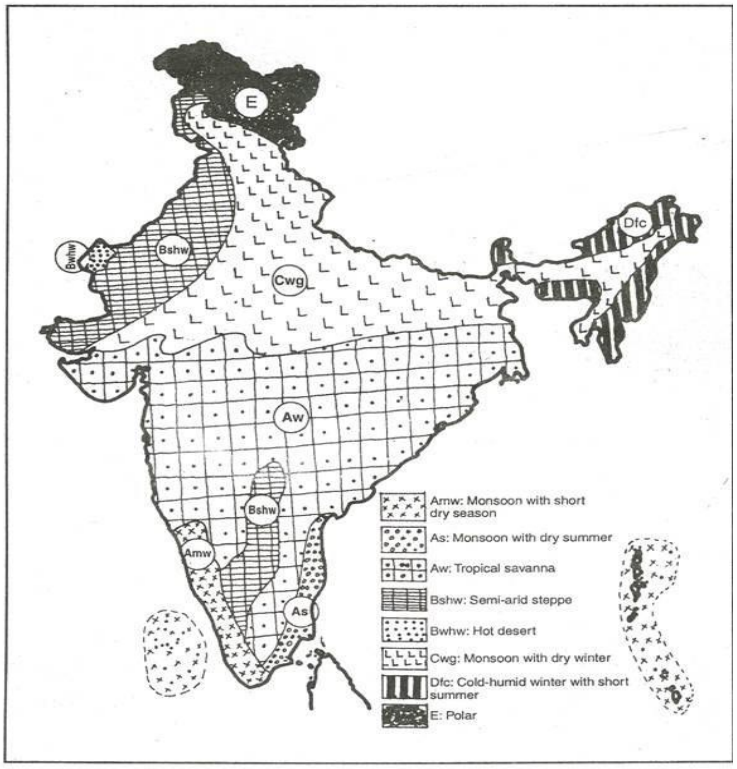
# Climatic Zones, Western Disturbance

## Climatic Zones in India

India possesses a large variety of climates ranging from extremely hot desert regions to high altitude locations with severely cold conditions similar to northern Europe. Within India it is possible to define six regions with distinct climates. The six climates are normally designated as Hot and Dry, Warm and Humid, Moderate, Cold and Sunny, Cold and Cloudy and Composite. The criteria of allocating any location in India to one of the first five climate zones are that the defined conditions prevail for more than six months. In cases where none of these categories can be identified for six months or longer, the climatic zone is called Composite.

## Koeppen's Scheme:

Koeppen's Amw type of climate prevails over the western coast of India, south of Goa. The as type characterised by dry summers is experienced along the Coromandel Coast. The dry climate prevails over two parts in India. The interior peninsula, Rajasthan and parts of Haryana have Bshw type of climate, while the extreme western Rajasthan experiences Bwhw type of climate. Most of the peninsular plateau has tropical savannah type of climate (Aw).

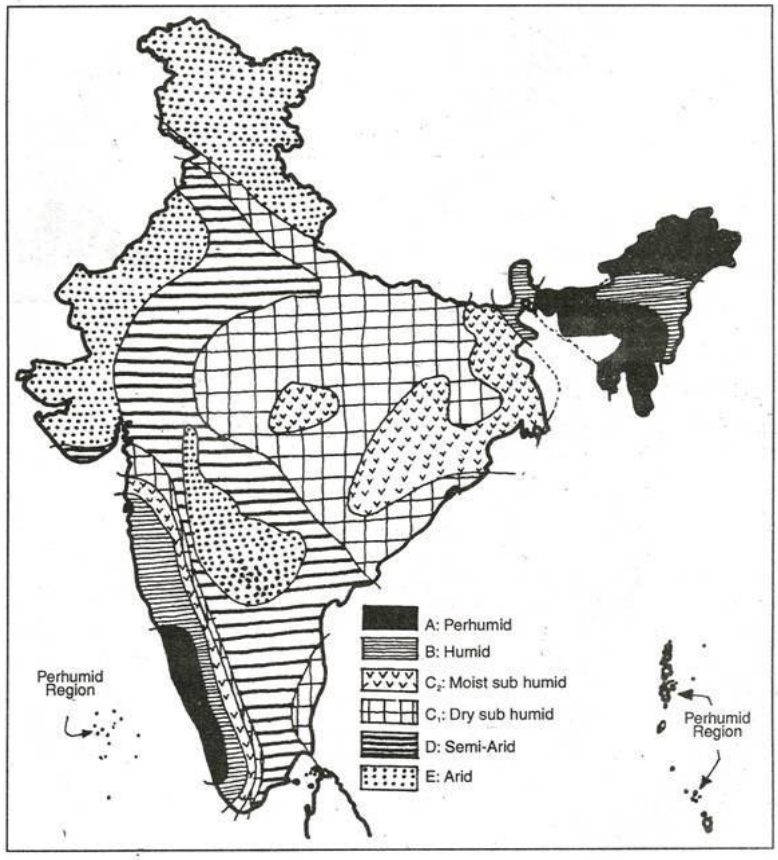



1. Monsoon type with short dry season (Amw)
2. Monsoon type with dry season in summers (As)
3. Tropical savannah type (Aw)
4. Semi-arid steppe climate (Bshw)

5. Hot desert type (Bwhw)
6. Monsoon type with dry winters (Cwg)
7. Cold-humid winter type with short summers (Dfc)
8. Polar type (E)

## Thornthwaite's Scheme:

Thornthwaite's scheme is based on the concept of water balance. If the rainfall of a place is less than the water which is lost through evaporation and transpiration, the place has a water deficit. If it is more than the need, then there is a surplus.



