangular patterns.
- Streams found in the Vindhyan Mountain of India.

2.8 Radial Drainage Pattern

- The tributaries from a summit follow the slope downwards and drain down in all directions.
- A good example of a radial drainage pattern is provided by the rivers originating from the Amarkantak plateau. River like Narmada, Son and Mahanadi originating from Amarkantak Hills.
- Radial drainage pattern are also found in the Girnar Hills (Kathiawar, Gujarat) and Mikir Hills of Assam.

2.9 Annular Drainage Pattern

- When the upland has an outer soft stratum, the radial streams develop subsequent tributaries which try to follow a circular drainage around the summit.
- Some examples of this are however found in **Pithoragargh** (Uttarakhand), **Nilgiri Hills** in Tamil Nadu and Kerala.

2.10 Parallel Drainage Pattern

- The tributaries seem to be running parallel to each other in a uniformly sloping region.

  Example: Rivers of lesser Himalayas, the small and swift rivers originating in the **Western Ghats** that flow into **Arabian Sea.**

2.11 Centripetal Drainage Pattern

- In a low lying basin the streams converge from all sides forming centripetal patter.
- Examples: **stream of Ladakh, Tibet** the **Baghmati** ant its tributaries **Nepal.**

2.12 Deranged Drainage Pattern

- This is an uncoordinated pattern of drainage characteristic of a region recently vacated by an ice-sheet.
- This type of drainage is found in the glaciated valley of **Karakoram.**

2.13 Barbed Drainage Pattern

- A pattern of drainage in which the confluence of a tributary with the main river is characterized by a discordant junction when the tributaries flow in opposite direction to their master stream.
- The **Arun River** (Nepal), a tributary of the Kosi is an interesting example of barbed drainage pattern.

2.14 Consequent Rivers

- The rivers which follow the general direction of slope are known as the consequent rivers they are also called **dipstreams.** Most of the rivers of peninsular India are **consequent rivers.**
- Example: river like **Godavari, Krishna and Cauvery.**

2.15 Subsequent Rivers

- A tributary stream that is eroded along an underlying belt of non-resistant rock after the main drainage pattern (Consequent River) has been established is known as a subsequent river.
- Due to the northward slope of the Peninsula towards the Great Plains, the rivers originating from the Vindhyan and the Satpura ranges flow northward into the Ganga system.
- The Chambal, Sind, Ken, Betwa, Tons and Son meet the Yamuna and the Ganga at right angles

3. Himalayan Drainage

- The Himalayan drainage system has evolved through a long geological history. It mainly includes the **Ganga,** the **Indus** and the **Brahamaputra** river basins.
- Himalayan drainage system are fed both by melting of snow and precipitation and hence, are perennial.
- These rivers form V-shaped valleys, rapids and waterfalls in their mountainous course.
- While entering the plains, they form depositional features like flat valleys, ox-bow lakes, flood plains, braided channels and deltas near the river mouth.

3.1 The Indus Drainage System

The Indus Drainage System

	River	Source	Length (In km)	Area drained (Sq.km)
1.	Indus	Bokhar Chu glacier near Manasarovar Lake	2,880 (1,114 in india)	11,78,440 (3,21,284 in India)
2.	Jhelum	Verinag	724	34,775 upto Indo-Pak Border
3.	Chenab	Bara Lacha Pass	1,180	26,155 upto Indo-Pak Border
4.	Ravi	Near Rohtang Pass	725	14,442 (5,957 in India)
5.	Beas	Beas Kund, Near Rohtang Pass	460	20,303
6.	Sutlej	Rakas Lake, Mansarovar	1,450	25,900(1,050 in India)

3.1.1 Indus (Sindhu)

- The Indus also known as **Sindhu,** is the western most **Himalayan river** in India.
- It flows in the northwest direction between **Ladakh** and **Zaskar.** It passes through **Ladakh** and **Baltistan.**
- It cuts across the **Ladakh Range,** forming a spectacular gorge near **Gilgit** in **Jammu and Kashmir.**
- The Indus flows in India only through the **Leh district** of Jammu and Kashmir.
- Its right back tributaries are (all originating from Sulaiman randge) **Kurram, Shyok, Gomal, Gilgit, Sangar Viboa** and **Tochi.**
- **Shyok river** also known as the **River of Death** in Yarkandi Uyghur and Karakoram regions.

3.1.2 Jhelum (Vitasta)

- It flows through Srinagar and the Wular lake before entering Pakistan through a deep narrow gorge.
- It joins Chenab near Jhang in Punjab province of Pakistan.
- Lidder, Sindhu and Neelum are its tributaries in Kashmir.

