

Indian Geography

Geographical Location of India

Indian Geographical Location

□ Lying between latitude 4°N to $37^{\circ}6'\text{N}$ and from longitude $68^{\circ}7'\text{E}$ to $97^{\circ}25'\text{E}$, the country is divided into almost equal parts by the Tropic of Cancer (passes from Jabalpur in MP).

□ The southernmost point in Indian Territory, (in Great Nicobar Island) is the Indira Point ($6^{\circ}45'$), while Kanyakumari, also known as Cape Comorin, is the southernmost point of Indian mainland. The country thus lies wholly in the northern and eastern hemispheres.

□ The $82^{\circ}30'\text{E}$ longitude is taken as the Standard Time Meridian of India, as it passes through the middle of India (from Naini, near Allahabad).

Area Geography & Boundaries Geography

1. India stretches 3,214 km from North to South & 2,933 km from East to West.

2. **Geography Area of India** : 32,87,263 sq. km. Accounts for 2.4% of the total world area and roughly 16% of the world population.

3. Mainland India has a coastline of 6,100 km. Including the Lakshadweep and Andaman and Nicobar Islands, the coastline measures about 7516.6 km.

4. In India, of the total land mass:

- **Plains Geography**: 43.3%
- **Plateaus**: 27.7%
- **Hills**: 18.6%
- **Mountains Geography**: 10.7%

5. In the South, on the eastern side, the Gulf of Mannar & the Palk Strait separate India from Sri Lanka.

6. Total land neighbours: 7 (Pakistan, Afghanistan, China, Nepal, Bhutan, Bangladesh and Myanmar).

7. India's Islands include the Andaman & Nicobar Islands in Bay of Bengal and Lakshadweep, Minicoy & Amindive Islands in the Arabian Sea.

Physiography of India

Indian Physiography

Physiographically, India can be divided into 3 units:

1. Mountains in the North
2. Plains in the Northern India & the Coast
3. Plateau region of the South

To these can be added the fourth, namely, the coasts and islands

Mountains in North India

The Himalayas in India

Means 'Abode of Snow'. They are one of the youngest fold mountain ranges in the world and comprise mainly sedimentary rocks.

They stretch from the Indus River in the west to the Brahmaputra River in the east. Total length is about 5000 km. The width of the Himalayas varies from 500 km in Kashmir to 200 km in Arunachal Pradesh. Their average height is 2000m.

The Eastern Himalayas-made up of Patkai Hills, Naga Hills, Mizo Hills and the Garo, Khasi and Jaintia Hills-are also known as Purvanchal.

The Pamir, popularly known as the Roof of the World, is the connecting link between the Himalayas and the high ranges of Central Asia.

Can be divided into 3 parallel or longitudinal zones, each with separate features.

The Great Himalayas or The Himadri

Average elevation extends upto 6000m & some of the world's highest peaks are here

Mt Everest (or Sagarmatha or Chomo Langma)	8850 m (in Nepal)
Mt Kanchenjunga	8598 m (in India)
Mt Makalu	8481 m (in Nepal)
Mt Dhaulagiri	8172 m (in Nepal)
Mt Cho Oyu	8153m (in Nepal)
Mt Nanga Parbat	8126m (in India)
Mt Annapurna	8078 m (in Nepal)
Mt Nando Devi	7817 m (in India)

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□ There are few passes and almost all of them have a height above 4,500 m. they include Shipki La and Bara Lapcha La in Himachal Pradesh, Burzil and Zozi La in Kashmir, Niti, Lipulekh and Thag La in Uttaranchal, and Jelep La and Nathu La in Sikkim.

Lesser Himalayas or The Himachal

- Average height of mountains is 3700 – 4500 m.
- Mountains and valleys are disposed in all direction (mountains rising to 5000 m and the valleys touching 1000 m).
- **Its important ranges are** : Dhauladhar, Pir Panjal, Nag Tibba, Mussoorie.
- **Important hill resorts are** : Shimla, Chhail, Ranikhet, Chakrata, Mussoorie, Nainital, Almora, Darjeeling.

Outer Himalayas or The Shiwaliks

- Lowest range (average elevation is 900-1200 m).
- Forms the foothills and lies between the Lesser Himalayas and the plains. It is the newest range.

Trans – Himalayan Zone

- This range lies to the north of the Great Himalayas. It has some important ranges like Karakoram, Laddakh, Zaskar, etc. the highest peak in this region is K2 or Godwin Austin (8611m, in Pak occupied Kashmir). Other high peaks are Hidden Peak (8068 m), Broad Peak (8047 m) and Gasherbrum II (8035 m).
- The longest glacier is Siachin in the Nubra valley, which is more than 72 km long (biggest glacier in the world). Biafo, Baltaro, Batura, Hispar are the other important glaciers in this region.
- This area is the largest snow-field outside the Polar Regions.

Peninsular Mountains

- While the Himalayas are Fold Mountains, they are not.
- **The Aravalli Mountains (Rajasthan)** : World's oldest. Guru Shikhar is the highest peak on which Mount Abu (1,722 m) is situated.
- The Vindhya Mountains
- The Satpura Mountains (highest point at Dhupgarh [1,350 m] near Pachmarhi)
- **The Western Ghats or Sahyadris** : Average height 1200mtrs, 1600km long. Its southern part is separated from the main Sahyadri range by Palghat Gap (link between Tamil Nadu & Kerala). Other passes are Thalghat (connects Nasik to Mumbai) and Bhorghat (connects Pune to Mumbai).
- **The Eastern Ghats (Highest peak : Mahendra Giri (1501 m))**.
- **The Nilgiris or The Blue Mountains** : Meeting place of the Western and the Eastern Ghats. Two highest peaks are Dodda Betta and Makurti.
- The highest peak of Peninsular India is Anaimudi (2695 m) in Anaimalai Hills.
- Cardamom hills or Ealaimalai is the southernmost mountain range of India.

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Facts about position of states

- UP borders the maximum number of States-8 (Uttarakhand, HP, Haryana, Rajasthan, MP, Chhattisgarh, Jharkhand, Bihar). After UP is Assam, which touches the border of 7 States.
- **Tropic of Cancer passes through 8 States** : Gujarat, Rajasthan, MP, Chhattisgarh, Jharkhand, WB, Tripuro, Mizoram.
- **Indian Standard Meridian passes through 5 States** : UP, MP, Chhattisgarh, Orissa, AP.
- **9 States form the coast of India. They are** : Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu. Andhra Pradesh, Orissa and West Bengal.
- 2 Union Territories, viz. Daman & Diu and Pondicherry are also on the coast.
- The Union Territories of Andaman and Nicobar Islands and Lakshadweep are made up of islands only.

The Plains of India

- To the south of the Himalayas and to the north of the Peninsula lies the great plains of North India. They are formed by the depositional works of three major river systems, Indus, Ganga and Brahmaputra. The vast plains of north India are alluvial in nature and the westernmost portion is occupied by the Thar Desert.
- The thickness of the alluvium is maximum in the Ganga plains and minimum in the Western Plains.
- In the Kerala plains are the backwaters or 'Kayak', which are the shallow lagoons or inlets of the sea, lying parallel to the coastline. The largest among these is the Vembanad Lake.
- The plains consist of four divisions:
 - **Bhabar** : Along the foothills of Shiwaliks. Highly porous
 - **Tarai** : Re-emergence of streams. Zone of excessive dampness
 - **Bhangar** : Older alluvium of the plains. Studded with calcareous formations called 'kankar'
 - **Khadar** : New alluvium and forms the flood plains along the river banks.

Peninsular Plateau of India

- Spreads south of the Indo-Gangetic plains flanked by sea on three sides. This plateau is shaped like a triangle with its base in the north. The Eastern Ghats and the Western Ghats constitute its eastern and western boundaries, respectively.
- Narmada, which flows through a rift valley, divides the region into two parts: The Malwa Plateau in the north & the Deccan Plateau in the south.
- Most of the rocks are of the igneous type.
- Vindhya Plateau is situated south of Malwa plateau.
- Chhota Nagpur Plateau lies to the west of Bengal basin, the largest and most typical part of which is the Ranchi plateau.

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- The Deccan Plateau is the largest plateau in India. It is made up of lava flows in the Cretaceous-Eocene era through the fissure eruptions.

Islands of India

- **Total coastline of India** : 7516 km. Longest coastline: Gujarat (Second longest is of Andhra Pradesh).

- Indian territorial limits include 248 islands

The Andaman and Nicobar Group

- Andamans is a group of 204 islands of which the largest is Middle Andaman.
- The Andamans are believed to be extensions of mountains system in the N.E. part of the country.
- Saddle Peak (737 m) in N.Andaman is the highest peak.
- The Nicobars is a group of 19 islands of which the largest is Great Nicobar. Most of them are volcanic in nature.
- Great Nicobar is the southernmost island and is only 147 km away from Sumatra island of Indonesia.
- **Volcanic Islands:** Barren and Narcondam Islands. Barren is in the process of eruption these days after lying dormant for 200 years.

The Arabian Sea Group

- All the islands in the Arabian Sea (Total 25) are coral islands and are surrounded by Fringing Reefs (North : Lakshadweep, South: Minicoy).

Note :

- Ten Degree Channel separates Andamans from Nicobars (Little Andaman from Car Nicobar)
- Duncan Passage lies between South Andaman and Little Andaman.
- Nine Degree Channel separates Kavaratti from Minicoy Island.
- Eight Degree Channel separates Minicoy Island (India) from Maldives.

Rivers of India

In India, the rivers can be divided into two main groups:

1. Himalayan Rivers
2. Peninsular Rivers

Himalayan Rivers of India

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In this three major river systems are there:

The Indus System

- It has a total length of 2880 km (709 km in India). Rises in Tibet (China) near Mansarovar Lake.
- In Jammu and Kashmir, its Himalayan tributaries are: Zaskar, Dras, Gartang, Shyok, Shigar, Nubra, Gilgit, etc.
- Its most important tributaries, which join Indus at various places, are: Jhelum (725 km), Chenab (1800 km), Ravi (720 km), Beas (470 km) & Sutlej (1050 km).
- Sources: Jhelum from Verinag (SE Kashmir), Chenab from Bara Lacha Pass (Lahaul-Spiti, H.R), Ravi from Kullu Hills near Rohtang Pass in H. R, Beas from a place near Rohtang Pass in H.E and Satluj from Mansarovar – Rakas lakes in W. Tibet.
- In Nari Khorsan province of Tibet, Satluj has created an extraordinary canyon, comparable to the Grand Canyon of Colorado (US).
- According to the Indus Water Treaty signed between India and Pakistan in 1960, India can utilize only 20% of the total discharge of Indus, Jhelum and Chenab.

The Ganga System

- It is 2525 km long of which 1450 km is in Uttarakhand and UP, 445 km in Bihar and 520 km in West Bengal.
- The Ganga, the head stream is constituted of two main rivers – Bhagirathi and Alaknanda, which combine at Devprayag to form Ganga.
- Before Alaknanda meets Bhagirathi at Devprayag, Mandakini meets Alaknanda at Rudraprayag.
- Sources: Bhagirathi from Gaumukh, Alaknanda from Badrinath, Mandakini from Kedarnath (all from Uttarakhand).
- Yamuna (1375 km) is its most important tributary (on right bank). It rises at the Yamunotri glacier in Uttarakhand. It runs parallel to Ganga for 800km and joins it at Allahabad. Important tributaries of Yamuna are Chambal (1050 km), Sind, Betwa (480 km) and Ken (all from south).
- Apart from Yamuna, other tributaries of Ganga are Ghaghra (1080 km), Son (780 km), Gandak (425 km), Kosi (730 km), Gomti (805 km), Damodar (541 km). Kosi is infamous as ‘Sorrow of Bihar’, while Damodar gets the name ‘Sorrow of Bengal’ as these cause floods in these regions.
- Hooghli is a distributory of Ganga flowing through Kolkata.

The Brahmaputra system

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- It has a total length of 2900 km. It rises in Tibet (from Chemayungdung glacier), where it is called Tsangpo, and enters the Indian territory (in Arunachal Pradesh) under the name Dihang.
- Important Tributaries: Subansiri, Kameng, Dhansiri, Manas, Teesta.
- In Bangladesh, Brahmaputra is known by the name of Jamuna while Ganga gets the name Padma. Their combined stream is known as Padma only. Meghna is the most important distributory before it enters the Bay of Bengal.
- The combined stream of Ganga and Brahmaputra forms the biggest delta in the world, the Sundarbans, covering an area of 58,752 sq. km. Its major part is in Bangladesh.
- On Brahmaputra is the river island, Majuli in Assam, the biggest river island in the world.
- Brahmaputra, or the Red River, is navigable for a distance of 1384 km up to Dibrugarh and serves as an excellent inland water transport route.

Rivers of the Peninsula in India

- Different from the Himalayan rivers because they are seasonable in their flow (while Himalayan rivers are perennial).
- They can be divided into two groups:

A. East Flowing Rivers of India (or Delta forming rivers)

- **Mahanadi River (858 km)** : Rises in Raipur distt. in Chhatisgarh. Main tributaries: Ib, Seonath, Hasdo, Mand, Jonk, Tel, etc.
- **Godavari River (1465 km)** : Also called Vriddha Ganga or Dakshina Ganga. It is the longest peninsular river. Rises in Nasik. Main tributaries: Manjra, Penganga, Wardha, Indravati, Wainganga, Sabari, etc.
- **Krishna River (1327 km)** : Rises in Western Ghats near Mahabaleshwar. Main tributaries: Koyna, Dudhganga, Panchganga, Malprabha, Ghatprabha, Bhima, Tungabhadra, Musi, etc.
- **Cauvery River (805 km)** : It is the largest peninsular river (maximum amount of water). Infact, it is the only peninsular river which flows almost throughout the year. Known as the 'Ganga of the South'. It rises from the Brahmagir range of Western Ghats. Main tributaries: Hemavati, Lokpawni, Shimsa. It is less seasonal than others as its upper catchment area receives rainfall during summer by the S.W monsoon and the lower catchment area during winter season by the retreating N.E. monsoon. Its 90% – 95% irrigation and power production potential is already being harnessed.
- **Swarnarekha River (395 km) and Brahmani (705 km)** : Rises from Ranchi Plateau.

B. West Flowing Rivers in India

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- **Narmada River (1057 km)** : Has only 1/10th part in Gujarat. Rises in Amarkantak Plateau and flows into Gulf of Khambat. It forms the famous Dhuandhar Falls near Jabalpur. Main tributaries: Hiran, Burhanpur, Banjar, Shar, Shakkar, Tawa, etc.
- **Tapti River (724 km)** : Rises from Betul distt in MR Also known as twin or handmaid of Narmada. Main tributaries: Purna, Betul, Arunavati, Ganjal, etc.
- **Sabarmati River (416 km)** : Rises from Aravallis in Rajasthan.
- **Mahi River (560 km)** : Rises from Vindhya in MR
- **Luni River (450 km)** : Rises from Aravallis. Also called Salt River. It is finally lost in the marshy grounds at the head of the Rann of Kutch.
- Sharavati is a west flowing river of the Sahyadris. It forms the famous Jog or Gersoppa or Mahatma Gandhi Falls (289 m), which is the highest waterfall in India.

Inland Drainage

- Some rivers of India are not able to reach the sea and constitute inland drainage. Ghaggar (494 km) is the most important of such drainage.
- It is a seasonal stream which rises on the lower slopes of the Himalayas and gets lost in the dry sands of Rajasthan near Hanumangarh. It is considered the old Saraswati of the Vedic times.

Note:

- The largest man-made lake in India is Indira Sagar Lake, which is the reservoir of Sardar Sarovar Project, Onkareshwar Project and Maheshwar Project in Gujarat-MP.

Indian and World Geography

- Chilka Lake (Orissa) is the largest brackish water lake of India. Otherwise also, it is the largest lake of India.
- Wular Lake (J & K) is the largest fresh water lake of India. Dul Lake is also there in J & K.
- From Sambhar and Didwana Lake (Rajasthan), salt is produced.
- Other important lakes are Vembanad in Kerala and Kolleru & Pulicat in AP.
- The three important Gulfs in the Indian Territory are:
 - **Gulf of Kutch (west of Gujarat)** : Region with highest potential of tidal energy generation
 - **Gulf of Cambay or Gulf of Khambat (Gujarat)** Narmada, Tapti, Mahi and Sabarmati drain into it.
 - **Gulf of Mannar (south east of Tamil Nadu)** : Asia's first marine biosphere reserve.

