



India Geography - Lecture notes 1

Geography Of India (Systematic And Regional) (Panjab University)



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INDIA

1. In the north, it is bound by the lofty Himalayas.
2. The Arabian Sea in the west
3. The Bay of Bengal in the east and the Indian Ocean in the south
4. The north-south extent from Kashmir to Kanyakumari is about 3,200 km.
5. And the east-west extent from Arunachal Pradesh to Kutch is about 2,900 km.

LOCATIONAL SETTING

1. India is located in the northern hemisphere
2. The Tropic of Cancer ($23^{\circ}30' \text{ N}$) passes almost halfway through the country
3. From south to north, India extends between $8^{\circ}4' \text{ N}$ and $37^{\circ}6' \text{ N}$ latitudes.
4. From west to east, India extends between $68^{\circ}7' \text{ E}$ and $97^{\circ}25' \text{ E}$ longitudes.
5. The southernmost point of the Indian Union— 'Indira Point' got submerged under the sea water in 2004 during the Tsunami.

SIZE

1. An area of 3.28 million square km.
2. India's total area accounts for about 2.4 per cent of the total geographical area of the world.
3. India is the seventh largest country of the world.
4. India has a land boundary of about 15,200 km

5. The total length of the coast line of the mainland including Andaman and Nicobar and Lakshadweep is 7,516.6 km.
6. India is bounded by the young fold mountains in the northwest, north and north east.
7. From Gujarat to Arunachal Pradesh there is a time lag of two hours.
8. Hence, time along the Standard Meridian of India ($82^{\circ}30'E$) passing through Mirzapur (in Uttar Pradesh) is taken as the standard time for the whole country.
9. Rajasthan is the largest state
10. Goa is the smallest state in terms of area.
11. No other country has a long coastline on the Indian Ocean as India has and indeed, it is India's eminent position in the Indian Ocean which justifies the naming of an Ocean after it.
12. Since the opening of the Suez Canal in 1869, India's distance from Europe has been reduced by 7,000 km.

Do you know?

1. The USA and Canada have six time zones extending from the Pacific coast to the Atlantic coast.
2. The local time changes by four minutes for every one degree of longitude.
3. The local time of longitude of $82^{\circ}30'E$ has been taken as the Indian Standard Time.

INDIA'S NEIGHBOURS

1. There are seven countries that share land boundaries with India
2. Across the sea to the south, lie our island neighbours— Sri Lanka and Maldives.
3. Sri Lanka is separated from India by the Palk Strait.

India shares its land boundaries with

1. Pakistan
2. Afghanistan
3. China (Tibet)

4. Nepal
5. Bhutan
6. Myanmar
7. Bangladesh

Two island countries

1. Sri Lanka
2. Maldives

PHYSICAL FEATURES OF INDIA

1. Most volcanoes and earthquakes in the world are located at plate margins, but some do occur within the plates.
2. The oldest landmass, (the Peninsula part of India), was a part of the Gondwana land.
3. The Gondwanaland included India, Australia, South Africa and South America as one single land mass.
4. The convectional currents split the crust into a number of pieces.
5. This leads to the drifting of the Indo-Australian plate after being separated from the Gondwana land, towards north.
6. The northward drift resulted in the collision of the plate with the much larger Eurasian Plate
7. Due to this collision, the sedimentary rocks which were accumulated in the geosynclines known as the Tethys were folded to form the mountain system of western Asia and Himalaya.

What is Gondwanaland?

1. It is the southern part of the ancient super continent Pangea with Angara Land in the northern part.
2. The Himalayan uplift out of the Tethys Sea and subsidence of the northern flank of the peninsular

plateau resulted in the formation of a large basin.

3. In due course of time this depression, gradually got filled with deposition of sediments by the rivers flowing from the mountains in the north and the peninsular plateau in the south.

4. A flat land of extensive alluvial deposits led to the formation of the northern plains of India.

5. Geologically, the Peninsular Plateau constitutes one of the ancient landmasses on the earth's surface.

PHYSIOGRAPHIC DIVISION OF INDIA

India can be divided into six physiographic regions.

- 1) The Northern Mountains (The North and North-eastern Mountains)
- 2) The Peninsular Plateau
- 3) Indo Gangetic Plains
- 4 Indian Deserts
- 5) The Coastal Plains (East & West)
- 6) Island

- 1) The Northern Mountains (The North and North-eastern Mountains)

1. The Himalayas consist of a series of parallel mountain ranges.

2. The general orientation of these ranges is from northwest to the southeast direction in the north-western part of India

3. Himalayas in the Darjeeling and Sikkim regions lie in an east west direction

4. While in Arunachal Pradesh they are from southwest to the northwest direction

5. In Nagaland, Manipur and Mizoram, they are in the north south direction

6. The approximate length of the Great Himalayan range, also known as the central axial range, is 2,500 km from east to west

7. Their width varies between 160-400 km from north to south.

8. Himalayas are not only the physical barrier; they are also a climatic, drainage and cultural divide.

On the basis of relief, alignment of ranges and other geomorphologic features the

Himalayas can be divided into the following sub-divisions

(i) Kashmir or North-western Himalayas

(ii) Himachal and Uttaranchal Himalayas

(iii) Darjeeling and Sikkim Himalayas

(iv) Arunachal Himalayas

(v) Eastern Hills and Mountains

(i) Kashmir or North-western Himalayas

Comprise a series of ranges such as

1. Karakoram

2. Ladakh

3. Zaskar

4. Pir Panjal

Figure (1) - Western Himalaya

1. The north-eastern part of the Kashmir Himalayas is a cold desert, which lies between the Greater Himalayas and the Karakoram ranges

2. Great Himalayas and the Pir Panjal range, lies the world famous valley of Kashmir and the famous Dal Lake.

3. The Kashmir Himalayas are also famous for Karewa formations, which are useful for the cultivation of Zafran, a local variety of saffron.