3.1.3 Chenab (Asikni)

- It is formed by two streams, the Chandra and the Bahaga, which join at Tandi near Keylong in Himachal Pradesh. Hence, it is also known as Chandrabhaga.
- It is the largest tributary of Indus (1,180 km) in India before entering Pakistan.
- It makes a hair pin bend near Kishtwar flowing across the Pir Panjal to enter into Pakistan.
- It receives water of Jhelum, Ravi and Satluj.
- Dulhasti Hydroelectric Project, Salal Hydroelectric **Project** and **Baglihar** Project are located on this river.

3.1.4 Ravi (Parushni)

- It forms a deep gorge in the **Dhauladhar range**.
- Ravi joins Chenab near **Sarai Sidhu**. Its drainage area lies between the south-eastern part of Pir Panjal and Dhualadhar range.

- It **runs along the Indo-Pak border** in Punjab plains along **Amritsar** and **Gurdaspur** before entering into Pakistan.

3.1.5 Beas (Vipasa)

- This river flows through Kullu valley and forms gorges in Dhauladhar range.
- This river basin lies completely within the Indian territory.
- It meets Satluj river at Harike in Punjab. India's longest canal Indira Gandhi Canal starts from this Harike Barrage.

3.1.6 Satluj (Satudri)

- It flows almost parallel to Indus (400 km) before entering India at Shipki La (Himachal Pradesh) and from Ropar enters in to Punjab plain. After entering into India, river Spiti joins this river in the north.
- It is known as Langchen Khamban in Tibet. It has created an extraordinary canyon at Nari Khorasan province of Tibet.
- It form international boundary (120 km) between India and Pakistan where it joins Indus at Mithankot.
- Govind Sagar Dam (Bhakra Dam) is situated on this river. Nathpa Jhakri Hydroelectric Project is located along this river in Shimla, Himachal Pradesh.

3.2. Ganga River System

- It is shared by **Uttarakhand** (110 km), **Uttar Pradesh** (1,450 km), **Bihar** (445 km) and **West Bengal** (520 km). The total length of Ganga river is **2,525 km**.

3.2.1 The Ganga Drainage System

River	**Source**	**Length** (in km)	**Area drained** (sq km)
• Ganga	Gangotri glacier	2,525	8,61,404
• Yamuna	Yamunotri glacier	1,376	3,66,223
• Chambal	Vindhyan hills	1,050	1,39,468
• Ramganga	Garhwal district	596	32,493
• Ghaghra	Mapchachungo	1,080	1,27,950

	Glacier		
• Gandak	Tibet-Nepal border	425 (in India)	46,300 (7,620 in India)
• Kosi	Sikkim-Nepal-Tibet Himalaya	730 (in India)	86,900 (21,500 in India)

- **Left bank tributaries** are Ramganga, Gomati, Ghaghara, Gandak, Kosi, Mahananda, Kali etc.
- **Right bank tributaries** are Yamuna, Son, Tons, karmansa, Punpun, Keol etc.

Doabs of Ganga River System

Doab	River Region
Ganga-Yamuna Doab	Ganga and Yamuna
Plain of Rohilkhand	Ramganga and Gomati
Awadh Plains	Gomati and Ghaghara
Eastern Plains of UP	Ghaghara and Gandak
Saran Plain	Gandak and Old Gandak
Mithila Plian	Old Gandak and Kosi
Plain of West Bengal	Kosi and Mahananda

- **Namami Gange Project** is an **Integrated Conservation Mission,** approved as **Flagship Programme** by the Union Government in **June 2014** with budget outlay of **Rs. 20,000 crore.**
- **Ministry of Water Resources, River Development and Ganga Rejuvenation** is the nodal agency. The **National Mission for Clean Ganga** (NMCG) is the implementation wing.

3.2.2 Yamuna

- it is the westernmost and the longest tributary of Ganga which join Ganga at Prayag (Allahabad).

- It has its source in the Yamunotri Glacier on the western slopes of the Banderpunch Range.
- The Tons river emerging from the Himalayas is the largest tributary of the Yammuna river.
- **Right bank tributaries:** Chambal, Sind, Betwa & Ken.
- **Left bank tributaries :** Hindan, Rind, Sengar and Varuna.

3.2.3 Chambal

- It rises near Mhow (Madhya Pradesh) in the Malwa plateau and flows northwards through a gorge upwards of Kota in Rajasthan, where the Gandhisagar dam has been constructed.
- Its main tributaries are Banas, Dhasan, Kali Sindh, Parbati. It join Yamuna at Etawah (Uttar Pradesh).
- Gandhi Sagar, Rana Pratap Sagar and Jawahar Sagar are the major multipurpose project built on this river. The Chambal is famous for its badland topography called the Chamba Ravines.