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THENI IAS ACADEMY**9943056137, 9976626064****Important River Valley Projects of India**

Bhakra Nangal Project	On Satluj in Punjab. Highest in India. Ht 226 m. Reservoir is called Gobind Sagar Lake
Mandi Project	On Beas in H.P
Chambal Valley Project	On Chambal in M.P & Rajasthan. 3 dams are there: Gandhi Sagar Dam, Rana Pratap sagar Dam and Jawahar Sagar dam
Damodar Valley Project	On Damodar in Bihar. Based on Tennessee Valley Project, USA
Hirakud	On Mahanadi in Orissa. World's longest dam: 4801 m
Rihand	On Son in Mirzapur. Reservoir is called Govind Vallabh Pant reservoir
Kosi Project	On Kosi in N. Bihar
Mayurkashi Project	On Mayurkashi in W.B
Kakrapara Project On	Tapi in Gujarat
Nizamsagar Project	On Manjra in A.P
Nagarjuna Sagar Project	On Krishna in A.P
Tungabhadra	On Tungabhadra in A.P & Karnataka
Shivasamudram Project	On Cauvery in Karnataka
Tata Hydrel Scheme	On Bhima in Maharashtra
Sharavathi Hydrel Project	On Jog Falls in Karnataka
Kundah & Periyar Project N	In T
Farakka Project	On Ganga in W.B. Apart from power and irrigation it helps to remove silt for easy navigation
Ukai Project	On Tapti in Gujarat
Mahi Project	On Mahi in Gujarat
Mata Tila Multipurpose Project	On Betwa in U.P & M.P
Thein Project	On Ravi, Punjab
Pong Dam	On Beos, Punjab

The Climate of India

India has tropical monsoon type of climate. It is greatly influenced by the presence of the Himalayas in the north as they block the cold the cold air masses from Central Asia. It is because of them only that the monsoons have a watershed in India.

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- The Tropic of Cancer divides India into two almost equal climatic zones, namely, the northern zone and the southern zone. The warm temperate or the subtropical climate of the northern zone gives it cold winter seasons and the hot summer seasons.
- The southern tropical climatic zone is warmer than the north and does not have a clear-cut winter season.
- The northern zone does not have the midday sun vertically overhead during any part of the year; the southern zone has the midday sun almost vertically overhead at least twice every year.

Climate Seasons in India

- In India, the year can be divided into four seasons, resulting from the monsoons which occur mainly due to the differential heating of land and movement of the sun's vertical rays.
- The vertical rays of the sun advance towards Tropic of Cancer from mid-March, due to which hot and dry weather arrives. As temperatures rise over most of northern and Central India, a vast trough of low pressure is created. The highest temperature experienced in South is in April while in North it is in May and June.
- This part of the year is marked by a dry spell and the north-western parts of the country experience hot, dry winds, called loo. In this period, the country also experience storms / dust storms at various places.
 1. Tornado like dust storms in Punjab and Haryana, called 'Andhis' in UP and 'Kalbaisakhis' in West Bengal. They involve strong convectional movements causing some precipitation.
 2. The 'Norwesters' originate over the Chhotanagpur Plateau and blow in the north-east direction which brings about 50 cm of rainfall in Assam and about 10 cm rainfall in West Bengal and Orissa. This rainfall is very useful for Assam tea and spring rice crops of West Bengal.
 3. Similarly, 'Cherry Blossoms' are there in Karnataka, beneficial to coffee plantation and 'Mango showers' in elsewhere South India, which are beneficial to mango crops.
- This weather is followed by hot, wet weather from June to September. In May, the south – west monsoon sets in. The normal dates of onset of the monsoon are May 20 in the Andaman and Nicobar Islands, June 3 in the Konkan, June 15 in Kolkata and June 29 in Delhi.
- The south – west monsoon enters the country in two currents, one blowing over the Bay of Bengal and the other over the Arabian Sea. This monsoon causes rainfall over most of the country (except Tamil Nadu and Thar Desert area). The S.W monsoon entering from Western Ghats causes heavy rainfall over Kerala coast, but Tamil Nadu falls on the leeward side. In the Thar area, the winds blow parallel to the Aravallis and do not cause rain. The Bay of Bengal current causes heavy rainfall in the north east parts of the country and a part of it turns west along the Himalayas over the Indo-Gangetic plains causing rainfall in this region. But the Bay of Bengal current, by the time it reaches W Rajasthan, runs out of moisture.

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- The Bay of Bengal branch after crossing the deltaic region enters the Khasi valley in Meghalaya and gets entrapped in it due to funnel shape of the region. It strikes Cherrapunji in a perpendicular direction causing heaviest rainfall in Mawsinram (Approx. 1400 cm).
- From mid-Sept to mid-Dec, the monsoon retreats. As the sun's vertical rays start shifting towards the Tropic of Capricorn, the low pressure area starts moving south and winds finally start blowing from land to sea. This is called north-east monsoon. The withdrawal of monsoon is a much more gradual process than its onset. It causes rainfall in Tamil Nadu as the winds pick some moisture from Bay of Bengal. This explains the phenomenon why Tamil Nadu remains dry when the entire country receives rain and why it gets rain when practically the entire country is dry.
- The cold and dry weather starts in early December. In this, the average temperature in south is 24-25c, and while in the north is 10-15c. In the latter part of December and in January, the dry spell is broken by the westerly depressions (temperate cyclones) from Mediterranean Sea, which causes some rain in north-west India.
- Almost all the precipitation in India is caused by the monsoons and it is primarily orographic in nature. Cyclonic storms provide only a little rain, mainly in the north.

Climatic Regions of India

India can be divided into a number of climatic regions.

- **Tropical Rain Forests in India** : Found in the west coastal plains, the Western Ghats and parts of Assam. Characterized by high temperatures throughout the year. Rainfall, though seasonal, is heavy- about 200 cm annually during May-November.
- **Tropical Savanna Climate** : In most of the peninsula region except the semi-arid zone in the leeward side of the Western Ghats. It is characterized by long dry weather throughout winter and early summer and high temperature (above 18.2c); annual rainfall varies from 76 cm in the west to 150 cm in the east.
- **Tropical Semi-Arid Steppe Climate** : It prevails in the rain-shadow belt running southward from Central Maharashtra to Tamil Nadu in the leeward side of the Western Ghats and the Cardamom Hills. It is characterized by low rainfall which varies from 38 cm to 80 cm, high temperature between 20 and 30.
- **Tropical and Subtropical Steppes** : Large areas in Punjab, Haryana and Kutch region. Temperature varies from 12-35c. The maximum temperature reaches up to 49c. The annual rainfall, varying from 30.5-63.5 cm, is also highly erratic.
- **Tropical desert** : This climate extends over the western parts of Bikaner, Jaisalmer and Bikaner districts of Rajasthan and parts of Kutch. It is characterized by scanty rainfall (30.5 cm), which is highly erratic. Rains are mostly in the form of cloud-burst. Mean monthly temperature is uniformly high (about 35c).
- **Humid Subtropical Climate with Dry Winters** : This area includes south of the Himalayas, east of the tropical and subtropical steppes and north of tropical savannah. Winters are mild to severe

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while summers are extremely hot. The annual rainfall varies from 63.5 cm to more than 254 cm, most of it received during the south west monsoon season.

Mountain Climate : Such type of climate is seen in mountainous regions which rise above 6,000 m or more such as the Himalayas and the Karakoram Range.

Peaty soils are found in Kottayam and Alappuzha districts of Kerala, where it is called Kari.

Marshy soils, high in vegetable matter, are found in northern Bihar, coastal parts of Orissa, Tamil Nadu and West Bengal and parts of UP

Soil Erosion in India

Acute in hilly and dry regions

Causes – depletion of forests, wrong use of lands such as cultivation on very steep slopes, cattle rearing. It ultimately leads to Badland Topography.

Remedy – Afforestation, contour cultivation etc.

Natural Vegetation in India

Tropical Wet Evergreen Forests

In areas over 250cm rainfall. In Western Ghats, hilly areas in N.E. India and Andaman and Nicobar Islands. Trees are rosewood, shisham, ebony, ironwood, etc.

Tropical Moist Deciduous Forests

In areas having rainfall between 100 – 200 cm. In peninsular region and along the foothills of Himalayas in Shivaliks, Bhabhar and Tarai.

The trees of these forests drop their leaves for about 6-8 weeks during the spring and early summer when sufficient moisture isn't available.

Trees are teak, sal, bamboo, sandalwood, rosewood, etc.

Thorn Forests

In areas having rainfall between 25 and 80cm. In arid regions of Rajasthan, Punjab, Haryana and Gujarat.

Trees are palm, acacia, etc.

Hill Forests

In hills of S.India and the Himalayas.

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□ **The type of trees depends upon the height of the mountain** : Sal and bamboo below 1000 m; oaks, chestnuts and other fruit trees, and chir forests between 1000 and 2000 m; pine, deodar, silver fern and spruce between 1600 and 3300 m; above 3600 m alpine forests with trees like silver firs, pines, birches, etc. Alpine forests give way to Alpine grasslands and scrubs as we move up further.

Tidal or Mangrove Forests

- Also known as Littoral or Swamp Forests.
- Occur along the sea coast and in the estuaries of rivers, especially in Sunderbans and the Andamans.
- Most important tree is Sundari. It provides hard and durable timber which is used for construction and building purposes as well as for making boats.

Note :

- According to the National Forest Policy, the minimum desired area which is considered safe for a tropical country like India is about 33%.
- Madhya Pradesh has the largest area under forests followed by Maharashtra, Andhra Pradesh, Orissa and Arunachal Pradesh.
- As per percentage of forest area to total area, first is Andaman and Nicobar Islands, followed by Mizoram, Manipur, Himachal Pradesh, Arunachal Pradesh, Tripura and Nagaland. They are in a very comfortable position as more than half of their area is under forests.
- Arunachal Pradesh has the highest per capita forest area.
- In Mangrove forests, West Bengal holds the first position, followed by Gujarat and Andaman and Nicobar Islands.
- The lowest forest percentage is in Haryana and Punjab, because of the extensive agriculture.

Biosphere Reserves in India

- The biosphere reserve program was launched by the UNESCO in 1971 under the aegis of its Man and Biosphere (MAB) Program, to provide a global network of protected areas for conserving natural communities.
- In India, the first biosphere reserve – Nilgiri biosphere reserve – came into being in 1986. So far, 14 biosphere reserves have been set up in the country.

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Nilgiri (Western Ghats)	Similipal (Orissa)
Nanda Devi (Uttarakhand)	Dibru-Daikhowa (Asom)
Nokrek (Meghalaya)	Dehong Dabang (Arunachal Pradesh)
Manas (Asom)	Panchmarhi (MP)
Sunderbans (West Bengal)	Kanchanjunga (Sikkim)
Gulf of Mannar (Tamil Nadu)	Agastyamalai (Kerala)
Great Nicobar (Andaman and Nicobar Islands)	Achaanak maar-Amarkantak (Madhya Pradesh)

Note :

□ Out of these 14, Nilgiri, Sunderbans, Manas and Gulf of Mannar have been recognized on World Network of Biosphere Reserves by UNESCO.

Project Tiger

□ It was launched on April 1, 1973 to ensure maintenance of viable population in India of the tigers.

There are 29 tiger reserves in the country

Name of Tiger Reserve	State
Bandipur	Karnataka
Corbett	Uttarakhand
Kanha	Madhya Pradesh
Manas	Asom
Melghat	Maharashtra
Palamau	Jharkhand
Ranthambhore	Rajasthan
Similipal	Orissa
Sunderbans	West Bengal
Periyar	Kerala
Sariska	Rajasthan
Buxa	West Bengal
Indravati	Chattisgarh
Nagariunsagar	Andhra Pradesh
Namdapha	Arunachal Pradesh
Dudhwa	Uttar Pradesh
Kalakad-Mundanthurai	Tamil Nadu
Valmiki	Bihar
Pencil	Madhya Pradesh
Tadoba-Andhari	Maharashtra
Bandhavgarh	Madhya Pradesh
Panna	Madhya Pradesh
Dampha	Mizoram
Bhadra	Karnataka
Pench	Maharashtra
Pakhui-Nameri	Arunachal Pradesh-Asom
Bori, Satpura, Pachmari	Madhya Pradesh
Nagarhole	Karnataka
Katarniaghat	Uttar Pradesh
Nameri	Asom
Kaziranga	Asom

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□ Nagarjunasagar Tiger Reserve in AP is the largest, while Pench in Maharashtra is the smallest. Bandipur in Karnataka was the first (1973-74), while Kaziranga is the latest (2006)

□ It was launched in February 1992, to assist States having wild elephants to ensure long term survival of identified viable populations of elephants in their natural habitat.

□ There are 14 Elephant Reserves in India.

Agriculture in India

Cropping Seasons in India

Kharif Crops of India

□ Sown in summers between May and July, and harvested after the rains, in September and October.

□ Eg: Rice, Jowar, Bajra, Maize, Cotton, Jute, Sugarcane, Tobacco, Groundnut, Pulses, etc.

Rabi Crops of India

□ Sown at the beginning of winter and harvested before the onset of the summer season, between Feb and April.

□ Eg: Wheat, barley, oilseeds, gram, potatoes, etc.

Zayad Crops

□ They are raised between April and June.

□ E.g. : Melon, watermelon, cucumber, toris, leafy and other vegetables.

Cash Crops of India (Commercial Crops)

□ Grown mainly for the market, only a small portion of the product is consumed by the farmers themselves (cotton, sugarcane etc.)

Mineral Resources of India

Coal Resources in India

West Bengal (Raniganj, Burdwan, Bankura, Purulio, Birbhum, Jalpaigudi, Darjeeling), Jharkhand (Jharia, Giridih, Kharhawadi, Bokaro, Hazaribagh, Kamapura, Rampur, Palamau), Orissa (Rampur, Hindgir, Talcher, Sambal), Madhya Pradesh and Chhatisgarh (Rewa, Pench valley, Umaria, Korba,

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Sohagpur, Mand river area, Kanha valley, Betul), etc. Power sector is the largest consumer of coal in India followed by steel industry, cement industry, etc.

Manganese

Orissa, Maharashtra (Nagpur, Bhandara, Ratnagiri), Madhya Pradesh (Balaghat, Chhindawara), Karnataka (Keonjhar, Bonai, Kalahandi), Andhra Pradesh (Kadur, Garibadi).

Copper Minerals

Madhya Pradesh (Balaghat), Rajasthan (Khetri), Jharkhand (Singhbhum, Masobani, Surda), Karnataka (Chitradurg, Hassan).

Mica Minerals

Jharkhand (Hazaribagh, Giridih, Kodarma), Bihar (Goya, Bhagalpur), Andhra Pradesh (Guntur, Vizag, Kurnool), Rajasthan (Bhilwara, Udaipur, Jaipur).

Petroleum Resources in India

Assam (Digboi, Naharkatiya, Badarpur, Masinpur and Pallharia), Gujarat, (Ankleshwar, Khambat, Kalol), Mumbai High, Bassein (south of Mumbai High), etc. Recently oil has been discovered in Cauvery basin, Krishna and Godavary basin, Khambat basin, etc.

Iron Resources

- India possesses Haematite, a very high-grade iron ore. In Madhya Pradesh (Bailadila, Jabalpur), Goa (North Goa), Karnataka (Bababudan hills, Chikmagalur, Hospet), Jharkhand (Singhbhum, Naomundi), Andhra Pradesh, Orissa.
- India is the fifth largest exporter of iron ore in the world. Japan is the biggest buyer accounting for about 3/4th of India's total exports. Major ports handling iron ore export are Vishakhapatnam, Paradip, Marmagao and Mangalore.

Bauxite Resources

Chief ore for producing aluminium. In Orissa (Kalahandi, Koraput, Sundargarh, Bolangir, Sambalpur), Jharkhand (Lohardaga, Gumla), Madhya Pradesh (Jabalpur, Mandla, Shahdol, Kami, Balaghat), Maharashtra, Andhra Pradesh, Gujarat, Tamil Nadu.

Gold Resources in India

Karnataka (Kolar, Hutti, Raichur), Andhra Pradesh (Ramgiri and Yeppamanna goldfields in Chittoor and Anantapur districts).

Silver, Zinc & Lead

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Rajasthan (Zawar mines near Udaipur), Andhra Pradesh (Mysore, Chitradurg), Karnataka (Kolar mines).

Uranium Resources in India

Jharkhand (Jaduguda), Rajasthan (Ajmer), Andhra Pradesh (Nellore, Nalgonda), Karnataka (Gulbarga).

Thorium Resources in India

Kerala coast (From Monazite sand), rocks of Aravallis in Rajastha

Oil Refineries

There are 19 refineries in India, 16 in public sector, one in joint sector and two in private sector. Public sector refineries are located at Digboi, Guwahati, Bongaigaon, Barauni, Haldia, Koyali, Mathura, Kochi, Chennai, Vishakhapatnam, Mumbai (2), Panipat, Narimanam, Numanigarh and Tatipaka. Joint sector refinery is at Mangalore. The private sector refinery of Reliance Limited is at Jamnagar, Gujarat and Essar Refinery at Vadinar, Gujarat.

