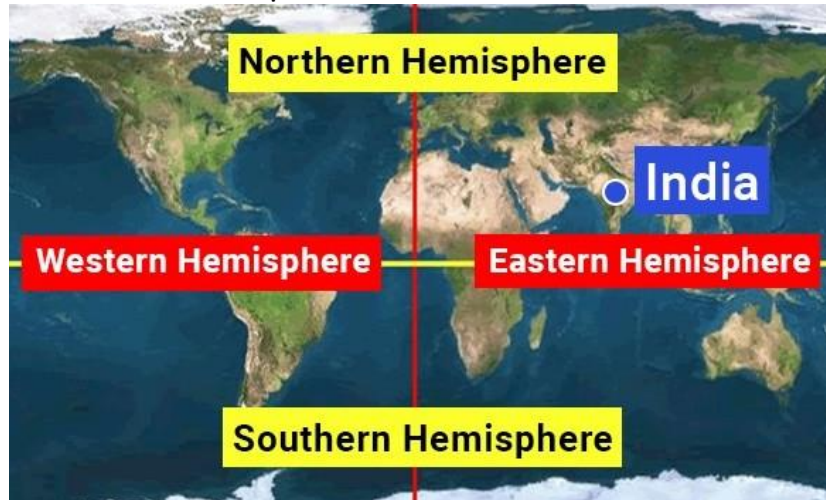
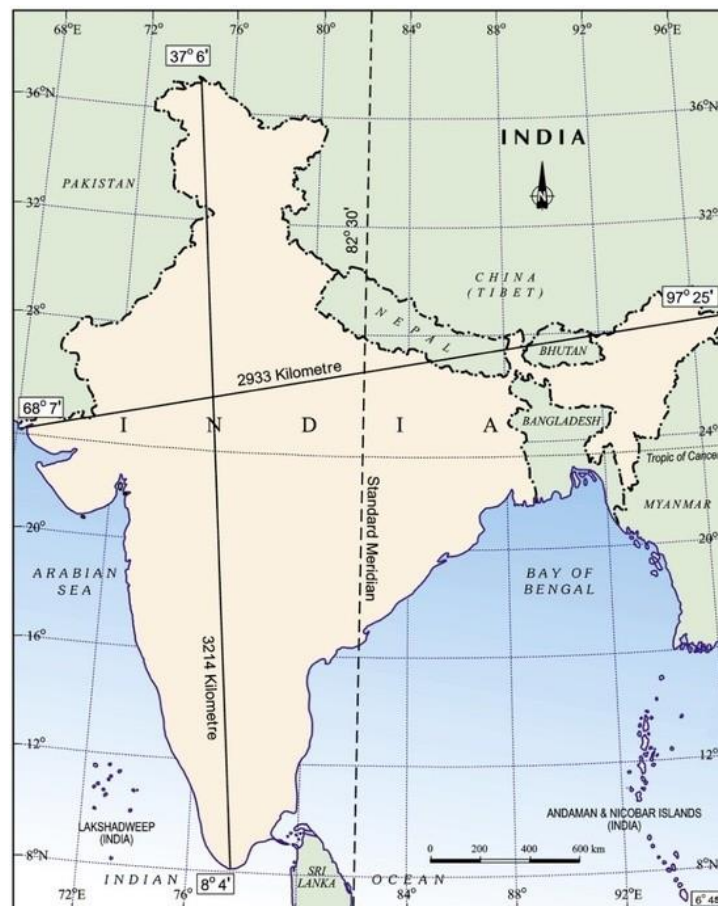


## Location of India

- India is situated in the Northern Hemisphere and lies closer to the Equator.
- India Lies in the Eastern Hemisphere

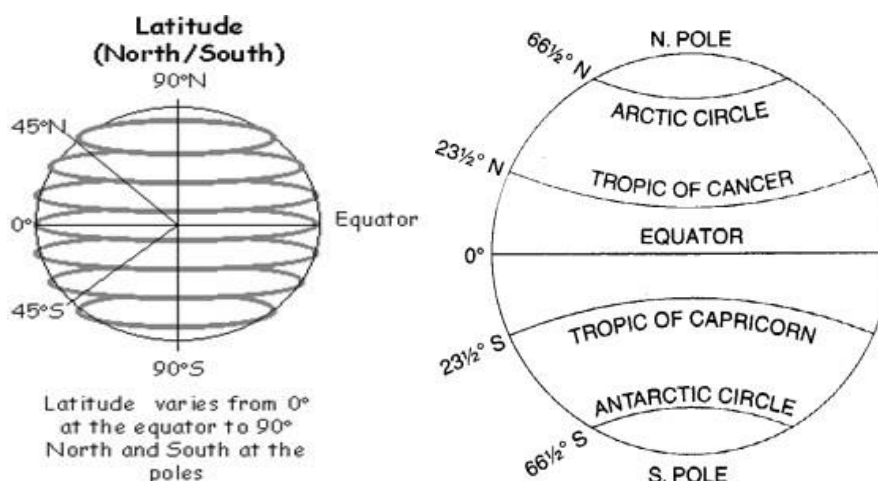


- The latitudinal and longitudinal extent of India are roughly about 30 degrees, whereas the actual distance measured from north to south extremity is 3,214 km, and that from east to west is only 2,933 km.
- Latitudinal extent (mainland)
  - 37° 6' North (Ladakh) to 8° 4' North (Tamil Nadu)
  - 68° 7' East to 97° 25' East longitude
- The IST (India Standard Time) line passes through 82° 30' E.
  - The IST is 5.30 hours ahead of the Greenwich Mean Time (GMT).
  - It passes through Mirzapur in Uttar Pradesh.
  - Other states through which the IST passes: Madhya Pradesh, Chhattisgarh, Odisha and Andhra Pradesh.



- The Tropic of Cancer passes through India and divides it into tropical and subtropical regions.
  - The Tropic of Cancer passes through 8 Indian states namely Gujarat, Rajasthan, Madhya Pradesh, Chhattisgarh, Jharkhand, West Bengal, Tripura and Mizoram.
- India is surrounded by water bodies on three sides.
  - Bay of Bengal on the east side.
  - Arabian Sea on the west side.
  - Indian Ocean on the south side.

#### Latitude:



- Latitude is the angle drawn from the centre of Earth with respect to the Equator.
- Latitude measures the angular distance north or south of the Equator.

