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NO DELTA FOUND AT WESTERN CAOST OF INDIA

The western coastal plain of India is devoid of any delta primarily due to its geological and geomorphological characteristics, as well as the specific hydrological and sedimentation patterns of the region. **Here are some key reasons for the absence of deltas on the western coast of India:**

1. **Geological Structure:** The western coast of India is primarily composed of hard and resistant rock formations, such as the Western Ghats (also known as the Sahyadri Mountains). These rocky formations do not allow for the extensive deposition of sediments that is necessary for the formation of deltas.
2. **Limited River Systems:** The rivers on the western coast generally have shorter courses and lower discharge compared to those on the eastern coast. As a result, there is less sediment transport and deposition along the western coast.
3. **Lesser Sediment Load:** The rivers on the western coast carry fewer sediments compared to their counterparts on the eastern coast.
4. **Strong Coastal Currents:** The western coast of India is subject to strong coastal currents, such as the West India Coastal Current and the Somali Current. These currents help prevent the accumulation of sediments at the river mouths, which is a necessary condition for the formation of deltas.
5. **Tectonic Activity:** The region around the western coast of India is tectonically active, with significant faulting and uplift of land. This geological activity can disrupt the formation and stability of deltas.
6. **Wave Action:** The western coast faces the Arabian Sea, which is known for its powerful waves and high-energy coastline. These waves can disperse sediments and prevent the formation of deltaic features.

COMPARISON OF THE ISLAND GROUPS OF THE ARABIAN SEA AND THE BAY OF BENGAL

Bay of Bengal	Arabian sea
➤ Andaman and Nicobar Islands were formed due to collision between Indian Plate and Burma Minor Plate [part of Eurasian Plate] [Similar to formation of Himalayas].	➤ Lakshadweep Islands are coral islands. These islands are a part Reunion Hotspot volcanism

➤ Andaman and Nicobar Islands are southward extension of Arakan Yoma range.	
➤ The Bay of Bengal Island groups consist of about 572 islands.	➤ There are approximately 36 islands.
➤ The Andaman islands are divided into three main islands i.e. North, Middle and South.	➤ In the Arabian Sea, there are three types of islands Amindivi Islands, Laccadive Islands, Minicoy Island.
➤ These are situated roughly between 6°N-14°N and 92°E -94°E.	➤ These are situated between 8°N-12°N and 71°E -74°E longitude.
➤ These islands are formed of granitic rocks. These islands are an elevated portion of submarine mountains.	➤ The entire island group is built of coral deposits.
➤ Saddle peak (737 m) in North Andaman is the highest peak.	➤ Most of the islands have low elevation and do not rise more than five metre above sea level (Extremely Vulnerable to sea level change).
➤ These islands have an equatorial type of vegetation.	➤ The littoral forests are the only natural vegetation.
➤ Andaman and Nicobar Islands separated by a waterbody which is called the Ten-degree channel.	➤ The entire group of islands is broadly divided by the Nine degree channel, north of which is the laccadive Island and to the south of the minicoy Island.
➤ Andaman and Nicobar islands are inhabited by the tribals like Jharwas, shompen and onges.	➤ In Lakshadweep islands, there is majority of Islam followers.
➤ These tribal groups have their own language.	➤ The language spoken by them is Malayalam.

- **Barren Island**, the only active volcano in India is situated in the Nicobar Islands.

DRAINAGE SYSTEM

A river is a **ribbon-like body of water that flows downhill from the force of gravity**. A river can be wide and deep, or shallow enough for a person to wade across. A flowing body of water that is smaller than a river is called a stream, creek, or brook.

A river basin and a watershed are related concepts in hydrology and geography, but they refer to slightly different geographical and hydrological areas:

River Basin:

- A **river basin, also known as a drainage basin or catchment area, is a larger geographical region** that encompasses the entire land area drained by a river and its tributaries.
- It is defined by the natural topography of the land, as all the precipitation, surface runoff, and groundwater within this area ultimately flow into the main river and its network of tributaries.
- River basins can vary significantly in size. They can range from small, local basins to massive ones that cover entire continents.
- The boundaries of a river basin are determined by **the topographic divides, which separate one basin from another**.

Watershed:

- A watershed, also known as a **water catchment or drainage area, is a smaller, specific area within a river basin**. It represents the land area that contributes to the flow of water into a particular river, stream, or body of water.
- Watersheds are often delineated based on the flow patterns of water. The high points, or ridgelines, within a watershed define the areas where water flows toward a particular stream or river.
- Watersheds are essential for understanding local hydrology, water quality, and the management of water resources. They are often used as units for conservation and land-use planning.

DRAINAGE PATTERN:

It refers to the system of flow of surface water mainly through the forms of rivers and basins.

The drainage system depends upon factors such as slope

of land, geological structure, amount of volume of water and velocity of water.

Types of Drainage Patterns

1. Dendritic Drainage Pattern:

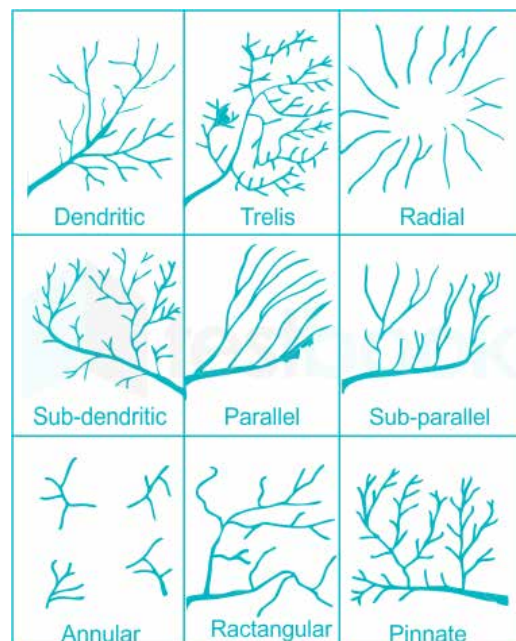
- ❖ It is the most common form and **resembles the branching pattern of tree roots**.
- ❖ The dendritic pattern develops where the river channel follows the slope of the terrain.
- ❖ The pattern develops in areas where the rock beneath the stream has no particular structure and can be eroded equally easily in all directions.
- ❖ Tributaries join larger streams at acute angles (less than 90°).
- ❖ E.g. The rivers of the northern plains; Indus, Ganga and Brahmaputra.

2. Parallel drainage pattern:

- ❖ It develops in regions of parallel, elongated landforms where there is a pronounced slope to the surface.
- ❖ Tributary streams tend to stretch out in a parallel-like fashion following the slope of the surface.
- ❖ E.g. The rivers originating in the Western Ghats; Godavari, Kaveri, Krishna, and Tungabhadra.

3. Trellis Drainage Pattern:

- Trellis drainage develops in folded topography where hard and soft rocks exist parallel to each other.
- Down-turned folds called synclines form valleys in which reside the main channel of the stream.
- Such a pattern is formed when the primary tributaries of main rivers flow parallel to each other and secondary tributaries join them at right angles.



- ❖ E.g. The rivers in the upper part of the Himalayan region; Indus, Ganga and Brahmaputra.

4. Rectangular Drainage Pattern:

- ❖ The rectangular drainage pattern is found in regions that have undergone faulting.
- ❖ It develops on a strongly joined rocky terrain.
- ❖ Streams follow the path of least resistance and thus are concentrated in places where exposed rock is the weakest.
- ❖ The tributary streams make sharp bends and enter the main stream at high angles.
- ❖ **E.g. Streams found in the Vindhya mountain range; Chambal, Betwa and Ken.**

5. Radial Drainage Pattern:

- ❖ The radial drainage pattern develops around a central elevated point and is common to conically shaped features such as volcanoes.
- ❖ When the rivers originate from a hill and flow in all directions, the drainage pattern is **known as 'radial'**.
- ❖ **E.g. The rivers originating from the Amarkantak range; Narmada and Son (tributary of Ganga).**

6. Centripetal Drainage Pattern:

- ❖ It is just the opposite of the radial as streams flow toward a central depression.
- ❖ During wetter portions of the year, these streams feed ephemeral lakes, which evaporate away during dry periods.
- ❖ Sometimes, salt flats are also created in these dry lake beds as salt dissolved in the lake water precipitates out of solution and is left behind when the water evaporates away.
- ❖ **E.g. Loktak lake in Manipur.**

DIFFERENCE BETWEEN ESTUARY AND DELTA

Delta	Estuary
➤ In alluvial deposits, a delta is a low and triangular area where a river splits before draining into a bigger body of water.	➤ Tides come in and go out at the river's mouth, shaped like a funnel.
➤ The majority of fishing activities involve deltas.	➤ Agriculture is practiced in estuarine environments.

➤ Deltas developed at the mouths of rivers that transported enough sediment to expand outward.	➤ Estuaries are found where lake or ocean waters overflow into a river valley.
➤ Deltas form when rivers discharge their water and sediment into another body of water, such as an ocean, lake, or Rivers of India.	➤ An estuary is a partially enclosed coastal body of water where freshwater from rivers and streams mixes with saltwater from the ocean.
➤ Deltas can also empty into the land, though this is uncommon.	➤ Estuaries and their surrounding lands serve as transition points from land to sea.
➤ As a river approaches its mouth or end, it moves more slowly.	➤ Estuaries and the wetlands surrounding them are bodies of water typically found where rivers meet the sea.
➤ The rivers like Ganga, Krishna and Godavari forms delta.	➤ Narmada and Tapi rivers forms Estuaries.

