Geography of India
Unit - I

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LOCATION

India is a vast country. Lying entirely in the Northern hemisphere (Figure 1.1) the main land extends between latitudes 8°4'N and 37°6'N and longitudes 68°7'E and 97°25'E.

The Tropic of Cancer (23° 30'N) divides the country into almost two equal parts. To the southeast and southwest of the mainland, lie the Andaman and Nicobar islands and the Lakshadweep islands in Bay of Bengal and Arabian Sea respectively.

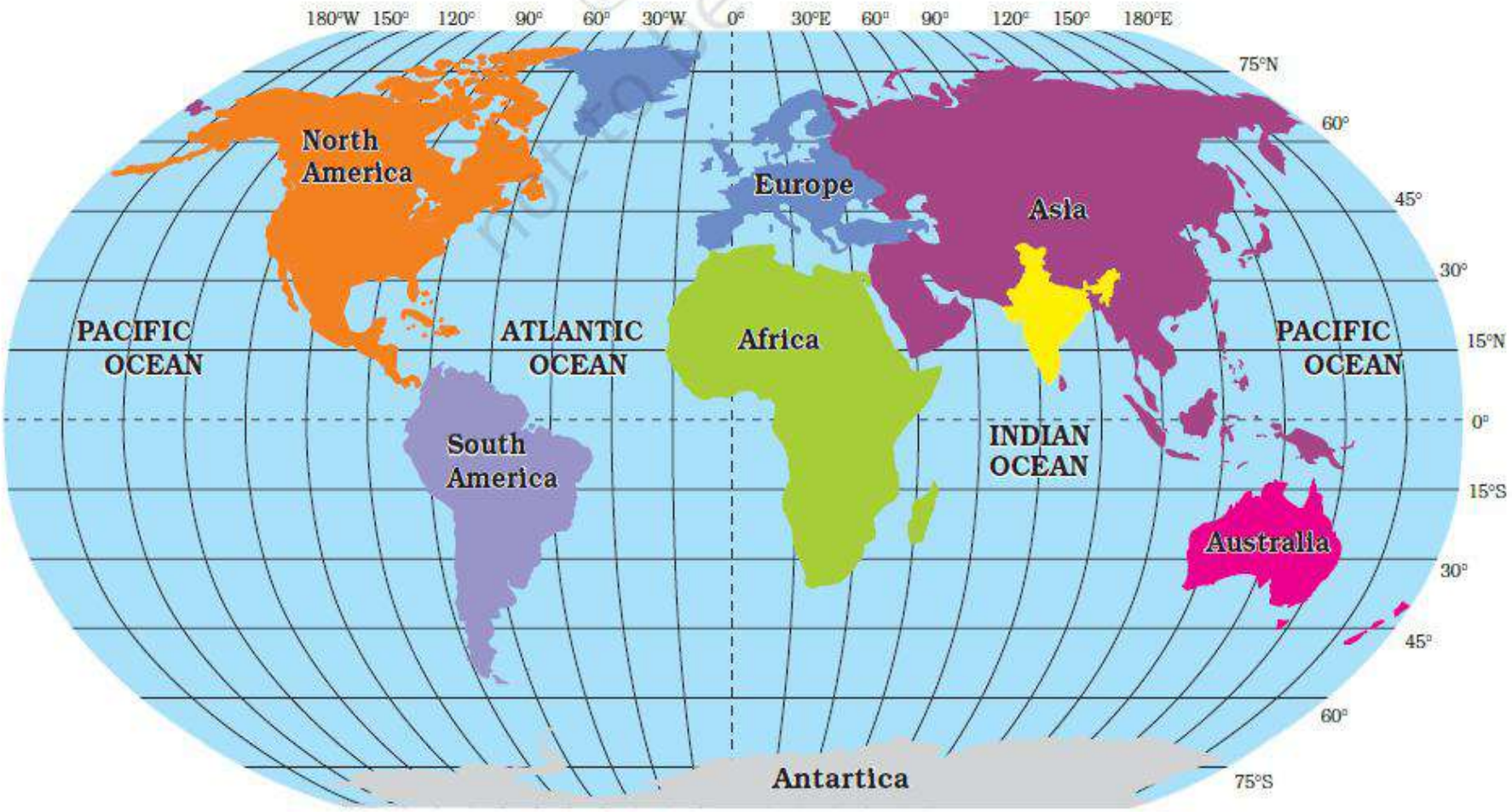
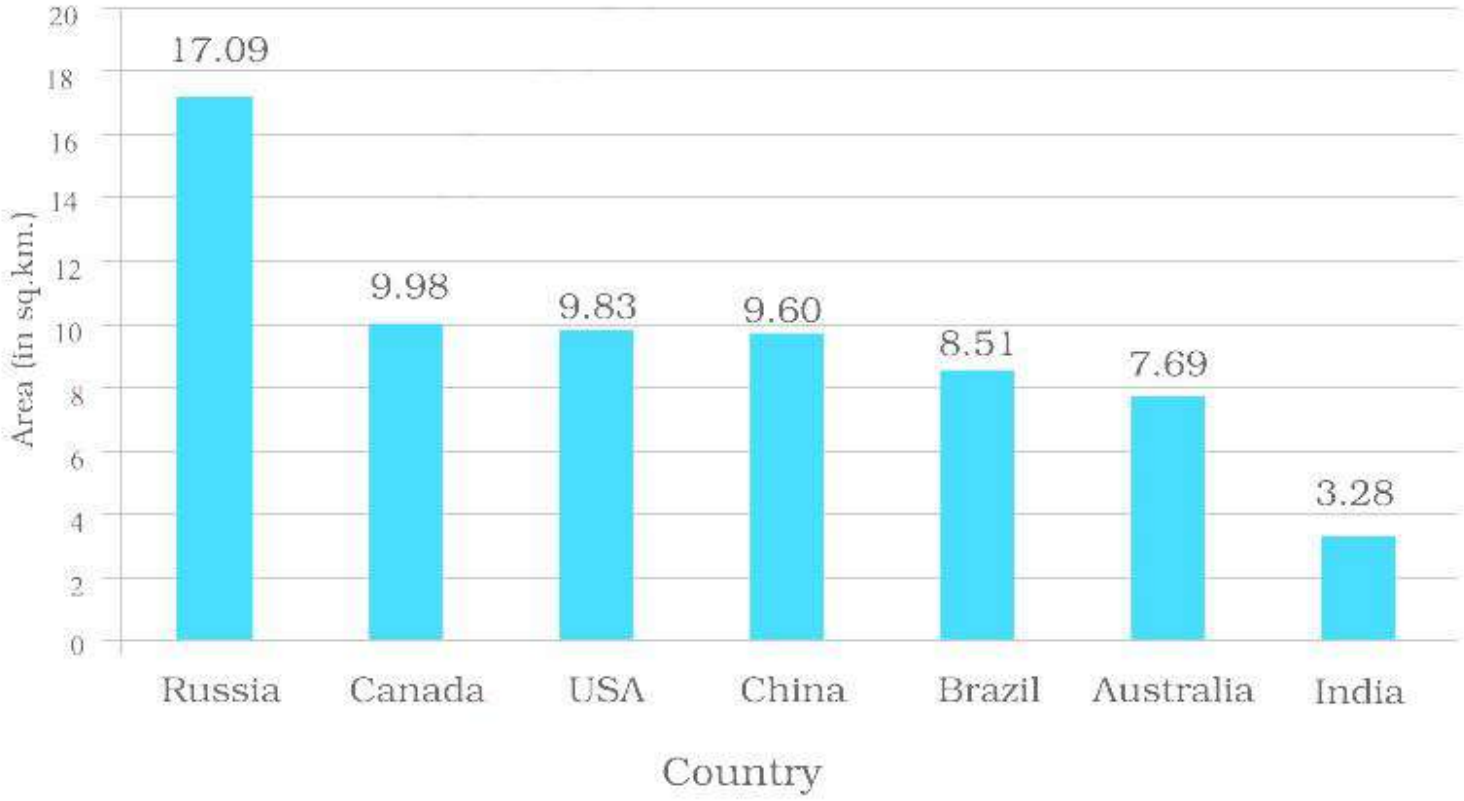