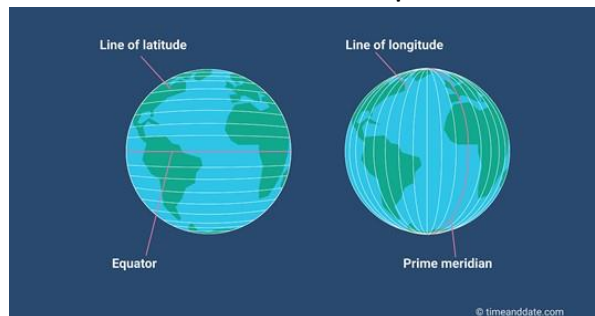
#### Important Latitudes:

1. Equator or 0 degree Latitude- Divides Earth in two halves
  2. Tropic of Cancer or 23½ degrees N – Northernmost limit of overhead Sun. Beyond this Sun rays are oblique.
  3. Tropic of Capricorn or 23½ degrees S – Southernmost limit of overhead Sun. Beyond this Sun rays are oblique.
  4. Arctic Circle or 66½ degrees N – Marks the latitude beyond which the Sun does not set on Summer Solstice (21st June)
  5. Antarctic Circle or 66½ degrees S – Marks the latitude beyond which the Sun does not set on winter Solstice (22nd December)
- Latitude is inversely proportional to Sun light intensity and temperature, which means the higher the latitude the lesser the Sun light intensity and lower the temperature and vice versa.
  - Tilt of Earth- Axis of Earth is tilted at 23½° from vertical axis of orbital plane.
  - This tilt causes varying lengths of day and night and seasonal changes. Seasonal changes:
    - On 21st June Sun rays directly overhead on Tropic of Cancer : Summer Solstice Also, there is 24 hrs Sunlight on Arctic Circle.
    - On 22nd December Sun rays directly overhead on Tropic of Capricorn : Winter Solstice
    - On 21st March Sun rays directly overhead on Equator : Spring Equinox
    - On 23rd September Sun rays directly overhead on Equator : Autumn Equinox

[Note: Day & Night occurrence is due to Rotation of Earth whereas Day & Night length due to tilt of the Earth]

## Longitude:

- It is the angular distance between the meridian passing through a given point and the Prime Meridian.
- Longitude varies between 0 degree to 180 degrees East or West.
- These longitudes are perpendicular to the latitudinal lines and are also known as Parallels.
- Meridian is the line connecting places/points with the same longitude.
- **Prime Meridian:**
  - It is the local solar time of Greenwich(London) which was chosen as standard time for the world and is also called the Greenwich line. It passes through the Royal Astronomical Observatory at Greenwich, near London, hence the name Greenwich line.
  - It divides Earth into Eastern and Western hemisphere.



## Longitude and time:

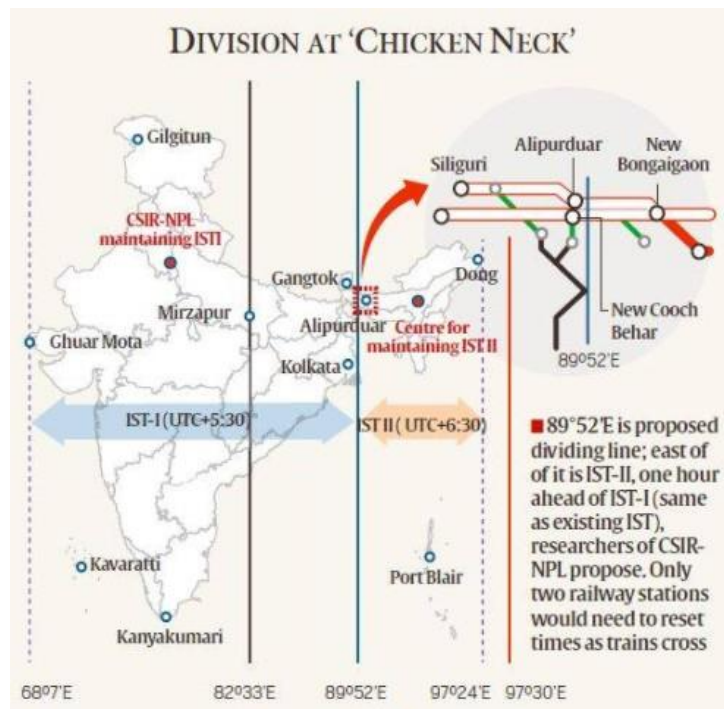
- All places on a given longitude have the same local time. E.g. suppose places a, b and c lie on 40 degrees longitude, then a, b and c will have the same local time.
- Eastern part of Earth sees early sunrise compared to western part, because the Earth rotates from West to East. It implies that Japan sees an early sunrise compared to India.
- Time at the Prime Meridian or Greenwich line is known as Greenwich Mean Time (GMT) and is taken as a reference for every time zone in the world.
- Places lying to the east of Greenwich witness the Sun early and gain time, whereas places lying to the west of Greenwich witness the Sun later and lose time.
- The Earth completes one revolution (360°) in one day or 24 hours, which implies that it passes through 15° in one hour or 1° in 4 minutes.
- As one moves in the East direction from the GMT, time is added and as one moves in the West from GMT, time is subtracted.

**Example:** If time is 1 PM at London then in India which lies East of GMT, the time will be 6:30 PM as IST is 5.30 hours ahead of the GMT.

- Most countries have a single time zone based on the central meridian of the country. But some large countries like Russia, USA have multiple time zones because of their huge size and other reasons.

## Time Zone of India

- At present India has only one Time zone, which is IST.
- But the longitudinal expanse of India is 30 degrees, which means 2 hour's difference between eastern most and western most part of India and it is sufficient enough to have two time-zones.
- A research paper of Council of Scientific & Industrial Research National Physical Laboratory (CSIR-NPL) has proposed to call the two time zones IST-I (UTC + 5.30 h) and IST-II (UTC + 6.30 h). The proposed line of demarcation is at 89°52'E, the narrow border between Assam and West Bengal.
- States west of the line would continue to follow IST (to be called IST-I). States east of the line viz. Assam, Meghalaya, Nagaland, Arunachal Pradesh, Manipur, Mizoram, Tripura, Andaman & Nicobar Islands would follow IST-II.



#### Need for two time zones:

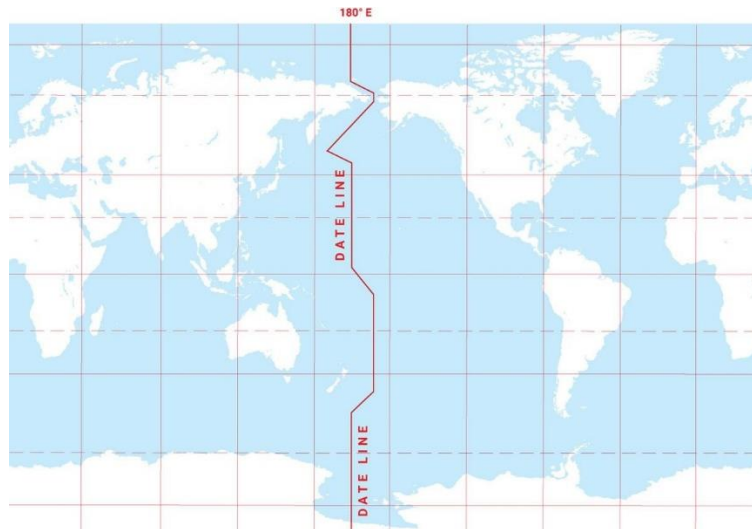
- There is an argument that, early sunrise in the easternmost parts i.e. the Northeastern states cause the loss of many daylight hours by the time offices or educational institutions open, and that early sunset, for its part, leads to higher consumption of electricity and there are increases in energy consumption.
- Effect on biological clocks of citizens (Circadian Rhythm): The longitudinal extremes of the country are assigned a single time zone creating problems relating to the biological clock.
  - Experts have established that the biological species are ruled by biological clocks (Circadian Rhythm) that run on a 24-hour light-dark cycle in synchronization with the sun and affect the productivity and efficiency of people.
- Experts also suggest that longer daylight during evenings is likely to contribute towards many other aspects like women's safety and security, increase in professional productivity etc.