InterLinking of Rivers

- The InterLinking of Rivers programme (ILR) programme is aimed at linking different surplus rivers of the country with deficient rivers so that the excess water from surplus regions could be diverted to deficient regions.
- **For example:** Ken-Betwa River Interlinking Project, Recently Union Finance Minister Nirmala Sitharaman has proposed a project to link five rivers in India in her budget speech **Godavari-Krishna, Krishna-Pennar and Pennar-Cauvery, Damanganga-Pinjal and Par-Tapi-Narmada.**
- **National Interlinking of Rivers Authority (NIRA)** is supposed to be an independent autonomous body for planning, investigation, financing and the implementation of the river interlinking projects in the country.

SOCIO-ECONOMIC ADVANTAGES OF INTER-LINKING OF RIVERS IN INDIA

The inter-linking of rivers in India is a proposed mega-engineering project aimed at connecting the country's rivers through a network of canals and reservoirs. Proponents of this project argue that it could bring several socio-economic advantages to the country.

Here are some of the potential socio-economic advantages cited by supporters:

1. **Water Resource Management:** Improved water availability for irrigation, drinking water supply, and industrial use in water-scarce regions. Mitigation of droughts and floods in different parts of the country through better water distribution and management.
2. **Agriculture and Food Security:** Increased agricultural productivity due to enhanced irrigation facilities. Enhanced food security through increased agricultural production.
3. **Rural Development:** Creation of employment opportunities in the construction and maintenance of canals, reservoirs, and related infrastructure.
4. **Hydropower Generation:** Potential for hydropower generation in canal-based and reservoir-based projects, contributing to the country's energy needs.
5. **Inland Navigation and Transportation:** Development of inland waterways for transportation, potentially reducing logistics costs and promoting trade. Improvement of connectivity between different regions of the country, facilitating economic integration.
6. **Flood Control:** Better flood control measures through the diversion of surplus water during monsoons to water-deficient regions.
7. **Urban Water Supply:** Enhanced urban water supply in major cities by tapping into distant water sources.
8. **Tourism and Recreation:** The creation of large reservoirs and water bodies could promote tourism, which could, in turn, boost local economies.

Conclusion: It's important to note that the inter-linking of rivers is a highly complex and ambitious project with potential **environmental, ecological, and social consequences**.

Balancing the potential socio-economic benefits with these concerns is a significant challenge, and thorough environmental and social impact assessments are essential before proceeding with such projects. **Public and stakeholder consultation is also crucial to address concerns and ensure responsible and sustainable river inter-linking.**

CHARACTERISTICS OF THE PENINSULAR RIVER

Peninsular rivers, also known as peninsular plateau rivers, are a distinct group of rivers that flow across the Indian subcontinent's peninsular plateau, which includes the Deccan Plateau. **These rivers exhibit several characteristic features:**

- **Seasonal Flow:** Peninsular rivers are typically seasonal in nature, with flow patterns heavily influenced by the monsoon rains.
- **Variable Discharge:** The discharge of peninsular

rivers varies greatly from one season to another. During the monsoon, they carry large volumes of water, leading to flooding in some areas, while in the dry season, the flow may reduce to a mere trickle or even dry up in certain stretches.

- **Flows from West to East:** Many peninsular rivers flow from the western part of the plateau towards the eastern coast. Examples include the Godavari, Krishna, and Cauvery rivers.
- **Rapid Flow:** They form numerous **waterfalls and rapids** as they descend, making them challenging to navigate.
- **Deep Valleys:** These rivers have eroded deep valleys, often forming gorges and canyons in their course. The Western Ghats, which many of these rivers originate from, are characterized by steep slopes and deep valleys.
- **Limited Navigability:** The rapid flow, rocky terrain, and seasonal variability make peninsular rivers less suitable for navigation compared to the rivers of the northern plains like the Ganges and Yamuna.
- **Perennial Tributaries:** While the main rivers may be seasonal, they are often fed by perennial tributaries originating from the Western Ghats.
- **Erosion and Sediment Deposition:** Peninsular rivers are known for their erosional and sediment-carrying capacity. During the monsoon, they erode the Western Ghats and transport large amounts of sediment downstream, which can affect the landscape and lead to sediment deposition in their lower reaches.
- **Lack of Deltas:** Unlike some rivers in the northern plains, peninsular rivers typically do not form deltas when they enter the sea. Instead, they often have estuaries or form small alluvial plains along their coastal areas.
- **Utilization for Irrigation:** Dams, reservoirs, and canal systems are often built to store and manage water for agricultural purposes.
- Examples of prominent peninsular rivers in **India include the Godavari, Krishna, Cauvery, Tungabhadra, and Penneru.** These rivers play a significant role in the water resources and agriculture of the Deccan Plateau and southern India.

CHARACTERISTIC FEATURES OF NORTH INDIAN RIVERS:

North Indian rivers and Peninsular rivers exhibit distinct characteristic features due to differences in their geographical locations, topography, and hydrological regimes. Here are the important **characteristic features of North Indian rivers:**

- **Perennial Flow:** North Indian rivers, such as

the Ganges (Ganga) and Yamuna, are generally perennial, because they are fed by the melting snow from the Himalayan glaciers in addition to monsoon rains.

- **Himalayan Origin:** Many North Indian rivers originate in the Himalayan mountain range, which is a significant source of freshwater
- **Snowmelt and Glacier Fed:** These rivers have a substantial snowmelt and glacier-fed component, resulting in a relatively constant water supply throughout the year, even during the dry season.
- **Flatter Terrain:** The northern plains of India, where these rivers flow, have a relatively flatter terrain compared to the Peninsular plateau. This results in meandering river courses with gentle slopes.
- **Fertile Alluvial Plains:** North Indian rivers have deposited rich alluvial soil in their floodplains, making them highly fertile. This makes the region suitable for intensive agriculture.
- **Deltas:** Several North Indian rivers, such as the Ganges and Brahmaputra, form extensive deltas where they meet the Bay of Bengal.
- **Navigation and Transportation:** The relatively gentle flow and predictable water supply of North Indian rivers make them suitable for navigation and transportation.

Differences from Peninsular Rivers:

- **Perennial vs. Seasonal Flow:** North Indian rivers are generally perennial, while Peninsular rivers are often seasonal, with significant fluctuations in water levels between the wet and dry seasons.
- **Source of Water:** North Indian rivers are primarily sourced from the Himalayas and are heavily dependent on snowmelt and glacier meltwater, whereas Peninsular rivers originate from the plateau and rely more on monsoon rains.
- **Terrain:** North Indian rivers flow through relatively flatter terrain in the northern plains, while Peninsular rivers have more rapid and steep courses as they flow from the Western Ghats to the eastern coastal plains.
- **Floodplains:** The floodplains of North Indian rivers are characterized by fertile alluvial soil, while those of Peninsular rivers may have rockier terrain.
- **Deltas:** North Indian rivers often form deltas at their mouths, while Peninsular rivers typically do not form deltas; they may have estuaries or small alluvial plains.
- **Navigation:** North Indian rivers are generally more suitable for navigation due to their gentler flow, while Peninsular rivers are less navigable.

CLIMATE AND VEGETATION

BURSTING OF THE MONSOON

The “bursting of the monsoon” is a term used to describe the onset of the monsoon season in a particular region. It signifies the abrupt and significant increase in rainfall and a shift in weather conditions from dry to wet, marking the official arrival of the monsoon. This phenomenon is of particular significance in regions where the monsoon plays a crucial role in the climate and agriculture.

- The first rain of monsoon is called a monsoon bursting. The sudden onset of monsoon winds filled with moisture associated with violent thunder and lightning is often called a monsoon bursting.

The bursting of the monsoon is characterized by the following key features:

- **Sudden Increase in Rainfall:** Prior to the monsoon burst, the region often experiences hot and dry weather. When the monsoon arrives, there is a sudden and substantial increase in rainfall. It can start as light rain and then intensify over a short period, leading to significant precipitation.
- **Change in Wind Patterns:** The arrival of the monsoon is associated with a shift in wind patterns. The Indian subcontinent, the monsoon winds blow from the southwest, bringing moisture-laden air from the Indian Ocean. **This shift in wind direction** is a key factor in the onset of the monsoon.
- **Temperature Drop:** The monsoon burst is often accompanied by a drop in temperatures, providing relief from the preceding hot and dry conditions. The rain-cooled air and increased cloud cover contribute to the cooling effect.
- **Agricultural Significance:** In many regions, agriculture relies on the monsoon rains for water, and the bursting of the monsoon is eagerly awaited by farmers. It marks the beginning of the planting season and the opportunity to cultivate crops that depend on adequate rainfall.
- **Social and Cultural Significance:** The onset of the monsoon is not just a meteorological event; it also has cultural and social significance in many societies. Monsoon festivals and rituals are common to celebrate the arrival of the rainy season.
- **Monitoring and Forecasting:** Meteorological agencies and institutions closely monitor the progress of the monsoon and issue forecasts to assist agricultural planning and disaster preparedness.
- The **timing and intensity of the monsoon’s arrival can vary from year to year and from region to region.** In some cases, the bursting of the monsoon is a highly anticipated and celebrated event, while in

other areas, it can lead to flooding and other weather-related challenges.