4. This region is drained by the river Indus, and its tributaries such as the Jhelum and the Chenab.

5. The Kashmir and north-western Himalayas are well-known for their scenic beauty and picturesque landscape

6. Famous places of pilgrimage such as Vaishno Devi, Amarnath Cave, Charar -e-Sharif, etc. are also located here and large number of pilgrims visit these places every year

7. Srinagar, capital city of the state of Jammu and Kashmir is located on the banks of Jhelum River.

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9. An Interesting Fact

10. In Kashmir Valley, the meanders in Jhelum River are caused by the local base level provided by the erstwhile larger lake of which the present Dal Lake is a small part.

11. The Himachal and Uttarakhand Himalayas

12. This part lies approximately between the Ravi in the west and the Kali (a tributary of Ghaghara) in the east

13. It is drained by two major river systems of India, i.e. the Indus and the Ganga.

14. Tributaries of the Indus include the river Ravi, the Beas and the Satluj

15. The tributaries of Ganga flowing through this region include the Yamuna and the Ghaghara.

16. The northernmost part of the Himachal Himalayas is an extension of the Ladakh cold

Some Important facts of this region

KAREWAS

KAREWAS ARE THE THICK DEPOSITS OF GLACIAL CLAY AND OTHER MATERIALS EMBEDDED WITH MORAINES.

Important passes of the region are

1. Zoji La on the Great Himalayas

2. Banihal on the Pir Panjal
3. Photu La on the Zaskar
4. Khardung La on the Ladakh range.

Important fresh lakes

1. Dal
2. Wular

Salt water lakes such as

1. Pangong Tso
2. Tso Moriri

‘Valley of flowers’

1. The famous ‘Valley of flowers’ is also situated in this region.
2. The places of pilgrimage such as the Gangotri, Yamunotri, Kedarnath, Badrinath and Hemkund Sahib are also situated in this part.
3. The region is also known to have five famous Prayags (river confluences)

(ii) Himachal and Uttaranchal Himalayas

Great Himalaya or Himadri

1. Northern most range is known as the Great or Inner Himalayas or the ‘Himadri’.
2. ‘Himadri’. It is the most continuous range consisting of the loftiest peaks with an average height of 6,000 metres.
3. The folds of Great Himalayas are asymmetrical in nature.
4. The core of this part of Himalayas is composed of granite.

It is perennially snow bound, and a number of glaciers descend from this range. The Himalayan Mountains are

divided into three main parallel ranges.

Bhotia's

1. In the Great Himalayan range, the valleys are mostly inhabited by the Bhotia's.
2. These are nomadic groups who migrate to 'Bugyals' (the summer glasslands in the higher reaches) during summer months and return to the valleys during winters.

Himachal or lesser Himalaya

1. The range lying to the south of the Himadri forms the most rugged mountain system and is known as Himachal or lesser Himalaya.
2. The altitude varies between 3,700 and 4,500 metres and the average width is of 50 Km.
3. The Pir Panjal range forms the longest and the most important range
4. The Dhauladhar and the Mahabharat ranges are also prominent ones.
5. This range consists of the famous valley of Kashmir, the Kangra and Kullu Valley in Himachal Pradesh.
6. This region is well known for its hill stations

Shiwaliks

1. The outer most range of the Himalayas is called the Shiwaliks.
2. They extend over a width of 10-50 Km and have an altitude varying between 900 and 1100 metres.
3. These ranges are composed of unconsolidated sediments brought down by rivers from the main Himalayan ranges located farther north.
4. Covered with thick gravel called Alluvium.
5. The longitudinal valley lying between lesser Himalaya and the Shiwaliks are known as Duns.
6. Dehra Dun, Kotli Dun and Patli Dun are some of the well-known Duns.
7. The word shiwalik has its origin in the geological formation found in and around a place called Sivawala

near Dehra Dun

8. Which was once a headquarter of the Imperial Survey and which subsequently established its

permanent headquarters at Dehra Dun.

9. Dehra Dun is the largest of all the duns with an approximate length of 35-45 km and a width of 22-25 km.

Some of the important hill stations

1. Dharamshala
2. Mussoorie
3. Shimla
4. Kaosani

The cantonment towns and health resorts

1. Shimla
2. Mussoorie
3. Kasauli
4. Almora
5. Lansdowne
6. Ranikhet

The two distinguishing features of this region

1. The 'Shiwalik
2. 'Dun formations'

Some important duns

1. Chandigarh-Kalka dun
2. Nalagarh dun
3. Dehra Dun
4. Haridwar dun

5. The Kota dun

(iii) The Darjeeling and Sikkim Himalayas

1. They are flanked by Nepal Himalayas in the west and Bhutan Himalayas in the east.
2. It is relatively small but is a most significant part
3. Known for its fast-flowing Rivers such as Tista
4. It is a region of high mountain peaks like Kanchenjunga (Kanchengiri), and deep valleys.
5. The higher reaches of this region are inhabited by Lepcha tribes while the southern part, particularly the Darjiling Himalayas, has a mixed population of Nepalis, Bengalis and tribals from Central India.