1. Haldia Refinery (IOC)
2. Mumbai Refinery (HPCL)
3. Panipat Refinery (IOC)
4. Vishakhapatnam Refinery (HPCL)
5. Digboi Refinery (IOC)
6. Mumbai Refinery Mahaul (BPCL)
7. Gujarat Refinery (IOC)
8. Nagapattnam Refinery (CPCL)
9. Barauni Refinery (IOC)
10. Kochi Refinery (Kochi Refineries Ltd)
11. Guwahati Refinery (IOC)
12. Numaligarh Refinery (NRL)
13. Mathura Refinery (IOC)
14. Mangalore Refinery (MRPL)
15. Bongaigaon Refinery (IOC)
16. Tatipaka Refinery (ONGC)
17. Manali Refinery (IOC)
18. Essar Refinery (Essar)
19. Jamnagar Refinery (Reliance Petroleum)

Industries in India

Cotton Textile Industry in India

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Most important industry in terms of employment and production of export goods. In Maharashtra (Mumbai, Sholapur, Pune, Kolhapur, Satara, Wardha, Hajipur), Gujarat (Ahmedabad, Vadodara, Rajkot, Surat, Bhavnagar), Tamil Nadu (Coimbatore-Manchester of South India). Tamil Nadu has the largest number of cotton textile mills in India

. **Silk Textile Industry in India** The location of silk industry is governed by two factors- prevalence of sericulture practices and availability of skilled labour. Karnataka is the leading producer, followed by West Bengal, Bihar, etc.

Woolen Textile Industries

In Punjab (Dhariwai, Amritsar, Ludhiana, Ferozpur), Maharashtra (Mumbai), UP (Kanpur, Mirzapur, Agra, Tanakpur), etc.

Jute Industries India

India manufactures the largest quantity of jute goods in the world. Mainly located in West Bengal, followed by Andhra Pradesh, Bihar, UP, MP.

Iron and Steel Industries

Located near the sources of raw materials and fuel (coal). In Jamshedpur (Jharkhand), Durgapur, Burnpur (W.B.), Bhadravati (Karnataka), Bokaro (Jharkhand), Rourkela (Orissa), Bhilai (Chhatisgarh), Salem (T.N.), Vishakhapatnam (A.P.).

Aluminium Smelting in India

Located mainly near the sources of raw materials, means of transport and cheap electricity. In Hirakud, Koraput (Orissa), Renukoot (UP), Korba (MP), Ratnagiri (Maharashtra), Mettur (TN), Alwaye

Copper Smelting Industry

In Khetri, Alwar, Jhunjhunu (Rajasthan), Singhbhum (Jharkhand), Agnigundala (A.P.).

Heavy Machinery Industry

In Ranchi, Vishakhapatnam, Durgapur, Tiruchirapalli, Mumbai, Kami.

Machine Tools Industry

It forms the basis for the manufacturing of industrial, defence equipments, automobiles, railway engines and electrical machinery. In Bangalore, Pinjore (Haryana), Kalamassery (Kerala), Hyderabad, Secunderabad, Srinagar, Ajmer.

Heavy Electrical Equipments

Power generation equipments. In Bhopal, Tiruchirapalli, Jammu, Ramchandrapuram (Hyderabad), Hardwar, Bangalore and Jogdishpur (UP).

Railway Equipments

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Locomotives in Indian Railways: In Chittaranjan (WB), Varanasi, Jamshedpur, Bhopal. Coaches: Perambur (TN), Kapurthala (Punjab), also at Bangalore and Kolkata.

Ship Building India

Hindustan Shipyard at Vishakhapatnam, Cochin Shipyard, Mumuai (Mazgaon Dock) and Kolkata (Garden Reach Workshop). For Indian Navy, only at Mazgaon.

Cycles India In Mumbai, Asansol, Sonapat, Delhi, Chennai, Jalandhar and Ludhiana.

Tractors in India

At Faridabad, Pinjore, Delhi, Mumbai, Chennai.

Fertilizers in India

- The location of fertilizer industry is closely related to petro-chemicals. About 70% of the plants producing nitrogenous fertilizers use naphtha as raw material.
- Naphtha is a by-product of oil refineries. Phosphate plants are dependent on mineral phosphate found in UP and MP. Now natural gas based fertilizer plants are also being set up.
- The Fertilizer Corporation of India (FCL) was set up in 1961. National Fertilizer Limited (NFL) was set up in 1974.
- In Sindri (Bihar), Nangal, Trombay, Gorakhpur, Durgapur, Namrup, Cochin, Rourkela, Neyveli, Varanasi, Vadodara, Vishakhapatnam, Kota and Kanpur.

Pharmaceuticals and Drugs

Antibiotics are prepared at Pimpri and Rishikesh. The Indian Drugs and Pharmaceuticals Limited has 5 plants at Hyderabad, Rishikesh, Chennai, Gurgaon and Muzaffarpur. A number of other units are concentrated in Mumbai, Baroda, Delhi, Kolkata and Kanpur.

Pesticides in India

Delhi and Alwaye

Sugar Industry

JP, Maharashtra, AP, TN, Karnataka and Bihar.

Aircraft Industry in India

Hindustan Aeronautics India Ltd. was formed by merging two aircraft factories at Bangalore and Kanpur. Four other factories are at Nasik, Hyderabad, Koraput (Orissa), Lucknow.

Rubber Industry in India

Bareilly (UP), Baroda (Gujarat Synthetic Rubber Units, Mumbai, Ahmedabad, Amritsar-Reclaimed Rubber Units

Nuclear Power Stations in India

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Tarapur	Maharastra
Kalpakkam	Tamil Nadu, called Indra Gandhi Nuclear Power Station
Narora	UP
Rawatbhata	Kota, Rajasthan
Kaiga	Karnataka
Kakrapara	Gujarat
Kundnkulam (TN)	Under construction with the assistance of Russia.

Major Thermal Power Plants

Neyveli	Tamil Nadu
Korba	Chhatisgarh
Obra	UP
Harduaganj	UP
Rihand	UP
Singrauli	UP
Parichha	UP
Talcher	Orissa
Farakka	West Bengal
Satpura	MP
Ramagundam	AP
Vindhyanchal	MP

Railways in India

Indian railway system is the largest in Asia and the fourth largest in the world. It is the biggest departmental public undertaking in the country.

- The first train ran in India between Bombay and Thane, a stretch of 34 km. on April 16 1853.
- The Indian Railways celebrated its 150th anniversary on April 16, 2003. To commemorate the occasion, 16 January – Shatabadi inter – city express trains were announced to be inducted.
- The second train ran between Howrah and Hooghly in 1854.
- The headquarters of Indian Railway is in New Delhi.
- The first electric train in India was 'Deccan Queen'. It was introduced in 1929 between Bombay and Poona.

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- Indian Railways has the second biggest electrified system in the world after Russia.
 - The fastest train in India is the Shatabadi Express whose maximum speed is 140 km/hr.
 - The total route covered is approx 63,000 km.
 - The total number of railway stations in India is 7,100.
 - The longest railway platform in India is at Kharagpur (W.B.).
 - Mumbai is the destination where maximum number of trains in India head for.
 - The longest train route is of 'Himsagar Express' from Jammu Tawi to Kanyakumari. It covers a distance of 3,726 km and passes through ten states.
 - The first Metro Rail was introduced in Kolkata (W.Bengal) on October 24, 1984. The two stations connected were Dumdum and Belgachhia.
 - The Indian Railways operate in three different gauges :
 1. Broad Gauge Railway (Distance between rails is 1.67 m).
 2. Metre Gauge Railways (Distance between rails is 1.00 m).
 3. Narrow Gauge Railways India (Distance between rails is 0.762 or 0.610 m).
- The broad gauge accounts for nearly 50% route followed by metre gauge (43%) and the remaining by narrow gauge. Indian railways are divided into 16 zones, headed by a General Manager who is responsible to the Railway Board, for all matters



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Railway Zones	Head Quarters
Central	Mumbai VT
Eastern	Kolkata
Northern	New Delhi
North Eastern	Gorakhpur
North-East Frontier	Maligaon-Guwahati
Southern	Chennai
South Central	Secunderabad
South Eastern	Kolkata
Western	Mumbai Churchgate
East Coast	Bhubaneshwar
East Central	Hajipur
North Central	Allahabad
North Western	Jaipur
South Western	Bangalore (Hubli)
West Central	Jabalpur
South-East Central	Bilaspur

- Northern Railway (NR) is the largest railway zone having length of 10,995 km.
- North – East Frontier (NEF) is the smallest railway zone having just 3,860 km route length.
- **Konkan Railways India** : It is a project to shorten the distance between Maharashtra, Goa and Karnataka. The total route length is 786 km between Apta (Maharashtra) and Mangalore (Karnataka).

Railway Manufacturing Units :

- **Chittaranjan Locomotive Works** : Located in Chittaranjan (W.B) and manufactures electric engines.
- **Diesel Locomotive Works** : Located in Varanasi (U.P) and manufactures diesel engines.
- **Integral Coach Factory in India** : Located in Perambur (TN) and manufactures rail coaches.
- **Wheel and Axle Plant** : Located at Yalahaka (Bangalore, Karnataka) and manufactures wheels and axles.
- **Diesel Component Works** : Located at Patiala (Punjab) and manufactures components of diesel engines.

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- **Rail Coach Factory in India** : Located at Kapurthala (Punjab) and manufactures rail coaches.
- Road Transport in India** India's road network is one of the largest in the world. The total length of roads is more than 33 lakh km.
- For the purpose of maintenance and construction, roads are classified into National Highways, State Highways, District Highways, Village Roads, Border Roads, etc.
- National highways are maintained by the Central Government, State highways by the respective state government while District highways by the respective District Board. Border roads and International highways are also die responsibility of Central Government.
- The present length of the National Highways in India is approx. 45,000 km. They constitute only 2% of the total road length and carries nearly 40% of the road traffic.

Some of the Important National Highways are:

- NH 1: New Delhi – Ambala – Jalandhar – Amritsar.
- NH 2: Delhi – Mathura – Agara – Kanpur – Allahabad – Varanasi – Kolkata.
- NH 3: Agra – Gwalior – Nasik – Mumbai
- NH 4: Thane and Chennai via Pune and Belgaun.
- NH 5: Kolkata – Chennai
- NH 6: Kolkata – Dhule
- NH 7: Varanasi – Kanyakumari
- NH 8: Delhi – Mumbai (via Jaipur, Baroda and Ahmedabad)
- NH 9: Mumbai – Vijaywada
- NH 10: Delhi – Fazilka
- NH 11: Agra – Bikaner
- NH 12: Jabalpur – Jaipur
- NH 24: Delhi – Lucknow
- NH 27: Allahabad – Varanasi
- NH 28: Barauni – Lucknow
- NH 29: Gorakhpur – Varanasi
- NH 56: Lucknow – Varanasi
- NH – 7 is the longest highway of India.

Note:

The Golden Quadrilateral Project connecting the four Metropolitan cities of Delhi, Mumbai, Chennai and Kolkata covering a total distance of 5846 km is currently being processed. It is the first phase of the National Highways Development Project (NHDP). Total cost of the project is Rs 300 billion, funded largely by the government's special petroleum product tax revenues and government borrowing. As of June '08, 5669 km of the intended road has been 4-laned.

- The North South – East West Corridor (NS-EW) is the largest ongoing expressway project in India. It is the second phase of the National Highways Development Project (NHDP), and consists of

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building 7300 kilometers of four/six lane expressways connecting Srinagar, Kanyakumari, Porbandar and Silchar. The final completion date of the project has been set as December 2009.

□ Maharashtra has the maximum length of surfaced roads in India.

Air Transport in India

J.R.D. Tata was the first person to make a solo flight from Mumbai to Karachi in 1931. 1. In 1935, the 'Tata Air Lines' started its operation between Mumbai and Thiruvananthapuram and in 1937 between Mumbai and Delhi.

2. In 1953, all the private Airline companies were nationalised and Indian Airlines and Air India came into existence.

3. Air India administers international flights while Indian Airlines caters to the domestic circuit.

4. Indian Airlines is now known by the name of 'Indian'.

5. Vayudoot Limited started in 1981 as a private air carrier and later on it merged with Indian Airlines.

6. Pawan Hans Limited operates helicopter support services to oil sector, hill stations and remote areas.

7. A number of private airlines also operates in India. They are Jet Airways, Sahara, etc.

8. The Civil Aviation Centre in Fursatgarh near Allahabad provided, among other things, ground training to the pilots.

Airports in India :

There are 12 International Airports in India :

- Begumpet Airport, Hyderabad
- Calicut International Airport, Calicut
- Chatrapati Shivaji International Airport, Mumbai
- Chennai International Airport, Chennai
- HAL Airport, Bangalore
- Goa Airport in Vasco da Gama city, Goa
- Lokpriya Gopinath Bordolio International Airport, Guwahati
- Indira Gandhi International Airport, Delhi
- Netaji Subhash Chandra Bose International Airport, Kolkata
- Rja Sansi International Airport, Amritsar
- Sardar Vallabhbhai Patel International Airport, Ahmedabad
- Thiruvananthapuram International Airport, Thiruvananthapuram

The Indira Gandhi International Airport and the Chatrapati Shivaji International Airport handle more than half of the air traffic in South Asia. Besides these airports several other domestic airports are located in India. In total, there are more than 334 civilian airports in India – 238 with paved runways and 108 with unpaved runways.

Water Transport in India

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Most efficient, least costly and environment friendly means of transportation. The total length of navigable waterways in Indian comprising rivers, canals, backwaters, etc, is 14,500 km out of which 3700 km is navigable by mechanised boats.

The government has recognised the following National Waterways of India:

- NW 1: Allahabad to Haldia – 1,629 km
- NW 2: Sadia to Dhubari (on Brahmaputra river) – 819 km
- NW 3: Kollam to Kottapuram – 186 km
- NW 4: Kakinada to Marakkanam (Along Godawari and Krishna river) – 1,100 km

Ports in India

- The Waterways Authority in India divides Indian ports into three categories, major, minor and intermediate.
 - India has about 190 ports in all, with 12 major and the rest intermediate and minor.
 - The 12 Major Ports are:

Port	State
Kolkata (including Haldia)	West Bengal
Paradip	Orissa
Vishakhapatnam	Andhra Pradesh
Chennai	Tamil Nadu
Ennore	Tamil Nadu
Tuticorin	Tamil Nadu
Cochin	Kerala
New Mangalore	Karnataka
Mormugao	Goa
Jawaharlal Nehru	Maharashtra
Mumbai	Maharashtra
Kandla	Gujarat

All these ports are administered by the respective Port Trusts, except the newly constructed Ennore port which is under the Ennore Port Ltd. Company.

Salient Features :

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- **Kolkata Port (including Haldia)** : Kolkata is a riverine port, located about 128 km from the Bay of Bengal on the banks of river Hooghly. Haldia was developed because excessive silting prevented the entry of large marine vessels in Kolkata.
- **Paradip Port** : Located on the Orissa coast along the Bay of Bengal. India exports raw iron to Japan from here.
- **Vishakhapatnam Port** : The deepest port, located in Andhra Pradesh. It serves the Bhilai and Rourkela steel plants.
- **Chennai Port** : Oldest artificial harbour. This port ranks only second after Mumbai in terms of the traffic handling capacity.
- **Ennore Port** : Declared a major port in 2001. It is the first port with corporate participation. Provided with all the modern facilities for handling the thermal coal required for Tamil Nadu Electricity Board Power Station.
- **Tuticorin Port** : It came into existence during the reign of Pandya kings. It has an artificial deep sea harbour.
- **Cochin Port** : A fine natural harbour located on Kerala coast. Handles the export of tea, coffee and spices and import of petroleum and fertilisers.
- **New Mangalore Port** : The 'Gateway of Karnataka'. Handles the export of iron-ore of Kudremukh.
- **Marmugao Port** : It has a naval base. India's leading iron-ore port.
- **Mumbai Port** : A natural port, India's busiest. A new port, Nhava Sheva, is being developed near Mumbai port.
- **Jawaharlal Nehru Port** : Occupies the 5th position in the world's faster growing ports.
- **Kandla Port** : Called the 'offspring of partition' as it was developed after the partition as a substitute of Karachi port. It is a tidal port and a free trade zone located in the Rann of Kachchh.