- The monsoon is a critical climatic phenomenon **in many parts of the world**, influencing various aspects of life, especially agriculture and water resources.
- **Example:** Mawsynram is the place with the highest rainfall in India. Mawsynram has the highest average annual rainfall not only in India but in the world. The average annual rainfall of Mawsynram is about 1239 cm. It is a village situated in the Khasi Hill of Meghalaya.
- When the jet stream moves from the southern part of the Himalayas to the north of the Himalayas, the monsoon winds reach the northern plains and cause the monsoon burst.
- **In general, the following are some of the dates of the monsoon burst in India;**
 - ❖ 1 June; Kerala, Tripura and Mizoram
 - ❖ 5 June; Karnataka and North Eastern States.
 - ❖ June 10; Mumbai
 - ❖ 15 June; Gujarat and Northern Plains
 - ❖ 15 July; North West India - Haryana and Punjab.

INTER-TROPICAL CONVERGENCE ZONE (ITCZ)

The Inter-Tropical Convergence Zone (ITCZ), also known as the Intertropical Front or Equatorial Convergence Zone, is a significant feature in Earth's atmospheric circulation. It is a belt of **low pressure that encircles the Earth near the equator**, where the northeast and southeast trade winds converge.

Key characteristics of the ITCZ include:

- **Low Pressure:** The ITCZ is characterized by a region of low atmospheric pressure, which is a result of warm, moist air rising near the equator. As this air ascends, it cools and condenses, leading to the formation of clouds and precipitation.
- **Convergence of Trade Winds:** The ITCZ marks the boundary where the trade winds from the Northern Hemisphere and the Southern Hemisphere converge. When these trade winds from the two hemispheres meet, it results in rising air.
- **Weather Patterns:** The ITCZ is associated with a zone of frequent and sometimes heavy rainfall. This makes it a region of significant weather activity, with the potential for thunderstorms, heavy downpours, and even tropical cyclone formation.
- **Variation with Seasons:** The position of the ITCZ is not static; it shifts slightly north and south of the equator with the changing seasons. It typically follows the maximum solar heating, so it moves northward during the Northern Hemisphere's summer and

southward during its winter.

- **Influence on Climate:** The ITCZ has a significant impact on the climate and weather patterns in regions near the equator. It is responsible for the wet and dry seasons in many tropical areas.
- **Tropical Rainforests:** Many tropical rainforests are located near or within the ITCZ because of the consistent availability of moisture and warm temperatures.
- The ITCZ is a dynamic and important component of the Earth's atmospheric circulation system.
- It plays a **vital role in the redistribution of heat and moisture** from the equator to higher latitudes and helps drive the planet's climate and weather patterns.
- However, the **exact position and intensity of the ITCZ can vary due to factors** like ocean currents and large-scale climate phenomena like El Niño and La Niña.

CYCLONES CAUSE RAINFALL IN NORTH-WESTERN INDIA DURING WINTER

Cyclones that cause rainfall in northwestern India during the winter months are primarily **Western Disturbances (WDs)**. Western Disturbances are extratropical weather systems that can bring moisture and precipitation to parts of northwestern India, including regions like **Punjab, Haryana, Rajasthan, and parts of North India**. Here are some key details about Western Disturbances:

- **Origin:** Western Disturbances originate in the **Mediterranean region and Central Asia**. They are low-pressure systems that form when cool, dry air masses from Europe interact with relatively warmer and moist air masses from the Mediterranean and Caspian Sea regions. These disturbances travel eastward across the Eurasian landmass.
- **Path:** As Western Disturbances move eastward, they often track **across Iran, Afghanistan, and Pakistan before entering India**. Their movement is influenced by the upper-level westerly jet streams.
- **Effect on Northwestern India:** When Western Disturbances reach northwestern India, they can bring significant rainfall and sometimes snowfall to the region during the winter months, typically between November and February. This precipitation is crucial for winter crops and replenishing groundwater reserves.
- **Impact:** Western Disturbances can lead to a wide range of weather conditions **in northwestern India, including rain, snow, thunderstorms, and sometimes even fog**. The amount of precipitation they bring can vary widely from one disturbance to another.

- Winter rains are beneficial for **Rabi crops like wheat, gram, peas, potatoes, etc.**
- Snowfall occurs in the mountainous regions of the Himalayas like **Jammu and Kashmir, Himachal Pradesh, Ladakh, Uttarakhand, etc.**
- The Western Disturbance brings with it rain as well as dust particles, which **increases the smoke and fog in the area around Delhi.**
- **Temperature Drop:** These disturbances often lead to a drop in temperatures in the affected regions, making them colder and providing relief from dry and cold conditions.

It's important to note that Western Disturbances play a critical role in the winter climate and agriculture of northwestern India. Farmers in these regions rely on the moisture brought by these disturbances to cultivate crops during the winter season, **which is known as the Rabi season in India.**

FACTORS AFFECTING CLIMATE OF INDIA

- **The climate of India belongs to the 'tropical monsoon type' indicating the impact of its location in tropical belt and the monsoon winds.** Although a sizeable part of the country lying north of the Tropic of Cancer falls in the northern temperate zone but the shutting effects of the Himalayas **and the existence of the Indian Ocean in the south have played significant role in giving India a distinctive climatic characteristic.**

1. Latitude

- ❖ India's centre region is **east-west oriented along the Tropic of Cancer.** The tropical zone has **high temperatures** all year round with a **limited daily and annual variation** due to its **proximity to the equator.** The region **north of the Tropic of Cancer** has a severe climate with a broad range of daily and annual temperatures due to its distance from the equator.

2. The Himalayan Mountains

- ❖ The Himalayas and their northern extensions serve as a functional climate barrier. The imposing mountain range functions as an **unbreakable barrier**, shielding the subcontinent from **the icy northern winds.** These frigid winds, which originate close to the **Arctic Circle**, spread across central and eastern Asia. The monsoon winds are also trapped by the Himalayas, which forces them to spread their moisture throughout the Indian subcontinent.

3. Distribution of Land and Water

- ❖ India is encircled by the Indian Ocean on three sides, a tall, continuous mountain wall in the north, and the Indian Ocean on one side. Compared to **the landmass, the ocean warms and cools** more gradually. This seasonal variation in **air pressure** is caused by the differential heating of **the land and the water** in and around the Indian subcontinent. Because of the difference in air pressure, the **monsoon winds' direction is reversed.**

4. Distance from the Sea

- ❖ Because of **their extensive coastlines, large coastal areas** enjoy a temperate climate. Interior regions of India are far from the **sea's balancing power.** Climate extremes therefore exist in certain regions. As a result, people in **Mumbai and around the Konkan coast** don't have a strong sense of seasonal weather patterns or extremes in temperature. Seasonal variations in the country's heartland, including Delhi, Kanpur, and Amritsar, have an effect on many facets of life.

5. Altitude

- ❖ As you ascend, the temperature decreases. Due to the thin air, areas in the highlands are generally cooler than areas in the plains. For instance, although Agra and Darjeeling share the same latitude, **Agra's January temperature is 16°C and Darjeeling's is only 4°C.**

6. Relief

- ❖ The physiographic or relief features of India have an impact on temperature, **air pressure**, wind speed and direction, as well as the amount and distribution of rainfall. The **southern plateau stays dry** because of its leeward location along the **Western Ghats** during the months of June through September, in contrast to the windward portions of the **Western Ghats and Assam.**

THE NATURE OF VEGETATION OF INDIAN

In the world, there are 12 mega biodiversity countries and our Country India is one of them. India has a huge variety of Flora and Fauna.

- **Natural vegetation refers to the plant cover that exists in a region without significant human interference or cultivation.** It includes all the native plant species that have evolved in a particular area over time and are well adapted to the local environmental conditions, including climate, soil, and topography. Natural vegetation varies widely

across different regions of the world, and it can be categorized into various types based on climate and ecological factors.

Features of Natural Vegetation

- The nature of vegetation and the height of the land are strongly intertwined.
- The climate varies as the height rises, and the natural vegetation changes as well.
- Temperature and moisture play a role in plant development.
- It also depends on parameters such as slope and soil thickness. Forest, grassland, and shrubs are the three main classifications.

Factors Affecting Natural Vegetation

1. Land

- ❖ The nature of land affects the natural vegetation directly and indirectly. **E.g. the type of vegetation in the mountainous regions** is different than that in the plateau and plain areas.
- ❖ The fertile land is generally devoted to agriculture, while the undulating and rough terrains are areas where grassland and woodlands develop and give shelter to a variety of wildlife.
- ❖ Topography is responsible for certain minor type's e.g. alpine flora, tidal forests, etc.