6. The British, taking advantage of the physical conditions such as

- Moderate slope
- Thick soil cover
- High organic content
- Well distributed rainfall throughout the year
- And mild winters,

7. Introduced tea plantations

8. In place of the Shiwaliks here, the 'duar formations' are important
9. Which have also been used for the development of tea gardens

(iv) The Arunachal Himalayas

1. These extend from the east of the Bhutan Himalayas up to the Diphu pass in the east.
2. The general direction of the mountain range is from southwest to northeast.
3. Some of the important mountain peaks of the region are Kangtu and Namcha Barwa.
4. These ranges are dissected by fast-flowing rivers from the north to the south, forming deep gorges.
5. Bhramaputra flows through a deep gorge after crossing Namcha Barwa.
6. Some of the important rivers are
 - The Kameng

- Subansiri
- The Dihang
- The Dibang
- The Lohit.

7. An important aspect of the Arunachal Himalayas is the numerous ethnic tribal community inhabiting in these areas.

8. Some of the prominent ones from west to east are

- The Monpa
- Daffla
- Abor
- Mishmi
- Nishi
- The Nagas

9. Most of these communities practise Jhumming.

(v) The Eastern Hills and Mountains

1. These are part of the Himalayan mountain system having their general alignment from the north to the south direction
2. They are known by different local names
3. In the north, they are known as Pataki Bum, Naga Hills,
4. In the south as Mizo or Lushai hills.
5. Most of these ranges are separated from each other by numerous small rivers.
6. The Barak is an important river in Manipur and Mizoram.
7. The physiography of Manipur is unique by the presence of a large lake known as 'Loktak' lake at the

centre, surrounded by mountains from all sides.

8. Mizoram which is also known as the 'Molassis basin' which is made up of soft unconsolidated deposits.

9. Most of the rivers in Nagaland form the tributary of the Brahmaputra.

10. While two rivers of Mizoram and Manipur are the tributaries of the Barak River, which in turn is the tributary of Meghna;

Some Highest Peaks of the Himalayas

Peak	Country	Height in metres
Mt. Everest	Nepal	8848
Kanchenjunga	India	8598
Makalu	Nepal	848
Dhaulagiri	Nepal	8172
Nanga Parbat	India	8126
Annapurna	Nepal	8078
Nanda Devi	India	7817
Kamet	India	7756
Namcha Barwa	India	775
Gurla Mandhata	Nepal	7728

THE HIMALAYAS AND OTHER PENINSULAR MOUNTAINS

1. The Himalayas along with other peninsular mountains are young, weak and flexible in their geological structure

2. They are still subjected to the interplay of exogenic and endogenic forces,

3. Resulting in the development of faults, folds and thrust plains.
4. These mountains are tectonic in origin, dissected by fast-flowing rivers which are in their youthful stage.
5. Various landforms like (are indicative of these stages)
 - a) Gorges
 - b) V-shaped valleys
 - c) Rapids
 - d) Waterfalls

2) The Peninsular Plateau

1. Rising from the height of 150 m above the river plains up to an elevation of 600-900 m is the irregular triangle known as the peninsular plateau.
2. Delhi ridge in the northwest, (extension of Aravalis), the Rajmahal hills in the east, Gir range in the west and the Cardamom hills in the south constitute the outer extent
3. An extension of this is also seen in the northeast, in the form of Shillong and Karbi-Anglong plateau
4. This is one of the oldest and the most stable landmass of India.
5. The general elevation of the plateau is from the west to the east
6. This is also proved by the pattern of the flow of rivers.
7. Some of the important physiographic features of this region are tors, block mountains rift valleys, spurs, bare rocky structures, series of hummocky hills and wall-like quartzite dykes

On the basis of the prominent relief features, the peninsular plateau can be divided into three broad groups:

- (i) The Deccan Plateau
- (ii) The Central Highlands

(iii) The Northeastern Plateau

The Deccan Plateau

1. This is bordered by the Western Ghats in the west.
2. Eastern Ghats in the east and the Satpura.
3. Maikal range and Mahadeo hills in the north.
4. Western Ghats are locally known by different names such as Sahyadri in Maharashtra, Nilgiri hills in Karnataka and Tamil Nadu and Anaimalai hills and Cardamom hills in Kerala.
5. Western Ghats are comparatively higher in elevation and more continuous than the Eastern Ghats.
6. Their average elevation is about 1,500 m with the height increasing from north to south.
7. 'Anaimudi' (2,695 m), the highest peak of Peninsular plateau is located on the Anaimalai hills of the Western Ghats.
8. Most of the Peninsular rivers have their origin in the Western Ghats.
9. Eastern Ghats comprising the discontinuous and low hills are highly eroded by the rivers such as the Mahanadi, the Godavari, the Krishna, and the Kaveri.
10. Some of the important ranges include the Javadi hills, the Palconda range, the Nallamala hills, the Mahendragiri hills
11. The Eastern and the Western Ghats meet each other at the Nilgiri hills.