#### Concerns:

- There is a possibility of human error in changing time when crossing the time zone due to low literacy and awareness among people.
- Two time zones will require synchronizing railway traffic, failing to which may create confusion and lead to accidents.
- There will be an issue of changing the time every time while crossing from one time-zone to another which may further create confusion among local people.

#### International Date Line (IDL)

- It is an imaginary line which follows 180° meridian and the date changes by exactly one day when it is crossed
- A person crossing IDL from west to east gains a day whereas crossing from east to west loses a day.
- The international date line is not a straight line rather it varies in a zig-zag manner.



### India's proximity to Equator:

- India is closer to the Equator so it receives more sunlight.
- The areas south of the Tropic of Cancer lie in the tropical zone and hence receive high solar insolation.

### International Solar Alliance

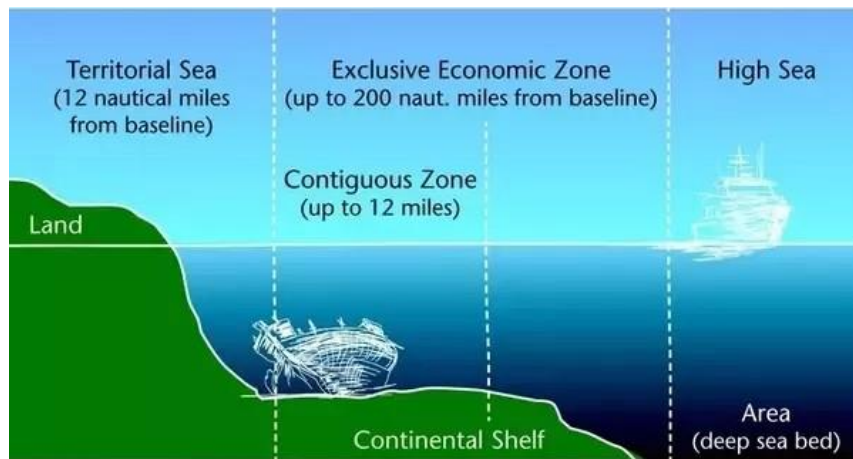
- To harness the availability of sunlight in the tropical region, India propagated the idea of the International Solar Alliance.
- The International Solar Alliance (ISA) was conceived as a coalition of
  - o solar-resource-rich countries (which lie either completely or partly between the Tropic of Cancer and the Tropic of Capricorn) to address their special energy needs.
- ISA was launched by the Prime Minister of India and the President of France on 30th November 2015 in Paris, France on the side-lines of the United Nations Climate Change Conference (COP-21).
- It will provide a dedicated platform for cooperation among solar-resource-rich countries, through which the global community, including governments, bilateral and multilateral organizations, corporates, industry, and other stakeholders, can contribute to help achieve the common goal of increasing the use and quality of solar energy in meeting energy needs of prospective ISA member countries in a safe, convenient, affordable, equitable and sustainable manner
- As on 15 January 2021, 89 countries have signed the framework agreement of the ISA.
- The Interim Secretariat of the ISA is at National Institute of Solar Energy (NISE), Gurgaon, India.

- The area north of the Tropic of Cancer lies in the subtropical zone.

### Coastal location

- India is surrounded on three sides by sea. On the eastern side there is the Bay Of Bengal and Andaman sea, on western side there is Arabian Sea and on the southern side lies the Indian Ocean.
- India has a coastline of approx 7500 kms.
  - o The Bay of Bengal is contiguous with West Bengal, Odisha, Andhra Pradesh and Tamil Nadu.
  - o The Arabian sea is contiguous with Gujarat, Maharashtra, Goa, Karnataka and Kerala.





## India and Neighbours

India is a country of vast geographical expanse. In the north, it is bound by the Himalayas. The Arabian Sea in the west, the Bay of Bengal in the east and the Indian Ocean in the south. India shares land boundaries with seven countries

- Bangladesh 4096 kms
- China 3488 kms
- Pakistan 3323 kms
- Nepal 1751 kms
- Myanmar 1643 kms
- Bhutan 699 kms
- Afghanistan 106 kms
- India shares sea boundary with two nations
- Sri Lanka
- Maldives

### India and Bangladesh:

- Indian states bordering Bangladesh are West Bengal, Assam, Meghalaya, Tripura and Mizoram.



- The Border with Bangladesh is known as Radcliffe line.

- 2015 Land Boundary agreement:
  - Under the Land Boundary Agreement between two nations the Bangladeshi enclaves in India and Indian enclaves in Bangladesh were transferred.
  - It involved handing over 17,000 acres of land to Bangladesh in return for 7,000 acres in 162 enclaves in West Bengal, Assam, Tripura and Meghalay.

### India and China

- Indian States/UTs sharing border with China are- Ladakh (UT), Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh.



### Border disputes between India & China:

- In the Western sector:
  - Here India shares 2152 km long border with China, and territorial disputes over Aksai Chin region of Jammu and Kashmir, with both countries claiming the region as their own.
  - The recent dispute is around the region of the northern bank of Pangong Tso lake, Demchok and the Galwan Valley.
- In the middle sector:
  - Here India roughly shares about 625 km long boundary with China with a few minor disputes regarding Tibet.
- In the Eastern Sector:
  - Here India shares a 1,140 km long boundary with China and this boundary line is called McMahon Line.
  - The major dispute here is around the region of Tawang Valley of Arunachal Pradesh, Chumbi Valley (Doklam Tri- Junction) which India shares with Bhutan.

### India and Pakistan

- Indian States/UTs sharing border with Pakistan are Gujarat, Rajasthan, Punjab, Jammu & Kashmir (UT), Ladakh (UT).



## **Border Dispute between India and Pakistan**

- Pakistan occupied Kashmir(Pok) It Comprises Muzaffarabad region and GilgitBaltistan region.
  - Muzaffarabad region is known as Azad Kashmir in Pakistan.
  - Also, Pakistan is in process of converting Gilgit Baltistan as its 5th Provincebesides its current provinces of Sindh, Punjab, Balochistan and Khyber Pakhtunkhwa.
  - India claims Pok region as its own as per the Treaty of Accession signed between Maharaja of erstwhile Jammu and Kashmir Princely State and India.
  - Muzaffarabad region is included in Indian UT of Jammu and Kashmir andGilgit Baltistan is included in UT of Ladakh.
- Siachen Glacier- claimed by both India and Pakistan.
  - Currently under Indian Control after and is a part of Ladakh UT.
  - It was occupied by Operation Meghdoot.
  - Actual Ground Position Line is west of Siachen Glacier.
- Trans Karakoram Track or Shaksgam Valley-
  - 5180 square Km Area, North West of Siachen glacier and was given to Chinaby Pakistan in 1963.
  - India claims this as part of Ladakh UT
- Sir Creek
  - It lies in the vicinity of Kutch region of India and Sindh province of Pakistan.
  - The dispute lies in the interpretation of the maritime boundary line between Kutch and Sindh and till now the area of Sir Creek has not been demarcatedbetween India and Pakistan by a clearly delineated maritime border.
  - It is important because of the potential natural gas and crude oil resources inits EEZ. Also, presence of other resources like fish, salt etc.