2. Soils

- ❖ Different types of **soils provide basis for different types** of vegetation.
- ❖ The sandy soils of the desert support cactus and thorny bushes while wet, marshy, deltaic soils support mangroves and deltaic vegetation.
- ❖ The **hill slopes** with some depth of soil have conical trees.
- ❖ **Soil is an equally determining factor** in few regions. Mangrove forests, swamp forests are some of the examples where soil is the major factor.

3. Temperature

- ❖ Temperature determined the **nature and extent of vegetation of a region along with the humidity in the air, precipitation, and soil.**
- ❖ Temperature affects the nature, **type, and growth of vegetation** of a place because when the temperature decreases or height increases, the climate gets colder.
- ❖ **For Example, the fall in temperature affects the types of vegetation** and its growth on the slopes of the Himalayas and the hills of the peninsula above the height of 915 m.

- ❖ Here on **the slope of the Himalayas**, the vegetation changes from tropical to subtropical temperate and alpine vegetation.
- ❖ Similarly, at higher altitudes, where the climate is extremely cold, lichens and mosses grow.

4. Photoperiod (Sunlight)

- ❖ It is defined as the variation in the duration and amount of sunlight at different places. This variation in sunlight is due to latitude, altitude, season, and duration of the day.
- ❖ For Example, the Growth of trees and plants is high in summer due to the longer duration of sunlight. **Longer duration of sunlight the Southern Himalayas has covered with thick vegetation than the Northern slopes.**

5. Precipitation

- ❖ In India, almost the full rainfall season receives in advancing South-West monsoon i.e. (June to September). Areas always have denser vegetation with heavy rainfall than the other areas with lesser rainfall.
- ❖ **For Example, Monsoon rains cause a heavy growth of tropical evergreen forests on the western slopes of Western Ghats because of the southwest monsoon rains whereas, on other hand, the eastern slopes do not have dense forests.**

6. Altitude

- ❖ Increasing elevation causes a distribution of vegetation similar to that of increasing latitude.
- ❖ In general, 'altitude mimics latitude' and there occurs a close parallel between latitudinal and altitudinal zonation of climate and thus natural vegetation too. E.g. **Mount Kenya in east Africa and Mount Chimborazo in Equador** have their feet on the equator but their peaks are snow covered.

CLIMATIC CONDITIONS REQUIRED FOR TROPICAL EVERGREEN FORESTS

- Tropical evergreen forests are a type of natural vegetation that develops under specific climatic conditions. **These forests are characterized by the following climatic conditions:**
- **High Temperature:** Tropical evergreen forests are found in regions where temperatures remain high throughout the year. These areas typically have **mean monthly temperatures above 18°C (64°F).**
- **High Precipitation:** They receive abundant rainfall throughout the year, with annual rainfall totals often exceeding 2000 mm (79 inches). This consistent rainfall supports the lush, green vegetation.

- **No Distinct Dry Season:** Unlike tropical deciduous forests, which have a dry season, tropical evergreen forests do not have a prolonged dry period. They receive rainfall evenly throughout the year.
- **High Humidity:** The combination of high rainfall and high temperatures leads to high humidity levels in these regions, which is favorable for the growth of dense and diverse vegetation.
- **Limited Seasonal Variation:** These forests typically do not experience significant temperature fluctuations or seasonal changes. They remain green and vibrant year-round.
- Tropical evergreen forests are often found in equatorial regions within about **10 degrees of the equator, where the climate remains consistently warm and wet. Examples of regions with tropical evergreen forests include the Amazon Rainforest in South America, the Congo Rainforest in Africa, and parts of Southeast Asia, such as the rainforests of Borneo and Sumatra.**
- Tropical evergreen forests of India are found in the **Andaman and Nicobar Islands**, the **Western Ghats**, which fringe the **Arabian Sea**, the coastline of peninsular India, and the **greater Assam region** in the north-east.
- **Plant Species in Tropical Evergreen Forests:** Some of the commercially important trees of tropical evergreen forest are ebony, mahogany, rosewood, rubber and cinchona. Teak is the most dominant species of tropical deciduous forests. **Bamboos, sal, shisham, sandalwood, khair, kusum, arjun, mulberry** are other commercially important species.
- **Animal Species in Tropical Evergreen Forests:** Elephants Monkeys Lemur Deer One-Horned Rhino (Assam, West Bengal) Birds Bats Sloth Scorpions Snails

SOCIAL FORESTRY

Social forestry means **the management and protection of forests and afforestation on barren lands** with the purpose of helping in the environmental, social and rural development.

- The National Commission on Agriculture (1976) has classified social forestry into three categories. These are **Urban forestry, Rural forestry and Farm forestry.**

1. **Urban forestry:** Urban forestry pertains to the raising and management of trees on public and privately owned lands in and around urban centres such as green belts, parks, roadside avenues, industrial and commercial green belts, etc.

2. **Rural forestry:** Rural forestry lays emphasis on promotion of agro-forestry and community-forestry.
 - Agro-forestry is the raising of trees and agriculture crops on the same **land inclusive of the waste patches.** It combines forestry with agriculture, thus, **altering the simultaneous production of food, fodder, fuel, timber and fruit.**
 - Community forestry involves the raising of trees on public or community land such as the village pasture and **temple land, roadside, canal bank, strips** along railway lines, and schools etc. Community forestry programme aims at providing benefits to the community as a whole.
 - Community forestry provides a means under which the people of landless classes can associate themselves in tree raising and thus, get those benefits which otherwise are restricted for landowners.
1. **Farm Forestry:** Farm forestry is a term applied to the process under which farmers grow **trees for commercial and non-commercial purposes** on their farm lands.
 - Forest departments of various states distribute seedlings of trees free of cost to small and medium farmers.
 - Several lands such as the margins of **agricultural fields, grasslands and pastures, land around homes and cow sheds** may be used for raising trees under noncommercial farm forestry.

POPULATION DISTRIBUTION

Population Density

Spatial distribution of population

Spatial distribution of population density is classified into the following categories:

1. Areas of Extremely Low Density
2. Areas of Low Density
3. Areas of moderate Density
4. Areas of high Density
5. Areas of very high Density

1. Areas of Extremely Low Density:

- ❖ Areas having **100 person per sq km and less than** that at Included in this class.
- ❖ They include **Arunachal Pradesh (17), Mizoram (52), Andaman and Nicobar Islands (46), and Sikkim (86).** Arunachal Pradesh and Mizoram are located in remote and inaccessible

parts of northeast India.

- ❖ Sikkim is also a mountainous area with a low density of population.
- ❖ Andaman and Nicobar Islands is situated far away from the Indian mainland. The hot and humid climate of these islands is injurious to health and very little economic development has taken place here.

2. Areas of Low Density:

- ❖ Areas having a **population density of 101 to 250 persons per sq km** are included in this class.
- ❖ These states are Nagaland (119), Manipur (122), Himachal Pradesh (123), Jammu and Kashmir (124), Meghalaya (132), Chhattisgarh (189), Uttarakhand (189), Rajasthan (201), and Madhya Pradesh (236). Meghalaya, Manipur, and Nagaland are hilly, forested, and dissected areas of northeast India.
- ❖ These areas suffer from almost the same problems as those of Arunachal Pradesh and Mizoram, although to a lesser extent.
- ❖ Himachal Pradesh and Uttarakhand are parts of the north-western Himalayan region and have very little level land to support high population density.
- ❖ Jammu and Kashmir have vast areas devoid of population. Only some parts of the Jammu region and Kashmir valley are thickly populated.
- ❖ **Large stretches of Leh (Ladakh) and Kargil have a population density of less than ten persons per sq km.** On the whole, Kargil has a population density of 10 persons/sq km while Leh (Ladakh) has only 3 persons per sq km. These are dry and cold areas and **badly lack the basic amenities of life.**
- ❖ **Rajasthan is the largest state of India.** There are obviously large variations in the density of population in different parts of the state depending upon the local conditions.
- ❖ Most of Rajasthan is a sandy desert lacking in water resources and does not support high population density.
- ❖ Western parts of the state are **having even less than 50 persons per sq km** whereas eastern and northeastern parts of this state have sufficient resources and have a comparatively high density of population.
- ❖ Madhya Pradesh is a part of the Deccan Plateau and is having rugged topography of hard rocks. Like Madhya Pradesh, Chhattisgarh has rugged topography, is thickly forested, and is largely inhabited by the tribal people. As such, the

population density in this state also is low.