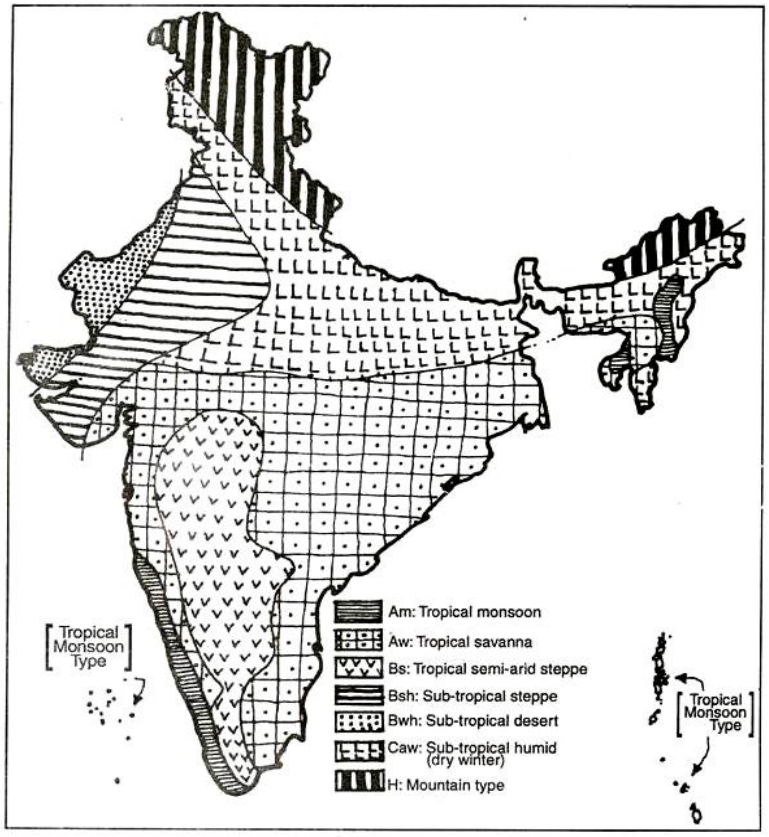

1. Perhumid (A)
2. Humid (B)
3. Moist sub-humid ($C_2$)
4. Dry sub-humid (C1)
5. Semi-arid (D)
6. Arid (E)

## Trewartha's Scheme:

Trewartha's classification of climate, which is a modified form of Koeppen's scheme, corresponds with the vegetative, agricultural and even geographical regions of India, in a fairly

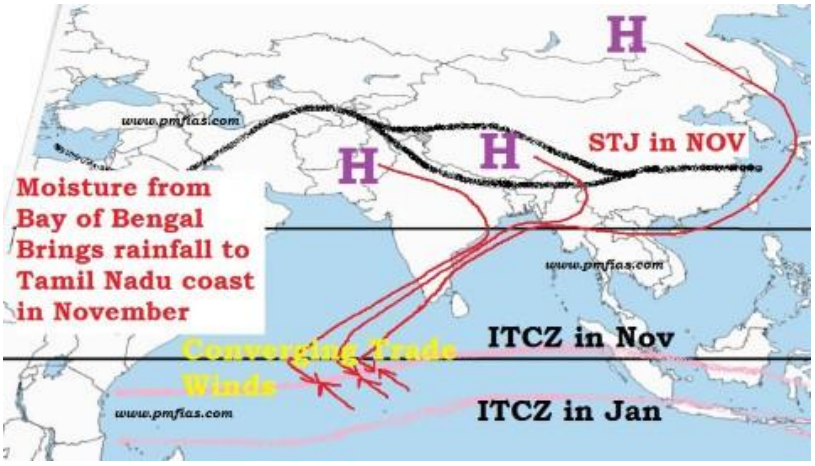
satisfactory manner. Four major climatic groups (A, B, C, and H) which are further subdivided into seven climatic types have been recognized.

A Tropical Rainy Climatic Group
Am—Tropical Monsoon
Aw—Tropical Savannah
B Dry Climatic Group
BS—Tropical Steppe (semi-arid)
Bsh—Sub-Tropical Steppe
Bwh—Sub-Tropical Desert
C Humid Mesothermal Climatic Group
Caw—Sub-Tropical Humid (Dry Winters)
H Mountain Climate
The climatic letters A, B, C and H stand for the major groups of climate and the other letters designate the sub-divisions of major groups




**Western Disturbances**

- In the winter season, the sub-tropical jet (STJ) is bifurcated into two branches due to physical obstruction of the Himalayas and Tibetan Plateau.
- One branch is flows to the south of the Himalayas, while the second branch is positioned to the north of the Tibetan Plateau.




- The ridge of the jet stream creates anticyclonic (with clockwise air circulation) conditions over North-West India.
- Consequently, the winds tend to descend over the north-western parts of India, resulting into the development of atmospheric stability and dry conditions (anticyclonic condition = no rainfall).
- But the sub-tropical jet (STJ) causes periodic changes in general weather conditions.

- The STJ drives the temperate low pressures over Mediterranean Sea towards east across Afghanistan, Pakistan and reach north-west India.
- These storms are residual frontal cyclones which move at the height of 2000 metres from the mean sea level.
- On an average, 4 to 6 cyclonic waves reach north-western India between October and April each year.

**Weather associated with Western Disturbances**

The arrival of these temperate storms [remnants of temperate cyclones] [western disturbances] causes precipitation leading to an abrupt decrease in air temperature over North-West India.

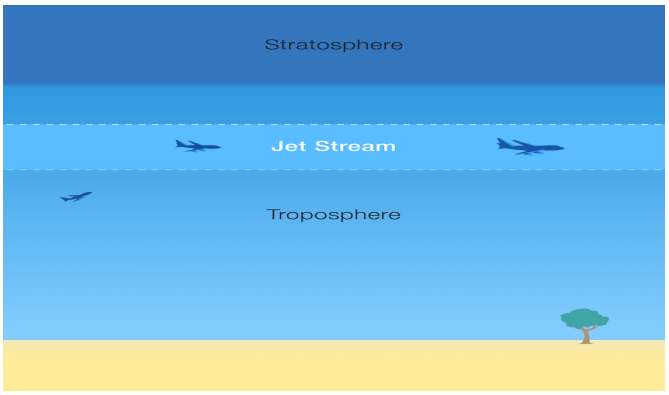
- The weather becomes clear after the western disturbances passes away.
- Western Disturbances also bring heavy snowfall in the Himalayan Region and a cold wave to north Indian plains.

**Importance of Western Disturbances**

- The western disturbances affect weather conditions during the winter season up to Patna (Bihar) and give occasional rainfall which is highly beneficial for the standing rabi crops, (wheat, barley, mustard, gram, lentil, etc.).

# Jet Stream, Tropical Savana Climate and Types of Climate

## Jet streams

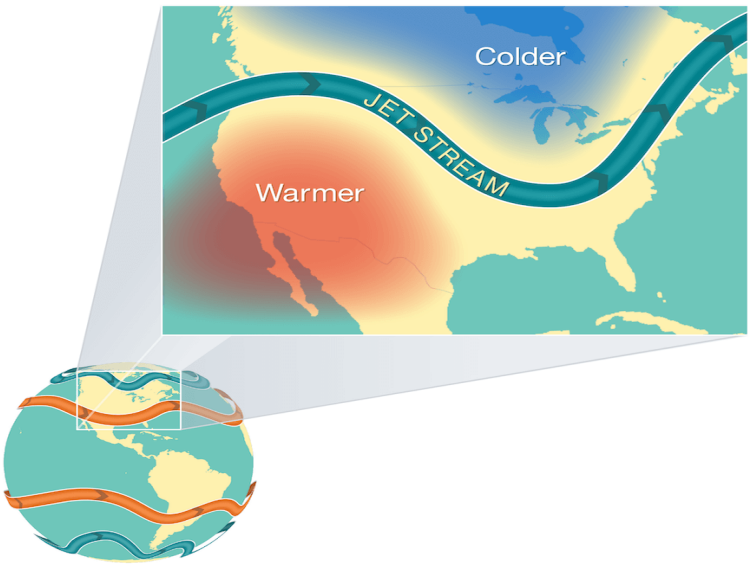



Jet streams are winds that blow horizontally from west to east at a high speed near the tropopause and the stratosphere. These are high speed winds which influence the weather and climatic conditions of the region over which they blow.