## **China Pakistan Economic Corridor (CPEC):**

- The China-Pakistan Economic Corridor (CPEC) is a 3,218-km route consisting of highways, railways and pipelines that will
- connect Gwadar port to Xinjiang in China. The CPEC is crucial for China's 'One Belt,One Road' initiative that aims to connect China to Europe and Asia.
- The Gwadar port is the showpiece of the ChinaPakistan Economic Corridor (CPEC) project, which Beijing sees as a crucial link that will help it in its drive to become a world power.
- India's concerns
  - India has boycotted the OBOR and the CPEC organised by China citingsovereignty and security issues.
  - The construction work by China in the disputed area includes security issuesfor India.
  - China's maritime presence in Gwadar Port can be highly detrimental to India's maritime and economic strategy because India also imports oil from the same region.



## India and Nepal



- Indian States sharing border with Nepal are Uttarakhand, UP, Bihar, Sikkim, West Bengal.
- Nepal acts as a buffer state between India and China.

### Border Dispute with Nepal

- Kalapani Territorial Dispute
  - Kalapani is located at an altitude of 3600m on the Kailash Mansarovar route and is administered as a part of Pithoragarh district in Uttarakhand.
    - Since the Indo-China war of 1962, Kalapani has been controlled by India's Indo-Tibetan Border Police (ITBP) under the aegis of The Ministry of Home Affairs (MHA).
    - Under the treaty of Sugauli signed between Nepal and the erstwhile British East India Company in 1816, the Kali River was determined as Nepal's western boundary with India. But the treaty made no mention of a ridgeline, following which the source of river Kali was changed a few times by British surveyors.
    - This discrepancy has led to the boundary disputes between India and Nepal, with each country producing maps including the territory in their own area to support their claims.
- Susta area border dispute
  - The Susta region is in the Terai region of Bihar and located on the eastern side of the Gandak river (Narayani River in Nepal).
  - 14,500 hectares of land is claimed by Nepal.

## India and Myanmar



- Indian states sharing the border with Myanmar are Mizoram, Nagaland, Manipur and Arunachal Pradesh.

- India and Myanmar has no major border dispute, the only concern is cross border terrorism.
- India and Myanmar are working on various developmental projects like Infrastructure development and connectivity, disaster relief, energy security etc.
- Myanmar is the only ASEAN member that shares its borders with India and hence provides opportunities for deepening ties with south-east Asian nations.

### India and Bhutan



- Indian states bordering Nepal Sikkim, West Bengal, Assam and Arunachal Pradesh.
- It is a land locked between India and China and acts as a buffer state.
- Both nations have peaceful and cordial relations with each other and cooperate on different aspects like environment protection, hydropower etc.
- Strategic importance of Bhutan: The Chumbi Valley is situated at the trijunction of Bhutan, India and China and is 500 km away from the “Chicken’s neck” in North Bengal, which connects the northeast with the rest of the country.

### India and Afghanistan

- The Wakhan Territory of Afghanistan touches India. The neighbouring part of India with Afghanistan lies in the Pakistan Occupied Kashmir (PoK) and is controlled by Pakistan.

## Physiographic regions of India

- The Indian plate was to the south of the equator millions of years ago and it was much larger in size and the Australian plate was a part of it. Over millions of years, this plate broke into many parts and the Australian plate moved towards the southeastern direction and the Indian plate to the north. This northward movement of the Indian plate is still continuing and it has significant consequences on the physical environment of the Indian subcontinent.
- ‘Physiography’ of an area is the outcome of structure, process and the stage of development. The land of India is characterised by great diversity in its physical features. India can be broadly divided into the following physiographic divisions:
  1. The Northern Mountains
  2. The Northern Plains
  3. The Peninsular Plateau
  4. The Indian Desert
  5. The Coastal Plains
  6. The Islands.

## The Northern Mountains

- It consists of three regions
- Trans Himalayas
- Himalayas
- North-East Hilly regions

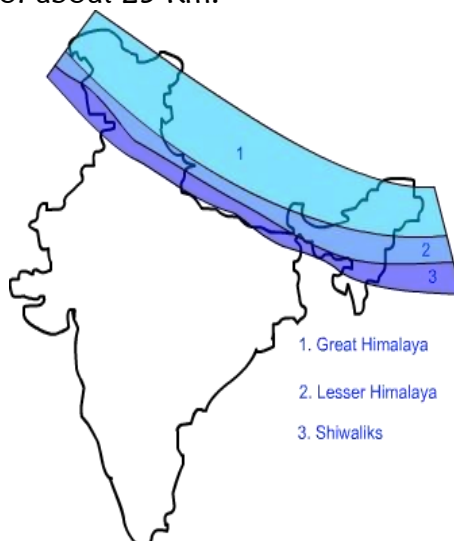
### Trans Himalayas

- It comprises Karakoram, Ladakh and Zaskar mountain ranges from north to south direction.
- K-2 peak, the second highest in the world and the Siachen glacier, is located in the vicinity of the Karakoram range.
- Nubra valley is located between Karakoram and Ladakh.
- The Indus valley lies between Ladakh and Zaskar.



### Himalayas

- It consists of a series of parallel mountain ranges, and the mountain ranges are parallel or converging.
- The mountain ranges have very deep valleys which separate them and form a dissected topography.
- The mountains are spread over India, Nepal, Bhutan and parts of China. The Himalayan range is approximately 2400 kms long.
- The Himalayan range passes through the Indian states/UT of Jammu and Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, West Bengal, Sikkim and Arunachal Pradesh.
- There are three parts of the Himalayan ranges
  - Greater Himalayas also known as Himadri. They have an average height of 6000 meters and width of about 25 Km.



- They are also called the Inner Himalayas and the majority of the world's highest mountain peaks are located in this range. Mount Everest (8848.86 meters) is the highest peak of the world located in Nepal-Tibet Himalayas.
- Other important peaks of this range are Nanga Parbat, Annapurna and Kanchenjunga.
- It has a number of glaciers like origin viz. Gangotri, Yamunotri, Zemu, Milam etc.
- Lesser/Lower Himalayas, also known as Himachal. They have an average height of 3700 to 4500 meters width of 60 to 80 Km.
  - It has various branches namely Pir Panjal in J&K and Himachal Pradesh, Dhauladhar in Himachal Pradesh, Nagtibha in Uttarakhand etc.
  - They are famous for hill stations like- Shimla, Kullu Manali, Mussoorie, Nainital, Dalhousie etc.
  - There are synclinal valleys between Greater Himalayas and Lesser Himalayas such as Kashmir valley, Kathmandu valley. These are fertile and densely settled
  - One distinguishing feature of this region from the point of view of physiography is the Dun formations. These are formed between Lesser Himalayas and Shivalik Himalayas. and Some important duns located in this region are the Chandigarh-Kalka dun, Nalagarh dun, Dehra Dun, Haridwar dun etc.
  - These dun valleys are formed between the lesser Himalayas and the Shivalik ranges.
- Shivalik Himalayas. They have an average height of 900 to 1100 meters.
  - The width of the Shiwaliks varies from 50 km in Himachal Pradesh to less than 15 km in Arunachal Pradesh.
  - These lie in the states of J&K, HP, Uttarakhand, South of Nepal, Bengal
  - They are called Jammu hills in Jammu, Dudhwa ranges in Uttarakhand, Darjeeling hills in West Bengal etc.