3.2.4 Son

- It joins Ganga about 16 km upstream of Danapur in Patna, Bihar. It originates from Amarkantak plateau (Madhya Pradesh)
- The important tributaries are Rihand, Johilla, Gopad, Kanhar and North-Koel (almost all the tributaries join it on the right bank).

3.2.5 Damodar (Sorrow of Bengal)

- Its important triburtaries are Barakar, Konar, Bokaro, Ghari and Bhera. The Barakar is the largest tributary of Damodar.
- Tilaiya Project and Maithon Project are located on Barakar river, whereas Panchet Project is located on Damodar river. Once known as the Sorrow of Bengal the Damodar has been now tamed by the Damodar Valley Corporation, a multipurpose project.

3.2.6 Ramganga

- It is comparatively small river rising in the **Garhwal hills** near **Gairsain**.
- Its important tributaries are **Kho, Ganga, Aril, Kosi and Deaha**. It joins Ganga near **Kannauj**.

3.2.6 Gandak (Narayani)

- It comprises of two stream Kaligandak and Trishulganga.
- It enters intro Ganga plains in **Champaran district** of Bihar and joins Ganga at **Sonpur** near Patna.
- Its main tributaries are **Kaligandak, Marshyangdi, Budhi Gandak, Trishuli** etc.

3.2.7 Ghaghara

- It is also known as **Karnali** in Nepal.
- It passes through Himalayas in Nepal and joins the **Sharda river** at Brahmaghat in India and together, they form the Ghaghara river.
- It is the largest tributary of Ganga in terms of volume.

Left bank tributaries: Bheri, Sarju, Kuwana, Rapti, Chhoti Gandak.
Right bank tributaries: Seti, Dahawar, Sarda, Budhi Ganga.

3.2.8 Gomati River

- It originates from **Fular Lake** in **Pilibhit**, Uttar Pradesh.
- It is the only tributary of Ganga that originates in plains. It joins the Ganga near **Ghazipur**.

3.2.9 Sarda/Saryu River

- It is also known as **Mahakali** or **Kali Ganga** in Uttarakhand.
- It originates from **Milam glacier** in **Nepal Himalayas** where it is known as **Goriganga**. It demarcates western borderof Nepal and India.

3.2.10 Kosal

- It is an antecedent river with its source to the north of **Mount Everest** in **Tibet**, where its main stream rises.
- Kosi river consists of **7 rivers** and is popularly known as **Sapt Kosi.**
- It is known for its frequent shifting courses causing widespread floods in Bihar and hence is infamous as **Sorrow of Bihar**. It has been however tamed by the construction of a barrage in **1965** near **Hanuman Nagar in** Nepal**.**
- In a joint venture, India and Nepal constructed embankments for floods control on Kosi river.

3.2.11 Mahananda

- It originates from **Darjeeling hills.** It is the **last left bank tributary** of Ganga joining it in West Bengal.

3.3 Brahmaputra River System

3.3.1 Brahmaputra

- The Brahmaputra, one of the largest rivers of the world, originates from **Chemayungdung glacier of Kailash range** near Manasarovar Lake in Tibet.

- In Tibet, Brahamputra river is known as **Tsangpo** means **the purifier**. The **Rango Tsangpo** is major right bank tributary of Tsangpo river in Tibet. In China, it is known as **Yarlung Zangbo.**
- **Mariam La** separates Brahmaputra from Manasarovar Lake.
- The river emerges from the foothills under the same **Dihang or Siang.** It enters India west of **Sadiya Town** in Arunachal Pradesh.
- While flowing southwest, it receives its main left bank tributaries viz., **Dibang or Sikang and Lohit;** thereafter, it is known as the **Brahmaputra**.
- Several islands are found in the path of this river, **Majuli** is the world's largest riverine island. It enters Bangladesh near Dhubri and flows southward.
- In Bangladesh, Teesta joins it at right bnak and later it is called as **Jammu** and therafter it merges with the Padma and falls in Bay of Bengal.
- **Left bank tributaries –** Burhi-Dihang, Dhansiri, Lohit.
- **Right bank tributaries –** Subansiri, Kameng, Manas and Sankosh.

3.3.2 Sankosh River

- It originates from northern Bhutan making border between Assam and West Bengal.
- This river joins Brahmaputra near Assam-Bangladesh border.