There are two types of jet streams that blow at the tropical belt of $30^0$ north latitudes- the westerly jet stream and the easterly jet stream.

A branch of westerly jet stream brings moderate to heavy rainfall followed by the cold waves to the Indian subcontinent.

The easterly jet stream also helps the Monsoon winds to blow into the greater part of India and brings monsoon showers.




## Climatic Regions of India

Climatic Regions of India India has a monsoon type of climate with large regional variations in terms of rainfall and temperature. These variations represent the subtypes of the monsoon climate. It is on this basis that the climatic regions can be identified.

A climatic region has a homogeneous climatic condition which is the result of a combination of factors. Temperature and rainfall are two important elements which are considered to be decisive in all the schemes of climatic classification.

While classifying Indian climatic regions, most geographers have given more importance to rainfall than to temperature as variations in rainfall are much more marked than those of temperature.

## Stamp's Classification of Climatic Regions of India

Stamp used 18°C isotherm of mean monthly temperature for January to divide the country into two broad climatic regions –

Temperate or continental zone in the north and

Tropical zone in the south.

This line runs roughly across the root of the peninsula, more or less along or parallel to the Tropic of Cancer.

The two major climatic regions are further divided into eleven regions depending upon the amount of rainfall and temperature.

| Temperate or Continental India | | |
|---|---|---|
| **Region** | **Avg Temperature** | **Annual Rainfall** |
| **Himalayan Region** | Sumer = 4°-7°C<br>Winter = 13°-18°C | East = Over 200 cm<br>West = much less |
| **North-western Region**<br>Northern parts of Punjab and southern parts of Jammu and Kashmir | Summer = 16°C<br>Winter = 24°C | Below 200 cm |
| **Arid Lowland**<br>Thar desert of Rajasthan, south western part of Haryana and Kachchh of Gujarat | Winter = 16° to 24°C<br>Summer = 48°C | Below 40 cm |
| **Region of moderate rainfall**<br>Punjab, Haryana, western Uttar Pradesh, Union Territory of Delhi, north-west Plateau area of Madhya Pradesh and eastern Rajasthan | Winter = 15°-18°C<br>Summer = 33°-35°C | 40 – 80 cm |
| **Transitional Zone**<br>Eastern Uttar Pradesh and Bihar | Winter = 15°-19°C Summer = 30° – 35°C | 100 -150 cm |
| **Tropical India** | | |
| **Region of very heavy rainfall**<br>Meghalaya, Assam, Tripura, Mizoram and Nagaland | Winter = 18°C in Summer = 32°-35°C | Over 200 |
| **Region of heavy rainfall**<br>Chhattisgarh, Jharkhand, Gangetic West Bengal, Odisha and coastal Andhra Pradesh | Winter = 18°-24°C<br>Summer = 29°-35°C | 100 – 200 cm |

| | | |
|---|---|---|
| **Region of moderate rainfall**<br>between Western and Eastern Ghats | Winter = 18°-24°C Summer = 32°C in | 50 -100 cm |
| **Konkan Coast**<br>Mumbai in the north to Goa in the south | Annual = 24°-27°C. | Over 200 cm |
| **Malabar Coast**<br>Goa to Kanniyakumari | Annual = 27°C | Over 250 cm |
| **Tamil Nadu**<br>Tamil Nadu and adjoining areas of Andhra Pradesh | Annual = 24°C | 100 to 150 cm<br>**(Retreating monsoon)** |

## Koeppen's Classification of Climatic Regions of India

Koeppen's Classification of Climatic Regions of India is an empirical classification based on mean annual and mean monthly temperature and precipitation data.
Koeppen identified a close relationship between the distribution of vegetation and climate.
He selected certain values of temperature and precipitation and related them to the distribution of vegetation and used these values for classifying the climates.
Koeppen recognized five major climatic groups, four of them are based on temperature and one on precipitation.

| **Koeppen's Scheme – Climatic Regions of India** | | |
|---|---|---|
| **Climate type** | **Region** | **Annual rainfall** |
| **Amw**<br>**(Monsoon type with short dry winter season)** | Western coastal region, south of Mumbai | over 300 cm |
| **As**<br>**(Monsoon type with dry season in high sun period)** | Coromandel coast = Coastal Tamil Nadu and adjoining areas of Andhra Pradesh | 75 – 100 cm<br>[wet winters, dry summers] |
| **Aw**<br>**(Tropical Savanah type)** | Most parts of the peninsular plateau barring Coromandel and Malabar coastal strips | 75 cm |
| **BShw**<br>**(Semi-arid Steppe type)** | Some rain shadow areas of Western Ghats, large part of Rajasthan and contiguous areas of Haryana and Gujarat | 12 to 25 cm |

| | | |
|---|---|---|
| **BWhw**<br>**(Hot desert type)** | Most of western Rajasthan | less than 12 cm |
| **Cwg**<br>**(Monsoon type with dry winters)** | Most parts of the Ganga Plain, eastern Rajasthan, Assam and in Malwa Plateau | 100 – 200 cm |
| **Dfc**<br>**(Cold, Humid winters type with shorter summer)** | Sikkim, Arunachal Pradesh and parts of Assam | ~200 cm |
| **Et**<br>**(Tundra Type)** | Mountain areas of Uttarakhand<br>The average temperature varies from 0 to 10°C | Rainfall varies from year to year. |
| **E**<br>**(Polar Type)** | Higher areas of Jammu & Kashmir and Himachal Pradesh in which the temperature of the warmest month varies from 0° to 10°C | Precipitation occurs in the form of snow |

## Savanna (Aw) Climates

Savanna of the tropical climates
Tropical climates with seasonal rainfall support the savanna (Creative Commons: Brian Harries).

Savanna climates are Aw climates in the Koppen classification system.

In some equatorial areas, there is a rainy season and a dry season. This pattern of seasonal rainfall results in the savanna. The savanna is a tropical grassland. The typical vegetation consists of grass with a few scattered trees.

In Africa, populations of large herbivores, such as the elephant, live in the savanna. Large carnivores such as lions also live in the savanna. The herbivores contribute to the creation of a grassland community. They do this by feeding or trampling on the seedlings of trees.

## Tropical semi-arid steppe climate

The Tropical semi-arid steppe climate covers the entire Indian coastal belt and adjoining areas. The climate in this region is hot with extreme rainfall during the monsoon season, from June to September. The Southern parts of the belt experiences hot, seasonally dry tropical savana climate while most of the northern half experiences hot, semi-arid, tropical steppe type of climate. The climate of this region however varies with the seasons. South

of Tropic of Cancer and east of the Western Ghats and the Cardamom Hills are the places experiencing such type of climate; it includes the states of Karnataka, interior Tamil Nadu, western Andhra Pradesh and central Maharashtra.