The Central Highlands

1. They are bounded to the west by the Aravali range.
2. The Satpura range is formed by a series of scarped plateaus on the south.
3. Generally at an elevation varying between 600-900 m above the mean sea level.
4. It is a classic example of the relict mountains which are highly denuded and form discontinuous ranges.

5. The extension of the peninsular plateau can be seen as far as Jaisalmer in the West.
6. The general elevation of the Central Highlands ranges between 700-1,000 m above the mean sea level.
7. It slopes towards the north and north-eastern directions.
8. Most of the tributaries of the river Yamuna have their origin in the Vindhyan and Kaimur ranges.
9. Banas is the only significant tributary of the river Chambal that originates from the Aravalli in the west.

The North-eastern Plateau

1. It is an extension of the main peninsular plateau.
2. Due to the force exerted by the north-eastward movement of the Indian plate at the time of the Himalayan origin, a huge fault was created between the Rajmahal hills and the Meghalaya plateau.
3. Later, this depression got filled up by the deposition activity of the numerous rivers.
4. Today, the Meghalaya and Karbi Anglong plateau stand detached from the main Peninsular Block.
5. The Meghalaya plateau is further sub-divided into three: Named after the tribal groups inhabiting this region.

(i) The Garo Hills

(ii) The Khasi Hills

(iii) The Jaintia Hills

6. An extension of this is also seen in the Karbi Anglong hills of Assam.
7. The Meghalaya plateau is also rich in mineral resources like coal, iron ore, sillimanite, limestone and uranium.
8. This area receives maximum rainfall from the south west monsoon.
9. The Meghalaya plateau has a highly eroded surface.

10. Cherrapunji displays a bare rocky surface devoid of any permanent vegetation cover.

Some quick facts

1. The northern boundary of the Peninsular Block may be taken as an irregular line running from Kachchh

along the western flank of the Aravali Range near Delhi and then roughly parallel to the Yamuna and the Ganga as far as the Rajmahal Hills and the Ganga delta.

2. The north-eastern parts are separated by the Malda fault in West Bengal from the Chotanagpur plateau.

3. The Peninsula is formed essentially by a great complex of very ancient gneisses and granites,

4. Since the Cambrian period, the Peninsula has been standing like a rigid block

5. As a part of the Indo-Australian Plate, it has been subjected to various vertical movements and block faulting.

6. The rift valleys of the Narmada, the Tapi and the Mahanadi and the Satpura block mountains are some examples of it.

7. The river valleys here are shallow with low gradients

8. Aravali hills, one of the oldest ranges of the world

9. The Vindhyas and the Satpuras are the important ranges.

10. The rivers Narmada and Tapi flow through these ranges.

11. These are west-flowing rivers that drain into the Arabian Sea.

12. Western Ghats are almost continuous,

13. The Eastern Ghats are broken and uneven

14. The plateau is rich in minerals like coal and iron-ore.

15. The western coastal plains are very narrow

16. The eastern Coastal plains are much broader

17. There are a number of east flowing rivers. The rivers Mahanadi, Godavari, Krishna and Kaveri drain

into the Bay of Bengal.

18. These rivers have formed fertile deltas at their mouth.

The Peninsula mostly consists of relict and residual mountains like

1. The Aravali hills
2. The Nallamala hills
3. The Javadi hills
4. The Veliconda hills
5. Palkonda range
6. The Mahendragiri hills

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3) INDO GANGETIC PLAINS

1. The third geological division of India comprises the plains formed by the river Indus, the Ganga and the Brahmaputra.
2. It was a geo-synclinal depression which attained its maximum development
3. During the third phase of the Himalayan mountain formation approximately about 64 million years ago.
4. Since then, it has been gradually filled by the sediments brought by the Himalayan and Peninsular rivers.
5. Average depth of alluvial deposits in these plains ranges from 1,000-2,000 m.

The Northern Plain

1. Formed by the interplay of the three major river systems, namely– the Indus, the Ganga and the Brahmaputra

2. Formed of alluvial soil
3. It spreads over an area of 7 lakh sq. km.
4. The plain being about 2400 Km long and 240 to 320 Km broad, is a densely populated physiographic division
5. The velocity of the river decreases which results in the formation of riverine islands
6. Majuli, in the Brahmaputra River is the largest inhabited riverine island in the world.
7. The rivers in their lower course split into numerous channels due to the deposition of silt
8. These channels are known as distributaries
9. The Northern Plain is broadly divided into three sections.
10. The Western part of the Northern Plain is referred to as the Punjab Plains. Formed by the Indus and its tributaries, the larger part of this plain lies in Pakistan.
11. The Indus and its tributaries—the Jhelum, the Chenab, the Ravi, the Beas and the Satluj originate in the Himalaya. This section of the plain is dominated by the doabs.
12. 'Doab' is made up of two words- 'do' meaning two and 'ab' meaning water
13. 'Punjab' is also made up two words- 'Punj' meaning five and 'ab' meaning water.
14. The Ganga plain extends between Ghaggar and Teesta rivers.
15. It is spread over the states of North India, Haryana, Delhi, U.P., Bihar, partly Jharkhand and West Bengal to its East, particularly in Assam lies the Brahmaputra plain.

