19. PHYSIOGRAPHY OF INDIA

India can be divided into six physiographic regions. They are

- The Himalayan Mountains
- Northern Plains
- The Great Indian Desert
- The Peninsular Plateau
- Coastal Plains
- Islands

The Himalayan Mountains

Himalaya Range or Himalaya Mountains also includes the Karakoram, the Hindu Kush, and other, lesser, ranges that extend out from the Pamir Knot. The Himalayan mountain system is the world's highest, and home to the world's highest peaks, the Eight-thousanders, which include Mount Everest and K2.

After Himalayan peaks, it is Aconcagua, in the Andes, at 6,962 metres, known to be the highest peak outside Asia. There are over 100 mountains in Himalaya system that exceeds 7,200 m. The main Himalayan ranges run from Indus river valley in the west to the Brahmaputra river valley in east forming an arc 2,400 km long, which varies in width from 400 km in the western Kashmir-Xinjiang region to 150 km in the eastern Tibet-Arunachal Pradesh region. In this 2400 kilometer long arc, there are three coextensive sub-ranges, with the northernmost, and highest, known as the Great or Inner Himalayas. Some other classifications divide the Himalayas into four mountain ranges viz. the Trans-Himalaya or the Tethys Himalaya, the Greater Himalaya, Lesser Himalaya and or Shivalik Himalaya.

Himalaya system gives rise to some of world's major river systems. The combined drainage basin is home to slightly less than half of world's population. The highest peak Everest is located in Nepal. Another peak K2 is on the border of Pakistan and China. Kanchenjunga is located on the border of Nepal and India. Nanda Devi is the highest peak within India.

Himalayan Orogeny

Geologically, the origin of the Himalayas is the impact of the Indian tectonic plate travelling northward at 15 cm per year to impact the Eurasian continent, about 40-50 million years ago. The formation of the Himalayan arc resulted since the lighter rock of the seabeds of that time was easily uplifted into mountains. The proof cited for this fact is that summit of Mount Everest is made of marine limestone.

Indian subcontinent was part of Gondwana and was separated from Eurasia by the Paleo-Tethys Ocean during Late Precambrian and the Paleozoic periods. Then, in the early Carboniferous, an early stage of rifting developed between the Indian continent and the Cimmerian Superterranes, which surrounded India in the Precambrian era towards north-eastern side.

During the Early Permian, this rift developed into the Neotethys Ocean. From that time on, the Cimmerian Superterranes drifted away from Gondwana towards the north. Nowadays, Iran, Afghanistan and Tibet are partly made up of these terrenes. Approximately 210 Million Years Ago, a major rifting episode split Gondwana in two parts. The Indian continent became part of East Gondwana, together with Australia and Antarctica. Later, the Indian plate broke off from Australia and Antarctica in the Early Cretaceous (130-125 Million Years Ago) with the opening of the "South Indian Ocean".

Around 85 Million Years Ago, during the Upper Cretaceous, the Indian plate began its very rapid northward drift covering a distance of about 6000 km, with the oceanic-oceanic subduction continuing until the final closure of the oceanic basin and the abduction of oceanic ophiolite onto India and the beginning of continent-continent tectonic interaction starting at about 65 Ma in the Central Himalaya.

This rapid relative speed between the Indian and Asian plates was very fast (18-19.5 cm/yr), and it later became fast (4.5 cm/yr) at 55 Million Years Ago. Since then there has been about 2500 km of crustal shortening and rotating of India by 45° counterclockwise in North-western Himalaya to 10°-15° counterclockwise in North Central Nepal relative to Asia.

During this process, most of the oceanic crust was "simply" subducted below the Tibetan block during the northward motion of India.

But a question where the continental crust of 2500 kilometers gone, which India travelled during this period has been largely under studies. Several theories have been put forward to explain what happened, since collision, to the 2500 km of "missing continental crust".

The first mechanism says that is 2500 kilometer continental crust also got subducted below Tibet.

Second is the extrusion or escape tectonics mechanism (Molnar & Tapponnier 1975) which sees the Indian plate as an indenter that squeezed the Indochina block out of its way. The third proposed mechanism is that a large part (-1000 km (Dewey, Cande & Pitman 1989) or -800 to -1200 km] of the 2500 km of crustal shortening was accommodated by thrusting and folding of the sediments of the passive Indian margin together with the deformation of the Tibetan crust. Out of them, it is the last mechanism which explains the creation of the high topographic relief of the Himalaya.

Classification of the Himalaya System

The Indian Himalayan region (IHR) with 250-300 km across stretches over 2,500 km from Jammu & Kashmir in the west to Arunachal Pradesh in the east. This great chain of mountains in Indian territory extends all along the northern border of the country from the eastern border of Pakistan on the west to the frontiers of Myanmar in the east covering partially/fully twelve states of India, viz., Jammu & Kashmir, Himachal Pradesh, Uttaranchal, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya and hills of Assam & West Bengal. This region represents about 16.2% of total area and 3.86% of total population of India. The region is vast, rugged and versatile. It supportsremarkable cultural, ethnic and biological diversity. Multiple ethnic compositions are a striking feature of the region; more than a third of all scheduled tribes of India inhabit the region. Ethnic spectra of central and western Himalaya differ conspicuously from that of the north eastern Himalaya. The region is characterized by mountain specificities viz. inaccessibility, fragile, marginality, diversity (heterogeneity), niche (natural suitability) and adaptability. The region occupies the strategic position of entire northern boundary (North-West to North-East) of the nation and contains snow-clad peaks, glaciers of higher Himalaya and dense forest cover of mid-Himalaya.

Some scholars don't confine the extent of Himalayas between the Indus and Brahmaputra rivers and opine that Himalayas extend beyond Indus in the form ofHazara, Sulaiman, Bugati and Makaran ranges that spread up to the Arabian Sea. In the same opinion, in east, Himalayas extend till Bay of Bengal in the form of Indo-Myanmar hills, Arakan Yoma and Tenasirim ranges.

In others view, Himalayas extend from Indus in the west to beyond the Brahmaputra Gorge in the east.

The Himalaya extends like a curve of parallel ranges for nearly 2500 kilometres across southern Asia. The young fold mountains consist of a series of parallel ranges with deep valleys between them. Being young fold mountains, Himalaya has variety of rock structures, deep gorges and high pyramidal peaks. In High Himalayas the rivers have steep gradients, which result from the differential uplift of the High Himalayas. It has been suggested that a long and narrow arc of High Himalayas has been uplifted during quaternary. The classification of the Himalayan Ranges is done on three bases viz. Geographical, Regional and Geological.