Nick Names of Important Indian Places

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THENI IAS ACADEMY**9943056137, 9976626064**

Nick Name	Place
Golden City	Amritsar
Manchester of India	Ahmedabad
City of Seven Islands	Mumbai
Queen of Arabian Sea	Cochin
Space City	Bangalore
Garden City of India	Bangalore
Silicon Valley of India	Bangalore
Electronic City of India	Bangalore
Pink City	Jaipur
Gateway of India	Mumbai
Twin City	Hyderabad - Sikandarabad
City of Festivals	Madurai
Deccan Queen	Pune

Nick Name	Place
City of Buildings	Kolkata
Dakshin Ganga	Godavari
Old Ganga	Godavari
Egg Bowls of Asia	Andhra Pradesh
Soya Region	Madhya Pradesh
Manchester of the South	Coimbatore
City of Nawabs	Lucknow
Venice of the East	Cochin
Sorrow of Bengal	Damodar river
Sorrow of Bihar	Kosi river
Blue Mountains	Nilgiri
Queen of the Mountains	Mussoorie (Uttarakhand)
Sacred river	Ganga
Hollywood of India	Mumbai
City of Castles	Kolkata
State of Five Rivers	Punjab
City of Weavers	Panipat

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THENI IAS ACADEMY**9943056137, 9976626064**

Nick Name	Place
City of Lakes	Srinagar
Steel City of India	Jamshedpur (Called Tatanagar)
City of Temples	Varanasi
Manchester of the North	Kanpur
City of Rallies	New Delhi
Heaven of India	Jammu & Kashmir
Boston of India	Ahmedabad
Garden of spices of India	Kerala
Switzerland of India	Kashmir
Abode of the God	Prayag (Allahabad)
Pittsburg of India	Jamshedpur

Important Indian Towns on Rivers

Town	River
Allahabad	At the confluence of the Ganga and Yamuna
Patna	Ganga
Varanasi	Ganga
Kanpur	Ganga
Hardwar	Ganga
Badrinath	Alaknanda
Agra	Yamuna
Delhi	Yamuna
Mathura	Yamuna
Ferozpur	Satluj
Ludhiana	Satluj
Srinagar	Jhelum
Lucknow	Gomti

Town	River
Jaunpur	Gomti
Ayodhya	Saryu
Bareilly	Ram Ganga
Ahmedabad	Sabarmati
Kota	Chambal
Jabalpur	Narmada
Panji	Mandavi
Ujjain	Kshipra
Surat	Tapti
Jamshedpur	Swarnarekha

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Town	River
Dibrugarh	Brahmaputra
Guwahati	Brahmaputra
Kolkata	Hooghly
Sambalpur	Mahanadi
Cuttack	Mahanadi
Seriranganatnam	Cauvery
Hyderabad	Musi
Nasik	Godavari
Vijayvada	Krishna
Curmool	Tungabhadra
Tiruchirapalli	Cauvery

Famous Hill Stations in India

Hill Stations	Height From Sea Level (m)	States
Gulberga	2550	J & K
Ooty (Ootacamund)	2290	Tamil Nadu
Shimla	2210	H.P
Pahalgam	2200	J & K
Darjeeling	2135	West Benga
Kodaikanal	2120	Tamil Nadu
Lansdowne	2120	Uttarkhand
Dalhousie	2035	H.P
Mussoorie	2006	Uttarkhand
Mukteshwar	1975	Uttarkhand
Nainital	1940	Uttarkhand
Kasauli	1985	H.P

Hill Stations	Height From Sea Level (m)	States
Coonoor	1860	Tamil Nadu
Gangtok	1850	Sikkim
Manali	1830	H.P
Ranikhet	1830	Uttarkhand
Ranchi	1800	Jharkhand
Srinagar	1770	J & K
Almora	1650	Uttarakhand
Shillang	1500	Maghalaya
Mahabaleshwar	1370	Maharashtra
Kalimpong	1250	West Bengal
Mt. Abu	1220	Rajasthan

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Hill Stations	Height From Sea Level (m)	States
Kullu Valley	1200	H.P
Panchgani	1200	Maharashtra
Mannar	1160	Kerala
Panchmarhi	1065	M.P
Periyar	915	Kerala
Mandi	709	H.P
Lonawala	620	Maharashtra
Khandala	620	Maharashtra

Tribal Groups of India

Tribal Groups	Found in
Abhors	North-East
Adivasis	MP (Bastar distt.)
Angami	Manipur
Apatamis	Arunachal Pradesh
Badagas	Tamil Nadu
Baigas	M.P
Bakkarwals	J & K
Bhils	M.P & Rajasthan
Bhotias	Uttarakhand
Bhuia	M.P
Birhors	M.P and Bihar
Chang	North - East
Chenchus	A.P and Orissa
Tribal Groups	Found in
Chutia	Assam
Gaddis	Himachal Pradesh
Gallong	North-East
Garos	Assam and Meghalaya
Gonds	M.P and Bihar
Gujlars	J & K and H.P
Irula	Tamil Nadu
Jaintias	Meghalaya
Jarawas	Little Andamans
Kanikar	Tamil Nadu
Katkari	M.P
Kharia	M.P
Khond	M.P
Khas	U.P

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Tribal Groups	Found in
Khasis	Assam and Meghalaya
Khonds	Orissa
Kol	M.P
Kolam	A.P
Kotas	Tamil Nadu
Kuki	Manipur
Lahaulas	Himachal Pradesh
Lepchas	Sikkim
Lushai	Tripura
Murias	M.P
Minas	Rajasthan
Moplahs	Kerala
Mundas	Bihar
Murias	M.P
Nishi	North - East
Nagas	Nagaland
Oarons	Bihar and Orissa
Onges	Andaman & Nicobar
Pho	North - East
Santhals	WB, Orissa and Bihar
Sangtam	North-East
Sema	Nagaland
Sentinelese	Andaman & Nicobar
Shompens	Andaman & Nicobar
Todas	Tamil Nadu
Uralis	Kerala
Wancho	North - East
Warlis	Maharashtra

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THENI IAS ACADEMY**9943056137, 9976626064**

Town	State	Industries
Ambala	Haryana	Scientific Instruments
Bokaro	Jharkhand	Steel Plant
Bangalore	Karnataka	Telephones, Aircrafts, Motors, Cotton Textiles, Toys
Batanagar	West Bengal	Shoes
Bareilly	U.P	Resin Industries, Match Factory

Indian Towns Associated with Industries

Town	State	Industries
Ahmedabad	Gujarat	Cotton Textiles
Agra	U.P	Leather, Marble, Carpet
Aligarh	U.P	Locks, Cutlery
Ankleshwar	Gujarat	Oil Fields
Ambarnath	Maharashtra	Machine Tools
Amritsar	Punjab	Woolen Clothes
Anand	Gujarat	Milk and its Products
Alwaye	Kerala	Fertilizer, Monazite Factory



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THENI IAS ACADEMY**9943056137, 9976626064**

Town	State	Industries
Bhilai	Chhattisgarh	Steel Plant
Barauni	Bihar	Chemical Fertilizer
Burnpur	West Bengal	Steel Plant
Bhurkunda	Jharkhand	Glass Industries
Bhagalpur	Bihar	Silk industries
Bhandara	Maharashtra	Explosives
Bhadravati	Karnataka	Iron & Steel
Bongaigaon	Assam	Petroleum
Bhadoi	U.P	Carpets
Churk	M P	Cement
Cyberabad	Andhra Pradesh	Electronics, Computers, Information technology
Chitranjan	West Bengal	Locomotive
Kolkata	West Bengal	Jute, Leather, Electric goods
Cochin	Kerala	Ship building, coconut oil, rubber
Calicut	Kerala	Coffee, coconut
Coimbatore	Tamil Nadu	Cotton industries
Dhariwal	Punjab	Woolen clothes
Durgapur	West Bengal	Steel
Digboi	Assam	Petroleum
Delhi	Delhi	Textiles, Electronics, D.D.T
Dalmianagar	Bihar	Cement
Darjeeling	W. Bengal	Tea
Dindigul	Tamil Nadu	Cigar, Tobacco
Frozabad	M.P	Bangle works
Guntur	Andhra Pradesh	Cotton industries
Gwalior	Madhya Pradesh	Pottery, Tobacco
Gomia	Jharkhand	Explosives
Hardwar	Uttarakhand	Heavy electricals
Hatia	Jharkhand	Heavy Engineering Corporation
Haldia	W. Bengal	Chemical fertilizer
Hazira	Gujarat	Artificial Rayon
Jamshedpur	Jharkhand	Iron & Steel, Locomotives, Railway coaches

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THENI IAS ACADEMY**9943056137, 9976626064**

Town	State	Industries
Jallundhur	Punjab	Surgical goods and sports articles
Jaipur	Rajasthan	Cloth Printing, Brass
Jharia	Jharkhand	Coal mines
Jabalpur	Madhya Pradesh	Bidi industry
Jainakot	Jammu & Kashmir	H.M.T watch
Japla	Jharkhand	Cement
Kanpur	U.P	Cotton and Woollen mills, Leather, Sugar
Katni	M.P	Cement
Korba	Chattisgarh	Aluminium factory, Thermal plant
Koyna	Maharashtra	Aluminium factory
Koyali	Gujarat	Petrochemical industries
Kolar	Karnataka	Gold mining centre
Kota	Rajasthan	Atomic power plant
Kanchipuram	Tamil Nadu	Silk clothes
Karnal	Haryana	Dairy product
Kandla	Gujarat	Chemical fertiliser, famous port
Khetri	Rajasthan	Copper industries
Ludhiana	Punjab	Hosiery
Lucknow	U.P	Embroidery work, Chicken work
Chennai	Tamil Nadu	Leather, cigarette, Integral coach factory
Madurai	Tamil Nadu	Cotton and Silk Weaving
Mirzapur	U.P	Carpet, Pottery, Brass industries
Muradabad	U P	Brassware, cutlery
Mathura	U.P	Oil refinery
Mysore	Karnataka	Sandalwood oil, Silk goods
Meerut	U.P	Publication work, Sports goods, Scissors making
Mumbai	Maharashtra	Cinema industries, Cotton textiles
Modinagar	U.P	Nylon thread
Moorie	Jharkhand	Aluminium
Majhagaon	Maharashtra	Ship building
Nagpur	Maharashtra	Cotton mills, Oranges
Nepanagar	Madhya Pradesh	Newsprint
Nasik	Maharashtra	Security Printing Press
Neyveli	Tamil Nadu	Lignite industries
Nunamati	Assam	Oil refineries
Narora	U.P	Atomic Power Plant
Nangal	Punjab	Fertilisers
Panna	M.P	Diamond mining

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Town	State	Industries
Pinjore	Haryana	Hindustan Machines Tools
Perambur	Tamil Nadu	Integral coach factory
Pimpri	Maharashtra	Penicillin factory
Raniganj	W. Bengal	Coal mining
Rourkela	Orissa	Steel plant, Chemical fertiliser
Rana Pratap Sagar	Rajasthan	Hydro Power Plant
Renukoote	U.P	Aluminium Plant
Roopnarayanpur	W. Bengal	Cables
Rishikesh	Uttarakhand	Antibiotic Plant
Saharanpur	U.P	Cigarette factory, News print
Sindri	Jharkhand	Chemical fertilizers
Srinagar	Jammu & Kashmir	Woolen shawls, Silk, Woodwork
Surat	Gujarat	Cotton textiles, Diamond Cutting
Surajpur	Haryana	Cement factory
Suratgarh	Rajasthan	Agriculture implements
Singbhum	Jharkhand	Copper, Iron
Singreni	Andhra Pradesh	Cool mining
Salem	Tamil Nadu	Iron and Steel
Samastipur	Bihar	Jute, Paper, Tobacco, Sugar
Tarapur	Maharashtra	Atomic Power Plant
Titagarh	W. Bengal	Paper & Jute
Thiruvananthapuram	Kerala	Coir matting
Trombay	Maharashtra	Oil refinery
Tiruchirapalli	Tamil Nadu	Cigar
Tirupati	Andhra Pradesh	Scooter
Tanjore	Tamil Nadu	Silk clothes
Thumba	Kerala	Rocket launching Station
Vijaypur	M.P	Fertilizers
Viiaynagar	Karnataka	Steel Plant
Vishakhapatnam	A.P	Ship building, Iron and Steel, Oil refinery
Varanasi	U.P	Rail Engines and Saari industries
Worli	Maharashtra	Baby food
Zainkot	J & K	HMT Watches

Largest Longest Highest and Smallest in India

Longest River	Ganges
The Longest Tributary River of India	Yamuna
The Longest River of the South	Godavari
Highest Mountain Peak	Godwin Austin (K2)

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Longest River	Ganges
Largest Lake (Fresh Water)	Wular Lake (Kashmir)
Highest Dam	Bhakra Dam (Punjab)
Largest Mosque	Jama Masjid, Delhi
Longest Road	Grand Trunk Road
State with Longest Coastline	Gujarat
Longest Railway Route	From Jammu to Kanyakumari
Longest Tunnel	Jawahar tunnel (Jammu & Kashmir)
Longest National Highway	NH - 7 which runs from Varanasi to Kanyakumari
Longest Dam	Hirakud Dam (Orissa)
Longest River Bridge	Mahatma Gandhi Setu, Patna

Longest River	Ganges
Largest Populated City	Mumbai (1.60 crore)
Largest Museum	National Museum, Kolkata
Largest Delta	Sunderban Delta, W. Bengal
Largest Dome	Gol Gumbaz, Bijapur (Karnataka)
Largest Zoo	Zoological Gardens, Alipur, Kolkata
Largest Man - made Lake	Govind Vallabh Pant Sagar (Rihand Dam)
Largest Desert	Thar (Rajasthan)
Highest Tower	Pitampura Tower, Delhi
Smallest State (Area)	Goa
Smallest State (Population)	Sikim
Highest Waterfall	Gersoppa waterfall (Karnataka)
Longest Electric Railway Line	From Delhi to Kolkata via Patna
Densest Populated State	West Bengal
Largest Cave Temple	Kailash temple, Ellora (Maharashtra)
Largest Animal Fair	Sonepur (Bihar)
Highest Gateway	Buland Darwaza, Fatehpur Sikri (Agra)
Biggest Hotel	Oberai-Sheraton (Mumbai)
Largest State (Area)	Rajasthan
Largest State (Population)	Uttar Pradesh
Place of Heaviest Rainfall	Mausinram (Meghalaya)
Largest Corridor	Rameshwaram temple corridor (Tamil Nadu)
Largest Cantilever Span Bridge	Howrah Bridge (Kolkata)
Largest Forest State	Madhya Pradesh
Highest Straight Gravity Dam	Bhakra Dam
Longest Railway Platform	Kharagpur (W. Bengal)
Largest Stadium	Salt Lake (Yuva Bharti), Kolkata

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THENI IAS ACADEMY**9943056137, 9976626064**

Longest River	Ganges
Largest Port	Mumbai
Highest Lake	Devatal (Garhwal)
Largest Lake (Saline Water)	Chilka Lake, Orissa
Highest Award	Bharat Ratna
Highest Gallantry Award	Paramveer Chakra
Largest Gurudwara	Golden Temple, Amritsar
Deepest River Valley	Bhagirathi & Alaknanda
State with Longest Coastline of South India	Andhra Pradesh
Longest River which forms estuary	Narmada
Largest Church	Saint Cathedral (Goa)
Longest Beach	Marina Beach, Chennai
Highest Battle Field	Siachin Glacier
Highest Airport	Leh (Laddakh)
Largest River Island	Majuli (Brahmaputra River, Assam)
Largest Planetarium	Birla Planetarium (Kolkata)

Important Monuments in India

Name	Place	Built by
Ajanta - Ellora Caves	Aurangabad (Mah.)	Gupta rulers
Aram Bagh	Agra (UP)	Babur
Agra Fort	Agra (UP)	Akbar
Akbar's Mausoleum	Sikandra (UP)	Akbar
Itmod - ud - daula Fort	Agra (UP)	Noorjahan
Anand Bhawan	Allahabad (UP)	Motilal Nehru
Bada Imambara	Lucknow (UP)	Asaf-ud-daula
Bharatpur Fort	Bharatpur (Raj.)	Raja Surajmal Singh
Bibi Ka Maqbara	Aurangabad (Mah.)	Aurongzeb
Char - Minor Hyderabad (AP)	Quli	Qutub Shah
Charar - e - Sharif	Jammu & Kashmir	Zainul Abedin
Chhota Imambara	Lucknow (UP)	Muhammad Ali Shah

Name	Place	Built by
Dargah Ajmer Sharif	Ajmer (Raj.)	Sultan Shyasuddin
Dilwara's Jain Temple	Mount Abu (Raj.)	Siddharaja
Deewan - e - Khas	Agra Fort (UP)	Shahjahan
Adhai Din Ka Jhopra	Ajmer (Raj.)	Qutubuddin Aibak
Elephanfa's cave	Mumbai (Mah.)	Rashtrakuta rulers
Fatehpur Sikri	Agra (UP)	Akbar
Ferozshah Kotla	Delhi	Ferozshah Tughlaq
Golghar	Patna (Bih.)	British Government