3.3.3 Teesta River

- It is the westernmost right bank tributary of Brahmaputra. It originates from Kanchenjunga and join Brahmaputra in Banglesh.
- This river also forms a deep gorge in Darjeeling hills.
- Its important tributaries are Rangpo, Rangit and Sevak.

3.3.4 Manas

- It is a **Transboundary River** in the Himalayan foothills between southern Bhutan and India.

3.3.5 Subansiri River

- It originates in **Tibet** and it is an **antecedent river**. It joins the Brahmaputra river.

3.3.6 Dhansiri River

- It originates from **Laisang hills** in Nagaland and after flowing through Nagaon, it join Brahmaputra river.

3.3.7 Kaland River

- It flows in southern parts of Manipur and Mizoram and drains into Bay of Bengal.

- A hydroelectric project is located on this river.

3.3.8 Barak River

- it originates from **Mt. Japov in Nagaland** and flows in Manipur. **Mawsynram** and **Cherrapunji** are situated in this river basin where highest rainfall of the world has bee recorderd.

4. Peninsular Drainage System

- The Peninsular drainage system is older than Himalayan river system which is evident from the broad, largely graded shallow valleys and the maturity of rivers.
- Most of the major Peninsular rivers except Narmada and Tapi flow from West to East.

4.1 Mahanadi (851 km)

- The Mahanadi rises near Sihawa in Raipur district of Chhattisgarh. It drains an area of around 1.42 lakh square kilometers and has a total course of 851 km.
- The river flows through the states of Chhattisgarh and Odisha.
- Its major tributaries are Sheonath, Mand, Ib, Tel, Ong, Jonk and Hasdeo.
- Hirakud dam, the longest dam in the world, is located on this river.

4.2 Godavari (1,465 Km)

- Godavari River is also known as Dakshin Ganga or Vridha Ganga.
- It is the largest peninsular river and second largest river of India.
- It rises from Tirmbakeswar in the Nashik district of Maharashtra.
- The Godavari basin extends over the states of Maharashtra, Madhya Pradesh, Chhattisgarh, Odisha, Telangana and Andhra Pradesh.
- It principal tributaries are Penganga, Indravati**, Pranhita, Manjara, Wainganga, Wardha** and **Pravara.**

4.3 Krihsna (1,401 km)

- It is the second largest east flowing peninsular river which rises near Mahabaleshwar in Sahyadri ranges.
- The river basin extends over the states of Maharashtra, Karnataka, Telangana and Andhra Pradesh.
- Its major tributaries are Koyna, Tungabhdra, Bhima, Malaprabha, Ghataprabha, Musi and Dudhganga.
- Dudhganga, Srisailam, Ghatprabha Hydroeletric Projects and Nagarjunasgar Dam is located in its basin.

4.4 Cauvery (800 km)

- Cauvery, also known as the Ganges of the South, is the fouth largest river of southern India.
- It originates from Brahmagiri hills of Kogadu district in Karnataka. It forms triangular delta near Thanjavur, Tamil Nadu.
- The principal tributaries are Herangi, Hemawathi, Shimsha, Akravati, Lakshman Tirtha, Kabini, Amravati and Bhavani.
- In Madhya district, it forms two islands Srirangapatnam and Shivanasamudra, on either side of the Shivanasamudra falls.

4.5 Narmada (1,312 km)

- It is the largest among all the west flowing rivers.
- It originates from the western flank of the Amarkantak Plateau in Madhya Pradesh.
- Flowing through rift valley between the Satpura in the south and Vindhyan range in the north, it forms a picturesque gorge in marble rocks and Dhuandhar waterfall near Jabalpur.
- It forms a 27 km long estuary and flow into Arabian, south of Bharuch.
- Its important tributaries are Hiran, Orsang, Barma, Kolar, Banjar, Tawa Kundi, etc.

4.6 Tapi (724km)

- Tapi is known as Twin or Handmaid of Narmada.
- It originates from Multai in the Betul district of Madhya Pradesh. It also flows through rift valley and drains into Gulf of Khambat.
- Ukai Project (Ballabh Sagar Project), Tawa River Valley Project and Kakrapur Dam are located on this river.
- Its important tributaries are Suki, Arunavati, Mona, Amravati, Purna, Sipna etc.

4.7 Luni

- It originates near Pushkar Valley of the Aravali range in two branches i.e. Saraswati and Sabarmati, which join with each other at Govindgarh from where it is called Luni.
- It is the largest river system of Rajasthan, west Aravalli.

4.8 Kali River

- It originates from the Western Ghats in Karnataka.
- It flows in the form of an arc and drains into Arabian Sea. It has been polluted due to the manganese contamination.