Geographical Regions of Himalaya

Himalayas can be divided into several regions, which are distinct in flora and fauna also. These different regions, demarcated at various thrust and faults, make the climate of Himalayas diverse. The climate ranges from tropical at the base of the mountains to permanent ice and snow at the highest elevations. The amount of yearly rainfall increases generally from west to east along the front of the range. This diversity of climate, altitude, rainfall and soil conditions generates enormous biodiversity region making it one of the Biodiversity Hotspots of the world. Himalayas can be divided into the following ecological regions:

1. The Terai belt
2. Bhabhar belt
3. Shiwalik Hills & Inner Terai
4. Lesser Himalayas
5. Midlands
6. Greater Himalaya
7. Trans-Himalaya

Terai belt

Terai belt is the zone of sand and clay soils at the junction of northern plains and Himalayas. As the name suggests, Terai region gets higher rainfall than the plains. The speed of the Himalayan Rivers is slowed down in the Terai region and these rivers deposit fertile silt during the monsoons. The water table in this region is high and vegetation is largely savannah in a mosaic of deciduous and evergreen forests called Terai-Duar forests.

Bhabhar belt

Bhabar belt is located above the Terai belt, also sometimes known as Himalayan foothills. It is made up of porous and rocky soils that get made of the debris washed down from the higher ranges. The climate here is subtropical and vegetation is Himalayan subtropical pine forests and Himalayan subtropical broadleafforests. The Himalayan subtropical pine forests are dominated by Chir trees and Himalayan subtropical broadleafforests are dominated by the sal tree (Shorea robusta).

Shivalik Hills & Inner Terai

Shivaliks or Churia or Margalla Hills are the outermost range of foothills extending across the Himalayan region through Pakistan, India, Nepal and Bhutan. This is mainly located along a Himalayan Frontal Thrust (HFT], The vegetation here is dominated by Himalayan subtropical pine and broadleaf forests. The Inner Terai valleys are open valleys north of Shiwalik Hills or nestled between Shiwalik sub ranges. Examples include Dehra Dun in India and Chitwan in Nepal.

Lesser Himalaya

Lesser Himalaya is also known as Mahabharat Zone. The hills here range 2000 to 3000 meters and are located along the Main Boundary Thrust (MBT] fault zone. This zone is home to some of the deepest canyons in the world. The vegetation here is Himalayan subtropical forests.

Midlands

This region is located north of the Mahabharata range or Lesser Himalaya. It is located along the Main Central Thrust fault zone, where the Greater Himalaya begin. Here the vegetation is along with coniferous forests along with broadleaf forests.

Greater Himalya

The Great Himalayas which is a single range and the oldest of the three ranges with a height above 6,000 m including Mount Everest, K2 and Kanchendzonga and nine of the 14 highest peaks in the world. Greater Himalayas is located north of the Main Central Thrust Here the highest ranges rise abruptly into the realm of perpetual snow and ice. The vegetation here is Himalayan alpine shrub and meadows. The shrublands are composed of junipers as well as a wide variety of rhododendrons. They also possess a remarkable variety of wildflowers. Valley of Flowers National Park in the western Himalayan alpine shrub and meadows contains hundreds of species. The upper limit of the grasslands increases from west to east, rising from 3,500 meters to 5,500 meters.

Trans-Himalayas

The trans-Himalaya is the rain-shadow region just behind the main peaks of the towering Himalayan Mountains. Notable places of the trans-Himalayas include the Tibetan Plateau, the Ladakh area of the Northern Indian Himalayas (Indus Valley) along with the Lahaul-Kinnaur-Spiti region and in north-western Nepal the Dolpo/Dolpa, Mustang, Manang Humla and Mugu areas. The Trans-Himalayas, mainly composed of granites and volcanic rocks of Neogene and Paleogene age are bounded by the Kailas (southwest), Nganglong Kangri (north), and Nyainqentanglha (southeast) mountain ranges and by the Brahmaputra River.

Regional Divisions of Himalayas

From westto East, Himalayas have been divided into:

- The Kashmir Himalayas
- The Himachal Himalayas
- The Kumaun Himalayas
- The Central & Sikkim Himalayas
- The Arunachal Himalayas and Purvachal Himalayas

The Kashmir Himalayas

The Kashmir Himalayas has the largest number of Glaciers in India. The Ladakh region of the Kashmir Himalayas is India's Cold Desert Biosphere reserve.

A special feature of the valleys of Kashmir Himalayas is the Karewa deposits which are made up of silt, clay and sand. The Karewas are known for saffron cultivation and have orchards of fruits and dry fruits such as apple, peach, almond, and walnut. The major characters of Kashmir Himalayas are Glaciers, snow peaks, deep valleys and High Mountain passes. The important passes are Pir- Panjal, Banihal, Zoji-La, Saser-La, Chang-La, Jara-La etc.

The Himachal Himalayas

Himachal Himalayas are spread in Himachal Pradesh. The Rohtang Bara-Lacha, Shipki-La are important passes joining India and China. The valleys of Kullu, Kangra, Manali, Lahaul, Spiti are known for orchards and tourist spots.

The Kumaun Himalayas / Central Himalayas / Garhwal Himalayas

Kumaun Himalayas are located between the Sutlej and Kali rivers. They are home to India's highest peak Nanda Devi. Other peaks located in Kumaun Himalayas are Kamet, Trishul, Badrinath, Kedarnath, Dunagiri, Gangotri etc. Gangotri and Pindar are important glaciers.

Garhwal Himalaya versus Kumaon Himalaya

The western part of Kumaon Himalaya is known as Garhwal Himalayan while East as Kumaon. Geographically, Garhwal Himalaya lies between the lat. 29°31' 9" N and 31°26' 5"N and long. 77°33' 5"E and 80°6' 0"E with a total geographical area of 29,089 km.

The Sikkim (Central) Himalayas

Sikkim Himalayas are located beyond the Kali River up to the Teesta River. Most of them are located in Nepal and known as Central Himalayas. These Himalayas are home to highest peaks of Himalayas such as Everest, Kanchenjunga, Makalu, Dhaulagiri, Annapurna etc. It is characterized by very few passes. Two passes viz. Nathu La and Jelep-La are important as they connect India's Sikkim to Tibet of China.

Eastern Himalayas & Purvanchal Hills

The Eastern Himalayas occupy the Arunachal Pradesh and Bhutan. The important hills in this region are Aka Hills, Daphla Hills, Miri Hills, Mishmi Hills, Namcha Barwa etc. The Dihang and Debang passes of Arunachal Pradesh are its parts. Passing from Arunachal Pradesh, there is an eastward extension of the Himalayas in the north-eastern region of India. This is known as Purvanchal Hills. Purvanchal Hills comprises the Patkai hills, the Manipur hills, Bairal range, the Mizo hills and the Naga hills. It is a densely forested area, mainly composed of strong sandstones.

Geological Divisions of Himalayas

From a geological point of view, Himalayas can be divided into four zones. These zones are identified on the basis of age and composition of the rocks.