3. Areas of Moderate Density

- ❖ This class includes those areas which are having 251 to 500 persons per sq km. The average for the whole of India (382 persons per sq km) also falls in this class.
- ❖ Odisha (269), Gujarat (308), Andhra Pradesh including Telangana (308), Karnataka (319), Tripura (350), Maharashtra (345), Goa (394), Assam (397), and Jharkhand (414) are included in this category.
- ❖ These areas are wide apart from one another and there are different reasons for moderate density of population in different areas.
- ❖ For example, Assam has tea estates whereas Andhra Pradesh, Telangana, Odisha, Karnataka, and Jharkhand **have agricultural and mineral resources.**
- ❖ Maharashtra is a highly urbanized and industrialized state. The neighboring state of Gujarat also has urban and industrial growth, although at a scale smaller than that of Maharashtra.
- ❖ Among North Eastern states **Tripura has sufficient level land which supports moderate population density.**

4. Areas of High Density:

- ❖ These are areas having a population density of 501 to 1000 per sq km. States and union territories included in this category are Punjab (550), Tamil Nadu (555), Haryana (573), Dadra & Nagar Haven (698), Uttar Pradesh (828), and Kerala (859).
- ❖ Punjab and Haryana have highly developed agriculture based on heavy inputs in the form of high-yielding varieties of seeds, chemical fertilizers, and canal and tube-well irrigation.
- ❖ Similarly, **Tamil Nadu's population is based on agriculture and industries. The coastal plain of Kerala is also very fertile.** However, Kerala has started showing a decline in the growth rate of the population.
- ❖ Uttar Pradesh is located in **the fertile Ganga Plain and supports high population density.**

5. Areas of Very High Density:

- ❖ Areas having more than 1000 persons per sq km are termed as areas of very high population density.
- ❖ West Bengal (1029), Bihar (1102), Lakshadweep (2013), Daman & Diu (2169) Pondicherry (2548). Chandigarh (9252) and Delhi (11,297) have a very high density of population due to

different factors operating in different areas.

- ❖ Like Uttar Pradesh, Bihar is located in the fertile plain of Ganga and supports a very high population density.
- ❖ It seems that measures to control for population growth have not given the desired results and Bihar has now surpassed West Bengal as the state with the highest density of population among the major states.
- ❖ West Bengal is located in the Ganga delta which is one of the most fertile areas of the world, producing **3-4 crops of rice in a year**.
- ❖ In addition, India's biggest industrial cluster is located in the Hugli basin. These factors combine together to make West Bengal the second most densely populated state of India.
- ❖ Among the union territories, Delhi has experienced one of the fastest population growths as a result of which its population density has increased considerably.
- ❖ This growth is primarily due to large-scale migration of people from the surrounding areas. People migrate to Delhi in large numbers in search of livelihood, and better amenities of life.

Very hot very cold in India have low population densities

Very hot and dry regions as well as very cold and wet regions in India typically have low population densities. The reasons for this phenomenon can be summarized as follows:

Very Hot and Dry Regions (e.g., Thar Desert in Rajasthan):

- **Harsh Climate:** Extremely hot and arid conditions, especially during the summer months, make these regions less hospitable for human settlement. High temperatures and limited water sources can be challenging for daily life.
- **Water Scarcity:** Water resources are often scarce in hot and dry areas. Access to reliable sources of water is vital for agriculture and human survival.
- **Limited Agriculture:** The arid climate and poor soil quality can hinder agricultural productivity.
- **Economic Opportunities:** The lack of economic opportunities and industrial development in these areas can lead to outmigration as people seek better prospects in more temperate and economically viable regions.

Very Cold and Wet Regions (e.g., High Himalayan Regions, Northern States during Winter):

- **Extreme Cold:** Extremely cold and snowy conditions,

especially at high altitudes or during the winter, Sub-zero temperatures and heavy snowfall make living conditions difficult.

- **Limited Infrastructure:** Many high-altitude regions lack basic infrastructure, including roads and transportation, making access and communication challenging, especially during severe winters.
- **Natural Hazards:** Very cold and wet regions are often prone to natural disasters like avalanches and landslides, which can be life-threatening and damage infrastructure.
- **Inaccessibility:** Harsh winter conditions can isolate some areas, making them less suitable for permanent residence.
- **Seasonal Migration:** People migrating to warmer and more accessible areas during extreme winter conditions.
- **Example: Large stretches of Leh (Ladakh) and Kargil have a population density of less than ten persons per sq km.** On the whole, Kargil has a population density of 10 persons/sq km while Leh (Ladakh) has only 3 persons per sq km.

Role of climate on the distribution of population

Climate plays a crucial role in influencing the distribution of population around the world. People tend to settle in areas with climates that are conducive to their well-being and livelihoods. **Here are some ways in which climate affects population distribution:**

- **Temperature and Comfort:** People generally prefer areas with moderate temperatures for comfortable living. This is why many of the world's largest cities are located in regions with temperate climates.
- **Precipitation and Water Availability:** Regions with sufficient rainfall, rivers, and lakes are more attractive for settlement.
- **Agriculture and Food Production:** Areas with the right combination of temperature and rainfall are more suitable for crop cultivation and livestock farming. These regions tend to support larger populations due to agricultural production and food availability.
- **Natural Hazards:** Areas prone to these hazards may experience lower population densities due to the risks associated with living there.
- **Economic Opportunities:** For example, areas with favorable climates for tourism or outdoor recreation may attract more people. Coastal areas are often hubs of trade and commerce due to access to ports and favorable climates.
- **Health and Disease:** Climate can influence the prevalence of certain diseases. Tropical regions with high temperatures and humidity may have higher rates of diseases like malaria, which can deter settlement

or lead to lower population densities.

- **Climatic Zones:** Population distribution is influenced by the adaptability of people to these climatic zones.
- **Migration:** People may move to areas with more favorable climate conditions.
- **Infrastructure and Adaptation:** In some cases, human-made infrastructure and technological advancements can help people adapt to adverse climate conditions.

THE RURAL POPULATION

- People’s residence is an important indicator of social and economic characteristics. According to the 2011 census, about 68.8 percent of India’s population lives in villages, meaning **68.8 percent of India’s population is rural.**
- The distribution of **the rural population is not uniform throughout the country.** There is inter-state and intra-state variation in the distribution of rural populations.
- One of the key reasons for the **large rural populations in these states is the heavy reliance on agriculture.** Agriculture has historically been the backbone of the Indian economy, and it continues to be a primary source of livelihood for a significant portion of the population.
- People in rural areas are engaged in various agricultural activities, including farming, livestock rearing, and allied occupations.
- The **agrarian nature of these states,** coupled with limited industrialization and employment opportunities in urban areas, leads to the predominance of rural populations.
- It’s important to note that efforts to promote rural development, increase non-agricultural job opportunities, and improve infrastructure in rural areas are ongoing to address some of the challenges associated with large rural populations.
- **Low socio-economic development** in the states causes a large rural population in India. Low socio-economic development includes low literacy rates—particularly female illiteracy, a large population’s dependence on agricultural activities, and low levels of industrialization.
- In India, **Himachal Pradesh (90%),** Arunachal Pradesh, Odisha, Bihar and Uttar Pradesh have more than 80% rural population.
- **Uttar Pradesh (78%):** Uttar Pradesh is the most populous state in India, and a significant portion of its population resides in rural areas. The state’s rural population is large due to factors such as a high birth rate, limited employment opportunities in urban areas, and the agricultural nature of the state’s

economy.

- **Bihar (88.7%):** Bihar is another state with a substantial rural population. Similar to **Uttar Pradesh, Bihar’s rural population** is primarily engaged in agriculture, and limited industrialization and employment opportunities in urban areas contribute to the prevalence of rural communities.

WORK PARTICIPATION RATES

The work participation rates in various states of India can vary significantly due to a combination of economic, social, and demographic factors. Several reasons contribute to these variations:

- **Economic Activity:** Economic opportunities, both in terms of quantity and quality of jobs, can influence the labor force participation. States with a well-developed industrial and services sector often have more employment options.
- **Agricultural Dominance:** States with a strong focus on cash crops, horticulture, or animal husbandry may have higher participation rates in the agricultural sector.
- **Urbanization:** People in urban areas are engaged in various industries, services, and manufacturing sectors, leading to higher work participation rates.
- **Education and Skill Levels:** Work participation can be influenced by the education and skill levels of the population.
- **Gender Disparities:** States with more progressive gender attitudes and policies often have higher female labor force participation rates.
- **Age Structure:** States with a larger working-age population may have higher participation rates, as more people are available to join the workforce.
- **Infrastructure and Connectivity:** States with better infrastructure often have higher participation rates because people can access job opportunities more easily.
- **Migration:** States that attract labor migrants from other regions may have higher participation rates, particularly in labor-intensive sectors such as construction and manufacturing.
- **Government Policies and Incentives:** States that implement pro-employment policies and provide incentives for industries may have higher participation rates.
- **Cultural and Social Factors:** States with more progressive attitudes toward women’s employment may see higher participation rates.

HUMAN SETTLEMENTS

Rural Settlement

Type of rural settlement

Rural settlements are often sparse and small. The majority of the population of rural settlements is involved in agriculture or primary activities. Village and Hamlet are examples of rural settlements.

The types of rural settlements largely depend on the area of location (plain, hill, desert) and inter-house distance. The rural settlements of India can be broadly divided into four types:

1. Nucleated Settlements:

- ❖ Nucleated settlements are characterized by a dense clustering of houses, often around a central point like a village square or a religious or administrative building. Houses are closely packed together.
- ❖ These settlements often develop near water sources, fertile land, and transportation routes. They are common in areas with limited land availability or in hilly terrain where flat land is scarce.
- ❖ **In the Bundelkhand region of central India and Nagaland, people prefer to live close by for security.**

2. Semi-clustered Settlements:

- ❖ Semi-clustered or fragmented settlements may result from a tendency of clustering in a restricted area of dispersed settlement. More often such a pattern may also result from segregation or fragmentation of a large compact village.
- ❖ Semi-cluster settlements are generally found in the plains of Gujarat and some parts of Rajasthan.