From the north to the south these plains can be divided into three major zones -

Bhabar

1. The rivers, after descending from the mountains deposit pebbles in a narrow belt of about 8 to 16 km in width lying parallel to the slopes of the Shiwaliks.
2. As a result of this, the streams and rivers coming from the mountains deposit heavy materials of rocks and boulders.
3. All the streams disappear in this bhabar belt.

Terai

1. South of this belt, the streams and rivers re-emerge and create a wet, swampy and marshy region
2. This was a thickly forested region full of wildlife
3. The forests have been cleared to create agricultural land and to settle migrants from Pakistan after partition.

Alluvial Plains

1. The alluvial plains can be further divided into Khadar, Kankar and the Bhangar

Bhangar

1. The largest part of the northern plain is formed of older alluvium. They lie above the flood plains of the rivers and present a terrace like feature.

Kankar

1. The soil in this region contains calcareous deposits

Khadar

1. The newer, younger deposits of the flood plains
2. They are renewed almost every year and so are fertile, thus, ideal for intensive agriculture.

4) The Indian Desert

1. The Indian desert lies towards the western margins of the Aravali Hills.
2. It is a land of undulating topography dotted with longitudinal dunes and barchans.
3. Receives very low rainfall below 150 mm per year.
4. Arid climate with low vegetating cover.
5. This is also known as Marusthali.
6. Due to extreme arid conditions, its surface features have been carved by physical weathering and wind actions .

7. Some of the well pronounced desert land features present here are mushroom rocks, shifting dunes and oasis (mostly in its southern part).
8. Most of the rivers in this region are ephemeral.
9. There are some streams which disappear after flowing for some distance and present a typical case of inland drainage by joining a lake or playa.
10. The lakes and the playas have brackish water which is the main source of obtaining salt.
11. Luni is the only large river in this region
12. On the basis of the orientation, the desert can be divided into two parts
13. The northern part is sloping towards Sindh and the southern towards the Rann of Kachchh.

Barchans (crescent shaped dunes)

Cover larger areas but longitudinal dunes become more prominent near the Indo-Pakistan boundary.

5) The Coastal Plains (east & west)

- Peninsular plateau is flanked by stretch of narrow coastal strips, running along the Arabian Sea on the west and the Bay of Bengal on the east.
- Lakshadweep Islands are located in the Arabian Sea.
- These are coral islands located off the coast of Kerala.
- The Andaman and the Nicobar Islands lie to the southeast of the Indian mainland in the Bay of Bengal.

The western coast

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1. Sandwiched between the Western Ghats and the Arabian Sea, is a narrow plain. It consists of three

sections.

2. The northern part of the coast is called the Konkan (Mumbai – Goa),

3. The central stretch is called the Kannad Plain

4. The southern stretch is referred to as the Malabar Coast.

The plain along the Bay of Bengal are wide and level

Northern Circar

- In the northern part, it is referred to as the Northern Circar

Coromandal Coast

- The southern part is known as the Coromandal Coast.
- Large rivers such as the Mahanadi, the Godavari, the Krishna and the Kaveri have formed extensive delta on this coast.
- Lake Chilika is an important feature along the eastern coast
- The Chilika Lake is the largest salt water lake in India. It lies in the state of Orissa, to the south of the Mahanadi delta.

6) The Islands

1. The country has also two groups of islands.
2. Lakshadweep Islands group lying close to the Malabar coast of Kerala
3. This group of islands is composed of small coral islands.
4. It covers small area of 32 sq. km.
5. Kavaratti Island is the administrative headquarters of Lakshadweep.
6. This island group has great diversity of flora and fauna.
7. The Pitli Island, which is uninhabited, has a bird sanctuary

Corals

1. Coral polyps are short-lived microscopic organisms, which live in colonies

2. They flourish in shallow, mud free and warm waters.
3. They secrete hard rock like substance
4. The coral secretion and their skeletons from coral deposits in the form of reefs:
5. They are mainly of three kinds
 - Barrier reef
 - Fringing reef
 - Atolls
6. The Great Barrier Reef of Australia is a good example of the first kind of coral reefs. Atolls are circular or horse shoe shaped coral reefs

Andaman and Nicobar islands

1. Elongated chain of islands located in the Bay of Bengal extending from north to south
2. They are bigger in size and are more numerous and scattered.
3. Divided into two broad categories
 - The Andaman in the north
 - The Nicobar in the south
4. It is believed that these islands are an elevated portion of submarine mountains.
5. These islands lie close to equator and experience equatorial climate and have thick forest cover.
6. India's only active volcano is found on Barren Island in Andaman and Nicobar group of Islands.
7. Each region complements the other and makes the country richer in its natural resources.

Conclusion -

The northern mountains are the major sources of water and forest wealth.

The northern plains are the granaries of the country.

The plateau is a storehouse of minerals, which has played a crucial role in the industrialisation of the country.

The coastal region and island groups provide sites for fishing and port activities.

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CLIMATE

- Refers to the sum total of weather conditions and variations over a large area for a long period of time (more than thirty years).