- Tibetan Region: This region lies north of the Greater Himalayas. Rocks in this region date back from the Palaeozoic Era to Pleistocene Epoch.
- Central or Himalayan Zone: This zone has Isoclinal folds and it includes the Greater Himalayas and some parts of Lesser Himalayas. The Isoclinal folds are essentially parallel to each other and thus approximately parallel to the axial plane. This region has abundant rocks such as granite as well as metamorphic rocks like schists and gneiss. This region also has sedimentary rocks.
- Himalayan Nappe Zone: A nappe (literally means tablecloth] is a large sheetlike body of rock that has been moved some kilometers away from its original position. Nappes form during continental plate collisions, when folds are sheared so much that they fold back over on themselves and break apart. The resulting structure is a large-scale recumbent fold. The nappes are most common in Kashmir and Kumaun Himalayas.
- Outer or Sub-Himalayan Zone: This zone includes the Siwalik range which is mainly composed of sedimentary deposits of upper tertiary period. This implies that the Shivalik hills are mainly derived from the eroded material of the main Himalayan ranges.

Important Mountain passes in Himalayas

The rugged terrain makes few routes through the mountains possible. Some of these routes include:

- Banihal is an important pass connecting the hill areas of Jammu to the Kashmir Valley. The Jawahar Tunnel (named after Pandit Jawaharlal Nehru), inaugurated in December 1956, was constructed for round-the-year surface transport
- Zoji La lies between the valley of Kashmir and the Kargil district, and is the only Western entrance to the highlands of Ladakh.
- Rohtang Pass in Himachal Pradesh, India.
- Mohan Pass is the principal pass in the Shiwalik Hills, the southernmost and geologically youngest foothills running parallel to the main Himalayas in Sikkim.
- Kora La at 4,594 meters elevation on the Nepal-Tibet border at the upper end of Mustang. The Kali Gandaki Gorge transects the main Himalaya and Transhimalayan ranges. Kora La is the lowest pass through both ranges between K2 and Everest, but some 300 metres higher than Nathula and Jelepla passes further east between Sikkim and Tibet.
- Aghill Pass: Situated to the north of K2 in the Karakoram at an elevation of5000 meters, joins Ladakh with the Xinjiang Province of China.

- Bara-Lacha: Bara-lacha la also known as Bara-lacha Pass is located in the Zanskar range connecting Lahaul district in Himachal Pradesh to Ladakh in Jammu and Kashmir, situated along the Leh-Manali highway.
- Bomdi-La: It connects Arunachal Pradesh with Lhasa, the capital of Tibet.
- Chang-La: The Changla Pass or Chang La Pass el. 5,360 m is located in Ladakh, India. It is the third highest motorable road in the world.
- Debsa Pass: Debsa Pass is a 5,360-metre (17,590 ft) high mountain pass in the Himalaya mountains between the Kullu and Spiti Districts of Himachal Pradesh.
- Dihang-Debang: Situated in the state of Arunachal Pradesh at an elevation of about 4000 feet this pass connects Arunachal Pradesh with Mandalay (Myanmar). The Dihang-Debang Biosphere reserve is located around this area.

Important Peaks of Himalayas

Eastern Himalayas versus Western Himalayas

Himalayas are also divided in terms of Eastern and Western Himalayas, the two parts which are different from each other in many ways.

The following table makes these important distinctions:

Some more observations:

- Western Himalayas are above 36°N Lat. (Mt. Godwin-Austin), and eastern Himalayas are below 28°N Lat (Kanchenjunga), Thus the 8° difference in the latitude between the two ends of the Himalayas has affected the altitude of the regional snowline so that it is lower in western Himalayas and higher in the east..
- The difference in the observed level of the snowline in western and eastern Himalayas is also due to yearly changes in the climatic conditions of the region. In the Himalayas, volume of precipitation changes from year to year, and with that the altitude at which snow falls also changes. In the years of high precipitation, often snow falls at lower altitude than the years of low precipitation.
- Himalayas are oriented east-west and their southern slopes are in direct sunshine for a larger part of the year so the snowline on the southern slopes of the ridges is higher than the northern slopes.
- Volume of precipitation decreases from the south towards the north, therefore southern ranges in eastern Himalayas have lower snowline than the northern ranges.
- Volume of precipitation increases with altitude.

The Northern Slopes and Southern Slopes of Himalayas

The Southern slopes in Himalayan region are covered with thick vegetation, while the northern slopes are generally barren. The reasons are many. The first is that Southern slopes receive more precipitation, as we all know and northern slopes in a rain shadow area. Further, the northern slopes usually receive sun rays only for a few hours during the day at a low angle. The southern slopes receive comparatively vertical rays during the middle of the day. As a result, southern slopes being warmer fall in the area of greater evapotranspiration, and that is why the vegetation is up to a higher altitude in southern slopes. Longer periods of sunshine also have an effect on the volume of snow accumulation on the southern slopes. Due to longer period of sunshine, less snow accumulates on the southern slopes than on the northern slopes. That is why; the snowline on southern slopes is lower in comparison to the northern slopes.

Great Plains

The Indo-Gangetic plains or the Great Plains are large alluvial plains dominated by three main rivers, the Indus, Ganges, and Brahmaputra. The great plains of India run parallel to the Himalayas, from Jammu and Kashmir in the west to Assam in the east, and drain most of northern and eastern India. The plains stretch 2400 kilometers from west to east and encompass an area of 700,000 km^2.

The major rivers in this region are the Ganges, Indus, and Brahmaputra along with their main tributaries- Yamuna, Chambal, Gomti, Ghaghara, Kosi, Sutlej, Ravi, Beas, Chenab, and Teesta—as well as the rivers of the Ganges Delta, such as the Meghna.The Great plain is home to nearly 1/7 of the world's population. It is bound on the north by the abruptly rising Himalayas, which feed its numerous rivers and are the source of the fertile alluvium deposited across the region by the two river systems. The southern edge of the plain is marked by the Vindhya- and Satpura Range, and the Chhota Nagpur Plateau. On the west

rises the Iranian Plateau.The Great Plains of India consists largely of alluvial deposits brought down by the rivers originating in the Himalayan and the peninsular region. The exact depth of alluvium has not yet been fully determined. As per recent estimates the average depth of alluvium in the southern side of the plain (north of Bundelkhand] varies between 1300 to 1400 meters, while towards the Shivaliks, the depth of alluvium increases. The maximum depth of alluvium has been recorded in Harvana near Ambala and Yamunanagar.

Divisions of Great Plain

Great plains are generally classified into four divisions:

The Bhabar belt

Bhabar belt is adjacent to the foothills of the Himalayas and consists of boulders and pebbles which have been carried down by the river streams. As the porosity of this belt is very high, the streams flow underground. The Bhabar is generally narrow about 7-15 km wide. Bhabar is wider in the western plains in comparison to the eastern plans of Assam. The porosity of Bhabar is so high that most of the narrow streams get disappeared in this belt only and some of them go underground. This is also one reason that it is not suitable for crops and only big trees are able to survive.

Thus, Bhabar belt is a narrow belt that is located above the Terai belt, also sometimes known as Himalayan foothills. It is made up of porous and rocky soils that get made of the debris washed down from the higher ranges. Streams disappear in this belt.