3. Hamlet settlement:

- ❖ Hamlet settlements are usually fragments of physically separated settlements and have many different units and specific names. **For example, Panna, Para, Palli, Nagla, Dhani, Tola, etc. are some familiar names.**
- ❖ The division of large villages is usually driven by social and ethnic factors.
- ❖ Hamlet settlements are generally found in **the middle and lower Gangetic plains, Chhattisgarh, and the lower valley of the Himalayas.**

4. Dispersed or isolated:

- ❖ Dispersed or solitary settlements are small in size and are often found as isolated huts or

settlements in the remote forest of the hills.

- ❖ It is commonly found in rough areas like Meghalaya, Uttarakhand, Himachal Pradesh, and Kerala.

The following are the factors responsible for the patterns of settlements in different physical environments:

- There are many factors that are responsible for the different types of rural settlements, the main one being the physical environment.
- Physical factors such as the nature of the **terrain, altitude, climate, and availability** of water are the main factors responsible for the patterns of settlements.
- Congested settlements in desert areas are driven by the availability of water.
- The dominant economic activities in an area, such as **agriculture, fishing, mining, or industry**, can influence the settlement pattern. Settlements may develop to support specific economic activities.
- Cultural practices, traditions, and historical developments play a significant role in shaping settlement patterns. These factors may influence the choice of settlement layout and location.
- The settlement patterns in the low plains in the **middle Ganges region, mainly Bihar and eastern Uttar Pradesh** are influenced by social and ethnic factors.
- A favorable climate favors congested settlements and a harsh climate forces people to live in a dispersed manner.
- People prefer to make houses in the raised areas in the flood-affected region.
- **Security and Defense:** The main factors of clustered settlement in **Bundelkhand and the Nagaland region** are a defense against theft and violence.

Changing morphology of rural morphology includes:

1. Physical morphology:

- ❖ In contemporary times the morphology of rural settlement has changed that can be attributed to various factors:

2. Physical factors:

- ❖ Relief / Topography, Climate, Economic Scenario, Area of Land holding

3. Human factors:

- ❖ Caste, Income Source, Population density, Location / Site

Various changes in rural settlement in India:

- Under the stresses of **new socio-economic orders, the old system is gradually losing its importance. Jajmani system is now a decayed institution and the rigidity of the caste system is fading out.**
- The rise in the **socio-economic conditions of the Dalits due to improvement in their education level has made them conscious** about their rights as a result of which the traditional barrier is breaking down.
- **Increase in land area under housing / Pucca.**
- Waste disposal sites are being set up.
- **Semi urbanization is taking place.**
- **Development of road highways and small scale factories etc.**
- Inclusion of basic amenities in rural area.
- **socio-cultural change acceptance of lower caste people.**
- Shrinking area under agriculture due to emergence of tertiary sector.
- Coming up of piped water and sewage system in rural settlement.

Classification of Indian cities and towns on the basis of specified functions

Indian cities and towns can be classified based on various functions and roles they play in the socio-economic landscape. Here are some common classifications with examples:

- 1. Administrative Cities:**
 - ❖ These cities are administrative and political centers, hosting government offices, legislative assemblies, and government institutions.
 - ❖ Examples: New Delhi (the capital of India), Chandigarh (the capital of Haryana and Punjab).
- 2. Industrial Cities:**
 - ❖ Industrial cities are known for their manufacturing and industrial activities, housing factories and industrial infrastructure.
 - ❖ Examples: Jamshedpur (known for Tata Steel), Ludhiana (known for textiles and hosiery), Jamnagar (known for oil refineries).
- 3. Commercial Cities:**
 - ❖ Commercial cities serve as major commercial and financial hubs, hosting banks, stock exchanges, and corporate headquarters.
 - ❖ Examples: Mumbai (financial capital of India), Kolkata (commercial and financial center), Bengaluru (Silicon Valley of India).
- 4. Tourist Cities:**
 - ❖ Tourist cities attract visitors with their cultural,

historical, or natural attractions, and they often have a well-developed tourism infrastructure.

- ❖ Examples: Jaipur (known for historical monuments), Goa (popular beach destination), Agra (home to the Taj Mahal).
- 5. Educational Cities:**
 - ❖ Educational cities are known for their concentration of educational institutions, including universities, colleges, and research centers.
 - ❖ Examples: Pune (Oxford of the East), Allahabad (host to several prestigious universities), Manipal (known for educational institutions).
 - 6. Port Cities:**
 - ❖ Port cities are important for international trade and commerce, with major ports facilitating the movement of goods.
 - ❖ Examples: Mumbai (major port city), Chennai (major seaport), Kolkata (located on the Hooghly River).
 - 7. Agricultural Cities:**
 - ❖ These cities are associated with agricultural activities, such as crop trading and marketing, and often serve as centers for the surrounding rural regions.
 - ❖ Examples: Abohar (known for agriculture), Mandi (India's leading wholesale agricultural market), Anantapur (agricultural trading hub).
 - 8. Tech Cities:**
 - ❖ Tech cities are prominent for their information technology and software industries.
 - ❖ Examples: Hyderabad (Cyberabad), Gurugram (part of the National Capital Region), Bengaluru (Silicon Valley of India).
 - 9. Hill Stations:**
 - ❖ Hill stations are towns located in hilly or mountainous regions, popular for tourism and as summer retreats.
 - ❖ Examples: Shimla (capital of Himachal Pradesh), Darjeeling (famous hill station), Mussoorie (Queen of the Hills).
 - 10. Religious Cities:**
 - ❖ Religious cities have great religious significance and are associated with pilgrimage sites, religious festivals, and cultural heritage.
 - ❖ Examples: Varanasi (one of the oldest cities and a major pilgrimage site), Amritsar (home to the Golden Temple), Puri (known for the Jagannath Temple).

11. Manufacturing Hubs:

- ❖ These cities are known for their concentration of manufacturing industries, particularly the production of specific goods.
- ❖ Examples: **Kanpur (known for leather and textile industries), Surat (known for diamond polishing), Tirupur (textile hub).**

URBAN AGGLOMERATION

An urban agglomeration in India is a continuous and extended urban area that includes the core city and its surrounding suburbs, **satellite towns, and peri-urban regions**, all functioning as an integrated and interconnected urban entity. These agglomerations exhibit economic, social, and infrastructure linkages. One prominent example of an urban agglomeration in India is the **National Capital Region (NCR) with New Delhi as its core city.**

National Capital Region (NCR):

- **Core City:** New Delhi, the capital of India.
- **Surrounding Regions:** The NCR includes the surrounding areas and satellite towns in **the states of Delhi, Haryana, Rajasthan, and Uttar Pradesh.** Some of the prominent towns and **cities within the NCR include Gurugram, Noida, Faridabad, Ghaziabad, Meerut, and Alwar.**

Characteristics of the NCR Urban Agglomeration:

- **Spatial Continuity:** The NCR is characterized by spatial continuity, with the urban development of New Delhi seamlessly merging into the surrounding regions and satellite towns.
- **Economic Integration:** The NCR is one of the most economically dynamic regions in India, with a concentration of industries, corporate headquarters, and commercial activities. The economic activities in New Delhi are closely linked with those in satellite towns like **Gurugram (a major IT and business hub) and Noida (known for its software and manufacturing industries).**
- **Social Integration:** The NCR has a diverse population from different parts of India and the world, contributing to a rich social and cultural mix. People living in **New Delhi, for example, work and socialize with residents of neighboring areas.**
- **Infrastructure Linkages:** The NCR is characterized by extensive infrastructure linkages, including a network of highways, expressways, metro rail systems, and other transportation facilities that connect New Delhi with its surrounding regions.
- **Administrative Boundaries:** While New Delhi serves as the political and administrative capital,

the NCR spans multiple states and administrative jurisdictions, each with its own local governments and authorities.

- The **National Capital Region serves as an excellent example of an urban agglomeration** in India, highlighting the complexity and interdependence of urban areas, and how these regions extend beyond administrative boundaries to form integrated urban zones.

What are metropolitan cities? How are they different from urban agglomerations?

Metropolitan cities and urban agglomerations are terms used in urban planning and demography to describe different aspects of urbanization and city development. While they share similarities, they are distinct concepts.

Metropolitan Cities:

Metropolitan cities are large and significant urban areas that serve as economic, cultural, and administrative hubs. They are characterized by the following features:

- **Size and Population:** Metropolitan cities are typically among the largest and most populous cities in a country. They have high population densities and are often centers of economic activity and commerce.
- **Economic Significance:** These cities play a crucial role in the national and regional economy, housing a concentration of industries, businesses, and services. They are known for their economic dynamism and employment opportunities.
- **Administrative Importance:** Metropolitan cities are often the administrative and political capitals of their respective regions or countries. They house government institutions, key administrative offices, and diplomatic missions.
- **Infrastructure and Connectivity:** These cities have well-developed infrastructure, including transportation networks, educational institutions, healthcare facilities, and cultural amenities.