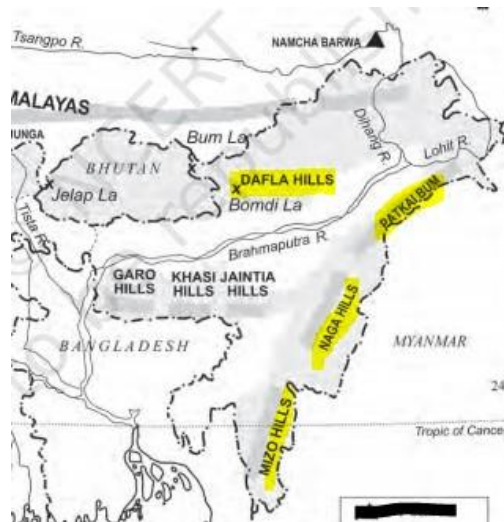
#### North-East Hilly regions

- These are part of the Himalayan mountain system having their general alignment from the north to the south direction. They are known by different local names. In the north, they are known as Patkai Bum, Nagahills, the Manipur hills and in the south as Mizo or Lushai hills.
- These hills have an average height of 2000 to 3000 mtrs. Most of these ranges are separated from each other by numerous small rivers like Braka in Manipur and Mizoram.
- These hills are covered with dense forests and the elevation of the mountains decreases from north to south. These mountains are characterized by rough terrain, dense forests and swift streams.

#### **Important Passes of Himalayan Ranges**

- Karakoram Pass in Jammu & Kashmir
- Khardung La in Jammu & Kashmir
- Chang La in Jammu & Kashmir
- Zoji La in Jammu & Kashmir
- Bara Lacha La in Himachal Pradesh
- Rohtang Pass in Himachal Pradesh
- Shipki La in Himachal Pradesh
- Lipu Lekh in Uttarakhand
- Nathu La in Sikkim
- Jelep La in Sikkim
- Bom Di La in Arunachal Pradesh
- Diphu in Arunachal Pradesh





### Origin of Himalayas/ Himalayan formation.

- Around 200 million years ago, a supercontinent comprised Australia, Antarctica, India, Africa, and South Africa, in the southern hemisphere known as Gondwana land.]

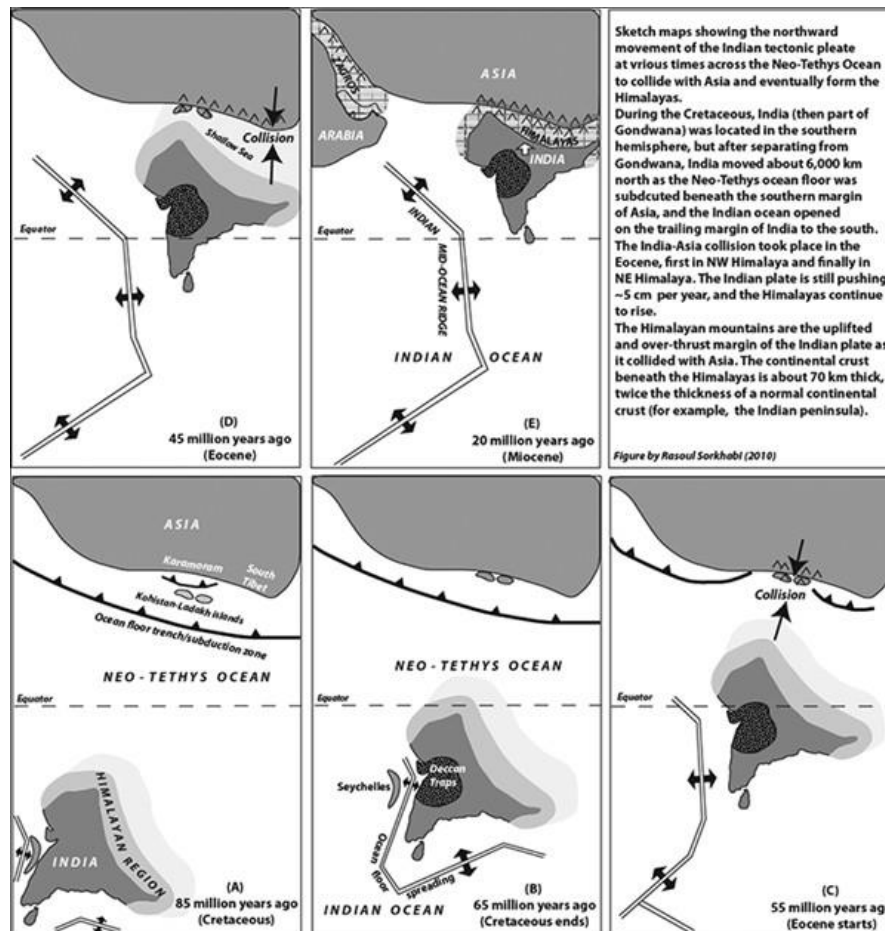


- In the North hemisphere there was Laurasia (also known as Angara land) comprising North America, Europe, Asia.
- Between these two Supercontinents Tethys sea was present.



## The Process

- Around 135 Million year ago Indian land (subcontinent) got detached from Gondwanaland and began to drift northwards.
- As Indian plate drifted northward, the Tethys ocean floor began to subduct beneath the southern margin of Asia (along the Karakoram and Tibet)
- At first the northwest corner of the Indian plate collided with Asia, probably at 65 million years ago, then the Tethys ocean floor closed in an oblique manner and India moved in counter clockwise rotation until its Northeastern corner collided with Asia. The Indus-Tsangpo Suture Zone marks the line of this plate collision.



- The sedimentary deposits of Tethys sea got uplifted and thus began the Himalayan formation.
- Indian plate is still moving in a north east direction colliding at a speed of 5cm / year with Eurasian plate. So, the Himalayas are still rising.
- These plate convergence builds up stresses and on occasion results in release of energy which makes Himalayas disaster prone. Earthquakes, landslides, Avalanches are more common in the Himalayas due to its fragile nature.

#### Impact of climate change on Himalayas

- Beside the Plate Tectonics which is causing disaster in the Himalayas as seen above. Climate change has also impacted the Himalayas negatively:
- Rise in temperature Melting of the glaciers lead to more river water leading to floods.
- Temperature rise More number of avalanches
- Due to higher temperatures there are more cloud bursts.
- Cloud burst could further lead to landslides and floods. (E.g.- 2013 Kedarnath Floods due to cloudburst and landslide)
- Climate change could lead to dry conditions leading to more forest fires

#### Impact of Human activities on Himalayas

- Deforestation - leading to more landslides and avalanches.
- Infrastructure development like Roads, tunnels, dams
- Tourism and construction activities
- Increasing population and urbanization

#### National Mission for Sustaining Himalayan Ecology

- The National Mission for Sustaining the Himalayan Ecosystem (NMSHE) is one of the eight missions under the National Action Plan on Climate Change (NAPCC).

- NMSHE is a multi-pronged, cross-cutting mission across various sectors. It contributes to the sustainable development of the country by enhancing the understanding of climate change, its likely impacts and adaptation actions required for the Himalayas.