The Terai belt

The Terai belt lies next to the Bhabar region and is composed of newer alluvium. The underground streams reappear in this region. The region is excessively moist and thickly forested. It also receives heavy rainfall throughout the year and is populated with a variety of wildlife. The Terai tract lies south of the Bhabar belt. The tract is marshy and lots of mosquitoes thrive there. The Terai belt is wider in eastern side especially in the Brahmaputra valley. The high rainfall, newer alluvium makes it excessive damp and lots of forests are found here. This implies that Terai belt is rich in biodiversity. Over the period of time, the forests have been cleared in various states such as Uttarakhand, Uttar Pradesh, Haryana, Punjab, and Jammu Divisions for cultivation of crops. Terai belt is known for the good cultivation of sugar-cane, rice, wheat, maize, oilseeds, pulses, and fodder.

The Bhangar belt

This is the largest part of the Northern Plains made up of old alluvium and forms the alluvial terrace of the flood plains. The soil in this region consists of calcareous deposits called kankar. The Bangar or Bhangar belt consists of older alluvium. In the Gangetic plains, it has a low upland covered by Laterite deposits. The Bhangar formations were deposited during the middle Pleistocene Period. The Bhangar land lies above the flood limits of the rivers. The older alluvium soil is dark in colour, rich in humus content and productive. Bhangar is generally a well drained and the most productive land of the Great Plains of India.

The Khadar belt

The Khadar belt lies in lowland areas after the Bhangar belt. It is made up of fresh newer alluvium which is deposited by the rivers flowing down the plain. The Khadar tracts are enriched by fresh deposits of silt every year during the rainy season. The Khadar land consists of sand, silt, clay and mud. After Independence, most of the Khadar land has been brought under cultivation and devoted to sugarcane, rice, wheat, maize, oilseeds, legumes, and fodder crops.

The Delta Plains

The deltaic plain is an extension of the Khadar land. It covers about 1.9 lakh sq km of area in the lower reaches of the Ganga River. It is an area of deposition as the river flows in this tract sluggishly. The deltaic plain consists mainly of old mud, new mud and marsh. In the delta region, the uplands are called 'Char' while marshy areas are known as 'Bili. The delta of Ganga being an active one, is extending towards the Bay of Bengal.

Importance of Great Plains

The Indo-Gangetic belt is the world's most extensive expanse of uninterrupted alluvium formed by the deposition of silt by the numerous rivers. The plains are flat and mostly treeless, making it conducive for irrigation through canals. The area is also rich in ground water sources. The plains are the world's most intensely farmed areas. The main crops grown are rice and wheat, which are grown in rotation. Others include maize, sugarcane and cotton. The Indo-Gangetic plains rank among the world's most densely populated areas. The Great Plains of India are covered with one of the most productive soils of the world. Its soils have the capacity to grow any crop of the tropical and temperate regions. The plains are often termed as the 'Granary of

India'. Most of the rivers traversing the Northern Plains of India are perennial in nature. A number of canals have been carved out of these rivers which make agriculture more remunerative and sustainable. The water table is high and suitable for tube well irrigation. The gentle gradient makes it navigable over long distances.

The Thar Desert

Thar Desert or Great Indian Desert is the world's ninth largest desert. It forms a significant portion of western India and covers an area of about 200,000 km^2 to about 238,700 km^2. In Pakistan is continues as Cholistan Desert. Most of the Thar Desert is situated in Rajasthan, covering 61% of geographic area of Raiasthan. About 10 percent of this region comprises sand dunes, and the remaining 90 percent consist of craggy rock forms, compacted salt-lake bottoms, and interdunal and fixed dune areas. Annual temperatures can range from 0°C in the winter to over 50°C during the summer. Most of the rainfall received in this region is associated with the short July-September southwest monsoon thatbrings around 100-500 mm of precipitation. Water is scarce and occurs at great depths, ranging from 30 to 120 m below the ground level. Rainfall is precarious and erratic, ranging from below 120 mm in the extreme west to 375 mm eastward. The soils of the arid region are generally sandy to sandy-loam in texture. The consistency and depth vary as per the topographical features. The low-lying loams are heavier and may have a hard pan of clay, calcium carbonate or gypsum.

Origin of Thar Desert

The origin of the Thar Desert is a controversial subject. Some consider it to be 4000 to 10,000 years old, whereas others state that aridity started in this region much earlier. Another theory states that area turned to desert relatively recently: perhaps around 2000 - 1500 BC. Around this time the Ghaggar-Hakra ceased to be a major river. It now terminates in the desert but at one time was a water source for the Indus Valley Civilization centre of Mohenjodaro.

It has been observed through remote sensing techniques that Late Quaternary climatic changes and neotectonics have played a significant role in modifying the drainage courses in this part and a large number of palaeochannels exist Most studies did not share the opinion that the palaeochannels of the Sarasvati River coincide with the bed of the present-day Ghaggar and believe that the Sutlej along with the Yamuna once flowed into the present riverbed. It has been postulated that the Sutlej was the main tributary of the Ghaggar and that subsequently the tectonic movements might have forced the Sutlej westwards, the Yamuna eastwards and thus dried up the Ghaggar-Hakra. Studies on Kalibangan in the desert region by Robert Raikes indicate that it was abandoned because the river dried up. Prof. B. B. Lai (retd. Director General of Archaeological Survey of India) supports this view by asserting: "Radiocarbon dating indicates that the Mature Harappan settlement at Kalibangan had to be abandoned around 2000-1900 BCE.

And, as the hydrological evidence indicates, this abandonment took place on account of the drying up of the Ghaggar-Hakra. This latter part is duly established by the work of Raikes, an Italian hydrologist, and of his Indian collaborators", (source: wikipedia)

Peninsular India

The Peninsular India comprises the diverse topological and climatic patterns of South India. The Peninsula is in shape of a vast inverted triangle, bounded on the west by the Arabian Sea, on the east by the Bay of Bengal and on the north by the Vindhva and Satpura ranges. The line created by the Narmada River and Mahanadi river is the traditional boundary between northern and southern India. Covering an area of about 16 Lakh km^2, the peninsular upland forms the largest physiographic division of India. It is bounded by the Aravallis in the North West, Hazaribagh and Rajmahal Mis in the northeast, the Western Ghats (Sahayadri Mountains) in the west and the Eastern Ghats in the east.

- The highest peak of Peninsular India is Anamudi that is 2695 metres above sea level.

The narrow strip of verdant land between the Western Ghats and the Arabian Sea is the Konkan region; the term encompasses the area south of the Narmada as far as Goa. The Western Ghats continue south, forming the Malnad (Canara) region along the Karnataka coast, and terminate at the Nilgiri mountains, an inward (easterly) extension of the Western Ghats. The Nilgiris run in a crescent approximately along the borders of Tamil Nadu with northern Kerala and Karnataka, encompassing the Palakkad and Wayanad hills, and the Satyamangalam ranges, and extending on to the relatively low-lying hills of the Eastern Ghats,

on the western portion of the Tamil Nadu-Andhra Pradesh border. The Tirupati and Anaimalai hills form part of this range.