Weather

- Refers to the state of the atmosphere over an area at any point of time.
- The elements of weather and climate are the same, i.e. temperature, atmospheric pressure, wind, humidity and precipitation.
- The word monsoon is derived from the Arabic word 'mausim' which literally means season.
- Monsoon' refers to the seasonal reversal in the wind direction during a year.
- The climate of India is described as the 'monsoon' type
- This type of climate is found mainly in the south and the Southeast Asia
- In the Thar Desert the day temperature may rise to 50°C, and drop down to near 15°C the same night.
- There is hardly any difference in day and night temperatures in the Andaman and Nicobar islands or in Kerala.

CLIMATIC CONTROLS

1. There are six major controls of the climate of any place

- Latitude
- Altitude
- Pressure
- Wind system
- Distance from the sea

- Ocean currents and relief features.

Latitude

- Due to the curvature of the earth, the amount of solar energy received varies according to latitude

Altitudes

- As one goes from the surface of the earth to higher altitudes, the atmosphere becomes less dense and temperature decreases. The hills are therefore cooler during summers.

Pressure and wind

- The pressure and wind system of any area depend on the latitude and altitude of the place. Thus it influences the temperature and rainfall pattern.

Distance from the sea

- The sea exerts a moderating influence on climate: As the distance from the sea increases, its moderating influence decreases and the people experience extreme weather conditions. This condition is known as continentality (i.e. very hot during summers and very cold during winters).

Ocean currents

- Ocean currents along with onshore winds affect the climate of the coastal areas, For example, any coastal area with warm or cold currents flowing past it, will be warmed or cooled if the winds are onshore.

Relief

- Plays a major role in determining the climate of a place. High mountains act as barriers for cold or hot winds; they may also cause precipitation if they are high enough and lie in the path of rain-bearing winds. The leeward side of mountains remains dry.

FACTORS AFFECTING INDIA'S CLIMATE

Latitude

1. The Tropic of Cancer passes through the middle of the country from the Rann of Kutch in the west

to Mizoram in the east

2. Almost half of the country, lying south of the Tropic of Cancer, belongs to the tropical area
3. All the remaining area, north of the Tropic, lies in the sub-tropics.
4. Therefore, India's climate has characteristics of tropical as well as subtropical climates.

Altitude

1. India has mountains to the north, which have an average height of about 6,000 metres.
2. India also has a vast coastal area where the maximum elevation is about 30 metres.
3. The Himalayas prevent the cold winds from Central Asia from entering the subcontinent.
4. It is because of these mountains that this subcontinent experiences comparatively milder winters as compared to central Asia.

Pressure and Winds

1. The climate and associated weather conditions in India are governed by the following atmospheric conditions:

- Pressure and surface winds;
- Upper air circulation;
- Western cyclonic disturbances and tropical cyclones.

2. India lies in the region of north easterly winds.
3. These winds originate from the subtropical high-pressure belt of the northern hemisphere.
4. They blow south, get deflected to the right due to the Coriolis force, and move on towards the equatorial low-pressure area.
5. Generally, these winds carry very little moisture as they originate and blow over land.
6. Therefore, they bring little or no rain. Hence, India should have been an arid land, but, it is not so

Coriolis force

An apparent force caused by the earth's rotation. The Coriolis force is responsible for deflecting winds towards

the right in the northern hemisphere and towards the left in the southern hemisphere. This is also known as

‘Ferrel’s Law’.

7. During winter, there is a high-pressure area north of the Himalayas.

8. Cold dry winds blow from this region to the low-pressure areas over the oceans to the south.

9. In summer, a low-pressure area develops over interior Asia as well as over north-western India.

10. This causes a complete reversal of the direction of winds during summer.

11. Air moves from the high-pressure area over the southern Indian Ocean, in a south-easterly direction, crosses the equator,

12. Turns right towards the low-pressure areas over the Indian subcontinent.

13. These are known as the Southwest Monsoon winds.

14. These winds blow over the warm oceans, gather moisture and bring widespread rainfall over the mainland of India.

Jet stream

1. The upper air circulation in this region is dominated by a westerly flow. An important component of this flow is the jet stream

2. These jet streams are located approximately over 27°-30° north latitude, therefore, they are known as subtropical westerly jet streams

3. Over India, these jet streams blow south of the Himalayas, all through the year except in summer.

4. The western cyclonic disturbances experienced in the north and north-western parts of the country are brought in by this westerly flow.

5. In summer, the subtropical westerly jet stream moves north of the Himalayas with the apparent movement of the sun.

Tropical easterly

An easterly jet stream, called the tropical easterly Jetstream blows over peninsular India, approximately over

14°N during the summer months.

Jet stream

These are a narrow belt of high altitude (above 12,000 m) westerly winds in the troposphere. Their speed

varies from about 110 km/h in summer to about 184 km/h in winter. A number of separate jet streams have

been identified. The most constant are the mid-latitude and the sub-tropical jet stream.

Western Cyclonic Disturbances

1. The western cyclonic disturbances are weather phenomena of the winter months brought in by the westerly flow from the Mediterranean region.
2. They usually influence the weather of the north and north-western regions of India
3. Tropical cyclones occur during the monsoon as well as in October -November, and are part of the easterly flow.
4. These disturbances affect the coastal regions of the country.