The winter season in tropical semi-arid steppe climate starts from January upto February and is followed by summer season from March to May. The period from October to December forms the post-monsoon season. The period is generally pleasant over the entire region except during a few spells of rain associated with north-east monsoon which affects the south-eastern parts of the State during October to December. The months of April and May are extremely hot, very dry and generally uncomfortable. Weather is usually very oppressive during June owing to high humidity and temperature. The next three months, namely July, August and September are somewhat comfortable due to reduced day temperature although the humidity continue to be very high.

The tropical semi-arid steppe climate is a transitional climate between the tropical wet and tropical dry climates. The controlling factors of the climate are similar to that of the tropical dry climate, though temperatures are cooler and annual precipitation is higher. Thus, tropical semi-arid steppe climate is considered to be steppe climate semi-arid rather than completely arid. The climate of the tropical steppe is a direct result of its interior continental location and proximity to the subtropical high. The tropical steppe is not as dry as the tropical desert climate, owing to its proximity to a source of moisture.

Steppe climate, much evaporation and plant transpiration would take place if water were available. Inadequate amounts of precipitation during the comparatively long summer droughts stress plants that require water during periods of high temperature. However, during the wet tenures of the year, ample rainfall occurs to meet the needs of the natural vegetation.

## Tropical desert

In regions with less than 70 cm of rainfall,the natural vegetation consists of thorny trees and bushes. This type of vegetation is found in the north-western part of the country including semi-arid areas of Gujarat, Rajasthan, Madhya Pradesh, Chhattisgarh, Uttar Pradesh and Haryana. Acacias, palms,euphorbias and cacti are the main plant species. Trees are scattered and have long roots penetrating deep into the soil in order to get moisture.

# Mountain Climate, Drought in India

The climate on a mountain varies depending on what altitude (how high) you are up a mountain. At the foothills (near the bottom) there may be a tropical climate, whilst the peaks (the very top of mountains) may be covered in ice. The uppermost level of mountains is often bare rock and snow. Tibet and the Himalayas and other mountain ranges such as the Rocky Mountains or the Andes are good examples of this.

Mountain weather conditions can change dramatically from one hour to the next. For example, in just a few minutes a thunder storm can roll in when the sky was perfectly clear, and in just a few hours the temperatures can drop from extremely hot temperatures to temperatures that are below freezing.

They receive more rainfall than low lying areas because the temperature on top of mountains is lower than the temperature at sea level.

Winds carry moist air over the land. When air reaches the mountain, it rises because the mountains are in the way. As the air rises, it cools, and because cool air can carry less moisture than warm air, there is usually precipitation (rain).

The climate on mountains get progressively colder with increased altitude (the higher up you go). This happens because as altitude increases, air becomes thinner and is less able to absorb and retain heat. The cooler the temperature the less evaporation there is, meaning that there is more moisture in the air.

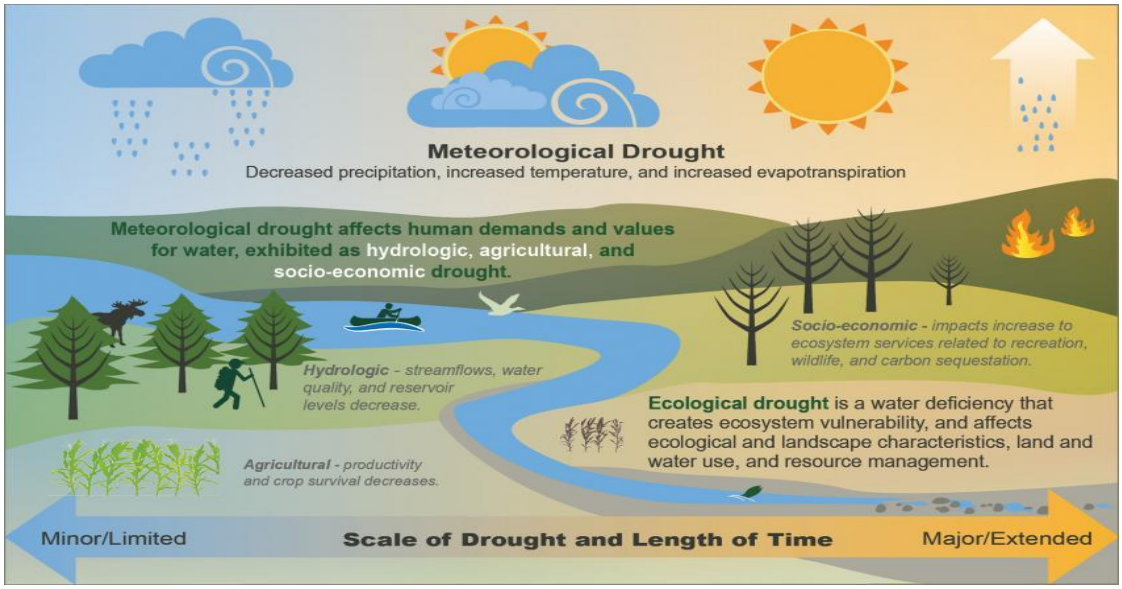
## Tropical Monsoon Climate

This type of climate occurs because of the monsoon winds which changes its direction according to the seasons. In this kind of tropical climate, there is a short and distinct dry season.

Therefore, this one comes under the influence of intertropical convergence zone at the time of high sun basically in summers, and under the influence of drier trade winds at the time of low sun i.e. basically in the winters.

## Definition of Drought

The term ‘Drought’ in simple words is the absence of water for a long period of time, at a place where it is considered abnormal as compared to its usual conditions. The distribution of water on the earth’s surface is not even. Some places have lots of freshwater e.g. rivers, lakes, lagoons, ponds etc.  and they are continuously replenished by rainfall and water from underground.