The Deccan plateau, covering the major portion of the states of Maharashtra, Karnataka and Tamil Nadu, is the vast elevated region bound by the C-shape defined by all these mountain ranges. No major elevations border the plateau to the east, and it slopes gently from the Western Ghats to the eastern coast.

The Peninsular India can be divided into following:

A. Central Highlands
B. Deccan Plateau
C. Western Ghats or Sahayadri
D. The Eastern Ghats

Central Highlands

The northern central highlands of peninsular India include the Aravallis, the Malwa Plateau, and some parts of Vindhyan Range.

Aravallis :

Aravallis Range literally meaning 'line of peaks' running approximately 800 km from northeast to southwest across states of Rajasthan. Harvana. and Gujarat and Pakistan's provinces of Punjab and Sindh. The northern end of the range continues as isolated hills and rocky ridges into Haryana state, ending in Delhi. The famous Delhi Ridge is the last leg of the Aravalli Range, which traverses through South Delhi and terminates into Central Delhi. The southern end is at Palanpur near Ahmadabad. Gujarat. The highest peak is Guru Shikhar in Mount Abu. Rising to 1722 meters, it lies near the southwestern extremity of the range, close to the border with the Gujarat. The city of Udaipur with its lakes lies on the south slope of the range in Rajasthan. Numerous rivers arises amidst the ranges including, Banas River, Luni River, Sakhi, Sabarmati River. The Great Boundary Fault fGBF! separates the Aravallis from the Vindhvan Mountains.

Origin of Aravallis:

The Aravallis Range is the eroded stub of a range of ancient folded mountains that rose in a Precambrian event called the Aravalli-Delhi Orogeny. The range joins two of the ancient segments that make up the Indian craton, the Marwar segment to the northwest of the range, and the Bundelkhand segment to the southeast. It has been postulated that the Aravalli peaks were extremely high once but since have worn down almost completely by millions of years of weathering. In stark contrast Himalayas are continuously rising young fold mountains of today. Aravallis is rich in mineral resources. The erosion of Aravalli has a great concern for the environment because the ranges from a natural barrier against the spread of the Thar desert northwards into the Gangetic plains in the Gangetic basin and Gujarat.

Malwa Plateau

The Malwa region occupies a plateau in western Madhya Pradesh and south-eastern Rajasthan with Gujarat in the west.

- The region includes the Madhya Pradesh districts of Dewas, Dhar, Indore, Jhabua, Mandsaur, Neemuch, Rajgarh, Ratlam, Shajapur, Ujjain, and parts of Guna and Sehore.
- Rajasthan districts of Jhalawar and parts of Banswara and Chittorgarh.
- The plateau is bound in north-east by the Hadoti region, in the north-west by the Mewar region, in the west by the Vagad region and Gujarat. To the south and east is the Vindhya Range and to the north is the Bundelkhand upland. The average elevation of the plateau is 450-500 m.

The western part of the Malwa Plateau is drained by the Mahi River, while the Chambal River drains the central part, and the Betwa River and the headwaters of the Dhasan and Ken rivers drain the east. The Shipra River is of historical importance because of the Simhasth mela, held every 12 years. Other notable rivers are Parbati, Gambhir and Choti Kali Sindh.

- The Vindhya Range marks the southern boundary of the plateau, and is the source of many rivers of the region.

Vegetation in the Malwa Plateau is tropical dry forest, with scattered teak [Tectona grandis] forests. The other main trees are Butea, Bombax, Anogeissus, Acacia, Buchanania and Boswellia. The shrubs or small trees include species of Grewia, Ziziphus mauritiana, Casearia, Prosopis, Capparis, Woodfordia, Phyllanthus, and Carissa. The Malwa plateau is considered to be an extension of the Deccan Traps and was formed at the end of Cretaceous period. Black. Brown and Bhtatori or stony soil is abundant in the Malwa Plateau. The black soil requires less irrigation because of its high capacity for moisture retention. The other two soil types are lighter and have a higher proportion of sand.

Vindhyan Range

The Vindhyan range is bounded by the Central Highlands on the south and the Aravalis on the northwest. It extends from Jobat (Gujarat] and Chittorgarh (Rajasthan] to Sasaram in Bihar for about 1050 km with general elevation between 450 to 600 metres. The western end of the Vindhyan range is in Gujarat at the eastern side of the Gujarat peninsula, near the border with Rajasthan and Madhya Pradesh. Reaching the sub-continent proper, the range runs east and north nearly to the Ganges River at Mirzapur. The area to the north and west of the range are arid and inhospitable, located in the shadow of both the Vindhya and the higher Aravalli range to the south blocking the prevailing winds.

The southern slopes of the Vindhyan Range are drained by the Narmada River, which proceeds westward to the Arabian Sea in the wide valley between the Vindhya Range and the parallel Satpura Range farther to the south. The northern slopes of the range are drained by tributaries of the Ganges, including the Kali Sindh, Parbati, Betwa, & Ken (both are tributary of the Yamuna,), Son & Tamsa or Tons both are tributary of the Ganges, drains the southern slopes of the range at its eastern end.

Vindhyachal Plateau

The Vindhyachal plateau lies to the north of the central part of the range. The cities of Bhopal, the capital of Madhya Pradesh, and Indore lie on this plateau, which rises higher than the Indo-Gangetic plain to its north.

Satpura Range

The Satpura range parallels the Vindhya Range to the north, and these two east-west ranges divide Indian Subcontinent into the Indo-Gangetic plain of northern India and the Deccan Plateau of the south. Satpura range rises in eastern Gujarat state near the Arabian Sea coast, running east through the border of Maharashtra and Madhya Pradesh to the east till Chhattisgarh.

- The Narmada River originates from north-eastern end of Satpura & runs in the depression between the Satpura and Vindhya ranges, draining the northern slope of the Satpura range and southern slopes of Vindhyan range, running west towards the Arabian Sea.
- The Tapti River originates from eastern-central part of Satpura, crosses the range in the center & further runs at the southern slopes of Satpura towards west meeting the Arabian Sea at Surat, draining central & the southern slopes of the Satpura Range.
- Please note that Mount Dhupgarh or Dhoopgarh is the highest point in the Satpura Range and in Madhya Pradesh, India. Located near Pachmarhi, it has an elevation of 1,350 metres.

The Chhotanagpur Plateau

Chhotanagpur Plateau covers much of Jharkhand state. It also covers the adjacent parts of Odisha, West Bengal, Bihar and Chhattisgarh. The Indo-Gangetic plain lies to the north and east of the plateau, and the basin of the Mahanadi River lies to the south. The total area of the Chhotanagpur Plateau is approximately 65,000 square kilometres. This Plateau consists of three steps. The highest step is in the western part of the plateau, ranging from 3,000 -3500 feet. The next part contains larger portions of the old Ranchi and Hazaribagh districts and some parts of old Palamu district, before these were broken up into smaller administrative units. The general height is 2,000 feet. The lowest step of the plateau is at an average level of around 1,000 feet, covering the old Manbhum and Singhbhum districts.