THE INDIAN MONSOON

1. The monsoons are experienced in the tropical area roughly between 20° N and 20° S.
2. To understand the mechanism of the monsoons, the following facts are important.
 - The differential heating and cooling of land and water creates low pressure on the landmass of India while the seas around experience comparatively high pressure.
 - (b) The shift of the position of Inter Tropical Convergence Zone (ITCZ) in summer, over the Ganga plain (this is the equatorial trough normally positioned about 5°N of the equator – also known as the monsoon trough during the monsoon season).

- (c) The presence of the high-pressure area, east of Madagascar, approximately at 20°S over the Indian Ocean. The intensity and position of this high-pressure area affects the Indian Monsoon.
- (d) The Tibetan plateau gets intensely heated during summer, which results in strong vertical air currents and the formation of high pressure over the plateau at about 9 km above sea level.
- (e) The movement of the westerly jet stream to the north of the Himalayas and the presence of the tropical easterly jet stream over the Indian peninsula during summer.

Inter Tropical Convergence Zone

1. The Inter Tropical Convergence Zone (ITCZ,) is a broad trough of low pressure in equatorial latitudes.
2. This is where the northeast and the southeast trade winds converge.
3. This convergence zone lies more or less parallel to the equator but moves north or south with the apparent movement of the sun.
4. Changes in the pressure conditions over the southern oceans also affect the monsoons.

Southern Oscillation or SO

1. Normally when the tropical eastern South Pacific Ocean experiences high pressure, the tropical eastern Indian Ocean experiences low pressure.
2. But in certain years, there is a reversal in the pressure conditions and the eastern Pacific has lower pressure in comparison to the eastern Indian Ocean.
3. If the pressure differences were negative, it would mean below average and late monsoons.

El Nino

1. A feature connected with the SO is the El Nino, a warm ocean current that flows past the Peruvian Coast
2. In place of the cold Peruvian current, every 2 to 5 years.

ENSO (El Nino Southern Oscillations)

- The changes in pressure conditions are connected to the El Nino. Hence, the phenomenon is referred to as ENSO

El Nino

1. This is a name given to the periodic development of a warm ocean current along the coast of Peru
2. It occurs when easterly trade winds in the tropical pacific relax- even reverse- to allow a vast pool of warm water piled up in of central and South America, leading to higher- than- normal sea- surface temperatures across the equatorial Pacific.
3. As a temporary replacement of the cold Peruvian current
4. El Nino' is a Spanish word meaning 'the child',
5. Refers to the baby Christ, as this current starts flowing during Christmas
6. As the ocean releases its heat and moisture to the atmosphere, intense thunderstroms once cooped up over the western pacific spread along the equator as well.
7. The presence of the El Nino leads to an increase in sea-surface temperatures and weakening of the trade winds in the region
8. The cumulative effect of this activity changes large scale circulation patterns at higher latitudes, altering storm tracks that change the typical distribution of rain and snowfall, as well seasonal temperatures.

THE ONSET OF THE MONSOON AND WITHDRAWAL

1. The Monsoon, unlike the trades, are not steady winds but are pulsating in nature, affected by different atmospheric conditions encountered by it

2. The duration of the monsoon is between 100-120 days from early June to mid-September.

'Burst 'of the monsoon,

- Around the time of its arrival, the normal rainfall increases suddenly and continues constantly for several days. This is known as the 'burst 'of the monsoon

3. The monsoon arrives at the southern tip of the Indian peninsula generally by the first week of June.

4. Subsequently, it divides into two – the Arabian Sea branch and the Bay of Bengal branch.

5. The Arabian Sea branch reaches Mumbai about ten days later on approximately the 10 Th of June.

6. The Bay of Bengal branch also advances rapidly and arrives in Assam in the first week of June.

7. The lofty mountains causes the monsoon winds to deflect towards the west

8. Over the Ganga plains

9. By mid-June the Arabian Sea branch of the monsoon arrives over Saurashtra-Kuchchh and the central part of the country.

10. The Arabian Sea and the Bay of Bengal branches of the monsoon merge over the north-western part of the Ganga plains.

11. Delhi generally receives the monsoon showers from the Bay of Bengal branch by the end of June

(tentative date is 29 Th of June).

12. By the first week of July, western Uttar Pradesh, Punjab, Haryana and eastern Rajasthan experience the monsoon.

13. By mid-July, the monsoon reaches Himachal Pradesh and the rest of the country

14. The withdrawal of the monsoon begins in north-western states of India by early September.

15. By mid-October, it withdraws completely from the northern half of the peninsula.

16. The withdrawal from the southern half of the peninsula is fairly rapid

17. By early December, the monsoon has withdrawn from the rest of the country.

18. The islands receive the very first monsoon showers, progressively from south to north,

19. From the first week of April to the first week of May.

20. The withdrawal, takes place progressively from north to south from the first week of December to the

first week of January.

THE SEASONS

1. The monsoon type of climate is characterised by a distinct seasonal pattern.

2. The weather conditions greatly change from one season to the other.

3. Any seasons are experienced in your place? Four main seasons can be identified in India –

- The cold weather season,
- The hot weather season
- The advancing monsoon
- The retreating monsoon

The Cold Weather Season (winter)

1. The cold weather season begins from mid-November in northern India and stays till February.

2. December and January are the coldest months in the northern part of India.

3. The northeast trade winds prevail over the country.

4. They blow from land to sea and hence, for most part of the country, it is a dry season.

5. Some amount of rainfall occurs on the Tamil Nadu coast from these winds as, here they blow from sea to land.

6. In the northern part of the country, a feeble high-pressure region develops, with light winds moving outwards from this area.