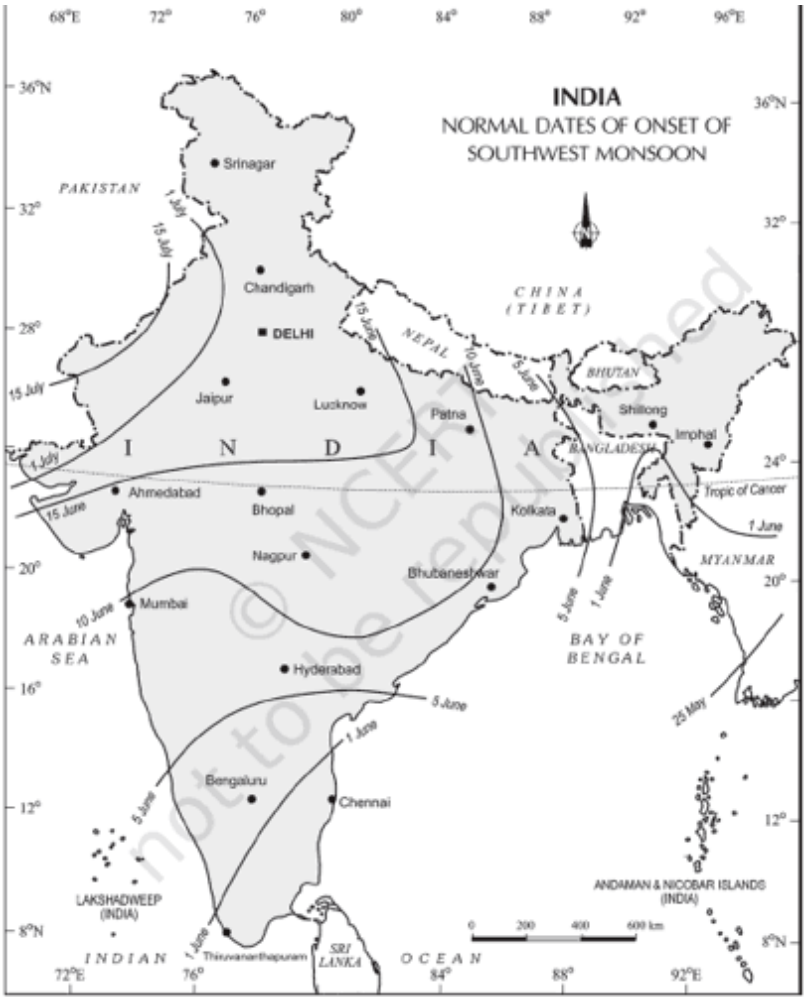

- India has an average annual rainfall of around 1150 mm. No other country has such a high annual average; however, there is considerable annual variation.

- **More than 80% of rainfall is received in less than 100 days** during the south-west monsoon and the geographic spread is uneven.

- **21% area receives less than 700 mm rains annually making such areas the hot spot of drought.** Inadequacy of rains coupled with adverse land-man ratio compels the farmers to practice rain-fed agriculture in large parts of the country (approx 45%).

- **Per capita, water availability in the country is steadily declining.** Irrigation, using groundwater aggravates the situation in the long run as groundwater withdrawal exceeds replenishment. In the peninsular region availability of surface water itself becomes scarce in years of rainfall insufficiency.

## Rainfall in India




India is a vast country in geographical terms, with various regions experiences very different climatic conditions. This is also reflected in the distribution of rainfall in India. Some regions experience very high rainfall and others receive very scanty rainfall. The difference between the recorded highest and lowest rainfall in India is approximately 1178 cm. In this article, we will discuss various zones of the country according to the average annual rainfall. This topic is an important part of the

India is placed in the monsoon type climatic region as it is the climatic pattern in the south and south-east Asia.

The monsoon is experienced all over the country but the regional variation is experienced in terms of Rainfall, wind pattern, temperature, the degree of wetness and dryness.

The monsoon pattern is partially understood when it is studied globally. The causes and distribution rainfall in South Asia makes it less complex to understand monsoon.

In summer the country experiences south-west monsoon and in winter it is the north-east monsoon.

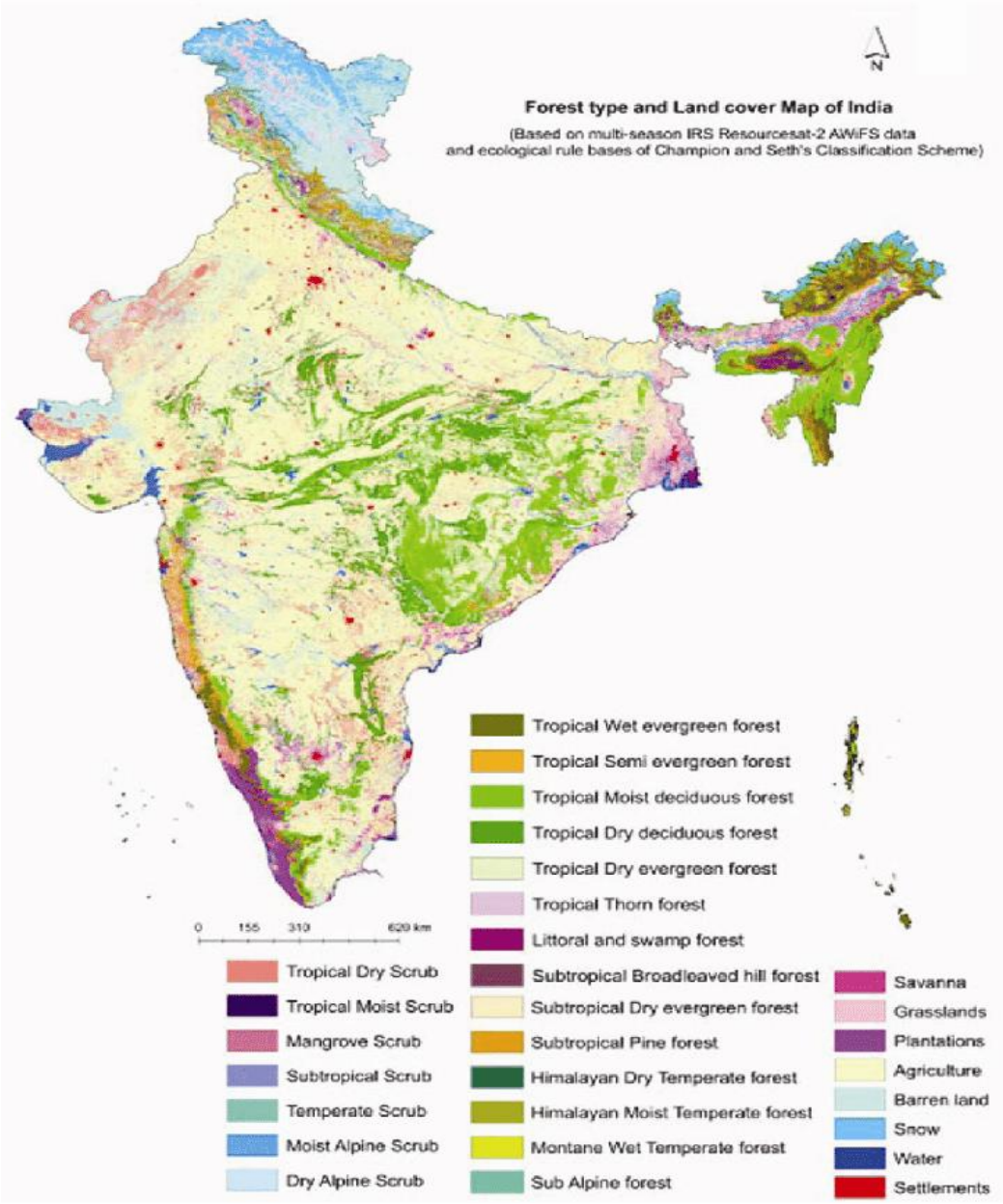
The various factors which are responsible for the formation and pattern of Indian Monsoon are:

Differential heating and cooling of land and water – in summer the land gets heated up faster than the sea, thus creates an intense low pressure in the continental area and the winds from high-pressure seas blows towards the land. It is vice-versa in the winter season.