Comparison:

The key difference between metropolitan cities and urban agglomerations is their scale and administrative structure:

- Metropolitan cities focus on the individual city itself, highlighting its economic, administrative, and cultural significance. They do not necessarily consider the surrounding regions in detail.
- Urban agglomerations, on the other hand, emphasize the interconnectedness of the core city with its suburbs and peri-urban areas, recognizing the extended urban development beyond the city limits.

India Example:

- Metropolitan City: New Delhi
- **New Delhi is the capital of India** and is considered a metropolitan city. It is one of the most populous and economically important cities in India. It serves as the political and administrative capital, houses the central government, and is a significant economic and cultural center.

Urban Agglomeration: The National Capital Region (NCR)

- The NCR, as previously mentioned, is an urban agglomeration that encompasses New Delhi and its surrounding areas in Delhi, Haryana, Rajasthan, and Uttar Pradesh. It represents the interconnected and extended urban development around New Delhi. **This includes cities like Gurugram, Noida, and Faridabad, which are integral to the NCR's economic and social dynamics.**
- Metropolitan cities focus on individual urban centers, while urban agglomerations recognize the interconnectedness of the core city with its surrounding regions, highlighting the spatial, economic, and social integration in a larger urban zone.

INDUSTRY

The iron and steel industry is fundamental to the industrial development of any country for several reasons:

The iron and steel industry is indeed fundamental to the industrial development of any country for several reasons. Here are some key points with examples:

- **Infrastructure Development:** Iron and steel are the basic building blocks for infrastructure development. They are crucial for constructing bridges, roads, railways, buildings, and other essential infrastructure. For example, the construction of skyscrapers like **the Burj Khalifa in Dubai or the Golden Gate Bridge in San Francisco relies heavily on steel.**
- **Manufacturing and Machinery:** Iron and steel are vital components in manufacturing and machinery. Industries such as automotive, aerospace, and shipbuilding depend on steel for the production of various components. **For instance, the automotive industry uses steel to make car frames, engine parts, and more.**
- **Energy Sector:** Steel is used extensively in the energy sector. Power plants, pipelines, and turbines are made from steel. An example would be the construction of oil and gas pipelines, which are essential for transporting energy resources over long distances.

- **Consumer Goods:** Many consumer products are made with steel, ranging from kitchen appliances to cutlery. Stainless steel is a common material used in making high-quality cookware and appliances, ensuring durability and longevity.
- **Job Creation:** The iron and steel industry creates jobs in various sectors, from mining and extraction to manufacturing and transportation. In emerging economies, steel production facilities provide employment opportunities for a large number of people, fostering economic growth. **For instance, the growth of the steel industry in China over the past few decades has been a significant driver of job creation.**
- **Export Opportunities:** A strong iron and steel industry can lead to export opportunities. Many countries export steel and steel products to other nations, contributing to their overall economic growth. **Examples include China, which is one of the world's leading steel exporters, and Germany, known for its high-quality steel products.**
- **Technological Advancements:** The iron and steel industry drives technological advancements. Research and development in metallurgy have led to the production of advanced steel alloys with improved strength, corrosion resistance, and other properties. These innovations have applications in a wide range of industries, such as aerospace and healthcare (for making medical instruments and devices).
- **National Security:** A self-sufficient iron and steel industry is crucial for a country's national security. This is because steel is a key material in defense and military applications, including the construction of armored vehicles, naval vessels, and weapons systems.
- **Environmental Impact:** Sustainable practices in the iron and steel industry are becoming increasingly important. The industry is working to reduce its carbon footprint through innovations like electric arc furnaces and recycling of steel. This helps countries meet environmental goals and commitments, such as reducing greenhouse gas emissions.
- **Raw Material Supply Chain:** The iron and steel industry relies on a complex supply chain, including iron ore mining, transportation, and processing. A strong steel industry encourages the development of these ancillary sectors, contributing to economic growth. **For example, Australia's iron ore exports to countries like China are a significant part of its economy.**

MIGRATION

- **Remittances:** One of the most significant positive

consequences of international migration for India is the inflow of remittances. Indian migrants working in other countries send money back to their families in India.

- ❖ **For example:** India, which saw a record-high of **USD 111 billion in remittances in 2022**, remittances from India to other countries totalled **US\$5.710 billion**.
- ❖ Around 40% of the India's remittances flow to **the states of Kerala, Tamil Nadu, Punjab, Andhra Pradesh and Uttar Pradesh** which are among the top international remittance receiving states.
- ❖ The amount of remittances sent by the internal migrants is very meagre as compared to international migrants but it plays an important role in the growth of the economy of the source area.

➤ **Negative consequences**

- ❖ The unregulated migration to the metropolitan cities of India has caused overcrowding.
- ❖ The development of slums in industrially developed states such as **Maharashtra, Gujarat, Karnataka, Tamil Nadu and Delhi** is a **negative consequence of unregulated migration**.

➤ **Demographic Consequences**

- ❖ Migration leads to the redistribution of the population within a country
- ❖ Rural urban migration is one of the important factors contributing to the population growth of cities.
- ❖ Age and skill selective out migration from the rural area have an adverse effect on the rural demographic structure.

➤ **Negative**

- ❖ The high out migration from **Uttarakhand, Rajasthan, Madhya Pradesh, and Eastern Maharashtra** have brought serious imbalances in age and sex composition in these states.

➤ **Social Consequences**

- ❖ **Agents of Social Change:** The new ideas related to new technologies, family planning, girls education, etc, get diffused from urban to rural areas through them.
- ❖ Migration leads to intermixing of people from diverse cultures. It led to the evolution of composite culture and breaking through the narrow considerations.

- ❖ **Negative Consequences**
- ❖ Anonymity creates a social vacuum and a sense of dejection among individuals.
- ❖ The continued feeling of dejection may motivate people to fall in the trap of anti-social activities like crime and drug abuse.

➤ **Environmental Consequences**

- ❖ The overcrowding of people due to rural-urban migration has put pressure on the existing social and physical infrastructure in the urban areas.
- ❖ It leads to the unplanned growth of urban settlement and the formation of slums shanty colonies.
- ❖ Due to the over-exploitation of natural resources, cities are facing the acute problem of depletion of groundwater, air pollution, disposal of sewage and management of solid wastes.

➤ **Other**

- ❖ **Cultural Exchange:** International migration leads to cultural exchange and a broadening of perspectives. Returning migrants often bring with them new ideas and experiences, which can enrich the local culture and society.
- ❖ **Challenges of Brain Drain:** While many Indian migrants contribute positively to the country's development, there is a concern about "**brain drain**." Some of India's brightest and highly skilled individuals emigrate, which can lead to a loss of talent. **However, this is balanced by the "brain gain" when some of them return with new skills and experiences.**

The impact of rural-urban migration on the age and sex structure of the place of origin and destination

- The impact of rural-urban migration on the age and sex structure of the place of origin (rural areas) and the destination (urban areas) can vary based on several factors, including the scale and duration of migration, the economic opportunities in urban centers, and government policies. Here are some general impacts with examples:

Impact on the Place of Origin (Rural Areas):

- **Aging Population:** Rural-urban migration often leads to an increase in the proportion of elderly people left behind in rural areas, contributing to an aging population.
 - ❖ This is because younger individuals, who are more likely to migrate for better job opportunities, leave rural areas.

- ❖ As a result, rural areas may have a higher dependency ratio, where the elderly and children make up a significant portion of the population.
- ❖ **For example**, in parts of rural India, where young adults migrate to urban areas for work, there may be a higher proportion of elderly individuals and children who are financially dependent on a smaller working-age population.
- **Gender Imbalance:** In many rural-urban migration scenarios, it is often young men who leave rural areas to seek employment in urban centers. This can lead to gender imbalances in rural communities, with a higher proportion of women left behind. **In regions of sub-Saharan Africa, for instance, where male labor migration is common, women may constitute a larger share of the rural population.**
- **Reduced Agricultural Workforce:** As young and able-bodied individuals migrate to urban areas, the agricultural workforce in rural regions may decline. This can have implications for agricultural productivity and rural livelihoods.
 - ❖ In countries like **Mexico, for example, where migration to the United States is prevalent**, rural communities experience a shortage of labor for farming activities.

Impact on the Place of Destination (Urban Areas):

- **Youthful Urban Population:** Rural-urban migration contributes to a relatively youthful population in urban areas.
 - ❖ This is because young adults and working-age individuals are more likely to migrate to cities in search of better job opportunities and a higher standard of living.
 - ❖ As a result, urban areas tend to have a larger share of young and economically active individuals. For instance, in cities like **Mumbai and Bengaluru in India**, there is a significant influx of young migrants seeking employment opportunities in the tech and services sectors.
- **Economic Productivity:** The migration of young and working-age individuals to urban areas enhances the economic productivity and dynamism of cities.
 - ❖ These individuals often contribute to various industries, including manufacturing, services, and the informal sector.
 - ❖ **For example, cities like Dubai and Singapore** rely on a diverse migrant workforce to drive economic growth and development.
- **Increased Workforce:** Urban areas benefit from an expanded labor force, which supports industrial

and service sector growth. This additional workforce contributes to economic development and urbanization.