The Chhotanagpur Plateau is composed of Archaean granite and gneiss rocks with patches of Dharwar and Damuda series of the Gondwana Period, and the lava flow of the Cretaceous Period. The western higher plateau of the Chhotanagpur Plateau is called Pat region. It is believed to be composed of Deccan lava. The largest part of the Chhotanagpur Plateau is called Ranchi Plateau. Damodar River originates here and flows through a rift valley. Damodar basin forms a trough between the Ranchi and Hazaribagh plateaus resulting from enormous fractures at their present edges, which caused the land between to sink to a great depth and incidentally preserved from denudation the Karanpura, Ramgarh and Bokaro coalfields. The plateau is covered with a variety tropical and subtropical dry broadleaf forests of which Sal forest is predominant. The plateau is home to the Palamau Tiger Reserve. Chhotanagpur plateau is a store house of minerals like mica, bauxite, copper, limestone, iron ore and coal. The Damodar valley is rich in coal and it is considered as the prime centre of coking coal in the country. Massive coal deposits are found in the central basin spreading over 2,883 km2. The important

coalfields in the basin are Jharia, Raniganj, West Bokaro, EastBokaro, Ramgarh, South Karanpura and North Karanpura.

Karbi-Meghalya plateau

Karbi-Meghalya plateau is in fact an extension of the main Indian peninsular plateau and are originally two different plateaus - Karbi Anglong plateau and Meghalya plateau. It is believed that due to the force exerted by the north-eastwardly movement of the Indian plate at the time of the Himalayan origin, a huge fault was created between the Rajmahal hills and the Karbi-Meghalaya plateau. Later, this depression was filled up by the depositional activity of numerous rivers. Today the Maghalaya and Karbi Anglong plateau remains detached from the main Peninsular block. This area receives maximum rainfall from the South-West monsoon.

Deccan Plateau

The Deccan Plateau covers the majority of the southern part of the country. It is located between three mountain ranges and extends over eight Indian states. The plateau covers 4,22,000 sq. km., 43 percent of India's landmass. On the west of the plateau are the Western Ghats and in the east are the Eastern Ghats. These mountain ranges rise from their respective nearby coastal plains and nearly meet at the southern tip of India. The mountains make the southward-pointing vertex of a triangle. The northern boundary of the triangle is made up by the Satpura Range and Vindhyan Range. These northern ranges separate the plateau from the heavily populated riverine plains of northern India.

Important Observations:

- This Plateau makes up a triangle nested within the familiar downward-pointing triangle of the Indian sub-continent's coastline.
- In the south, the plateau is mostly over 1,000 metres above sea level. In the north it is mostly about 500 m above sea level. The Deccan Plateau is higher in the west and slopes gently eastwards. This would imply that most Deccan plateau rivers flow from west to east. The rivers flowing through the Deccan plateau have cut deep valleys and divided the plateau into several smaller plateus such as the Maharastra Plateau, Andhra Plateau and Karnataka Plateau, f^ The plateau is very big and there are many habitats: different Ecosystems with different sorts of vegetation, climate, geology and animals. The forests on the plateau are older than the Himalayan mountains.
- The Western Ghats mountain range is tall and blocks the moisture from the southwest monsoon from reaching the Deccan Plateau, this is the reason that the Deccan Plateau region receives very little rainfall,
- The Godavari River and its tributaries, including the Indravati River, drain most of the northern portion of the plateau, rising in the Western Ghats and flowing east towards the Bay of Bengal. The Tungabhadra River, Krishna River and its tributaries, including the Bhima River, which also run from west to east, drain the central portion of the plateau.
- The southernmost portion of the plateau is drained by the Kaveri River, which rises in the Western Ghats of Karnataka and bends south to break through the Nilgiri Hills at Hogenakal Falls into Tamil Nadu, then forming the Sivasamudram Falls at the island town of Shivanasamudra, the second-biggest waterfall in India and the sixteenth-largest in the world, before flowing into the Stanley Reservoir and the Mettur Dam that created the reservoir and finally emptying into the Bay of Bengal.
- The two main rivers which do not flow into the Bay Of Bengal are the Narmada and Tapti. They start in the Eastern Ghats and flow into the Arabian Sea.
- All Deccan plateau rivers depend on the rains and dry up in the summers.

Western Ghats

The Western Ghats or Sahyadri runs north to south along the western edge of the Deccan Plateau, and separates the plateau from a narrow coastal plain along the Arabian Sea. The range starts near the border of Gujarat and Maharashtra, south of the Tapti River, and runs approximately 1600 km through the states of Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala ending at Kanyakumari, at the southern tip of India. These hills cover 160,000 km^2 and form the catchment area for complex riverine drainage systems that drain almost 40% of India. The average elevation is around 1,200-1300 metres. Observations about Western Ghats

- In India, there are two biodiversity hotspots viz. Eastern Himalayas and Western Ghats. Western Ghats are home to over 5000 species of flowering

plants, 139 mammal species, 508 bird species and 179 amphibian species, many undiscovered species lives. At least 325 globally threatened species occur in the Western Ghats.