# Forest in India, Season in India, Retreating Monsoon

## Forests in India

India's forests are rich in diversity and nature, ranging from the dry alpine forests of Ladakh in the north to the tropical moist rain forests of Kerala in the south and from the thorny forests of the desert tracts in the west to the wet evergreen forests of north-east India.



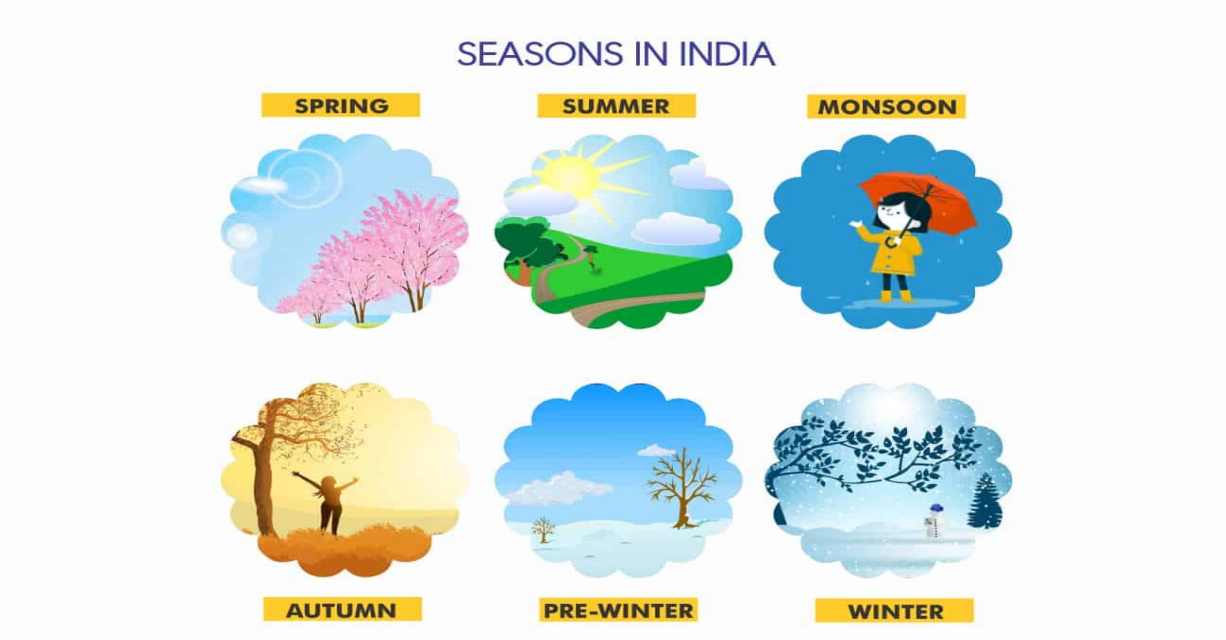
Over 40,000 plant species are found in these forests of which 7000 are endemic. India is the home of about 3000 trees. The plant wealth of India represents about 12 per cent of that of the entire world. The total geographical area of India is 32, 87,263 sq km, of which about 6, 75,500 sq km—equal to 22.50 per cent—is under forests.

According To The National Forest Policy (1952) About 33 Per Cent Of The Geographical Area Should Be Under Forest. However, The Existing Forest Area Is Much Below The Desired Level. The Areas Under Forest Cover In India Have Been Shown In Table. 6.3 The Himalayan Mountains, Bhabhar And Tarai, Western Chats, Eastern Ghats, Bundelkhand, Beghelkhand, Chotanagpur Plateau, Nilgiris, And The Hills Of Peninsular India Are The Main Areas Of Indian Forests. Unfortunately, About 5 To 6 Per Cent Of The Total Forest Area Of The Country Is Under The Category Of Degraded Forests.

The Forest Areas In India Is Much Below The World Average Of 34.5 Per Cent And That Of Brazil (57 Per Cent), Sweden (58 Per Cent), Usa (42 Per Cent), Germany (41 Per Cent), And Canada (36 Per Cent).Similarly, The Per Head Forest Area In India Is Only 0.07 Hectares As Against The World Average Of 1.10 Hectares, Canada At 23 Hectares, Brazil 8.6 Hectares, Australia 5 Hectares, Sweden 4 Hectares, And Usa 3.5 Hectares Per Head Of Population.

## SEASONS IN INDIA

Seasons Remind Us That Change Is The Law Of Nature And A Sign Of Progress. In India, There Are Mainly Six Seasons As Per The Ancient Hindu Calendar (The Lunisolar Hindu). The Twelve Months In A Year Are Divided Into Six Seasons Of Two-Month Duration Each. These Seasons Include Vasant Ritu (Spring), Grishma Ritu (Summer), Varsha Ritu (Monsoon), Sharad Ritu (Autumn), Hemant Ritu (Pre-Winter) And Shishir Ritu (Winter). However, As Per The India Meteorological Department (Imd), There Are Four Seasons In India Like Other Parts Of The World.




**Summer season**

The summer season in India is between the month of Jyeshtha and Ashadh & according to the English calendar, it occurs in May and June. Summer is the season after spring and before the monsoon.
Summer is the hottest seasons, which comes after spring and before autumn. The days are the longest and the nights are shortest. The average temperature in summer is 38 °C.

**Rainy season**
Rainy season in India is the time of year when the average rainfall occurs in most of the areas in the country. The season usually lasts between the month of July and August.
The term 'green season' is sometimes used as a synonym by the tourism officials. The days are short and the nights are long, the average temperature in summer is 34 °C.

**Autumn season**
An Autumn season in India is the time of year when the leaves fall off the trees, and the colours are amazing. It is also called as the fall season. The season usually lasts between the month of September and October.
Autumn is the season after rainy season and before the pre-winter season. Day and night have the same length and the average temperature in autumn is 33 °C.

**Pre- winter season**
Pre-winter season in India is the time of year when it is moderately cold (by Indian standards) with minimum temperatures decrease. The season usually lasts between the month of November and December.

Pre-winter is the season after autumn and before the winter season and the average temperature in autumn is 27 °C.

**Winter season**

The winter season in India is the coolest season of the year, usually lasts between the month of January and February.

The winter name comes from an old Germanic word that means the time of water and refers to the rain and snow of winter in middle and high latitudes.

Winter is the season after pre-winter and before the spring season and the average temperature in autumn is 23 °C.

**Spring season**

The spring season in India is in the months of March and April, it is considered as one of the beautiful seasons in the country. The average temperature in spring is 32 °C.