Figure 1.1 : India in the World



Source : United Nations Demographic Year Book 2015

Figure 1.2 : Seven Largest Countries of the World

Figure 1.1 : India : Administrative Divisions

Size

The land mass of India has an area of 3.28 million square km. India's total area accounts for about 2.4 per cent of the total geographical area of the world. From Figure 1.2 it is clear that India is the seventh largest country of the world. India has a land boundary of about 15,200 km and the total length of the coastline of the mainland, including Andaman and Nicobar and Lakshadweep, is 7,516.6 km.

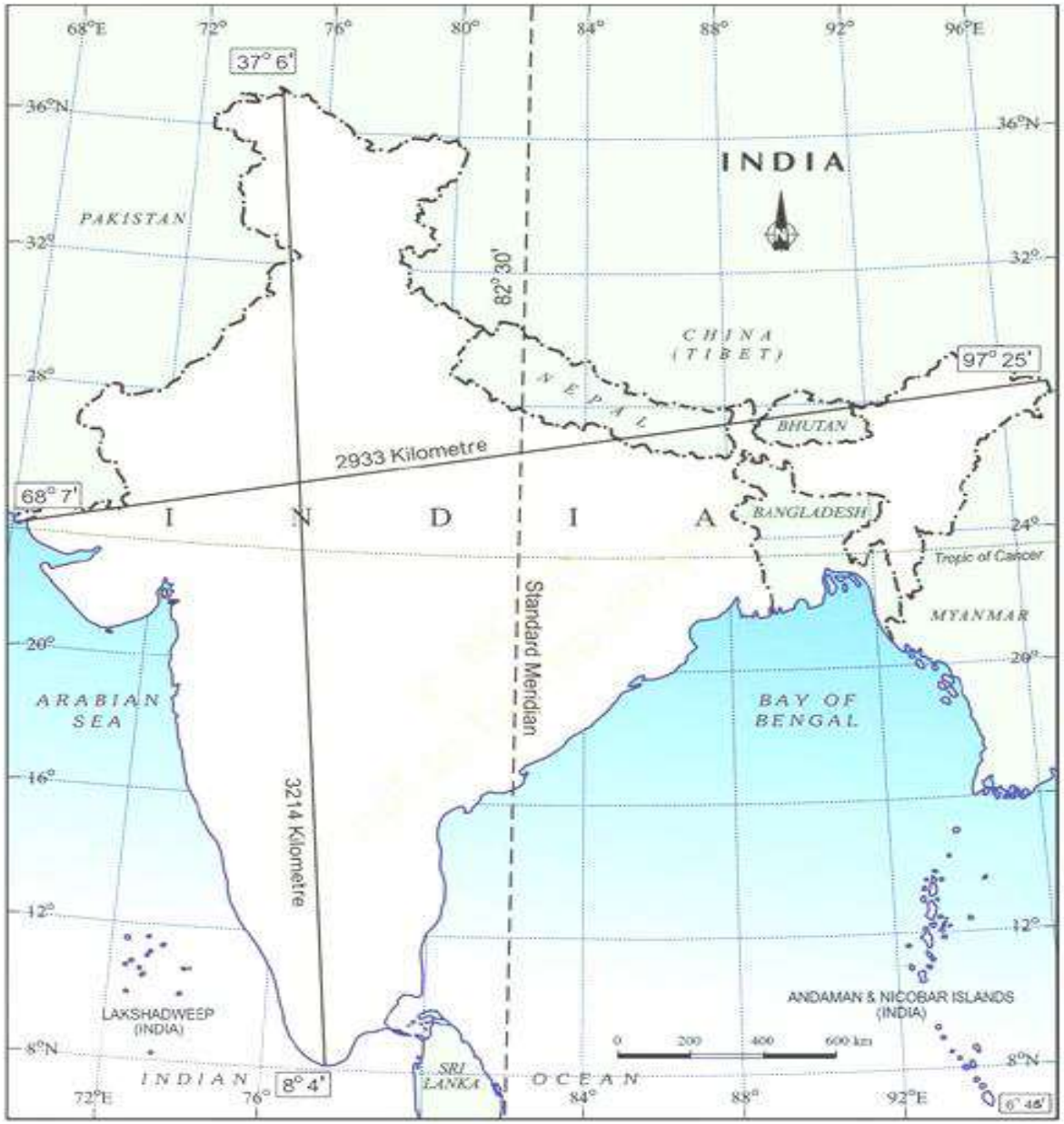


Figure 1.3 : India : Extent and Standard Meridian

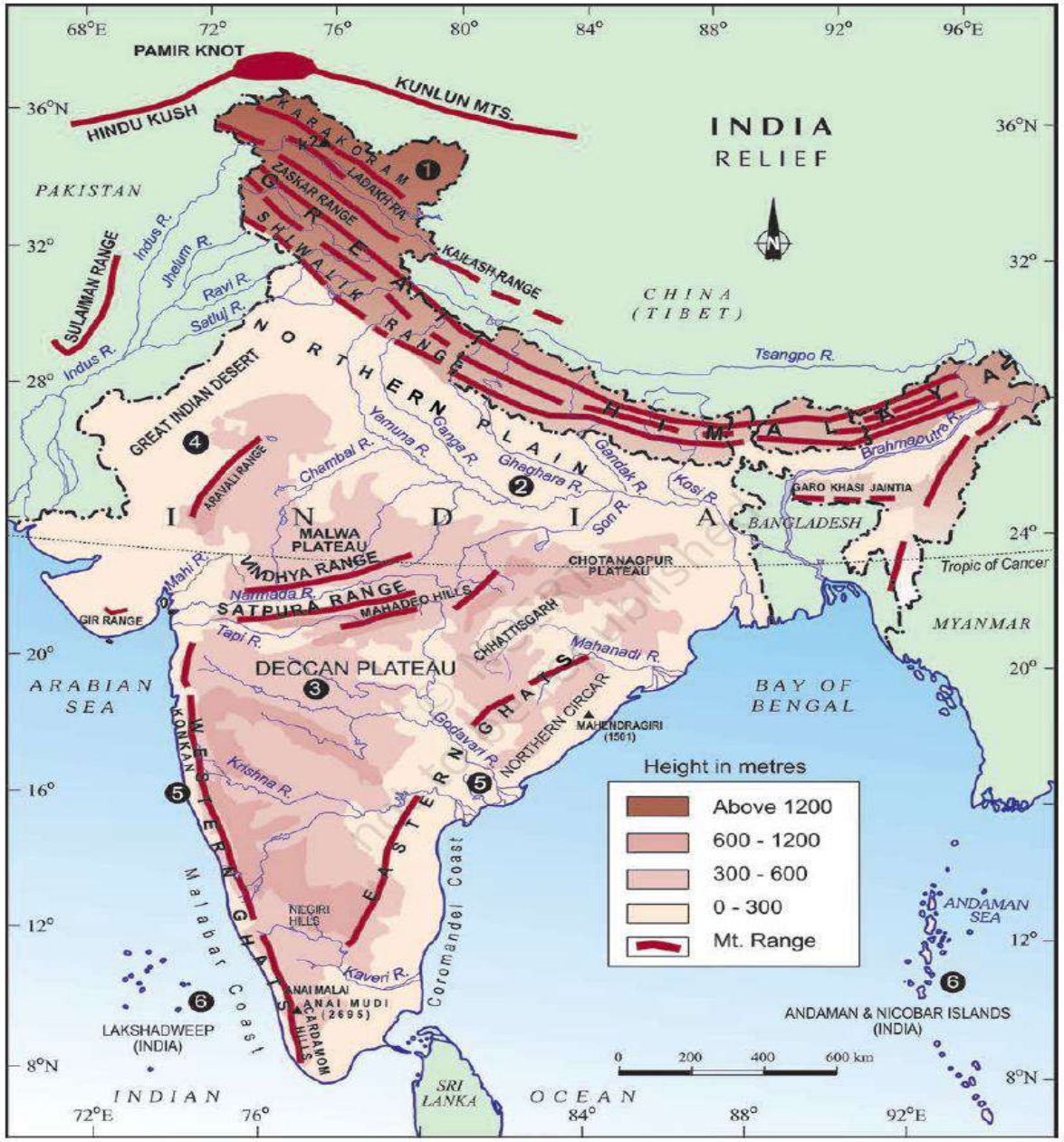
Figure 1.5 : India and Adjacent Countries

Physiographic Divisions of India

(1) The Himalayan Mountains
(2) The Northern Plains
(3) The Peninsular Plateau
(4) The Indian Desert
(5) The Coastal Plains
(6) The Islands

The Himalayas

(Abode of Snow)


INDIA
RELIEF