- ❖ In cities like **Beijing and Shanghai in China, rural-urban migration** has fueled the rapid expansion of the labor force, contributing to China's economic growth.
- **Cultural Diversity:** Rural-urban migration leads to cultural diversity in urban areas. The mixing of people from various backgrounds enriches the cultural fabric of cities.
 - ❖ **Cities like New York and London are known for their cultural diversity**, with migrants from around the world contributing to the multicultural nature of these urban centers.

The spatial patterns of female literacy in India vary significantly across different regions, states, and districts. Female literacy rates are influenced by a range of factors, including socio-economic conditions, cultural norms, government policies, and historical development. Here are some key spatial patterns and trends of female literacy in India:

- **Regional Disparities:** Northern and central Indian states, such as **Bihar, Uttar Pradesh, and Rajasthan**, tend to **have lower female literacy rates** compared to southern and western states, such as **Kerala, Tamil Nadu, and Maharashtra**. These disparities are a result of historical, social, and economic factors.
- **Urban-Rural Divide:** Female literacy rates are generally higher in urban areas compared to rural areas. Cities and urban centers often have better access to educational institutions, healthcare facilities, and employment opportunities. In contrast, rural areas may face more barriers to female education.
- **Gender Disparities:** There are significant gender disparities in literacy rates. **Female literacy rates** are typically lower than male literacy rates in most parts of India. These disparities are rooted in traditional gender roles, social norms, and, in some cases, discrimination against girls' education.
- **Progress in South India:** South Indian states, such as **Kerala and Tamil Nadu**, have made significant progress in improving female literacy rates. **Kerala, in particular**, stands out for its high levels of female literacy, achieved through investments in education and social development.
- **Tribal Areas:** In tribal and remote areas, female literacy rates can be particularly low. These regions often face geographical and socio-economic challenges, making it difficult to provide access to quality education.

- **Impact of Government Policies:** Government initiatives and policies have played a role in improving female literacy rates. Programs like **Sarva Shiksha Abhiyan (Education for All)** have aimed to increase access to primary education, which has contributed to higher literacy rates among girls.
- **National Education Policy, 2020** provides for setting up a **Gender Inclusion Fund (GIF)** especially for girls and transgender students to build the nation's capacity to provide equitable quality education for all girls as well as transgender students
- **Cultural and Social Norms:** Cultural and social norms play a significant role in shaping female literacy patterns. In some regions, early marriage, traditional gender roles, and limited mobility for girls can hinder their access to education.
- **Economic Development:** States with higher levels of economic development and industrialization often have higher female literacy rates. Economic growth can lead to greater investments in education and improved living standards.
- **Inter-State Variability:** Within India, there is considerable variability in female literacy rates among different states and union territories. States like **Delhi and Himachal Pradesh** have relatively higher female literacy rates, while states like **Bihar and Jharkhand** face greater challenges in this regard.

Note:

- Literacy in India is a key for social-economic progress. **The 2011 census, indicated a 2001–2011 literacy growth of 97.2%**, which is slower than the growth seen during the previous decade.
- Census of India pegged the average literacy rate to be **73% in 2011 while National Statistical Commission surveyed literacy to be 77.7% in 2017–18. Literacy rate in urban areas was 87.7%**, higher than rural areas with **73.5%**. There is a wide gender disparity in the literacy rate in India and effective literacy rates (age 7 and above) was **84.7% for men and 70.3% for women**.
- The low female literacy rate has a dramatically negative impact on family planning and population stabilization efforts in India. Studies have indicated that female literacy is a strong predictor of the use of contraception among married Indian couples, even when women do not otherwise have economic independence. The census provided a positive indication that **growth in female literacy rates (11.8%)** was substantially faster than in **male literacy rates (6.9%) in the 2001–2011 decadal**

period, which means the gender gap appears to be narrowing.

TRANSPORTATION

India has a diverse transportation system that encompasses various modes of transportation. The chief means of transportation in India include:

- **Road Transportation:**
- **Roads:** India has an extensive network of roads, including national highways, state highways, and rural roads. Road transport is the most widely used mode of transportation for both passenger and freight movement. It connects even the remotest areas of the country.
- **Rail Transportation:**
- **Railways:** Indian Railways is one of the largest railway networks in the world. It plays a crucial role in long-distance passenger and freight transportation.
- **Air Transportation:**
- **Airports:** India has a growing network of domestic and international airports. Air travel is popular for long-distance travel and international connections.
- **Water Transportation:**
- **Ports:** India has several major ports along its coastline, facilitating maritime trade. Inland waterways are also being developed for cargo movement.
- **Public Transportation:**
- **Public Transport Systems:** Many cities in India have public transportation systems, including buses, trams, and metro rail services.
- **Pipeline Transportation:**
- **Pipelines:** Pipelines are used primarily for the transportation of petroleum, natural gas, and other liquids or gases.

Factors Affecting Transportation Development in India:

Investment and Funding: Adequate funding and investment in transportation infrastructure are crucial for development. Public and private sector investments, as well as government initiatives and foreign aid, play a role.

- **Technological Advancements:** The adoption of modern technologies and transportation systems, such as high-speed trains, intelligent traffic management, and cleaner fuel options, can enhance transportation efficiency.
- **Urbanization and Population Growth:** Rapid urbanization and population growth contribute to the increasing demand for transportation. Urban

planning and public transport development become essential to manage congestion in cities.

- **Environmental Concerns:** Concerns about environmental sustainability are driving the development of eco-friendly transportation options and policies, such as electric vehicles and cleaner fuels.
- **Government Policies:** Transportation development is influenced by government policies, regulations, and planning. Policies related to infrastructure investment, safety standards, and land use planning are critical.
- **Geographical and Territorial Factors:** India's vast and diverse geographical and territorial characteristics influence transportation development. Difficult terrain, climate, and regional disparities pose challenges.
- **International Trade and Connectivity:** Enhancing transportation connectivity and trade relationships with neighboring countries influence the development of transportation networks, especially in border regions.

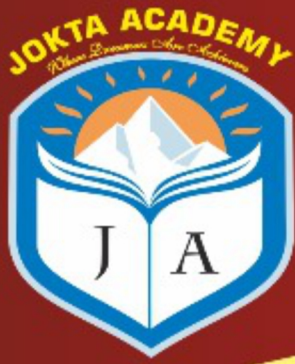
Role of Roads in Economic Development:

The role of roads in the economic development of India is of paramount importance, contributing to growth and connectivity across the country. Here is a description of their role with an example:

- **Connectivity and Accessibility:**
- Roads provide vital connectivity, ensuring accessibility to various parts of the country. They link urban and rural areas, remote regions, and economic hubs. This connectivity allows people, goods, and services to flow seamlessly.
- **Agricultural Development:**
- In the agricultural sector, roads play a pivotal role. They connect farmlands to markets and distribution centers, allowing farmers to transport their produce efficiently. For example, consider the impact of roads in Punjab, a major agricultural state. **The well-connected road network in Punjab has helped the state become one of India's leading producers of wheat and rice.** Farmers can quickly transport their crops to markets and food processing units, reducing post-harvest losses and increasing income.
- **Trade and Commerce:**
- Roads are essential for trade and commerce. They enable the smooth movement of goods and raw materials between different regions, markets, and ports. Take, for instance, **the "Golden Quadrilateral" project, which connects Delhi, Mumbai, Chennai, and Kolkata** via a network of high-quality highways. This project has significantly

boosted inter-state trade and commerce, promoting economic growth in these major cities.

- **Industrial Development:**
- The growth of industries is closely linked to road infrastructure. Industries require efficient transportation for the movement of raw materials and finished products. One prime example is the emergence of **automobile manufacturing hubs in and around Chennai**. The presence of good road connectivity has attracted numerous automobile manufacturers and ancillary industries to the region, contributing to industrial development.
- **Tourism and Services:**
- Roads also support the tourism and services sectors. India's road network provides access to tourist destinations, boosting domestic and international tourism. For example, **the road connectivity to popular hill stations like Shimla and Manali in Himachal Pradesh** has made them accessible to tourists, leading to the development of tourism-related services and businesses.
- **Rural Development:**
- Roads are critical for rural development. They connect villages to district headquarters, providing access to education, healthcare, and government services. Improved road infrastructure can help reduce rural-urban disparities and enhance the quality of life in rural areas.
- **Employment Generation:**
- Road construction and maintenance create job opportunities, directly and indirectly. Laborers, engineers, and skilled workers are employed in road projects, leading to income generation and economic development.
- **Logistics and Supply Chains:**
- Efficient logistics and supply chain management rely on road networks. The timely delivery of goods and services is essential for businesses to operate effectively. For instance, the **"Delhi-Mumbai Industrial Corridor"** project aims to improve connectivity along the **Western Dedicated Freight Corridor**, allowing for faster movement of goods and promoting industries along the corridor.
- The development of road infrastructure in India is a linchpin for economic growth and development. It promotes **agricultural productivity, industrialization, trade, and tourism, and enhances rural development and employment generation**. Roads are the backbone of India's economic progress and connectivity.



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