4.9 Vedavathi River

- It is tributary of Tungabhadra River and also known as Hagari.
- It originates from Bababudanagiri hills of Western Ghats and flows through Karnataka and Andhra Pradesh.

4.10 Mahi River

- It originates in Vindhyan hills of Madhya Pradesh and flows from east to west.
- It flows through Rajasthan and Gujarat making an estuary finally drains into the

5. Small Rivers Flowing towards the West

(Draining into Arabian Sea)

1. **Shetruniji:** Rises near Dalkahwa in Amreli district of Gujarat.
2. **Bhadra:** Aniali village in Rjakot district. A dam is built across the river near Lakkavalli.
3. **Dhadhar:** Rises near Ghantar Village in Panchmahal district.
4. **Sabarmati:** Rises from Aravallis in Rajasthan.
5. **Vaitaran:** Raises from the Trimbak hills in Nashik district of Maharashtra
6. **Sharavathi:** It originates from Shimoga district of Karnataka. The famous **Jog falls** is located on this river.
7. **Mandavi:** It is also known as the **Lifeline of Goa.**
8. **Zuari:** It is the largest river of Goa.
9. **Bharathapuzha:** Originates near **Annamalai hills,** Kerala. It is **longest river** of **Kerala,** also known as **Ponnani.**
10. **Periyar:** The second largest river of Kerala. It is impounded by an arch dam at **Idukki.**
11. **Pamba:** River of Kerala which falls in Vemabanad lake after transversing course of **177 km.**

6. Small Rivers Flowing towards the East

(Draining into Bay of Bengal)

1. **The Subarnarekha:** It originates from Ranchi Plateau, forming boundary between West Bengal and Odisha in its lower course.
2. **The Brahmani:** It came into existence through the confluence of South Koel and Sankh rivers in Odisha.
3. **The Penneru:** It originates from the Nandi Durg hills in Karnataka and flows in northward direction.
4. **Baitarani:** This river originates from the Kendujhar Hills of Odisha and drains into Bay of Bengal.
5. **Vasmsadhara:** It originates in southern part of Odisha and forms an estuary at the mouth of Bay of Bengal.
6. **Palar river:** It's main tributaries are Poini and Cheyyar. It flows through Karnataka and Tamil Nadu and falls into Bay of Bengal
7. **Tamraparni:** Source of the river is Western Ghats (Near Alwarkurichi) and Drains into the Gulf of Mannar
8. **The Vaigai:** It rises in the Eastern slopes of Varushanadu hills.

7. Major Water Falls of India

Waterfalls are a spectacular sight to many eyes. Who would not like water crashing from tremendous heights and making plunge pools below it. India is home to most beautiful waterfalls in the world. Here monsoons are the major water providers to many waterfalls. The rains power the rivers and they create gushing waterfalls that become the ultimate travel destination every year. Take a look at such waterfalls in India below.

Major Water Falls of India

Waterfalls	Height (m)	Location/State	Waterfalls	Height (m)	Location/State
Kunchikal	455	Shimoga/Karnataka	Vantawng	299	Serchhip/Mizoram
Barehipani	399	Mayurbhanj/Odisha	Penchalakona	219	Nellore/ Andra Pradesh
Langshiang	337	Western Khasi Hill/ Meghalaya	Kune	200	Pune/Maharashtra
Nohkalikai	332	Eastern Khasi Hill/Meghalaya	Soochipara	168	Wayanad/Kerala
Nohsngithiang	315	Eastern Khasi Hill/Meghalaya	Joranda	157	Mayurbhanj/Odisha
Dudhsagar	310	Goa	Shivanasamudra	98	Kaveri/Karnataka
Kynrem	305	Eastern Khasi Hill/Meghalaya	Hundru	98	Subarnrekha/Jharkhand
Meenmutty	300	Wayand/Kerala	Kapildhara	100	Narmada/Madhya Pradesh
Thalaiyar	297	Dindigal/Tamil Nadu	Pykara	55-61	Nilgiri Region/Ooty
Barkana	259	Shimoga/Karnataka	Gokak	55	Belagvi/Karnataka
Jog/ Gersoppa	253	Karnataka	Kakolat	49	Nawada/Bihar
Khandadhar	244	Sundaragh/Odisha	Chuliya	18	Rawatbhata/Rajasthan

9. Soil of India

9.1 Soil Types

- Soil is the network of interacting living organisms within the earth's surface layer which support life above ground. It is a thin upper weathered layer of the earth crust. The major constituents of the soil are minerals, humus, water and air.
- The naturally occurring soil is influenced by (i) parent material, (ii) climate, (iii) physical, chemical and biological agents (micro-organism) in it, (iv) land use practices and (v) time.
- Paedogenesis is the natural process of soil formation. It includes various subsidiary processes such as humiliation, weathering, leaching and calcification. Pedology is the study of soils in their natural environment. It deals with pedogenesis, soil morphology and soil classification.