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Name	Place	Built by
Gateway of India	Mumbai (Mah.)	British Government
Hauz Khas	Delhi	Alauddin Khilji
Hawa Mahal	Jaipur (Raj.)	Maharaja Pratap Singh
Humayun's Tomb	Delhi	Hymayun's wife
Jama Masjid	Agra (UP)	Shahjahan
Jama Masjid	Delhi	Shahjahan
Jagannath Temple	Puri (Ori.)	Anantvarmun Ganga
Jantar - Mantar	Delhi	Sawai Jai Singh
Jaigarh Fort	Jaipur (Raj.)	Sawai Jai Singh
Jim Corbett Park	Nainital (Uttar.)	Sir Malcom Hqilley
Jodhpur Fort	Jodhpur (Raj.)	Rao Jodhoji
Kanheri's Fort	Mumbai (Mah.)	Buddhists
Khirki Masjid	Delhi	Ghyasuddin Tughlaq
Lai Bagh	Bangalore (Kar.)	Hyder Ali
Lakshmi Narayan Temple	Delhi	Birla Family
Makka Masjid	Hyderabad (AP)	Quli Qutub Shah
Moti Masjid	Agra Fort (UP)	Shahjahan
Moti Masjid	Delhi Fort	Aurangzeb
Nahargarh Fort	Jaipur (Raj.)	Sawai Jai Singh
Nishat Garden	Srinagar (J & K)	Asaf Ali
Parana Qila	Delhi	Shershah Suri
Pathar Ki Masjid	Patna (Bih.)	Pervez Shah
President House	Delhi	British Government
Qutub Minor	Delhi	Qutubuddin Aibak
Red Fort	Delhi	Shahjahan
Safdar Jung Tomb	Delhi	Shuja-ud-daula
Sabarmati Ashram	Ahmadabad (Guj.)	Mahatma Gandhi
Shantiniketan	West Bengal	Rabindra Nath Tagore
Shish Mahal	Agra (UP)	Shahjahan
Shalimar Garden	Srinagar (J & K)	Jahangir
Shershah's Tomb	Sasaram (Bih.)	Shershah's son
Saint George Fort	Chennai (TN)	East India Company
Sati Burj	Mathura (UP)	Raja Bhagwan Das
Sun Temple	Konark (Ori.)	Narsimhadeva
Swarna Mandir (Golden Temple)	Amritsar (Pun.)	Guru Ramdas
Taj Mahal	Agra (UP)	Shahjahan
Vellure Math	Kolkata (WB)	Swami Vivekanand
Victoria Memorial	Kolkata (WB)	British Government

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THENI IAS ACADEMY**9943056137, 9976626064**

Name	Place	Built by
Vishnupad Temple	Gaya (Bih.)	Rani Ahiliabai
Viiaya Stambha	Chittorgarh (Raj.)	Maharana Kumbha

States in India

India, a union of states, is a Sovereign, Secular, Democratic Republic with a Parliamentary system of Government.

- The President is the constitutional head of Executive of the Union. In the states, the Governor, as the representative of the President, is the head of Executive.
- The system of government in states closely resembles that of the Union. There are 28 states and 7 Union territories in the country. Union Territories are administered by the President through an Administrator appointed by him.
- From the largest to the smallest, each State / UT of India has a unique demography, history and culture, dress, festivals, language etc.

List of States in India

Andhra Pradesh	Arunachal Pradesh	Asom or Assam
Bihar	Chattisgarh	Goa
Gujarat	Haryana	Himachal Pradesh
Jammu & Kashmir	Jharkhand	Karnataska
Kerala	Madhya Pradesh	Maharashtra
Manipur	Megalaya	Mizoram
Nagaland	Orissa	Punjab
Rajasthan	Sikkim	Tamil Nadu
Tripura	Uttarkhand	Uttar Pradesh
West Bengal		

Union Territories of India Andaman & Nicobar Islands India

Capital	Port Blair
Area	8.249 sq km
Population	356,152
Sex Ratio	846
Growth Rate	26.94%
Literacy	81.30%
Districts	2
Languages	Hindi, Nicobarese, Bengali, Malayalam, Tamil, Telegu

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- Andamans is a group of 204 islands, while Nicobars is a group of 19 islands. Out of these only 36 islands in Andamans and 12 islands in Nicobars are inhabited.
- India's southern-most location, Indira Point, is located in Nicobars only.
- These islands are mostly inhabited by tribals. Important tribes are the Great Andamanese, Onge, Jarawas and Sentinalese in Andamans and Nicobarese and Shompens in Nicobars.
- Tourism and agriculture is the mainstay of economy.
- Mangrove forests are found in abundance in these islands

Chandigarh in India

Capital	Chandigarh
Area	114 sq. km
Population	900,914
Sex Ratio	773
Growth Rate	40.33%
Literacy	81.94%
Languages	Hindi, Punjabi, English

- It is one of the most beautiful and well-planned places in India. It was designed by a French architect, Le Corbusier.
- Chandigarh serves as a joint capital of Punjab and Haryana.
- Many large and small scale industries are here which give Chandigarh its revenue.

Dadra & Nagar Haveli Dadra & Nagar Haveli

Capital	Silvassa
Area	491 sq. km
Population	220,490
Sex Ratio	811
Growth Rate	59.20%
Literacy	57.63%
Languages	Gujarati, Hindi

- It is predominantly a rural area having about 79% population of tribals.

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- Forests cover about 40% of the total area.

Daman & Diu India

Capital	Daman
Area	112 sq. km
Population	158,204
Sex Ratio	989
Growth Rate	55.59%

Capital	Daman
Literacy	78.18%
Districts	2
Languages	Gujarati

- Agriculture and small-scale industries are the back-bone of economy.

Delhi Union Territory

Capital	Delhi
Area	1,483 sq. km
Population	1,37,82,976
Sex Ratio	821
Growth Rate	46.31%
Literacy	81.67%
Districts	9
Languages	Hindi, Punjabi, Urdu and English

- Delhi is the eighth largest metropolis in the world by population.
- Delhi is the largest commercial centre of northern India and is the largest centre of small industries.
- Delhi has greater number of vehicles than the total vehicles of Mumbai, Kolkata and Chennai put together

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Lakshadweep in India

Capital	Kavaratti
Area	32 sq. km
Population	60,595
Sex Ratio	947
Growth Rate	17.19%
Literacy	86.66%
Languages	Jeseri (Dweep Bhasha) and Mahal

Lakshadweep is group of 25 coral islands. It is the smallest Union Territory.

- Coconut is the only major crop.
- Fishing is another major activity.

Puducherry Union Territory

Capital	Puducherry
Area	492 sq. km
Population	973,829
Sex Ratio	1001

Capital	Puducherry
Growth Rate	20.56%
Literacy	81.24%
Districts	4
Languages	Tamil, Telegu, Malayalam, English, French

It is a former French colony, consisting of four districts, and named after the largest. In Sept 2006, the territory changed its name from Pondicherry to the vernacular original, Puducherry, which means, "New Village".

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□ It is basically an agriculture based economy.

Sanctuaries and Parks in India

Name	Location	Reserves for
Achanakmar Sanctuary	Bilaspur, Chhattisgarh	Tiger, bear, chital, sambar, bison
Bandhavgarh National Park	Shahdol, Madhya Pradesh	Tiger, panther, chital, nilgai, wild bear
Bandipur Sanctuary	Border of Karnataka and Tamil Nadu	Elephant, tigers, panther, sambar, deer, birds
Banarghatta National Park	Bangalore	Elephant, chital, deer, gray
National Park	Karnataka	Partridges, green pigeon
Bhadra Sanctuary	Chikmagalur, Karnataka	Elephant, chital, panther, sambar, wild bear
Bhimabandh Sanctuary	Monghyr, Bihar	Tiger, leopard, sambar, wild bear, chital, water birds
Bori Sanctuary	Hoshangabad, Madhya Pradesh	Tiger, panther, sambar, chital, wild boar, barking deer
Borivli National Park	Mumbai	Panther, sambar, langur, wild boar, chinkara
Chandraprabha Sanctuary	Near Varanasi Uttar Pradesh	Famous for Gir lions, chital and sambar
Corbett National Park named in memory of Jim Corbett, famous sportsman	Nainital, Uttaranchal	Tiger, leopards, elephants, sambar

Name	Location	Reserves for
Dachigam Sanctuary	Dachigam, Kashmir	Kashmiri stag
Datma Sanctuary	Singbhum, Uttaranchal	Elephants, leopard, wild bear, barking deer
Dandeli Sanctuary	Dharwar, Karnataka	Tiger, panther, elephant, chital, sambar, wild bear
Dudhwa National Park	Lakhimpurkheri U.P.	Tiger, panther, sambar, chital, nilgai, barking deer
Gandhi Sagar Sanctuary	Mandsaur, M.P.	Chital, sambar, chinkara, barking deer, wild birds
Garampani Sanctuary	Diphu, Assam	Elephant, leopard, wild buffalo, langur
Ghana Bird Sanctuary	Bharatpur, Rajasthan	Water birds, black-buck, chital, sambar
Gir Forest	Junagarh, Gujarat	India's biggest wild life sanctuary famous for Gir lions
Gautam Buddha Sanctuary	Gaya, Bihar	Tiger, leopard, sambar, chital, barking deer
Hazaribagh Sanctuary	Hazaribagh, Jharkhand	Tiger, leopard, chital, nilgai, sambar, wild cat
Intanki Sanctuary	Kohima, Nagaland	Elephant, gaur, tiger, panther, barking deer, wild boar
Jaldapara Sanctuary	West Bengal	Rhinoceros

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Name	Location	Reserves for
Kawal Sanctuary	Adilabad, A.P.	Tiger, panther, gaur, chital, wild bear
Kaziranga National Park	Jorhat, Assam	Horned rhinoceros, gaur, elephant, leopard, wild buffalo
Khangchandra National Park	Gangtok, Sikkim	Snow leopard, musk deer, Himalayan bear
Kinnersani Sanctuary	Khamrsan, A.P.	Tiger, panther, gaur, chital, sambar, nilgai
Kolleru Pelicanary	Elluru A.P.	Pelicans, painted stork
Nagerhole National Park	Coorg, Karnataka	Elephant, tiger, panther, sambar, chital
Namdafa Sanctuary	Tirap, Arunachal Pradesh	Elephant, panther, sambar, tiger, chital, king cobra
Nawegaon National Park	Bhandara, Maharashtra	Tiger, panther, sambar, chital, nilgai
Pachmarhi Sanctuary	Hoshangabad, M.P.	Tiger, panther, bear, sambar, nilgai, barking deer
Pakhil Sanctuary	Warangal A.P.	Tiger, panther, sambar, chital, nilgai
Parambikulam Sanctuary	Palghat, Kerala	Tiger, leopard, gaur, elephant, nilgai, chital
Pench National Park	Nagpur, Maharashtra	Tiger, panther, gaur, sambar, chital, nilgai
Periyar Sanctuary	Idukki, Kerala	Elephant, tiger, panther, gaur, nilgai, sambar, wild bear
Ranganthitoo Bird Sanctuary	Islands in Cauvery river in Karnataka	Important bird sanctuary
Rohla National Park	Kulu, H.P.	Snow leopard, brown bear, musk deer, snow cock, snow pigeon
Sariska Sanctuary	Alwar, Rajasthan	Tiger, panther, sambar, nilgai, chital, chinkara
Sharaswathy Valley Sanctuary	Shimoga, Karnataka	Elephant, tiger, panther, sambar, gaur, chital, wild bear
Shikari Devi Sanctuary	Mandi, H.P.	Black bear, musk deer, panther, leopard, partridge
Shivpuri National Park	Shivpuri, M.P.	Tiger, panther, sambar, hyena, sloth bear, nilgai
Similipal Sanctuary	Mayurbhanj, Orissa	Elephant, tiger, leopard, gaur, chital
Someshwara Sanctuary	Canara, Karnataka	Tiger, panther, wild boar, leopard
Sunderban Tiger Reserve	South 24 parganas, West Bengal	Tiger, deer, wild boar, crocodile, Gangetic dolphin

Important Indian Towns on Rivers

Town	River
Allahabad	At the confluence of the Ganga and Yamuna
Patna	Ganga
Varanasi	Ganga
Kanpur	Ganga
Hardwar	Ganga
Badrinath	Alaknanda
Agra	Yamuna
Delhi	Yamuna
Mathura	Yamuna
Ferozpur	Satluj
Ludhiana	Satluj
Srinagar	Jhelum



Town	River
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Town	River
Lucknow	Gomti
Jaunpur	Gomti
Ayodhya	Saryu
Bareilly	Ram Ganga
Ahmedabad	Sabarmati
Kota	Chambal
Jabalpur	Narmada
Panji	Mandavi
Ujjain	Kshipra
Surat	Tapti
Jamshedpur	Swarnarekha
Dibrugarh	Brahmaputra
Guwahati	Brahmaputra
Kolkata	Hooghly
Sambalpur	Mahanadi
Cuttack	Mahanadi
Seriranganatnam	Cauvery
Hyderabad	Musi
Nasik	Godavari
Vijayvada	Krishna
Curnool	Tungabhadra
Tiruchirapalli	Cauvery



Heights of Some Important Indian Peaks

S No	Peak	Height in metres above mean Sea Level
1	K2	8,611
2	Kanchen Junga	8,598
3	Nanga Parvat	8,126
4	Gasher Brum	8,068
5	Broad Peak	8,047
6	Disteghil Sar	7,885
7	Masher Brum E	7,821
8	Nanda Devi	7,817
9	Masher Brum W	7,806
10	Rakaposhi	7,788
11	Kamet	7,756
12	Saser Kangri	7,672
13	Skyang Kangri	7,544
14	Sia Kangri	7,422

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S No	Peak	Height in metres above mean Sea Level
15	Chaukhamba (Badrinath Peak)	7,138
16	Trisul West	7,138
17	Nunkun	7,135
18	Pauhunri	7,128
19	Kangto	7,090
20	Dunagiri	7,066

Lengths of Some Important Indian Rivers

S No	River	Length (km)
1	Indus	3,000
2	Brahmaputra	2,900
3	Ganga	2,510
4	Godavari	1,450
5	Narmada	1,290
6	Krishna	1,290
7	Mahanadi	890
8	Cauvery	760

Major Ports in India

Sl. No.	Western Coast	Eastern Coast
1	Kandla (Child of Partition)	Kolkata - Haldia (Riverine Port)
2	Mumbai (busiest and Biggest)	Paradip (Exports Raw Iron into Japan)
3	Jawahar Lal Nehru (Fastest Growing)	Vishakhapatnam (Deepest Port)
4	Marmugao (Naval base also)	Chennai (Oldest and Artificial)
5	Mangalore (Exports Kudremukh Iron - ore)	Ennore (Most Modern in Private Hands)
6	Cochin (Natural Harbour)	Tuticorin (Southernmost)

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World Geography

Cosmology Important Facts

The Universe or the Cosmos, as perceived today, consists of millions of Galaxies. A galaxy is a huge congregation of stars held together by the forces of gravity.

- Edwin Hubble in 1924 first demonstrated existence of galaxies beyond Milky Way. He proved that these galaxies are flying away from each other and that the farther they are, the faster they fly. This means that the universe is expanding like a balloon that is being blown up.
- In the ancient times, the knowledge about the universe was vague and confined to mystery and religious perceptions
- In 140 AD, Ptolemy propounded the theory that the earth was the centre of the universe and the sun and other heavenly bodies revolved around it. In 1543, Copernicus argued that the sun and not the earth was the centre of the universe.
- However, he still equated the universe with the solar system. Kepler supported Copernicus but said that the sun was the centre of the solar system and not the universe. In 1805, Hershel made it clear that the solar system was a part of the much larger system of stars called galaxy.
- Our galaxy is Milky Way Galaxy (or the Akash Ganga). It is spiral in shape. It consists of over a 100 billion stars rotating and revolving about its centre. Nearest galaxy to ours is Andromeda.
- The Big Bang Theory evaluates that 15 billion years ago, cosmic matter (universe) was in an extremely compressed state, from which expansion started by a primordial explosion. This explosion broke up the superdense ball and cast its fragments far out into space, where they are still traveling at thousands of miles per second.
- It is from these speeding fragments of matter that our galaxies have been formed. The formation of galaxies and stars has not halted the speed of expansion. And, as it happens in all explosions, the farthest pieces are flying the fastest.
- Later, Pulsating (Oscillating) Universe Theory was given which says that universe periodically expands from the explosion of the primordial body, then contracts back and explodes again, over immensely long cycles, ad infinitum.
- Measurement Units of Space are :
- **Light Year** : It is the distance covered by light in one year in vacuum at a speed of 3×10^8 km/s.
- **Astronomical Unit (A.U)** : It is the mean distance between the earth and the sun. One light year is equal to 60,000 A.U.
- **Parsec** : It represents the distance at which the mean radius of earth's orbit subtends an angle of one second of an arc. It is equal to 3.26 light years.
- Stars are self – luminous bodies that account for 98 per cent of the material in the galaxy. The rest 2 per cent consists of interstellar or galactic gas and dust in an attenuated form.