Spring is the season after winter and before summer. The days become longer and the weather heats up, days become longer and nights become shorter in these seasons.

Spring is known in Old English as Lent. In the 14th century, it was called “Springing Time” – a reference to plants “spring from the ground”.

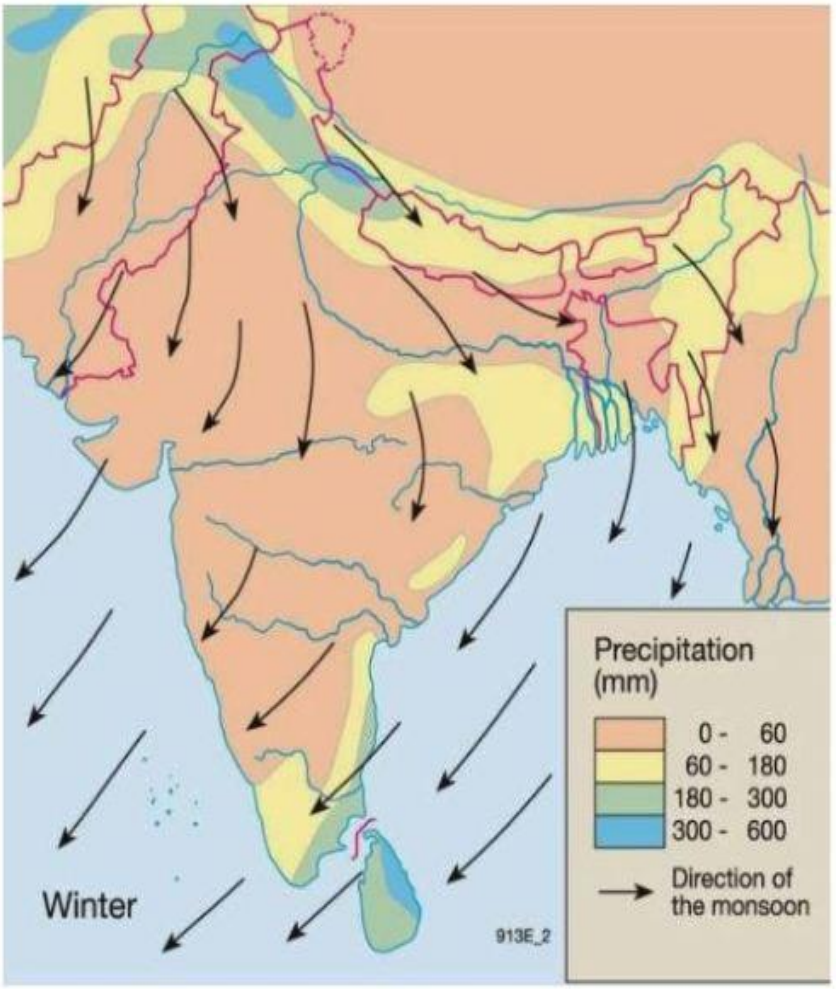
In the 15th century, it was shortened to “spring-time” and in the 16th century only to “spring”, it refers to the seasons as well as ideas of rebirth, rejuvenation, renewal, revival, and rebirth.

## Retreating Monsoon

In simple words, retreating means withdrawal. So, withdrawal of south-west monsoon winds from skies of north India during months of October and November is known as retreating monsoon. The withdrawal is gradually and takes about three months.

- With retreat of the monsoons, the clouds disappear and the sky becomes clear. The day temperature starts falling steeply.
- Monsoon rains weakens all over India except few south eastern states.
- Monsoon trough weakens and gradually shifts south wards
- Most severe and devastating tropical cyclones originate in the Indian seas especially in the Bay of Bengal due to retreating monsoons.
- Direction of winds is from North west to south east and Winds blow from surface to sea there by carrying no moisture.
- It is helpful in Rabi crop cultivation.