> The word rock is not used only for hard and highly resisting material like Granite and Sandstone but also for the rare and less resisting soils lie kankar, clay, loess and alluvium.

- Soil develops where rock and sediments (lithosphere) are influenced by flora and fauna (biosphere), water (hydrosphere) and climate (atmosphere).

Soils Type	States where found	Rich in	Lacks in	Crops grown
Alluvial	Mainly found in the plains of Gujarat, Punjab, Haryana, Uttar Pradesh, Bihar, Jharkhand etc.	Potash and Lime	Nitrogen and Phosphorus	Large variety of rabi and kharif crops such as wheat, rice, sugarcane, cotton and jute etc.
Black (Regur Soil)	Deccan Plateau, Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh, Tamil Nadu, Valleys of Krishna and Godavari Rivers	Lime, Iron, Magnesia, Potash and Alumina	Phosphorous, Nitrogen and Organic matter	Cotton, sugarcane, jowar, tabacco, wheat and rice etc.

Red	Eastern and southern part of the Deccan Plateau, Odisha, Chhattisgarh and southern parts of the middle Ganga plain.	Iron oxide and Potash	Nitrogen, Phosphorous and Humus	Wheat, rice, cotton, sugarcane and pulses.
Laterite	Karnataka, Kerala, Tamil Nadu, Madhya Pradesh, Assam and Orissa hills.	Iron oxide and Potash	Organic matter, Nitrogen, Phosphate and Calcium	Cashewnut, tea, coffee, rubber
Arid	Western Rajasthan, North Gujarat and Southern Punjab	Soluble salts and Phosphate	Humus and Nitrogen	Only drought resistant salt tolerant and desert crops such as barley, rapeseed, cotton, millets, maize and pulses.
Saline and Alkaline	Western Gujarat, details of Eastern Coast, Sunderban areas of West Bengal, Punjab and Haryana	Sodium, Potassium, Magnesium	Nitrogen and Calcium	Unit for agriculture

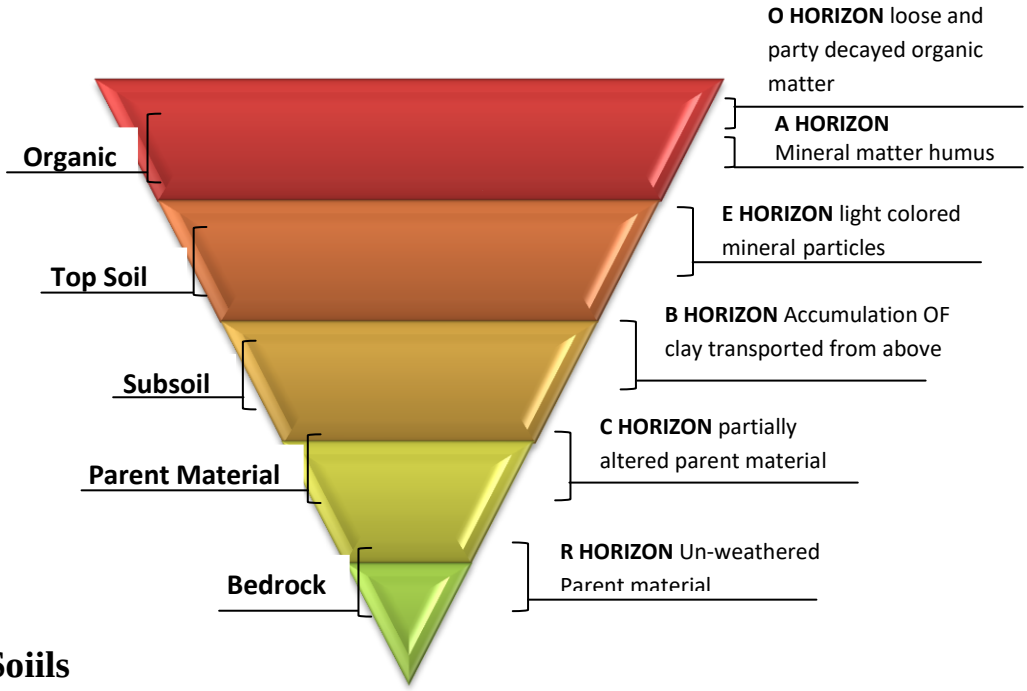
The World Soil Day is celebrated every year on h December by Food and Agriculture Organization (FAO) of the United Nations. It aims to communicate messages on the importance of soil quality for food security, health ecosystems and human well-being. Keep soil alive protect soil biodiversity-is the theme for 2020.