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- Stars are formed by gravitational contractions from these vast clouds of galactic gas and dust. Star forming clouds are thousands of times denser than the normal interstellar gas. Star forming matter is richer in hydrogen and helium.
- A star's colour indicates the temperature of its surface. Blue colour denotes maximum temperature. Then comes yellow, then red, etc.
- The life of a star is spread over billions of years. It begins to form by compression of galactic gas and dust. Compression generates heat which in turn causes hydrogen to be converted into helium in nuclear fusion, thereby emitting large amount of heat and light.
- Continued nuclear fusion over a period of time starts depletion of hydrogen and the helium core becomes

increasingly heavy, resulting into swelling and reddening of outer regions. Such stars of gigantic dimensions are termed as Red Giants.

- If the star is of sun's size, it becomes a White Dwarf. Their central density can reach up to 10_ grams per cubic cm.
- If the star is bigger than the sun but not more than twice as big, it will turn into a Neutron Star or Pulsar. Their central density is 10¹⁴ grams per cubic cm. They are formed due to Novae or Super novae explosion.
- Stars having mass greater than three times that of the sun, because of their great gravitational power, have contracted so much that they have developed super density of 10¹⁶ grams per cubic cm. It is so dense that nothing, not even light, can escape from its gravity and hence called 'Black Hole'.
- Brightest star outside our Solar System is Sirius, also called Dog Star.
- Closest star of Solar System is Proxima Centauri (4.2 light years away). Then come Alpha Centauri (4.3 light years away) and Barnard's Star (5.9 light years away).

Earth Solar System

Earth solar system consists of :

- The Sun
- The Planets
- Dwarf Planets

and countless fragments of left – overs called asteroids, meteors, comets and satellites of the planets (Called small solar system Bodies).

Origin of Solar System

Various theories have been given by different persons to explain the origin of Solar System.

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Gaseous Hypothesis	Kant
Nebular Hypothesis	Laplace
Planetesimal Hypothesis	Chamberlin and Moulton
Tidal Hypothesis	James Jeans & Harold Jeffrey
Binary Star Hypothesis	H. N. Russel
Fission Hypothesis	Ross Gun
Cepheid Hypothesis	A.C. Banerji
Nova Hypothesis	Hoyle & Lyttleton
Electromagnetic Hypothesis	H. Alfven
Interstellar Dust Hypothesis	Schmidt
Nebular Cloud Hypothesis	Dr. Von Weizsacker
Protoplanet Hypothesis	G. Kuiper

Solar System Some Facts	
Biggest Planet	Jupiter
Smallest Planet	Mercury
Nearest Planet to Sun	Mercury
Farthest Planet from Sun	Neptune
Nearest Planet to Earth	Venus
Brightest Planet	Venus
Brightest star after Sun	Sirius
Planet with maximum satellites	Jupiter
Coldest Planet	Neptune
Hottest Planet	Venus
Heaviest Planet	Jupiter
Red Planet	Mars
Biggest Satellite	Gannymede

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Solar System Some Facts	
Smallest Satellite	Deimos
Blue Planet	Earth
Morning/Evening Star	Venus
Earth's Twin	Venus
Green Planet	Neptune
Planet with a big red spot	Jupiter
Lord of the Heavens	Jupiter
Greatest Diurnal Temperature	Mercury

Earth Movements

The Earth also called Blue Planet. It is the densest of all planets.

Earth Circumference : 40,232 Kilometers.

Earth Area : 510 million Square Kilometers Average distance from sun: 149 million-Kilometers.

Earth Perihelion : Nearest position of earth to sun. The earth reaches its perihelion on January 3 every year at a distance of about 147 million-Kilometers.

Aphelion : Farthest position of earth from sun. The earth reaches its aphelion on July 4, when the earth is at a distance of 152 million Kilometers. The shape of the earth is oblate spheroid or oblate ellipsoid (i.e. almost spherical, flattened a little at the poles with a slight bulge at the centre).

2 Types of Earth Movements:

1. Rotation or daily movement.
2. Revolution or annual movement.

Earth Rotation

- Spins on its imaginary axis from west to east in 23 hrs, 56 min and 40.91 sec.
- Rotational velocity at equator is 1667 Kilometers/h and it decreases towards the poles, where it is zero.
- Earth's rotation results in
 - i . Causation of days and nights;
 - ii . A difference of one hour between two meridians which are 15° apart;
 - iii. Change in the direction of wind and ocean currents;
- Rise and fall of tides everyday. The longest day in North Hemisphere is June 21, while shortest day is on 22 Dec (Vice-versa in S. Hemisphere).
- Days and nights are almost equal at the equator.

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Earth Revolution

- It is earth's motion in elliptical orbit around the sun. Earth's average orbital velocity is 29.79 Kilometers/s.
- Takes 365 days, 5 hrs, 48 min and 45.51 sec. It results in one extra day every fourth year.
- Revolution of the earth results in
 - i . Change of seasons
 - ii . Variation in the lengths of days and nights at different times of the year
 - iii . Shifting of wind belts
 - iv . Determination of latitudes.
- Inclined Axis: The axis is an imaginary line running from north to south and passing through the centre of the earth. It always remains inclined at an angle of $66\frac{1}{2}^\circ$ to the plane of the earth's orbit, and is tilted $23\frac{1}{2}^\circ$ from a line perpendicular to this plane. The two facts, i.e., a fixed angle of the earth's axis to the plane of the orbit and the axis always pointing in the same direction, when combined with the earth's movements, results in varying lengths of days and nights, seasonality and changes in the altitude of sun at different times of the year.
- Earth Seasons are periods into which the year can be divided as a result of the climatic conditions, largely due to the changes in the duration and intensity of solar radiation.

The 4 Earth Seasons are:

- **Spring**: On March 21, the sun is directly overhead the equator. This is the season of spring in the northern hemisphere.
- **Summer**: On June 21, the sun is directly overhead the Tropic of Cancer. Thus, the northern hemisphere experiences summer.
- **Autumn**: On September 23, the sun returns to the equator, and the northern hemisphere experiences autumn.
- **Winter**: On December 22, the sun is at the Tropic of Capricorn, and the northern hemisphere experiences winter.

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Earth Some Important Facts

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Age	4,60,00,00,000 years
Total surface area	51,01,00,500 Square Kilometers
Land area (29.08%)	14,89,50,800 Square Kilometers
Water area (70.92%)	36,11,49,700 Square Kilometers
Mean density	5.52 gm. per cc
Equatorial diameter	12,755 Kilometers
Polar diameter	12,712 Kilometers
Escape velocity	11.2 Kilometers/sec
Mass	5.880 1024 kg

Volume	10,83,20,88,40,000 kg³
Distance from Moon	3,82,200 Kilometers
Highest place on Earth	Mount Everest (8,850 m)
Deepest point in Ocean	Challenger Deep in Mariana Trench in Pacific Ocean near Philippines (11,033 m deep)
Deepest point on Land	Dead Sea (396 m deep)
Rotation time	23 hrs, 56 min, 40.91 sec
Revolution time	365 days, 5 hrs, 48 min, 45.51 sec
Satellite	1 (Moon)
Tilt of axis from Orbital Plane	23° 27'
Distance from Sun	14,94,07,000 Kilometers
Equatorial circumference	40,075 Kilometers
Polar circumference	40,024 Kilometers
Average Ocean depth	3,554 m
Date of perihelion (minimum distance from Sun)	Jan 3
Date of aphelion (maximum distance from Sun)	July 4
Orbital circumference	924,375,700 Kilometers
Average Orbital speed	29.783 Kilometers/sec. (107,218 Kilometers/h)
Minimum surface temperature	88° C
Mean surface temperature	14° C
Maximum surface temperature	58° C

Earth Latitude and Longitude

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Earth Latitude

- Imaginary lines drawn parallel to the equator. Measured as an angle whose apex is at the centre of the earth
- The equator represents 0° latitude, while the North Pole is 90° N and the South Pole 90° S
- $23\frac{1}{2}^\circ$ N represents Tropic of Cancer while $23\frac{1}{2}^\circ$ S represents Tropic of Capricorn.
- $66\frac{1}{2}^\circ$ N represents Arctic Circle while $66\frac{1}{2}^\circ$ S represents Antarctic Circle.
- There are total 181 latitudes including the equator. Each parallel of latitude is a circle, but they are not equal.
- The circle becomes smaller towards the poles. Equator is the 'Greatest Circle' that can be drawn on the earth's surface.
- The distance between any two parallels of latitude is always equal.

Earth Longitude

- It is the angular distance measured from the centre of the earth. On the globe the lines of longitude are drawn as a series of semicircles that extend from the North Pole to the South Pole through the equator. They are also called meridians.
- The distance between any two meridians is not equal. At the equator, 1 degree = 111 km. At 30° N or S, it is 96.5 km. It goes on decreasing this way until it is zero at the poles.
- There are 360 meridians of longitude. The prime meridian is a longitude of 00, passing through the Royal Observatory at Greenwich near London.
- This meridian is taken by geographers to divide the earth into the eastern and the western hemispheres.
- Each meridian of longitude is a semi-circle. 180° meridian (International Date Line) lies exactly opposite to 0° meridian. Such points are called Antipodal Points.
- The earth is divided into 24 longitudinal zones, each being 15° or 1 hour apart in time (4 minutes / degree).

Longitude and Time

- Places that are on the same meridian have the same local (sun) time. Since the earth makes one complete revolution of 360° in 24 hours, it passes through 15° in one hour or 1° in 4 minutes.
- The earth rotates from west to east, hence places east of Greenwich see the sun earlier and gain time whereas places west of Greenwich see the sun later and lose time.
- A suitable memory acronym can be: East-Gain-Add (E.G.A.) and West-Lose-Subtract (W.L.S.). So, if it is noon in London (near 0°), 15° east will be one hour ahead of London or 1 p.m. and Chennai of 80° E will be 5 hours 20 minutes ahead. To avoid confusion about having many local times within one country, a particular Meridian is chosen for the whole country whose time is known as 'standard time'.
- Generally, the standard meridians are chosen to differ from the Greenwich meridian by the multiples of fifteen degree or seven and a half degree, i.e., by exact number of hours or half hours. The world is thus divided into a number of time zones. Larger countries like Russia, Canada, USA

etc., have greater east-west extension, so they adopt several time zones. Russia has 11 time zones while USA and Canada have 5 time zones.

□ India, whose longitudinal extent is approx. 30° , has adopted only one time zone, selecting the 82.5°E for the standard time which is 5 hours and 30 minutes ahead of GMT (Greenwich Mean Time).

International Date Line

□ It is the 180° meridian running over the Pacific Ocean, deviating at Aleutian Islands, Fiji, Samoa and Gilbert Islands.

□ Travelers crossing the Date Line from west to east (i.e., from Japan to USA) repeat a day and travelers crossing it from east to west (i.e., from USA to Japan) lose a day.

Earth Eclipses

Earth Lunar Eclipse

□ When earth comes between sun and moon.

□ Occurs only on a full moon day. However, it does not occur on every full moon day because the moon is so small and the plane of its orbit is tilted about 5° with respect to the plane of the earth's orbit. It is for this reason that eclipses do not occur every month.

□ Can last up to one hour 40 minutes. The moon does not become completely dark during most lunar eclipses. In many cases, it becomes reddish. The earth's atmosphere bends part of the sun's light around the earth and towards the moon.

□ This light is red because the atmosphere scatters the other colors present in sunlight in greater amounts than it does red.

Earth Solar Eclipse

When moon comes between sun and earth.

□ Can be partial or total.

□ Occurs only on a new moon day when the moon is in line with the sun. However, due to the inclination of the moon's orbit, a solar eclipse doesn't occur on every new moon day.

Earth Climate

Earth Climate

The average weather conditions over a large area is called the climate of a place. Weather conditions over a specific length of time, usually a period of 31 years, are taken into consideration.

On a large scale, the climate of a particular region is determined by:

- i. Latitude and tilt of the earth's axis, which determines the amount of solar radiation received by the area
- ii. The distribution of land and sea and proximity of ocean currents
- iii. The altitude and topography of the area
- iv. The location of the area in relation to the main circulation belts of the earth.

Climate can be classified on the basis of temperature, rainfall, evaporation, evapotranspiration and water balance. One of the universally accepted climate classifications is by Koeppen which is being described here.



Types of Climates

Tropical Rain Forest Climate

- Also called equatorial type of climate or Selvas.
- 5° – 10° of equator, nights and days equal.
- Average monthly temperature is 24° – 27°c, annual range least. Diurnal range of temperature far greater than the annual range. Here night is the winter.
- Called 'Belt of Calm' or Doldrums.
- Convictional rainfall. Annual rainfall is 250 cm.
- Broad-leaved evergreen dense forests. Trees are gregarious and there is competition for sunlight. Have more species of plants and animals than in all others combined.
- In Amazon basin, Congo basin, Indonesia.

2. Tropical Monsoon Climate

- Complete seasonal reversal of winds.
- Rainfall seasonal (generally in summers). Due to this vegetation is deciduous.
- Approx. 200 cm of rainfall.
- Occurs in Western Guinea coast of Africa, South-Eastern Asia, Northern Australia, some parts of Amazon valley and West Indies.

3. Tropical Grasslands/Savanna Climate

- Average annual temperature is 23°c. Annual rainfall is about 150 cm. Area- Africa, East and Central South America.
- Bounded by tropical rain forest climate towards the equator and dry climate towards the poles, the Savannah type is characteristic of grasslands in tropical and subtropical latitudes. Grasslands are dotted with scattered trees and bushes that can survive the drought season.
- Rainfall in summer owing to convectional ascent of air. Distinct dry season in winter. Trees with longer roots, fireresistant.

4. Tropical-Subtropical hot Desert

- Situated in the trade wind belt. Occupy the western margins of continents. The area includes North America – Colorado Desert, Mexican Desert; Africa-Sahara, Kalahari, Namib Desert; S W.Asia-Arabian, Iranian, Thar Desert; S.America-Atacama; Australia-Great Australian Desert.
- Average annual temperature is 38° c; annual summer temperature is 40° c, annual winter temperature is 15° c. average annual rainfall is about 25-40 cm. Greatest diurnal temperature.

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- Highest insolation, as there is no clouds cover to scatter the insolation.
- Vegetation is xerophytic.

5. Middle Latitude Desert Climate

- Found between 35°-50° N and S.
- Area:** Tarim, Gobi, Russian Turkistan and C. Iran. In Southern Hemisphere, only in Patagonia.
- Unlike the hot deserts, they have very cold winters because of their interior location.

6. Tropical and Subtropical Steppes

- Transition belt between hot deserts and humid climates. Occupy pole-ward margins of the tropical and subtropical deserts.
- Average annual temperature is 21° c. Semi-arid climate characterized by abundance of shrubs and grasses.
- Known by different names:
 - Prairies – North America
 - Pampas – South America
 - Veldt – South Africa
 - Downs – Australia
 - Steppes – Eurasia
 - Canterbury – New Zealand
 - Postaz – Hungary
 - Manchurian – Russia

7. Mediterranean Climate

- In the western coast of continents between 30°-45° N & S; Around the Mediterranean Sea, in South Europe, North Africa, California coast, Central Chile, Cape of Good Hope and South East Australia.
- Characterized by dry summer and humid winter. Off-shore trade winds blow in summer; they are dry and give no rainfall. Cyclonic rainfall in winter.
- Average annual temperature is 16° c. average winter temperature, 10° c, summer 25°c annual rainfall is 40-60cm.
- Olives, grapevine and citrus family fruits are the chief products of these regions which are also known for grain farming.

8. China Type Climate

- Average annual temperature is 19° c, annual rainfall 120 cm.
- In the eastern coasts of continents between 25°- 45° N & S. Areas- China, South East USA, South Brazil, Eastern Argentina, South East Africa, South East Australia, South Japan. It is the eastern counterpart of the Mediterranean type.
- Characteristics-Hot summers and mild winters. Rainfall throughout the year.

9. West European Type Climate

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- On the western side of continents between 40°-65° N & S. Areas- North West Europe including British Isles, West coast of Canada, South Chile, Southern New Zealand.
- Summers are moderate to cool (15°-18°); winters mild (2°-10°). Average annual temperature is 10° C.
- Annual Rainfall: 75-100 cm. No dry season as the westerly winds blow from the ocean throughout the year. Rainfall is mostly of cyclonic origin.