## North-eastern monsoon:



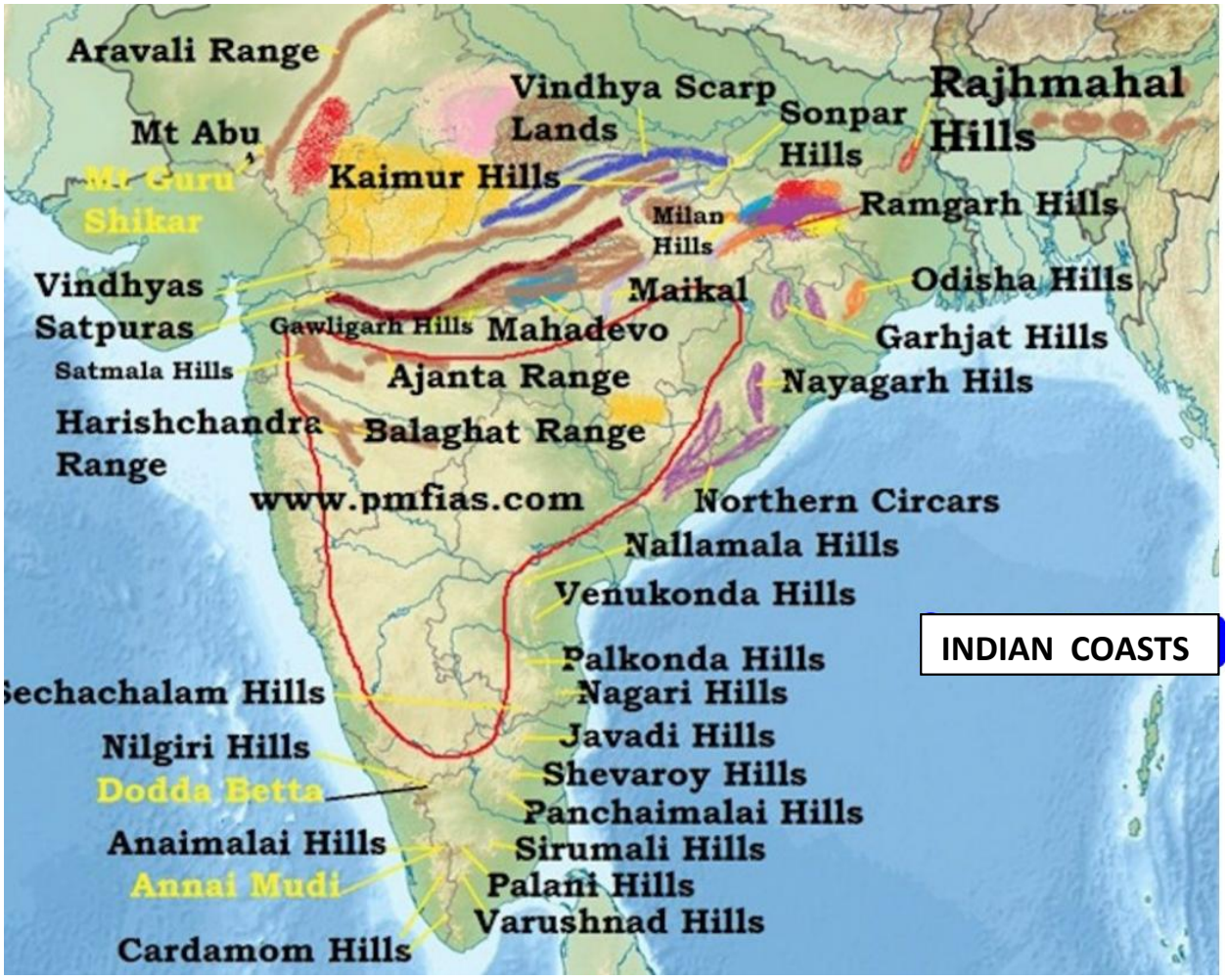

- Northeast Monsoon affects only five sub-divisions of Tamil Nadu, Kerala, South Interior Karnataka, Rayalaseema and Coastal Andhra Pradesh
- On-set of north east monsoon coincides with retreating monsoon winds.
- Unlike retreating monsoon, onset of north eastern monsoon is not clearly defined.
- Winds change its direction to north easterly beginning with Tamil Nadu, along with substantial increase in rainfall intensity and spread beginning with Tamil Nadu and Andhra Pradesh.
- Rainfall variation is huge in north-east monsoon.
- El-Niño has no effect on north-eastern monsoon winds unlike south-western monsoon winds.
- Winds blow from sea to land there by causing rainfall. For instance, monsoon winds absorb moisture while passing through Bay of Bengal and cause rainfall in parts of Andhra and Tamil Nadu.
- The rainfall helps in preparing land for next cropping season.

# Natural Vegetation, Types of Forest and Coast of India

## Coastal Plains in India

India is a country that is surrounded by the sea on three of its sides. The coastal plains in India are along the west and east of the country. Extending up to 7516.6 km, the coastal plains in India are of two types:

1. Eastern Coastal Plains of India
2. Western Coastal Plains of India




## Eastern Coastal Plains of India

The eastern coastal plains stretch from West Bengal in the north to Tamil Nadu in the south and pass through Andhra Pradesh and Odisha. Deltas of the rivers Mahanadi, Krishna, Godavari and Cauveri are present in the eastern coastal plain. The deltas are very fertile and productive for agriculture. Therefore, the delta of the River Krishna is called the '**Granary of South India**'. The Eastern coast is again divided into three categories:

- **Utkal coast:** Extending between the Chilika Lake and Kolleru Lake, they are much wider than the western coastal plains and undergo immense rainfall. Some of the crops that are cultivated here are rice, coconut and banana.

- **Andhra coast:** Extending between the Kolleru Lake and Pulicat Lake, the Andra coast forms a basin area for the Krishna and the Godavari rivers.
- **Coromandel coast:** The Coromandel coast extends between Pulicat Lake and Kanyakumari in Tamil Nadu. This Indian coastline remains dry in summer and receives rainfall during the winters due to the north-east monsoons.

## Western Coastal Plains of India

Western Coastal Plains stretches from Kerala in the south to Gujarat in the north passing through Karnataka, Goa and Maharashtra. The western coastal plains stretch for 1500 km north to south and its width ranges from 10 to 25 km. The West Continental Shelf is at its widest off the Bombay coast. This place is rich in oil. Along the Malabar Coast, there are many beautiful lagoons which makes the place a tourist destination. The western coast is narrower than the eastern coast.

The western coast is further divided into four categories:

- **Kachchh and Kathiawar coast:** Kachchh, formerly a gulf is formed by the deposition of silt by the Indus. The area of Kachchh is covered with shallow water during the monsoons and is divided into Great Rann in the north and Little Rann in the east. Whereas, Kathiawar is situated to the south of Kachchh.
- **Konkan coast:** It extends between Daman in the north to Goa in the south. Rice and cashew are the two important crops of this region.
- **Kanada coast:** It extends between Marmagaon and Mangalore and is rich in iron deposits.

**Malabar coast:** Extending between Mangalore to Kanyakumari, the Malabar coast is relatively broad. This region also consists of lagoons running parallel to the coast in southern Kerala.

## Natural Vegetation of India

Have you noticed different kinds of plants and vegetation when you travel to different states? Even around your house, you can notice various types of trees and bushes! Such is the diverse natural vegetation of India. In this chapter, we will cover some basics about the natural vegetation of India. We will also look at some interesting classifications and examples of the same.

## The Thorn Forests and Scrubs

In regions with less than 70 cm of rainfall, the natural vegetation of India consists of thorny trees and bushes. This type of vegetation is found in the north-western part of the country including semi-arid areas of Gujarat, Rajasthan, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, and Haryana. Acacias, palms, euphorbias, and cacti are the main plant species. Trees are scattered and have long roots penetrating deep into the soil in order to get moisture.

## Hill Forest

Hill Forest is a 225-acre natural area located in Davidson County approximately ten miles west of downtown Nashville. It is named for its previous owner, whose estate owned this forestland for

nearly a century prior to its protection as a state natural area. Its preservation was uncertain until it was acquired by the Friends of Warner Parks in 2010 through a highly successful fundraising effort. It will become an addition to the Warner Parks, which is also a registered state natural area.

## Mangrove forest

Mangroves Forest is the home of low and medium height of various types of trees. The swamps protect coastal areas of India and home to so many species of Aquatic Birds, water animals and reptiles. Myristica swamp of Karnataka Western Ghats, Konkan,Gujarat and mangroves of Kollam are few more sites of wetland in India.

***Sundarbans Mangroves, West Bengal***

The Great Sundarbans is the largest Mangroves region in the world and a UNESCO World Heritage Site. Sundarbans region is densely covered by mangroves, its a National Park, Tiger Reserve and a Biosphere Reserve Park of India.

***Bhitarkanika Mangroves, Odisha***

Bhitarkanika Mangroves is India's second largest forest,located in Odisha. Bhitarkanika is created by the two river delta of Brahmani and Baitarani river and one of the important Ramsar Wetland in India.

***Godavari – Krishna Mangroves, Andhra Pradesh***

The Godavari Krishna mangroves lies in the delta of the Godavari and Krishna rivers in Andhra Pradesh. Mangroves ecoregion is under protection for Calimere Wildlife and Pulicat Lake Bird Sanctuary.

***Pichavaram Mangroves, Tamil Nadu***

Pichavaram mangrove is one of the largest mangrove in India, situated at Pichavaram near Chidambaram in Tamil Nadu. Pichavaram ranks among the one of the most exquisite scenic spot in Tamil Nadu and home of many species of Aquatic birds.

*Baratang Island Mangroves, Andamans* Baratang Island Mangroves is beautiful swamp, located at Great Andaman and Nicobar Islands. Mangrove Swamps of Baratang Island are situated between Middle and South Andamans, capital city Port Blair.