### **The Northern Plains**

- The northern plains are formed by the alluvial deposits brought by the rivers the Indus, the Ganga and the Brahmaputra.
- They are situated to the south of the Himalayas and are the youngest unit of India.
- These plains extend approximately 3,200 km from the east to the west. The average width of these plains varies between 150-300 km.
- The maximum depth of alluvium deposits varies between 1,000-2,000 m.
- Its Northern Boundary is clearly marked by Shiwaliks while its southern boundary merges with the peninsula.

### **Division of the Northern Plains**

- From the north to the south, these can be divided into three major zones: the Bhabar, the Terai and the alluvial plains. The alluvial plains can be further divided into the Khadar and the Bhangar.

#### **Bhabar Plains**

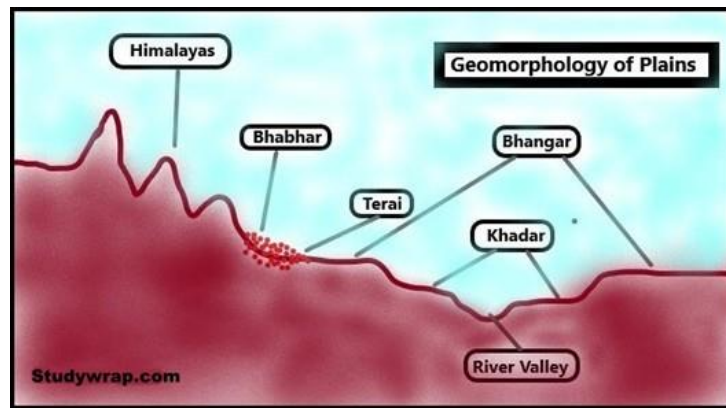
- Bhabar is a narrow belt ranging between 8-10 km parallel to the Shivalik foothills at the break-up of the slope. As soon as rivers from Himalayas reach here their speed decreases resulting in decrease in their load carrying capacity.
- Therefore, heavy materials like boulders, stones, pebbles, and coarse sediments get deposited here. Because of which it has high porosity.
- Many small streams disappear in this region.
- Ground Water level is very low due to porosity depth of tube wells is more in this region and the region is not very fertile not good for agriculture

### **Terai plains**

- It lies south of the Bhabar and is approximately 10-20 km wide.
- Most of the streams and rivers re-emerge without having any properly demarcated channel, thereby creating marshy and swampy conditions known as the Terai.
- Maximum reserve of ground water level in India is found in this region.
- Artesian wells are found here where water flows under natural pressure without pumping.
- This region has a luxurious growth of natural vegetation and houses a varied wildlife.

#### **Alluvium Plains**

- It lies further south of the Terai belt and consists of old and new alluvial deposits known as the Bhangar and Khadar respectively.
- These plains have characteristic features of mature stages of fluvial erosional and depositional landforms such as sand bars, meanders, oxbow lakes and braided channels.
- Small sized particles carried by rivers like sand, silt, clay get deposited here. Forming the Alluvial tract.
- Floods are common during monsoon. This results in formation of floodplains.
- These floodplains containing younger alluvium deposits are known as Khadar Plains or betlands. It is very fertile land. The continuous depositions by the river over time results in formation of uplands. Because of which river changes its course. And no further newer/younger alluvium is deposited. These areas containing deposits of older alluvium are known as Bhangar Plain.



- Bhangar plains also contain calcium carbonate nodules called Kankars.

### The Peninsular Plateau

- It is the oldest and largest physiographic region of India and is bordered on all sides by hill ranges
- It was part of Gondwana land and is older than the Himalayas.
- The average height of the plateau is 600-900 m above sea level
- Most of the peninsular rivers flow west to east. Narmada-Tapti are the exceptions which flow from east to west in a rift valley.
- It is a highly stable block except few changes in the past like Narmada-Tapti rift valley formation, basalt lava eruption on Deccan and Malwa plateau.
- The Peninsular Plateau is composed of several smaller plateaus, hill ranges interspersed with river basins and valleys.
- Senile topographic features due to prolonged erosion like shallow river valleys, small rounded hills, relict and residual hills, highly dissected plateaus.
- This region is a rich source of mineral resources and minerals like coal, iron, aluminium are found here.



### Division of the Peninsular Plateau

- It can be broadly divided in
- Central Highlands
- Deccan Plateau
- Shillong Plateau/The Northeastern Plateau



## Central Highlands



- Highly eroded, discontinuous range, combination of hills and plateaus dominate here.
- General Elevation: 700-1,000 m above the mean sea level and it slopes towards the north and Northeastern directions.
- Hills- Aravalli, Vindhya, Rajmahal Hills
- Plateaus- Malwa, Bundelkhand, Baghelkhand, Chota Nagpur plateau

### Aravalli Mountains

- It is spread in the states of Rajasthan, Gujarat, Haryana, Delhi
- One of the oldest folded mountains of the world.
- Mineral rich- Zinc, lead, silver, iron, gypsum, marble etc.
- Mining is the dominant activity here. Rampant building construction near the Delhi region. Increase in deforestation. All these have contributed to land degradation, increase in desertification in Aravallis.
- Aravallis in Delhi-Haryana region is called Delhi ridge and it marks the northwest boundary of the Indian Peninsula.
- Guru Shikhar (1722m) is the highest peak of Aravallis near Mount Abu.
- Mount Abu is the only hill station in Rajasthan. It also has Dilwara temple

### Vindhyan Ranges

- It is spread in the states of Gujarat, MP, UP, Bihar
- In UP, Bihar it is known as Kaimur hills
- Act as watershed between Gangetic and peninsular rivers

### Malwa Plateau

- It lies between the Aravalli and Vindhyan ranges and is spread in the states of MP, Rajasthan, Gujarat
- Due to the presence of Basaltic rocks which are Magnetite rich (iron) the colour of soil is black.
- Black soil is fertile therefore Malwa is a well developed agriculture region.

### Bundelkhand

- Located on the North East of Malwa
- Half of it lies in UP and another half in MP
- This region is mineral rich.
- Dry land, semi-arid, drought prone because far away from oceans and Vindhyas block the moisture laden clouds.
- The soil found in this region is red due to the presence of Iron Oxide. The Red soil is fertile so agriculture is not well developed in this region.

## Baghelkhand

- East of Malwa and south of Bundelkhand
- Covers areas of MP and UP
- The region is rich in limestone, sandstone etc

## Chota Nagpur Plateau

- It lies in the East of Kaimur.
- It is majorly in Jharkhand, but also in some parts of Chhattisgarh, Odisha and West Bengal.
- This region is the most mineral rich belt of India. Minerals like iron, coal, manganese, gold, mica, etc are found here.
- Cut by river Damodar in the middle. South of it lies Ranchi plateau and to the north lies Hazaribagh plateau.
- This plateau consists of a series of steps like sub-plateaus (locally called patlands – high-level plateau). Also known as Ruhr of India.

## Raj Mahal hills

- It lies to the east of Chota Nagpur plateau
- It forms the eastern boundary of central highlands
- It covers the states of Jharkhand and West Bengal
- It is volcanic in origin, made up of horizontal layers of solidified lava forming a trap-like structure with step-like appearance.
- **Hills:** Satpura, Western Ghats, Eastern Ghats
- **Plateaus:** Deccan Trap, Telangana plateau, Karnataka plateau, Bastar plateau.