9. Layers of Soil

9.1 Definition of Soil

Soil can be simply defined as a mixture of small rock particles/debris and organic materials/ humus which develop on the earth surface and support growth of plants.

9.2 Soil Layers



9.3 Formation of Soiils

Karewas Soils

- Lacustrine deposits, formed during the Pleistocene period due to endogenetic forces, in the valleys of Kashmir and Bhadarwah in Doda district of Jammu are known as Karewas.
- These are the flat topped mounds, composed of fine salt clay, sand and boulder-clay.
- The Karewas are very fertile deposits and are used for the cultivation of Saffron, almonds, Walnuts, Apple and Orchards.

Snowfields

- The areas under snow and glaciers are collectively known as snowfields. The high peaks of the Greater Himalayas are Karakoram, Ladakh and Zaskar.
- The soils in these areas are immature, generally without soil erosion. They remain frozen and are unsuitable for the cultivation of crops.

Laterization

- It is common to the soils found in the humid tropical and subtropical environments.
- The high temperatures and heavy precipitation results in the rapid weathering of rocks and minerals.
- Almost all of the by-products of weathering are translocated from A horizon to B horizon by leaching.
- The B-Horizon in a lateritic soil has high concentration of illuviated materials. Heavy leaching causes the soils to have an acidic pH because of the net loss of base captions.
- This type of soil is known as Laterite which means brick-like as it used in tropical areas for making bricks.

Calcification

- It occurs when evapotranspiration exceeds precipitations causing the upward movement of dissolved alkaline salts from the groundwater. It occurs in warm, semi-arid environment.
- In some cases, the deposits can form a hard layer called Caliche. The most common substance involved in this process is Calcium Carbonate.

Podsolisation

- It occurs in cool and moist climates.
- It occurs when strongly acid soil solutions cause the breakdown of clay minerals. As a result Silica, Aluminium and Iron from complexes with organic substances in the soil.

Gleying

- It occurs in waterlogged, anaerobic conditions when iron compounds are either reduced or removed from the soil, or segregated out as mottles or concretions in the soils. A
- The removal of iron leaves the soil a grey or bluish colour. Marshy wetlands often contain gleyed soils.

Salinization

- It is the process of accumulation of salts, such as sulphates and Chlorides of Calcium, Magnesium, Sodium and Potassium, in soils in the form of a salty horizon.
- It is quite common in arid and semi-arid regions.

9.4 International Year of Soils

The International Year of Soils, 2015 (IYS 2015) was declared by the sixty-eighth session of the United Nations General Assembly on December20,2013 after recognizing December 5 as World Soil Day.

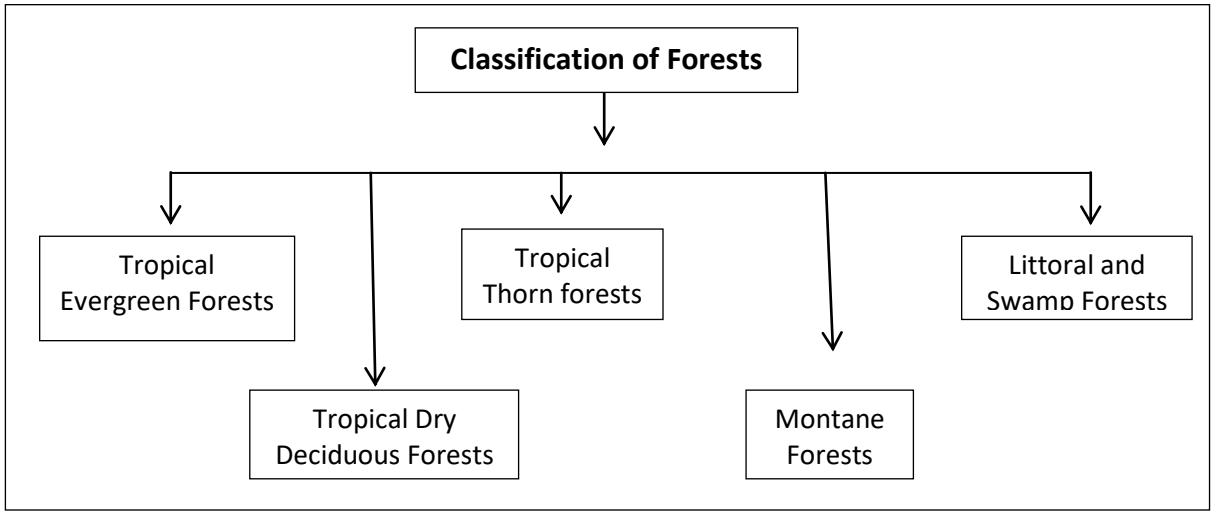
10 Classification of Forest Based on Administration

10.1 Statutary Conditions

I. **Reserved Forest:** In these forests, entry of people is prohibited for the collection of timber and grazing of cattle. A total of 53%of forest area of the country fall under this category.