- The mountains of the Western Ghats are Block Mountains formed due to the down warping of a part of land into the Arabian Sea. As per other view, they are not true mountains, but are the faulted edge of the Deccan Plateau.
- All the important rivers of Peninsular India, like the Godavari, Krishna and Kaveri rise from the Western Ghats.
- Western Ghats are home to many hill stations like Matheran, Lonavala-Khandala, Mahabaleshwar, Panchgani, Amboli Ghat, Kudremukh and Kodagu.
- The range is called
  - Sahyadri in northern Maharashtra
  - Sahya Parvatam in Kerala
  - Nilagiri Malai in Tamil Nadu
- The confluence of the Eastern and the Western Ghats is at Biligirirangan Hills in Karnataka.
- Anamudi 2,695 metres in Kerala the highest peak in Western Ghats. Chembra Peak 2,100 metres, Banasura Peak 2,073 metres, Vellarimala 2,200 metres and Agasthya mala 1,868 metres are also in Kerala. Mullayanagiri is the highestpeakin Karnataka 1,950 meters.
- The smaller ranges of the Western Ghats include the Cardamom Hills and the Nilgiri Hills. Cardamom hills are located in southeast Kerala and southwest Tamil Nadu. They cover about 2,800 km^2 of mountainous terrain with deep valleys, and includes the drainages of the west flowing Periyar, Mullayar and Pamba rivers. It includes Idukki Dam and Mullaperiyar Dam. They conjoin the Anaimalai Hills to the northwest, the Palni Hills to the northeast and the Agasthyamalai Hills to the south as far as the Ariankavu pass. The crest of the hills form the boundary between Kerala and Tamil Nadu. Anamudi is also located in Cardamom Hills.
- The Nilgiri Hills are home to the hill station Ooty. In the southern part of the range in the Anaimalai Hills, in western Tamil Nadu and Kerala.
- The major gaps in the range are the Goa Gap, between the Maharashtra and Karnataka sections, and the Palghat Gap on the Tamil Nadu/Kerala border between the Nilgiri Hills and the Anaimalai Hills.
- The northern portion of the narrow coastal plain between the Western Ghats and the Arabian Sea is known as the Konkan Coast or simply Konkan, the central portion is called Kanara and the southern portion is called Malabar region or the Malabar Coast.
- The foothill region east of the Ghats in Maharashtra is known as Desh, while the eastern foothills of the central Karnataka state is known as Malenadu. The largest city within the mountains is the Pune in the Desh region on the eastern edge of the range.
- The mountains intercept the rain-bearing westerly monsoon winds, and are consequently an area of high rainfall, particularly on their western side. The dense forests also contribute to the precipitation of the area by acting as a substrate for condensation of moist rising orographic winds from the sea, and releasing much of the moisture back into the air via transpiration, allowing it to later condense and fall again as rain. The Jog Falls in Karnataka, one of the most spectacular waterfalls in India are located in Western Ghats.
- The climate is humid and tropical in the lower reaches tempered by the proximity to the sea. Elevations of 1,500 m and above in the north and 2,000 m and above in the south have a more temperate climate. Average annual temperature here is around 15 °C. In some parts frost is common, and temperatures touch the freezing point during the winter months. Mean temperature range from 20°C in the south to 24 °C in the north. It has also been observed that the coldest periods in the south western ghats coincide with the wettest.
- During the monsoon season between June and September, the unbroken Western Ghats chain acts as a barrier to the moisture laden clouds. The heavy, eastward-moving rain-bearing clouds are forced to rise and in the process deposit most of their rain on the windward side. Rainfall in this region averages 3,000-4,000 mm. The eastern region of the Western Ghats which lie in the rain shadow, receive far less rainfall averaging about

1,000 mm bringing the average rainfall figure to 2,500 mm.

- The vegetation in Western Ghats is tropical and subtropical moist broadleaf forest ecoregions. The northern portion of the range is generally drier than the southern portion, and at lower elevations makes up the North Western Ghats moist deciduous forests ecoregions, with mostly deciduous forests made up predominantly of teak. Above 1,000 meters elevation are the cooler and wetter North Western Ghats Montane rain forests, whose evergreen forests are characterized by trees of family Lauraceae.
- The evergreen Wayanad forests of Kerala mark the transition zone between the northern and southern ecoregions of the Western Ghats. The southern ecoregions are generally wetter and more species-rich. At lower elevations are the South Western Ghats moist deciduous forests. The moist forests transition to the drier South Deccan Plateau dry deciduous forests, which lie in its rain shadow to the east.
- Above 1,000 meters are the South Western Ghats montane rain forests, also cooler and wetter than the surrounding lowland forests, and dominated by evergreen trees, although some montane grasslands and stunted forests can be found at the highest elevations.
- The South Western Ghats montane rain forests are the most species-rich ecoregion in peninsular India; eighty percent of the flowering plant species of the entire Western Ghats range are found in this ecoregion.
- The forest in the Western Ghats has been severely fragmented due to human activities, especially clear felling for tea, coffee, and teak plantations during I860 to 1950.
- Species that are rare, endemic and habitat specialists are more adversely affected and tend to be lost faster than other species. Complex and species rich habitats like the tropical rainforest are much more adversely affected than other habitats. The area is ecologically sensitive to development. Though this area covers barely five percent of India's land, 27% of all species of higher plants in India (4,000 of 15,000 species) are found here. Almost 1,800 of these are endemic to the region. The range is home to at least 84 amphibian species, 16 bird species, seven mammals, and 1,600 flowering plants which are not found elsewhere in the world.
- Western Ghats is home to India's 2 biosphere reserves. 13 National parks, several wildlife sanctuaries and many Reserve Forests.
- The Nilgiri Biosphere Reserve comprising 5500 km^2 of the evergreen forests of Nagarahole, deciduous forests of Bandipur National Park and Nugu in Karnataka and adjoining regions of Wayanad and Mudumalai National Park in the states of Kerala and Tamil Nadu forms the largest contiguous protected area in the Western Ghats.
- The Silent Valley National Park in Kerala is among the last tracts of virgin tropical evergreen forest in India.
- A critically endangered mammal of the Western Ghats is the nocturnal Malabar Large-spotted Civet. The arboreal Lion-tailed Macaque is endangered. Only 2500 of this species are remaining. The largest population of Lion Tailed Macaque is in Silent Valley National Park. Kudremukh National Park also protects a viable population.
- These hill ranges serve as important wildlife corridors, allowing seasonal migration of endangered Asian Elephants.
- The Nilgiri Bio-sphere is home to the largest population of Asian Elephants and forms an important Project Elephant and Project Tiger reserve. Brahmagiri and Pushpagiri wildlife sanctuaries are important elephant habitats. Karnataka's Ghat areas hold over six thousand elephants (as of 2004] and ten percent of India's critically endangered tiger population.

Eastern Ghats

Eastern Ghats or Purbaghata are a discontinuous range of mountains along India's eastern coast. They run from West Bengal through Orissa and Andhra Pradesh to Tamil Nadu in the south passing some parts of Karnataka. They are eroded and cut through by the four major rivers of southern India, the Godavari, Mahanadi, Krishna, and Kaveri. The mountain ranges run parallel to the Bay of Bengal. The Deccan Plateau lies to the west of the range, between the Eastern Ghats and Western Ghats.

The Eastern Ghats are not as high as the Western Ghats. The climate of the higher hill ranges is generally

cooler and wetter than the surrounding plains and the hills are home to coffee plantations and enclaves of dry forest The Bilgiri Hills, which run east from the Western Ghats to the River Kaveri, forms a forested ecological corridor that connects the Eastern and Western Ghats, and allows the second-largest wild elephant population in India to range between the South Eastern Ghats, the Biligiri and Nilgiri Hills, and the South Western Ghats. The famous temple Malai Mahadeshwara Hills Temple is situauted in Chamarajanagar District in the Karnataka state on the Eastern Ghat.