## Satpura

- South of Vindhya
- Narmada river valley between Satpura and Vindhya. Narmada valley divides north India and south India or divides central highland and Deccan plateau.
- Narmada valley formation Earlier Vindhya and Satpura joined together. But during the time of Himalayan formation a fault developed due to internal heat. This fault subsided and resulted in the formation of Rift valley. Narmada flows through this rift valley in an eastward direction and drains into Arabian sea.
- Satpura and Vindhya are the block mountains of this rift valley
- Narmada originates from the Amarkantak region. Amarkantak is the eastern most part of Maikal hills. Son river also originates from Amarkantak. But Son runs in south to north direction whereas Narmada runs in east to west direction.
- Parts of Satpura range are- Raj pipla hills (Gujarat, Maharashtra, MP), Mahadeo hills (MP), Maikal hills (MP, Chhattisgarh).

### **Deccan Trap**

- It lies to the South of Satpura
- Largely in Maharashtra and some parts in Karnataka, Telangana
- Similar to Malwa: Before Himalayan formation volcanic eruption in Deccan trap extensive lava flow Basaltic rocks developed which are Magnetite rich (iron) gave rise to black soil.
- This area good for agriculture crops like cotton, sugarcane, jowar etc

### **Karnataka plateau**

- Mineral rich, Similar to Chota Nagpur plateau.
- Kolar gold mines, iron mine at Bellary, manganese etc.

### **Telangana Plateau**

- Dry land, semi arid, red soil similar to Bundelkhand

### **Bastar Plateau**

- North of Telangana and south of Deccan trap.
- In south Chhattisgarh.
- Naxal affected belt, Left wing extremism security issues
- Dandakaranya: Bastar + surrounding area of Deccan trap, Telangana, Andhra, Odisha.

### **Western Ghats (also known as Sahyadri)**

- Its height increases progressively from north to south
- Nilgiri hills- at tri junction of Karnataka, TN and Kerala.
  - Peak- Dodabetta (second highest in south India)
  - Ooty/ Udhagamandalam hill station in TN near Dodabetta peak
  - Silent Valley near Nilgiri. It is in Kerala.
- Anaimalai hills- South of Nilgiri.
  - In Kerala and TN
  - Peak- Anamudi 2695m (highest peak of Western Ghats and also of south India)
  - Munnar hill station in Kerala near Anaimalai
- Cardamom hills- South of Anaimalai
  - Kerala and TN
- Agasthyamalai hills- South of Cardamom hills
  - Near Kanyakumari
- Palani hills- in Tamil Nadu
  - Hill station Kodaikanal. Artificial lake on the hill station called Kodaikanal lake.

### **Eastern ghats**

- Northern Circar hills- in Odisha and Andhra Pradesh
  - Peak- Mahendragiri in Odisha [another Mahendragiri is in Tamil Nadu which is a facility for space satellite]
- Garjat hills in Odisha
- Nallamala, Velikonda and Palkonda hills, Seshachalam hills in Andhra Pradesh. [Konda in Telugu means hills]
- Golconda hills in Telangana- Kohinoor diamond was found here
- Javadi and Shevaroy hills in Tamil Nadu
- Eastern Ghats beyond Shevaroy hills merge into Western Ghats at the Nilgiri.

### Difference between Western and Eastern Ghats

• Western Ghats	• Eastern Ghats
• Parallel to western Coast	• Parallel to Eastern coast
• States of Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu	• Odisha, Andhra Pradesh, Telangana, Tamil Nadu
• Almost continuous belt. Can be crossed only by passes	• Discontinuous and dissected because of the rivers erosive action
• Relatively younger and higher compared to Eastern ghats	• Older and lower compared to western ghats
• Western flank of it got submerged in Arabian sea. Therefore, coast here is Submerged coast.	• Deposition of sediments by rivers has resulted in emergent coast
• Forms watershed of peninsula- Godavari, Krishna, Kaveri originates here	• No major rivers originate
• Average width- 50 to 80 Km	• Average width- 100 to 200 Km
• Average elevation 900 to 1600 m	• Average elevation 600 m
• Highest peak Anamudi 2695 m	• Highest peak Jhindagada 1690 m

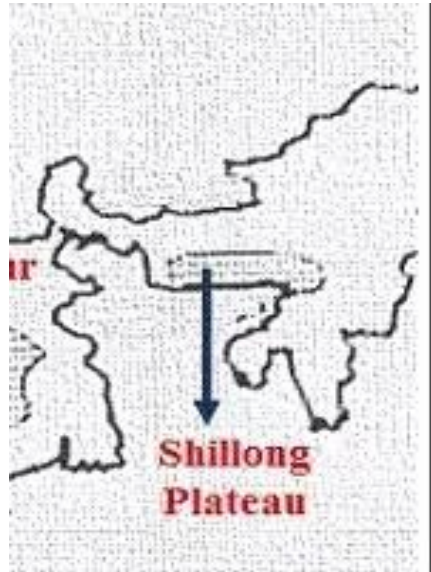


### Major passes in the Western Ghats.

- Thal Ghat – It links Nasik to Mumbai.
- Bhor Ghat – It links Mumbai to Pune.
- Pal Ghat – This pass is located between the Nilgiris and the Annamalai mountains. connects Kochi (Kerala) and Chennai (TN).
- Senkota Pass – This pass located between the Nagercoil and the Cardamom hills links Thiruvananthapuram and Madurai.



## Shillong Plateau/ Meghalaya Plateau



- Hills- Garo, Khasi, Jaintia
- Khasi hills famous for rainfall- Mawsynram, Cherrapunji
- It also extends in Assam as Karbi Anglong Plateau. Mikir hills is in Karbi Anglong.
- The region is rich in mineral resources like coal, iron ore, sillimanite, limestone and uranium.
- Earlier attached to Chota Nagpur Plateau. But it got separated from Chota Nagpur and created a gap known as Rajmahal – Garo gap. The gap was the result of downfaulting. The gap at present is filled with alluvium of Ganga and Brahmaputra rivers.
- Shillong (1,961 m) is the highest peak of the plateau.

## The Indian Desert



Map No. 7.6 The Desert Region of India

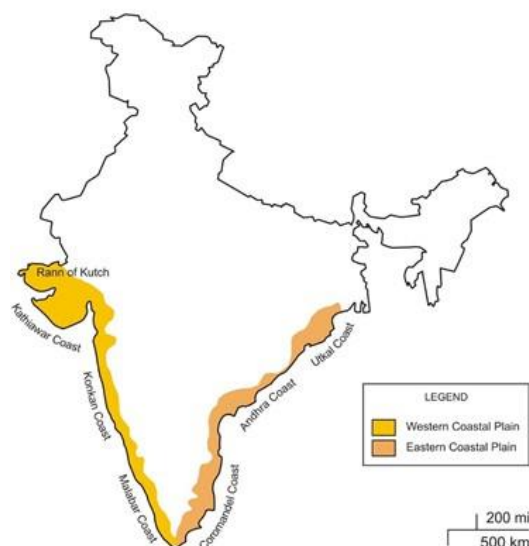
- This region lies to the northwest of the Aravali hills.
- It is also called the Great Indian desert and is a land of undulating topography dotted with longitudinal dunes and barchans.
- This region receives low rainfall below 150 mm per year; hence, it has an arid climate with low vegetation cover.
- It is because of these characteristic features that this is also known as Marusthali.
- The underlying rock structure of the desert is an extension of the Peninsular plateau, yet, due to extreme arid conditions, its surface features have been carved by physical weathering and wind actions.