10. Cool East Coast Climate

- The Corn Belt of US has this type of climate; that is why it is known as 'Corn-Belt' climate.
- Average summer temp is 21°-24°c; it is long, warm and humid.
- Winter temp average -4° to 1.7° for a period of 3-5 months.

11. Continental Type Climate

- Coldest winter month average -12° to -6.7°c.
- Hottest summer months average 18°c to 21°c. In the interior parts of big continents.

12. Taiga Climate

- Taiga means snow forests or coniferous forests; needle shaped leaves, composed of evergreen spruce, fir and pine. Extends in two large belts in east-west direction from Alaska to Newfoundland in North America and from Norway to Kamchatka Peninsula in Eurasia.
- Cool and short summers (around 10°c) and very cold and long winters (below 0°c).
- Annual range of temperature highest. (In Verkhoyansk, Jan temp is -50°, annual range being 64°c)
- Total annual precipitation below 50 cm.
- These forests are the most important source of softwood and fur bearing animals.

13. Tundra Climate

- Summers are warm enough to melt the thin snow cover or small water bodies, with the result that land is water soaked and marshes, swamps are common.
- Precipitation less than 30 cm.
- Blizzards blow.
- Lichens and mosses common.

14. Highland Climate

- Experienced in the mountainous regions.
- Determined by elevation, shape of the highland, exposure to winds and location.
- Here winds are much stronger than at low levels.
- Vegetation varies as we move up.

Important Deserts of the World:

- Sahara – N. Africa (Includes the Libyan and the Nubian Desert)
- Australian – Australia (Includes Gibson, Simpson, Victorian, Great Sandy)
- Arabian – Arab Countries (Includes Rub'al Khali & An-Nafad of S. Arabia and Dast-e-Lut & Dast-e-Kavir of Iran)
- Kalahari – Africa (mainly in Botswana)
- Gobi – Mongolia

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- Atacama – Central Chile
- Patagonian – Argentina
- Nabib – Namibia
- TaklaMakan – Sinkiang, China
- Karakum – Turkmenistan
- Sonoran – Arizona and California (USA)
- Thar – India

Isopleth

- Lines drawn on map along which the value of a particular phenomenon is uniform.

Some Important Isopleths are:

Isopleth	Reactions
Isobars	Equal pressure
Isobaths	Equal depth in sea
Isobronts	Thunder-storm at the same time
Isohaline	Salinity
Isohels	Sunshine
Isohyets	Rainfall
Isohypse (or Contour Lines)	elevation above sea-level
Isonif	Snow
Isotherms	Temperature
Isoneph	Cloudiness
Isodapan	Equal transportation cost distance
Isocline	Slope

The Earth Hydrosphere**The Earth Hydrosphere**

- Earth Hydrosphere is the name given to the mass of water that covers about 71% of the earth's surface.
- The average depth of oceans is about 4 km.

Earth Ocean Floor

- It is very irregular as the surface of the continents.

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- Four major units of Earth ocean floor are:

Continental Shelf of India

- It is the coastal part of the ocean which is not very deep and the slope of the bottom is very gentle.
- Extends to a depth of 100 fathoms (1 fathom = 1.8 m).
- In regions where the mountains extend along the coast, the shelf is narrower. About 20% petrol and gas found here. They also provide the richest fishing ground in the world. Marine life exists entirely here. They occupy about 7% of the total ocean area.

Continental Slopes

- Extends seawards from the Continental Shelf. The continent blocks are supposed to end at the site of continental slope.
- The boundary between shelf and slope is known as Andesite Line, named after the andesite rock.
 - Depth is up to 2000 fathoms.
- They cover about 8.5% of the total ocean area.

Continental Rises

- At the foot of slope is found an area slightly rising due to the accumulation of debris transported over the slope.

- Oil deposits occur here.

Abyssal or the Deep Sea Plains

- It is the deepest and the most extensive part of the ocean floor and accounts for about 40% of the total ocean floor.
- Parts of the abyssal plains are occupied by raised ridges or submarine mountains and by very deep trenches or canyons.
- Ridges are the raised areas in sea. E.g., Mid-Adantic ridge (S-shaped), Indian Ocean ridge (inverted Y-shaped).
- A ridge rising more than 1000m above the ocean floor is called Seamount. Flat topped seamounts are called Guyots (maximum in Pacific Ocean)
- Some parts of the ridge or volcanic peaks reach the surface of the oceans and form islands (E.g. Hawaii Islands).
- Trenches are narrow and steep sided depressions. They occur where two plates of the earth's crust are moving together and one is being pushed down below the other. Deepest is. Challenger Deep, a part of Mariana Trench in Pacific Ocean, near Philippines, is more than 11 km deep.
- Submarine canyons are the deep gorges on the ocean floor and are restricted to the continental shelves, slopes and rises.

Salinity of Water

The proportion of dissolved salts to pure water is called salinity. The average salinity in the oceans and seas is 350/00, i.e., 35 grams of salt in one litre of water.

Salinity in decreasing order is: NaCl, MgCl, MgSO₄, CaSO₄, KSO₄, etc. Chlorine is the most abundant element.

Max salinity: Lake Van (Turkey) – 3330/00. Then Dead Sea – 2400/00. Most saline sea is Red Sea.

- The main source of salinity is dissolution of the rocks of

oceanic crust, which contains salts.

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- It is maximum at the tropics, because here temperature is high. Equatorial regions come second because although they have high temperatures, they have high rainfall also. Poles have minimum salinity because of addition of fresh water in the form of icebergs and excessive snowfall.
- It causes vertical circulation of water.



Earth Waves

- They are caused due to the friction with the winds.
- There is no forward movement of water in a wave. When a wave enters shallow water, it breaks. The top of it is thrown forward and this is when water moves forward. Water from the breaking wave runs up the shore as swash and back down the shore as backwash
- The maximum height of waves in most oceans is about 12 m but they may be as high as 15 m. Seismic waves or tsunamis are the waves caused by earthquakes in volcanic eruptions in the sea bottom. The tsunamis which hit the coasts in the SE Asia on Dec 26, 2004, caused havoc in that region.

Coral Reefs in India

- Corals are a kind of calcareous rocks chiefly made of the skeletons of minute sea organisms called 'polyps'. They are formed due to accumulation and compaction of skeletons of these lime secreting organisms.
- Corals are found mainly in the tropical oceans and seas because they require high mean annual temperature ranging around 20° c. They cannot survive at a greater depth than 60-77m below sea level. Muddy or very saline water is injurious for their growth.
- The coral reefs are classified on the basis of nature, shape and mode of occurrence into the following three:
 1. **Fringing Reef:** Coral reefs that develop along the continental margins or along the islands are called fringing reefs. The seaward slope is steep and vertical while the landward slope is gentle. Sometimes there is a lagoon or shallow channel between the fringing reef and the land. Such reefs are found near Rameshwaram in the Gulf of Mannar.
 2. **Barrier Reef:** They are the largest, most extensive, highest and widest reefs of all. They are formed off the coastal platforms and parallel to them. There is an extensive but shallow lagoon between the coastal land and the barrier reef. The Great Barrier Reef of Australia is the largest barrier reef in the world.
 3. **Atoll:** A reef of narrow growing corals of horse shoe shape and crowned with palm trees is called an atoll. It is generally formed around an island or in an elliptical form on a submarine platform. There is a lagoon in the middle of the coral ring. E.g. Fiji Atoll.

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Earth Tides

Earth Tides

- Refer to the phenomenon of regular rise and fall of the sea water. Though both sun and moon exert gravitational force on earth, resulting in the production of tides, the moon, by nature of its closeness to the earth, has greater control over the timings of the tidal rises and falls.
- The interval between two tides is 12 hrs and 26 minutes.

Spring Tide

- When the sun, moon and the earth are in a straight line, the gravitational force is at its greatest because tide producing forces of both sun and moon complement each other and they pull together. This produces tides of unusually great range, called the spring tide.
- **These occur about twice a month:** at new moon when the sun and the moon are in conjunction and at full moon when they are in opposition.

Neap Tide

- Lowest magnitude as the tide producing forces of sun and moon act opposite to each other, as they form a triangle.
- This happens during phases of first and third quarter, i.e., at half moon, the sun's tide producing force tends to balance the tide producing force of the moon., resulting in tides of unusually small range known as neap tides.

Internal Structure of Earth

The Crust of Earth

- It is the outermost and the thinnest layer of the earth's surface, about 8 to 40 km thick. The crust varies greatly in thickness and composition – as small as 5 km thick in some places beneath the oceans, while under some mountain ranges it extends up to 70 km in depth.
- The crust is made up of two layers- an upper lighter layer called the Sial (Silicate + Aluminium) and a lower density layer called Sima (Silicate + Magnesium).
- The average density of this layer is 3 gm/cc.

The Mantle of Earth

- This layer extends up to a depth of 2900 km.
- **Mantle is made up of 2 parts:** Upper Mantle or Asthenosphere (up to about 500 km) and Lower Mantle. Asthenosphere is in a semi-molten plastic state, and it is thought that this enables the lithosphere to move about it. Within the asthenosphere, the velocity of seismic waves is considerably reduced (Called 'Low Velocity Zone').
- The line of separation between the mantle and the crust is known as Mohorovicic Discontinuity.

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The Core of Earth

- Beyond a depth of 2900 km lies the core of the earth.
- The outer core is 2100 km thick and is in molten form due to excessive heat out there. Inner core is 1370 km thick and is in plastic form due to the combined factors of excessive heat and pressure. It is made up of iron and nickel (Nife) and is responsible for earth's magnetism. This layer has the maximum specific gravity.
- The temperatures in the earth's core lie between 2200°C and 2750°C.
- The line of separation between the mantle and the core is called Gutenberg-Wiechert Discontinuity.

Note:

Temperature Inside the Earth: In the first 100 km, 12° increase per km. In the next 300 km, 2° increase per km. After that it is 1° increase per km.

Composition of Earth

- Made up of over 100 elements.
- The following 8 are important

Oxygen	46.5%
Silicon	27.72%
Aluminium	8.13%
Iron	5.01%
Calcium	3.63%
Sodium	2.85%
Potassium	2.62%
Magnesium	2.09%
Magnesium	2.09%



Earth Rocks

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Rocks of Earth

Any aggregate of material particles that forms part of the earth's crust is called a rock.

There are 3 major types of rock types :

Igneous Rocks

- Formed by the solidification of molten magma from the interior of the earth.
- Most abundant of the three types of rocks (95%).
- They do not occur in layers. Most of them are crystalline and do not contain fossils.
- All other types of rocks originate from these rocks, thus called Primary rocks.

They are classified on several grounds as mentioned below:

1. On the basis of mode of occurrence

- Intrusive Igneous Rocks:** They are formed by the solidification of magma beneath the earth's surface. They are further divided into plutonic and hypabyssal igneous rocks. Plutonic rocks cool deep beneath the earth. E.g., Granite. Hypabyssal rocks cool just beneath the earth's surface. E.g., Batholith, laccolith, phacolith, sills, dykes, etc.
- Extrusive Igneous Rocks:** They are formed due to cooling and solidification of hot and molten lava at the earth's surface. E.g., Basalt, gabbro, etc.

2. On the basis of Silica Content

- Acidic igneous rocks having more silica. E.g. Granite.
- Basic igneous rocks having less silica. E.g. Gabbro.

Sedimentary Rocks

- Made up of weathered remains of igneous rocks. Also contains fossils of plants and animals.
- Comprise only about 5% of the earth's crust but cover about 75% of the total land surface.
- The layers of sedimentary rocks hold all reserve of coal, oil and natural gas.
- Also known as Stratified Rocks because of the layers.
- Sedimentary rocks fall into three main groups:
 1. **Mechanically Formed:** These are called clastic sedimentary rocks; the sediments are largely derived from pre-existing rocks that have been broken down and then transported by water, wind or ice to form rocks.
 2. **Organically Formed Rocks:** These rocks are derived from remains of plants (e.g. peat, lignite, bituminous coal), or animals (e.g., chalk and coral).
 3. **Chemically Formed:** E.g., Gypsum, salt rock, etc.

Metamorphic Rocks

- Sometimes igneous or sedimentary rocks metamorphize or change due to great 'pressure, intense temperature or the action of water and chemical activity.
 - Examples of metamorphic rocks formed from different rocks are:

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Metamorphic Rock	Made From
Slate	Shale and mudstone
Quartzite	Sandstone
Gneiss	Aranite
Marble	Limestone, dolomite or chalk
Schist	Shale
Anthracite	Coal



Earthquakes

Earthquakes

- Tremors or vibrations of earth's surface produced by internal forces.
- The point of origin of earthquake is called Seismic focus. Most of the earthquakes originate at the depth of 50-100 km inside the earth.
- The point on the earth's surface vertically above the earth's surface is called Epicentre.
- The passage of earthquake waves is recorded by Seismograph.
- The magnitude of waves is measured on Richter's scale. For measurement of the intensity of the earthquake (damage caused), the Modified Mercalli Intensity Scale is used.

Types of Waves Earthquakes

1. **Primary Waves (P-Waves):** Travel from the point of happening by the displacement of surrounding particles. They are transmitted through solids, liquids and gases. Travels fastest.
2. **Secondary Waves (S-Waves):** Travels through solids only. Thus they cannot pass through core.
3. **Surface Waves or Long Waves (L-Waves):** Travels on earth's surface and causes maximum destruction. They are recorded after the P and S waves.

Distribution of Earthquakes

- Around the Pacific Ocean along a belt of volcanoes known as the Ring of Fire. 68 per cent of the volcanoes are experienced in this region.
- From the middle of Asia (Himalayas, Caspian Sea) through the Mediterranean Sea to West Indies. 21 per cent earthquakes are experienced in the region.
- Mid-Atlantic ridge belt which accounts for 11 per cent of the earthquakes.

Earth Volcanoes

A volcano is a vent or opening usually circular in form through which heated materials consisting of gases, water, liquid lava and fragments of rocks are ejected from the highly heated interiors to the

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surface of the earth. Volcanic eruptions are closely associated with several interconnected processes such as

- The gradual increase in temperature with increasing depth at a rate of 1°C per 32 m due to heat generated by degeneration of radioactive elements inside the earth
- Origin of magma because of lowering of melting point caused by reduction in pressure of overlying rocks due to fractures caused by splitting of plates
- Origin of gases and water-vapour due to heating of water
- Ascent of magma due to pressure from gases and vapour
- Occurrence of volcanic eruptions. These eruptions are closely associated with plate boundaries.

Classification of Volcanoes

1. Classification on the basis of Periodicity of Eruptions:

- **Active Volcano:** Volcano which erupt periodically. E.g. Mauna Loa in Hawaii, Etna in Sicily, Vesuvius in Italy, Stromboli in Mediterranean Sea, etc.
- **Dormant Volcano:** Volcano which has been quiescent for a long time but in which there is a possibility of eruption. E.g. Fujiyama in Japan, Krakatoa in Indonesia, Barren island Volcano in Andamans, etc.

2. Classification on the basis of Mode of Eruption

- **Central Eruption Type or Explosive Type:** E.g. Hawaiian type, Strombolian type, Volcanian type, Pelean type, Vesuvius type, etc.
- **Fissure Eruption or Quiet Eruption Type:** Large quantities of lava quietly flow up from fissures and spread out over the surrounding areas. Successive lava flow results in the growth of a lava plateau. E.g. Deccan Plateau, etc.

Distribution of Volcanoes in the World

- About 15% of world's active volcanoes are found along the 'constructive or divergent' plate margins, whereas

80% volcanoes are associated with the 'destructive or convergent' plate boundaries.

1. The Circum-Pacific belt or the 'Ring of Fire'. It extends across the Kamchatka Peninsula, Kurile Islands, the Islands of Japan, Philippines, New Guinea, New Zealand and the Solomon Islands. It also passes through the Antarctica and the western coast of America.
2. The Mid-Continent belt includes volcanoes of Alpine mountain chain, the Mediterranean Sea and the fault zone of eastern Africa. E.g. Stromboli, Vesuvius, Etna, Kilimanjaro, etc.
3. The Mid-Atlantic belt in which the volcanoes are fissure eruption type. E.g. Iceland, Canary Islands, Cape Verde, Azores, etc.

Earth Mountains

Types of Mountains

Fold Mountains of the World

They are formed when the rocks of the crust of the earth folded under stress, mainly by forces of compression (as a result of series of earthquakes).

E.g. – All big mountain systems: Himalayas, Alps, Andes, Rockies, Atlas, etc.

On the basis of age, fold mountains are grouped into: Young / New Fold Mountains

Came into existence after the continental drift. E.g. Himalayas, Andes, Rockies, Alps. Himalayas are regarded the youngest mountains in the world.

Old Mountains

They belong to pre-drift era, then subjected to denudation and uplift; many faults were formed; occur as relict mountains today. E.g. Pennines (Europe), Appalachians (US), Aravallis (India).