Some other Observations

- lindhagada is the highest mountain in the Eastern Ghats situated in Araku. district Vishakapatnam in Andhra Pradesh.
- The region boasts of fertile soil but hydropower generation here is not as profitable as it is in the Western Ghats.
- Eastern Ghats are older than the Western Ghats, and have a complex geologic history, related to the assembly and break-up of the ancient supercontinent of Rodinia and the assembly of the Gondwana supercontinent.
- The Eastern Ghats is the homeland for many Buddhist ruins from Orissa to south andhra.
- The Eastern Ghats harbour primarily tropical moist deciduous vegetation, which represents species of high economic, timber, medicinal potential. Eastern Ghats are highly significant in terms of its biodiversity. Of the estimated 3,200 flowering plant taxa, there are about
- 528 tree taxa under 271 genera belonging to 80 families distributed in different regions of Eastern Ghats. In total 454 species under 243 genera and 78 families are endemic to Eastern Ghats.
- Based on geological and tectonic considerations, the Eastern Ghats in Orissa starts from North of Similipal in Mayurbhanj district and runs through Malkangiri.
- Seventeen districts of Orissa come under the Eastern Ghats including 14 protected areas (13 wild life sanctuaries, one Biosphere reserve, one National Park, two tiger reserve and one Ramser Wetland],

Important Observations: Mountains, Hills and Hill Ranges of India

Mount Abu

- Highest peak in the Aravalli Range
- Located in Sirohi district, Rajasthan.
- Highest peak on the mountain is Guru Shikhar, at 1,722 metres
- Ancient name of Mount Abu is "Arbudaanchal"
- Only hill station in Rajasthan
- Mount Abu Wildlife Sanctuary was established in 1960 and covers 290 km^2 of the mountain. S Mount Abu is home to a number of Jain temples. The Dilwara Temples are a complex of temples, carved of white marble, that were built between the 11th and 13th centuries AD. The oldest of these is the Vimal Vasahi temple, built in 1021 AD by Vimal Shah and dedicated to the first of the Jain Tirthankaras.
- Home to famous Nakki Lake.
- The Achalgarh fort, built in the 14th century by Rana Kumbha of Mewar, stands nearby. It encloses several Jain temples
- Location of Madhuban which is the headquarters of the Brahma Kumaris World Spiritual University.

Cardamom Hills

- Part of the southern Western Ghats located in southeast Kerala and southwest Tamil Nadu.
- Name comes from the cardamom spice grown in much of the hill's cool elevation, which also grows pepper and coffee.
- Home to drainages of the west flowing Periyar, Mullakudy and Pamba rivers. It includes Idukki Dam and Mullaperiyar Dam.
- They conjoin the Anaimalai Hills to the northwest, the Palni Hills to the northeast and the Agasthyamalai Hills to the south as far as the Ariankavu pass. The highest peak in the range is Anamudi, with a height of 2,695 metres.
- The central part of the hills comprises the Periyar Wildlife Sanctuary covering an area of 777 km^2. The 350 km^2 core zone of the sanctuary is the Periyar National Park and Tiger Reserve. Periyar is a major ecotourism destination.

Anamudi

- Located in Kerala, Highest peak of western Ghats and also in south India. S Elevation 2695 meters.
- Anamudi literally translates to "elephants forehead," a reference to the resemblance of the mountain to an elephant's head.
- Highest point in India outside the Himalaya-Karakoram mountain range.

Anginda peak

- Anginda peak is in the Nilgiri Hills of the Western Ghats in Kerala.
- Highest peak in Silent Valley National Park.

Phawngpui

- Phawngpui or the Blue Mountain of Mizoram is a highly revered peak, considered to be the abode of the Gods.
- Phawngpui Peak is the highest mountain peak in Mizoram (2165 metres)
- Famous for orchids and rhododendrons.

Doddabetta

- Doddabetta is highest mountain in the Nilgiri Hills, at2637 metre.

Kangchenjunga

- Kangchenjunga is the third highest mountain of the world with an elevation of 8,586 m.
- Located along the India-Nepal border in the Himalayas.
- Kangchenjunga is also the name of the section of the Himalayas and means "The Five Treasures of Snows", as it contains five peaks, four of them over 8,450 m
- The treasures represent the five repositories of God, which are gold, silver, gems, grain, and holy books.
- Until 1852, Kangchenjunga was assumed to be the highest mountain in the world, but calculations made by the Great Trigonometric Survey of India in 1849 came to the conclusion that Mount Everest (known as Peak XV at the time) was the highest and Kangchenjunga the third-highest

Nanda Devi

- Second highest mountain in India and highest entirely within the country.
- Part of the Garhwal Himalayas, and is located in the state of Uttarakhand, between the Rishiganga valley on the west and the Goriganga valley on the east.
- Peak is regarded as the patron-goddess of the Uttarakhand Himalaya.

Garo Hills

- Part of the Garo-Khasi range in Meghalaya, India.It is one of the wettest places in the world. The range is part of the Meghalaya subtropical forests ecoregion.
- Two mountain ranges - the Arabella range and the Tura range, pass through the Garo Hills, forming the great Balpakram valley in between.
- Largest town Tura.
- Shillong also located in Garo Hills. Khasi Hills
- Khasi Hills are part of the Garo-Khasi range in the Indian state of Meghalaya, and is part of the Patkai range and of the Meghalaya subtropical forests ecoregion.

Jaintia Hills

- Tribal region located in HImalaya.
- Home to Monolith in Nartiang which is touted as one of the tallest monolith in the world.

Mizo Hills

- Lushai Hills (or Mizo Hills) are part of the Patkai range in Mizoram and partially in Tripura, India.

Naga Hills

- Located on India Myanmar border,
- Naga hills, reaching a height of around 3825 metres, lie on the border of India and Burma (Myanmar). These hills are part of a complex mountain system, and the parts of the mountain ranges inside the Indian state of Nagaland and the Burmese region of Sagaing are called the Naga Hills.
- In British India, the major part of the hills came under the Naga Hills district.
- The hills, due to their complexity and position form a barrier between the two countries. The Naga Hills are part of the Arakan Range (Rahkine Range) which to the north rise to 12,552feet.

Palni Hills

- Palni Hills or Palani Hills are in Tamil Nadu.
- They are eastward extension of the Western Ghats ranges, which run parallel to the west coast of India.

- Home to one of the shrines of Lord Karthikeyan or Murugan.

Patkai Hills

- Located on India's North Eastern border with Burma.
- Mawsynram and Cherrapunji, on the windward side of these hills are the world's wettest places, having the highest annual rainfall.
- Climate ranges from temperate to alpine due to altitude.

Shivalik Hills

- Was known as Manak Parbat in ancient times.
- Also known as Churia andMargalla hills.
- Southernmost and geologically youngest east-west mountain chain of the Himalayas ranging from Indus to Brahamputra.
- Chiefly composed of sandstone and conglomerate rock formations, which are the solidified detritus of the great range in their rear, but often poorly consolidated.
- Bounded on the south by a fault system called the Main Frontal Thrust, with steeper slopes on that side.
- Sivapithecus or Ramapithecus is among many fossil finds in the Siwalik region.
- The Siwalik Hills are also among the richest fossil sites for large animals anywhere in Asia.

Zanskar Range

- Located in Jammu & Kashmir of India, seperates Zanskar from Ladakh.
- Geologically, the Zanskar Range is part of the Tethys Himalaya, an approximately 100-km-wide synclinorium formed by strongly folded and imbricated, weakly metamorphosed sedimentary series.
- The average height of the Zanskar Range is about 6,000 m (19,700ft). S Its eastern part is known as Rupshu.