- Some of the well pronounced desert land features present here are mushroom rocks, shifting dunes and oasis (mostly in its southern part).
- On the basis of the orientation, the desert can be divided into two parts: the northern part is sloping towards Sindh and the southern towards the Rann of Kachchh.

### The Coastal Plains

- India has a long coastline. On the basis of the location and active geomorphological processes, it can be broadly divided into two: (i) the western coastal plains; (ii) the eastern coastal plains.

#### Coastal Plain of India



#### Western coastal plains

- The western coastal plains stretch for 1500 km north to south and its width ranges from 10 to 25 km.
- These plains receive more rainfall than their eastern counterparts.
- It is a submerged coastal plain. Because of this submergence natural condition for ports and harbours. Therefore more natural harbours on western coast
- Northernmost section is Rann of Kutch. Coast in Gujarat is called as Gujarat plain and it includes Kutch and Kathiawar coast
- Coastal plains from the Daman to Goa are called Konkan coast. It is generally flat and composed of basaltic trap rocks .
- Karnataka Coast runs from Goa to Mangalore. It is rich in iron deposits.
- From Mangalore to Cape Comorin runs the Malabar Coast. It has lagoons or backwaters called Kayals. Examples of it are Ashtamudi and Vembanad Kayal.
- Western coastal plain is narrower in middle and becomes broader in North and South
- Rivers do not form Deltas in western coast

#### Eastern coastal plains

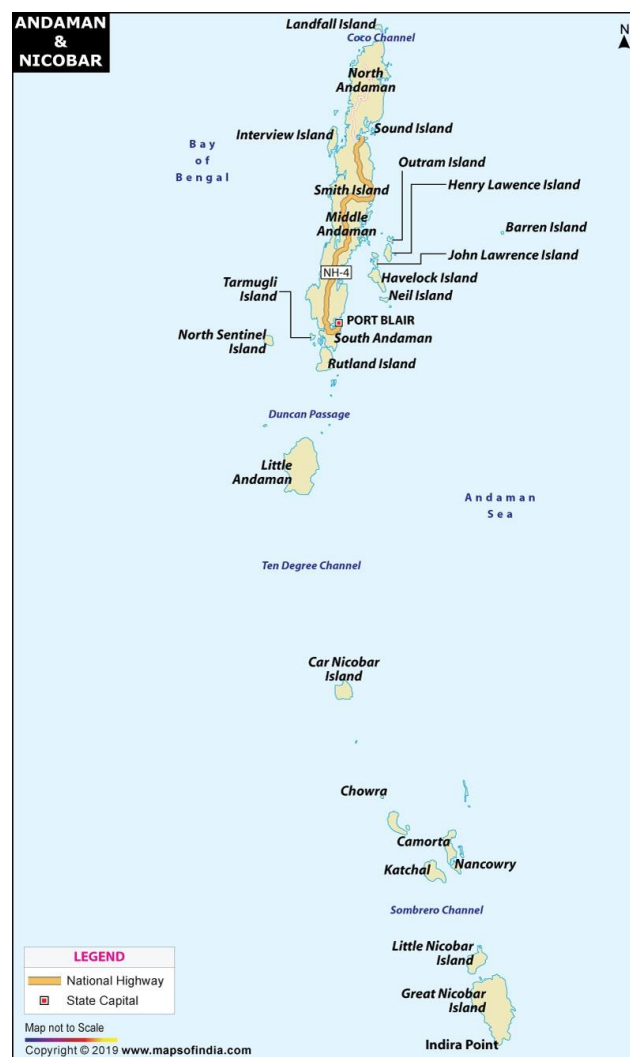
- They are emergent coastal plains. Therefore, less ports and harbours.
- These are wider but dryer resulting in shifting sand dunes. Rivers have formed thick alluvial deltas which are very fertile.
- It remains dry in summer and receives rainfall during the winters due to the north-east monsoons.
- It is divided into
  - Coromandel Coast from Kanyakumari to Godavari Delta
  - Utkal Coast in Odisha: It is between the Chilika Lake and Kolleru Lake
  - Andhra coastal plains: It extends between the Kolleru Lake and Pulicat Lake. It forms a basin area for the Krishna and the Godavari rivers.
- Eastern coastal plains have a good network of canals.

## The Islands

- There are two major island groups in India one in the Bay of Bengal and the other in the Arabian Sea.

### Andaman and Nicobar island

- It is the largest group having 572 islands
  - It lies in the Bay of Bengal.
  - Andaman is closer to Myanmar and Calcutta (west Bengal)
  - Nicobar is closer to Aceh area of Sumatra islands (Indonesia)
  - These islands are elevated portions of submarine mountains. They are an extension of Arakan yoma mountain of Myanmar.
  - Saddle peak highest peak of Andaman
  - Channel between South Andaman and Little Andaman called as Duncan passage
  - Channel between Car Nicobar and Little Andaman is called 10 degree and it divides Andaman and Nicobar into two channels for shipping
  - 6 degree channel or great channel divides Sumatra and Great Nicobar (divides India and Indonesia)
  - Coco channel separates India from Myanmar (Cocos Islands).
  - Barren island is the only active volcano of India, located on Andaman islands. It is close to Myanmar
- Narcondam island in Andaman is a dormant volcano. It is north of Barren island close to Myanmar.





### Lakshadweep

- It is the smallest territory of India with an area of 32 sq.km.
- It is close to Malabar coast
- The island group has been formed by accumulation of skeletons of corals (limestone skeletons)
  - Corals have a symbiotic relationship with zooxanthellae algae. Corals are colourful because of algae present on it.
- Kavaratti –capital of Lakshadweep
- Some important islands are Amini, Suheli, Bangaram, Androth islands and Minicoy. Minicoy is the southernmost island of Lakshadweep.
- The islands of this archipelago have storm beaches consisting of unconsolidated pebbles, shingles, cobbles and boulders on the eastern seaboard.
- South of Minicoy is the Maldives and the 8 degree Channel lies between Minicoy (Lakshadweep) and Maldives.

### Other islands in Bay of Bengal

- New Moore island—was disputed territory between India and Bangladesh. It got submerged largely into water. Which indicates sea level rise. Sundarbans is also prone to sea level rise.
- Wheeler island was renamed as Abdul kalam island in Odisha. It is famous for missile testing.
- Chandipur- north of Wheeler island. It is not an island, it is famous for missile testing.
- Sriharikota island, famous for satellite launching in Andhra Pradesh.
- Katchathevu island in Palk Strait—India in good gesture gave it to Sri Lanka fishermen.
- Pamban island (Rameshwaram and Dhanushkodi) in Ram Setu region.

### Other islands in Arabian sea

- Diu island — Gujarat
- Elephanta island — near Mumbai
- Wellington island — near Kochi. The island is a naval facility
- Salsette island — Mumbai.