7. Influenced by the relief, these winds blow through the Ganga valley from the west and the northwest.

8. The weather is normally marked by clear sky, low temperatures and low humidity and feeble, variable winds.

9. A characteristic feature of the cold weather season over the northern plains is the inflow of cyclonic disturbances from the west and the northwest.

10. These low-pressure systems, originate over the Mediterranean Sea and western Asia and move into India, Along with the westerly flow.

‘Mahawat

They cause the much-needed winter rains over the plains and snowfall in the mountains. Although the total

amount of winter rainfall locally known as ‘mahawat ’is small, they are of immense importance for the cultivation of ‘rabi ’crops

The Hot Weather Season (summer)

1. Due to the apparent northward movement of the sun, the global heat belt shifts northward.
2. In March, the highest temperature is about 38° Celsius, recorded on the Deccan plateau.
3. In April, temperatures in Gujarat and Madhya Pradesh are around 42° Celsius.
4. In May, temperature of 45° Celsius is common in the north-western parts of the country
5. In peninsular India, temperatures remain lower due to the moderating influence of the oceans.

'Loo'

These are strong, gusty, hot, dry winds blowing during the day over the north and north-western India.

1. Sometimes they even continue until late in the evening
2. Direct exposure to these winds may even prove to be fatal

'Kaal Baisakhi'

In West Bengal, these storms are known as the 'Kaal Baisakhi' calamity for the month of Baisakh

Advancing Monsoon (The Rainy Season)

1. By early June, the low-pressure condition over the northern plains intensifies.
2. It attracts, the trade winds of the southern hemisphere.
3. These south-east trade winds originate over the warm subtropical areas of the southern oceans. They cross the equator
4. Blow in a south-westerly direction entering the Indian peninsula as the south-west monsoon.
5. As these winds blow over warm oceans, they bring abundant moisture to the subcontinent.
6. These winds are strong and blow at an average velocity of 30 km per hour.
7. Early in the season, the windward side of the Western Ghats receives very heavy rainfall, more than 250 cm

8. The Deccan Plateau and parts of Madhya Pradesh also receive some amount of rain in spite of lying in the rain shadow area.
9. The maximum rainfall of this season is received in the north-eastern part of the country.
10. Mawsynram in the southern ranges of the Khasi Hills receives the highest average rainfall in the world.
11. Rainfall in the Ganga valley decreases from the east to the west.
12. Rajasthan and parts of Gujarat get scanty rainfall.
13. Phenomenon associated with the monsoon is its tendency to have 'breaks' in rainfall.
14. It has wet and dry spells.
15. The monsoon rains take place only for a few days at a time.
16. These breaks in monsoon are related to the movement of the monsoon trough.
17. The trough and its axis keep on moving northward or southward
18. When the axis of the monsoon trough lies over the plains, rainfall is good in these parts
19. Whenever the axis shifts closer to the Himalayas, there are longer dry spells in the plains,
20. Widespread rain occur in the mountainous catchment areas of the Himalayan Rivers.
21. These heavy rain bring in their wake, devastating floods causing damage to life and property in the plains.
22. The frequency and intensity of tropical depressions too, determine the amount and duration of monsoon rains.

23. These depressions form at the head of the Bay of Bengal and cross over to the mainland.

24. The depressions follow the axis of the “monsoon trough of low pressure”.

25. The monsoon is known for its uncertainties.

26. The alternation of dry and wet spells vary in intensity, frequency and duration.

Retreating Monsoon (The Transition Season)

1. During October-November, with the apparent movement of the sun towards the south,

2. The monsoon trough or the low-pressure trough over the northern plains becomes weaker.

3. Gradually replaced by a high-pressure system.

4. The south-west monsoon winds weaken and start withdrawing gradually

5. By the beginning of October, the monsoon withdraws from the Northern Plains.

6. The months of October-November form a period of transition from hot rainy season to dry winter conditions.

7. Mawsynram, the wettest place on the earth is also reputed for its stalagmite and stalactite caves.

Cyclonic depressions

1. The low-pressure conditions, over north-western India

2. Get transferred to the Bay of Bengal by early November.

3. This shift is associated with the occurrence of cyclonic depressions,

4. Which originate over the Andaman Sea.

5. These cyclones generally cross the eastern coasts of India cause heavy and widespread rain.

6. These tropical cyclones are often very destructive.

7. Deltas of the Godavari, the Krishna and the Kaveri are frequently struck by cyclones, which cause great damage to life and property.

DISTRIBUTION OF RAINFALL

1. The western coast and north-eastern India receive over about 400 cm of rainfall annually.

2. It is less than 60 cm in western Rajasthan and adjoining parts of Gujarat, Haryana and Punjab.

3. Rainfall is equally low in the interior of the Deccan plateau, and east of the Sahyadris
4. A third area of low precipitation is around Leh in Jammu and Kashmir
5. The rest of the country receives moderate rainfall.