Block Mountains of the World

These are formed when great blocks of earth's crust may be raised or lowered. During the uplift of structural mountains, sometimes magma flows upwards into the crust.

On its cooling and hardening beneath the surface, it contracts and the overlying rock may crack into large blocks moving up or down. An intense folding of rocks is generally followed by faulting of strata due to horizontal forces of tension. The land between the two parallel faults either raises forming Block Mountains or Horsts, or subsides into a depression termed as Rift Valley or Graben.

Eg: Narmada, Tapti and Damodar valley in India, the Vosges in France and Black forest in Germany (through which Rhine River flows).

Volcanic Mountains of the World

Formed as a result of volcanic eruption & the outflow of lava (through crater, the opening). Also called Mountains of Accumulation. Have a gentle slope.

E.g: Cotopaxi in Andes, Vesuvius and Etna in Italy, Fujiyama in Japan, Mauna Loa and Kilauea (Most active volcano) in Hawaii, Ojos del Salado in Argentina / Chile (Highest active volcano), Popocatepeti in Mexico, Rainier of Washington, Stromboli in Mediterranean (called Lighthouse of the Mediterranean), Mirapi and Krakatao in Indonesia, etc.

Relict Mountains

Sometimes, the mountains are carved out as a result of erosion of plateaus & high planes by various agents of erosion. E.g., Highlands of Scotland, Sierras of Spain, Catskill mountains of New York and Nilgiri, Parasnath, Girnar, Rajmahal of India.

Major Mountain Ranges of the World

Andes	South America	6,960
Himalayas-Karakoram-Hindukush	South Central Asia	8,850
Rockies	North America	4,401
Great Dividing Range	East Australia	2,228
Western Ghats	Western India	2,637
Caucasus	Europe, Asia	5,642
Alaska	USA	6,194

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Alps	Europe	4,808
Apennines	Europe	2,912
Ural	Asia	1,895
Pennines	Europe	893
Pyrenees	Europe	3,404
Appalachian	North America	2,040

Earth Pressure and Winds

Air moving in a particular direction is called wind. The principal cause of winds is difference in pressure. Air always moves from areas of high pressure to those with low pressure. The slope of the pressure from high to low is known as Pressure Gradient and the direction of this direction decides the direction of winds.

- Wind velocity is directly related to the steepness of the pressure gradient.
- In addition, the direction of winds is affected by the Coriolis Force, which is caused by the rotation of the earth. Under the influence of this effect, winds are deflected to their right in the Northern Hemisphere and to their left in the Southern Hemisphere.
- This is referred to as Parrel's Law. Coriolis force is absent at the equator and increases towards the poles. Due to this, the winds, which would blow at right angles to the isobars under the pressure gradient, blow obliquely to them.

Global Pressure Belts

Equatorial Low Pressure Belt (or Doldrums)

- From 5°N to 5°S.
- Tremendous heat, thus warm air rises creating low pressure. Also, the centrifugal force is very high at the equator, where the velocity of rotation is high. Hence, the air masses tend to be thrown out, resulting in low pressure.
- Wind speed low, that's why called Doldrums (Belt of Calm).

Tropical High Pressure Belt (or Horse Latitudes)

- From 30° to 35° N and S.
- Apart from 2 months, usually high temperature.
- Here the pressure is high, although high temperature, because here pressure depends on the rotation and movement of air (as winds from Doldrums belt rises up and accumulate here. Also winds from Sub-Polar Low Pressure Belt accumulate here).

Sub-Polar Low Pressure Belt

- From 60° to 65°N and S
- Here the low pressure is created because of intense high pressure at the poles.

Winds and Their Types

- 3 broad categories are:**

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1. **Regular Winds/Prevailing Winds/Planetary Winds:** (E.g.: Trade winds, Westerlies and Polar Easterlies).
2. **Periodical Winds (which blow seasonally):** Monsoons
3. **Variable Winds:** Cyclones and other local winds

Trade Winds

- Trade in German means Track. To blow trade means to blow steadily in the same direction and in a constant course'.
- These are steady currents of air blowing from the sub-tropical high pressure belts towards the equatorial low pressure areas (doldrums). Under the influence of the Coriolis force they blow from the north-east in the northern hemisphere and from the south-east in the southern hemisphere.

Westerlies

- Blows from subtropical high pressure to sub-polar low pressure belt.
- In the northern hemisphere, land masses cause considerable disruption in the westerly wind belt. But between 40° and 60° S lies the almost unbroken ocean belt. Westerlies are strong and persistent here, giving rise to mariner's expressions- 'Roaring Forties', 'Furious Fifties' and 'Shrieking Sixties'.

Polar Easterlies

- Move from high pressure poles to sub-polar low pressure areas.
- These are deflected by the Earth's rotation to become east winds, or the polar easterlies

**Local Winds**

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Land and Sea Breeze	They are experienced in coastal areas. Due to differential heating, the atmospheric pressure over the land mass is lower than over the neighboring sea during the day. Therefore, winds blow from sea to land (sea breeze). At night the air pressure over land is higher due to a lower temperature than over the adjacent ocean and the wind starts blowing from land to sea (land breeze). Land breeze is not as strong as sea breeze.
Chinook	Hot, dry wind in Rockies, also called 'snow eater'.
Foehn	Hot, dry wind in the Alps.
Khamsin	Hot, dry wind in Egypt.
Sirocco	Hot, moist wind from Sahara to Mediterranean Sea.
Solano	Hot, moist wind for Sahara towards Iberian Peninsula.
Harmattan	Hot, dry wind blowing outwards from the interior of West Africa, also called 'Guinea Doctor'.
Bora	Cold, dry wind blowing outwards from Hungary to the north of Italy (near Adriatic Sea).
Mistral	Very cold wind, which blows down from the Alps over France.
Punas	Cold, dry wind blowing down towards the western side of Andes.
Blizzard	Very cold winds in Tundra region.
Brickfielder	Hot wind in Australia.
Purga	Cold wind in Russian tundra.
Levanter	Cold wind in Spain.
Norwester	Hot wind in New Zealand.
Santa Ana	Hot wind in Southern California in USA.

Cyclones & Anticyclones

Cyclones in World

- It is a system of very low pressure in the center surrounded by increasingly high pressure outwards.
- In this, the winds blow in a circular manner in Anticlockwise direction in Northern Hemisphere. Clockwise direction in Southern Hemisphere.
- In the temperate region, they occur due to the coming close and imperfect mixing of two masses of air of contrasting temperature and humidity conditions. Cyclones of this type are also known as Wave Cyclones or Temperate Cyclones.
- On the other hand, in the tropical regions, they occur due to intense heating up of air in some regions causing very low pressure in these locations. Tropical seas and oceans are most conducive to the development of tropical cyclones.

These are known as :

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- Cyclones – in the Indian Ocean
- Hurricanes – in the Caribbean Islands
- Typhoons – in the China Sea
- Willy-Willies – in the North West Australia
- Tornadoes – in coastal US.
- Twisters – in Mississippi Valley, USA

Tornadoes are very strong tropical cyclones of a smaller size. They are especially feared in the Mississippi Valley in US and here they are called Twisters. They differ from cyclones in that they generally develop over land. They are more destructive than cyclones as the speed of winds is very high, exceeding 320 km per hour.

Anticyclones

- They are opposite to cyclones in all respects. They are the centers of high pressure with gentle outward flow of air.
- The air circulation is clockwise in the northern hemisphere and anticlockwise in the southern hemisphere.
- Weather associated with an anticyclone is fair weather.

Earth Humidity

Earth Humidity refers to the amount of water vapour present in the air.

- The ratio between the amount of water vapour actually present in the air mass and the maximum amount that the air mass can hold at that temperature is called relative humidity. It is expressed as a percentage. It varies inversely with temperature, given a fixed amount of water vapour.
- Absolute humidity denotes the actual quantity of water vapour present in the air and it is defined as the weight of water vapour (grams) in a given volume of air (cubic meter).
- The term specific humidity is applied to express the ratio of weight of water vapour to the weight of moist air (including water vapour). It is stated as grams of water vapour per kilogram of moist air.
- Earth Humidity is measured by an instrument called hygrometer. Another instrument used for the same purpose is sling psychrometer.

Condensation, Dew Point and Related Aspects

- The physical process of transformation from the vapour to the liquid state is condensation. This is the basis of all types of precipitation- the fall of water from the atmosphere to the ground in any form.
- Dew point is the temperature at which the air is fully saturated and below which condensation normally occurs.
- Dew is the deposition of water droplets on the ground. It occurs when the temperature of the ground surface falls and the air in contact with it is cooled below its dew point. Dew is likely to occur on clear and calm nights.
- Frost is a weather condition that occurs when the air temperature is at or below 0°C moisture on the ground surface and objects freezes to form an icy deposit.

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- Fog is made of the droplets of water suspended in the lower layers of the atmosphere, resulting from the condensation of water vapour around nuclei of floating dust or smoke particles. A visibility of less than 1 km is the internationally recognized definition of fog. Fog is not considered as a form of precipitation.
- Smog (Smoke + Fog) is a form of fog that occurs in areas where the air contains a large amount of smoke.
- Mist is the term for reduction of visibility between 1-2 km, caused by condensation producing water droplets within the lower layers of atmosphere.
- Haze is formed by water particles that have condensed in the atmosphere and the visibility in this case is more than 1 km but less than 2 km. Haze may also be produced by presence of dust and smoke, which reduce visibility.

Earth Clouds

Earth Clouds are masses of minute water droplets and / or ice crystals formed by the condensation of water vapour and held in suspension in the atmosphere. Condensation, which results from cooling, usually takes place around nuclei such as dust, smoke particles and salt. Such particles are called condensation nuclei. Earth Clouds are of different types and they can be classified on the basis of their form and altitude.

On the basis of form, there are two major groups:

1. Stratiform or layered types, and
2. Cumuliform or massive types.

Stratiform Clouds

- These clouds, which are fairly thin and blanket like, are sub-divided into three main categories on the basis of altitude.
- High Clouds (mean ht 5-13 km)
 - **Cirrus Clouds:** Indicates fair weather.
 - **Cirrocumulus Clouds:** Forms the mackerel sky.
 - **Cirrostratus Clouds:** Produces a halo around sun and moon.
- Middle Clouds (mean ht 2-7 km)
 - **Altostratus Clouds:** Indicate fine weather.
 - **Alto-stratus Clouds:** Associated with development of bad weather.
- Low (mean ht up to 2 km)
 - **Stratus Clouds:** Brings dull weather, usually accompanied with a drizzle.
 - **Nimbostratus Clouds:** If rain or snow is falling from a stratus cloud, it is called nimbostratus.
 - **Stratocumulus Clouds:** Indicators of fair or clearing weather.

Cumulus Clouds

- They are massive clouds having a vertical extent from 1,500 to 9,000 m. They resemble the head of a cauliflower. When these clouds are sunlit, they are brilliantly white and are called 'wool-clouds'. They occur mainly in summer and are produced by convection.

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☐ **Cumulonimbus Clouds:** Under different weather conditions, a cumulus cloud may develop into cumulonimbus, the thunderstorm cloud mass of enormous size which brings heavy rainfall, thunder and lightning and gusty winds.

Precipitation Clouds

☐ It refers to falling of water, snow or hail from the clouds and results when condensation is occurring rapidly within a cloud.

☐ The most common form of precipitation is rain and it is formed when many cloud droplets coalesce into drops too large to remain suspended in the air. Rainfall occurs when the dew point of air is above the freezing point.

☐ Sometimes the raindrops freeze before reaching the ground and precipitation occurs in the form of ice pellets, called sleet.

☐ Snow is produced when condensation takes place at a temperature below freezing point, so that the minute crystals (spicules) of ice form directly from the water vapour.

☐ Hail consists of masses of ice with a layered structure. It occurs when there are very strong updrafts in the clouds carrying raindrops up to a high altitude, causing them to freeze. Hail stone is a rounded lump of ice having concentric layers.

Conditions for Precipitation

☐ There are three possible ways by which precipitation is produced.

Convective Precipitation

☐ It is caused by heating of moist air in the lower layers of atmosphere which rises, expands, and is cooled adiabatically to its dew point. Convection rain is often accompanied by lightning and thunder. It occurs in regions near the equator in the afternoon as a result of the constant high temperature and high humidity.

Orographic Precipitation

☐ In this, precipitation is caused by moisture-laden air being forced to rise over a relief barrier (mountain ranges). As the air rises in the windward side, it is cooled at the adiabatic rate. If sufficiently cooled, precipitation results; when the air descends on the leeward side, it gets warmed and dry, having no source from which to draw up moisture.

A belt of dry climate, often called a rain shadow, may exist on the leeward side.

Cyclonic frontal Precipitation

☐ When the air is caused to rise upwards due to cyclonic circulation, the resulting precipitation is said to be of the cyclonic type.

Earth Ocean Currents

Actual transportation of water from one part of ocean to another. Because of differences in density, salinity, temperature of ocean waters, rotation of earth, shape of coastline and the prevailing winds. Currents circulate in clockwise direction in Northern Hemisphere and in anti-clockwise direction in Southern Hemisphere.

Currents in Pacific Ocean

a. **North-Equatorial Current (Warm):** Flows across from east to west, i.e., from North America it reaches the Philippines.

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b. Kuroshio Current (Warm): N. Eq. current along the Philippines, Taiwan & Japan coast form this current. From the S.E. Japan the current, under the influence of prevailing westerlies, flows right across the ocean.

c. After reaching the west coast of N. America, it bifurcates into 2 branches :

i. Alasca Current (Warm): Along the coast of British Columbia & Alasca.

ii. California Current (Cold): It moves southward along the coast of California

d. Oyashio Current (Cold): Flows along the east coast of Kamchatka peninsula.

e. Okhotsk Current (Cold): Comes from the N. Pole & merges with the Oyashio current.

f. East Australian Current (Warm): Flows from east to west in S. Pacific Ocean.

g. Peru Current (Cold): Cold current near the west coast of S. America.

Currents of Atlantic Ocean

a. Guinea Current (Warm): Flows off the W. African coast (hot).

b. Florida Current (Warm): Along the coast of US up to the cape Hatterus.

c. Gulf Stream (Warm): Beyond the Cape Hatterus up to the Grand Banks of New Found Land, florida current is known as Gulf Stream. From the Grand Banks the Gulf Stream moves eastward across the Atlantic as the Atlantic Drift.

d. Atlantic Drift divides into 2 branches:

i. Norwagian Current: The main current passes along the Norway coast & enters the Arctic Ocean.

ii. Canary Current: The south branch of N. Atlantic drift flows near Spain by this name.

e. 2 Cold Currents: The East Greenland Current & the Labrador Current flows from the Arctic Ocean into the Atlantic Ocean. The Labrader Current meets the Gulf Stream. The influence of these 2 currents produces the famous fogs around New Found Land. [Most busy fishing ground of the world].

f. Brazil Current (Warm): Flows along the S. American coast from North to South

g. Benguela Current (Cold): Cold current from S. to N near the 'Cape of Good Hope',

h. Falkland Current (Cold): Cold flowing along the S.E. coast of S. America from S. to N. (meets the Brazil current)

Currents of the Indian Ocean

The currents in the N. Indian Ocean differ entirely from the general pattern of circulation. They change their direction from season to season in response to the seasonal rhythm of the monsoons.

In winters the N. Equatorial current & the S. Equatorial current flows from East to West.

Mozambique Current: Warm current flowing through the Mozambique Channel.

Agulhas Current: Warm current at the South-East coast of Africa.

Continents of the World

World Continents

Asia, Africa, North America, South America, Europe, Australia and Antarctica are the seven continents of the world. These seven continents were believed to be part of Pangaea which was a single landmass around 250 million years ago. Due to the tectonic movement, the landmass broke up and the component continents separated and moved away to its present position. All these took around 1 million years to complete. Pangaea was surrounded by a sea, the Panthalassa.

The continents of the world map will give you information about the geographical positions of the continents as well as their political divisions.

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The Continents of the World,

- Asia Continents Countries
- Africa Continents Countries
- North America Continents Countries
- South America Continents Countries
- Europe Continents Countries
- Australia Continents Countries
- Antarctica Continents Countries

World Continents: Some Facts

Continents	Biggest Country	Highest Peak	Longest River
Asia	China	Mt. Everest (8850 m)	Yangtze Kiang
Africa	Sudan	Mt. Kilimanjaro (5895 m)	Nile
North America	Canada	Mt. Mckinley (6194 m) Mississippi	Missouri
South America	Brazil	Mt. Aconcagua (6960 m)	Amazon

Continents	Biggest Country	Highest Peak	Longest River
Europe	Russia	Mt. Elbrus (5642 m)	Ob
Australia	Australia	Mt. Coscuisco (2228 m)	Darling
Antarctica	-	Vinson Massif (5140 m)	-



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