II. **Protected Forest:** These forests are under the supervision of the government but local people have the right to collect wood for fuel and feed the cattle in this region, but provided there should be no serious threat to forests. A total of 29% the country's forest areas belong to this category.

III. **Unclassified Forest:** There is no restriction on cutting trees and feeding cattle in unclassified forest. About 18% forest area of the country falls under this category.



10.2 Classification of Forests

10.2.1 Tropical Evergreen Forests

- These forests are found in areas receiving more than 200 cm of rainfall and having temperature above 22°C.

- Tropical Evergreen Forests are found in Sahyadri (Western Ghats), Shillong Plateau, Andaman and Nicobar Islands and Lakshadweep.
- These forests are dense and multi-layered. It harbours many types of plants and animals. The trees are evergreen as there is no definite period to shed their leaves.

The vegetation of these forests includes Mahogany, Rosewood, Bamboo, Canes, Cinchona, and Rubber etc.

- The semi evergreen forests are found in the less rainy parts of these regions. Such forests have a mixture of evergreen and moist deciduous trees.
- The forests are also important for the cultivation of spices.

10.2.2 Tropical Wet Deciduous Forests

- These are also called as Monsoon forests. These forests are found in the parts of Chhattisgarh. Odisha, Bihar, Jharkhand, Andhra Pradesh, Karnataka, Kerala and Tamil Nadu.
- Moist Deciduous forests are found in the area with100-200 cm of rainfall. The major regions include western slopes of Sahyadri, north-eastern parts of peninsular plateau, Bhabar and Terai Region along the foothills of Shiwaliks.
- The major vegetation of these forests includes Teak, Sal, Mango, Mahua, Bamboo, Shisham, Khair and sandal. All these are economically very important.
- Dry Deciduous forests are found in the regions with 70-100 cm of rainfall. These represent transition type as on the wetter side these gives way to moist deciduous and on the drier side these become thorn forests.
- Trees of these forests have thick bark and are not very high (generally 6-9 m height).
- They are distributed in eastern Rajasthan, western Madhya Pradesh, south-western Uttar Pradesh, southern Punjab, Haryana and the rain shadow region of Western Ghats.
- Overgrazing is the most important problem in these forests. the vegetation of this region includes Mahua, Babool, Tendu, Khair, Pepal etc.

10.2.3 Tropical Thorn Forests

- These forests are found in the areas with rainfall less than 75 cm, humidity less than 50% and high temperature around 25-30°C.
- These forests are also found in a crescent belt extending from Indore district of Madhya Pradesh to plateau regions of Kurnool district of Andhra Pradesh.

- The main species of these forests are Babool, Khair, Palm, Date, Cacti and Palas.

10.2.4 Montane Forests

- Since climatic conditions change with increasing height, the change in vegetation cover at different heights in mountainous region is also observed.
- Here the vegetation ranges from tropical to alpine type. At an altitude of 1500 m deciduous forest are found while the altitude of coniferous forest various from 1500-3000.
- The vegetation found here includes Deodar, Spruce, Silver fir, Chir etc whose leaves are conical.
- Broad leaf evergreen trees like Oak, Magnolia, Lawrell etc are found in the heavy rainfall regiions of the eastern Himalayas.

10.2.5 Littoral and Swamp Forests

- These forests are also called Tidal or Mangrove.
- The deltaic tracts of Ganga, Godavari, and Krishna etc are ideally suited for this type of forests.
- The best example of this type of forest is Sunderbans which is the largest mangrove forest of the world.

Van Mahotsav was launched in 1950 to make people aware of the importance of planting trees. Van Mahotsav is usually observed in the first week of July every year. The objective is to keep local people involved in plantation drives and spread environmental awareness.

- The United Nations General Assembly declared 21 March as the international day of Forests (IDF), in 2012.
- The theme for each International Day of Forests is chosen by the collaborative partnership on forests. The theme for 2021 is Forest Restoration: A path to Recovery and Well Being.