PAMIR KNOT
KUNLUN MTS.
HINDU KUSH
KARAKORAM
LADAKH RANGE
ZASKAR RANGE
GREAT HIMALAYAN RANGE
SHIWALIK RANGE
KAILASH RANGE
SULAIMAN RANGE
PAKISTAN
CHINA (TIBET)
Indus R.
Jhelum R.
Ravi R.
Satluj R.
Tsangpo R.
NORTHERN PLAIN
GREAT INDIAN DESERT
ARAVALI RANGE
Chambal R.
Yamuna R.
Ganga R.
Ghaghara R.
Gandak R.
Kosi R.
Brahmaputra R.
GARO KHASI JAINTIA
BANGLADESH
MALWA PLATEAU
VINDHYA RANGE
Son R.
CHOTANAGPUR PLATEAU
Tropic of Cancer
Mahi R.
Narmada R.
SATPURA RANGE
MAHADEO HILLS
GIR RANGE
MYANMAR
Tapi R.
CHHATTISGARH
Mahanadi R.
DECCAN PLATEAU
ARABIAN SEA
BAY OF BENGAL
KONKAN
WESTERN GHATS
EASTERN GHATS
NORTHERN CIRCAR
MAHENDRAGIRI (1501)
Godavari R.
Krishna R.
Coromandel Coast
Malabar Coast
NEGIRI HILLS
Kaveri R.
ANAI MALAI
ANAI MUDI (2695)
CARDAMOM HILLS
LAKSHADWEEP (INDIA)
ANDAMAN & NICOBAR ISLANDS (INDIA)
ANDAMAN SEA
SRI LANKA
INDIAN OCEAN
Height in metres
Above 1200
600 - 1200
300 - 600
0 - 300
Mt. Range
0 200 400 600 km
68°E
72°
76°
80°
84°
88°
92°
96°E
36°N
32°
28°
24°
20°
16°
12°
8°N

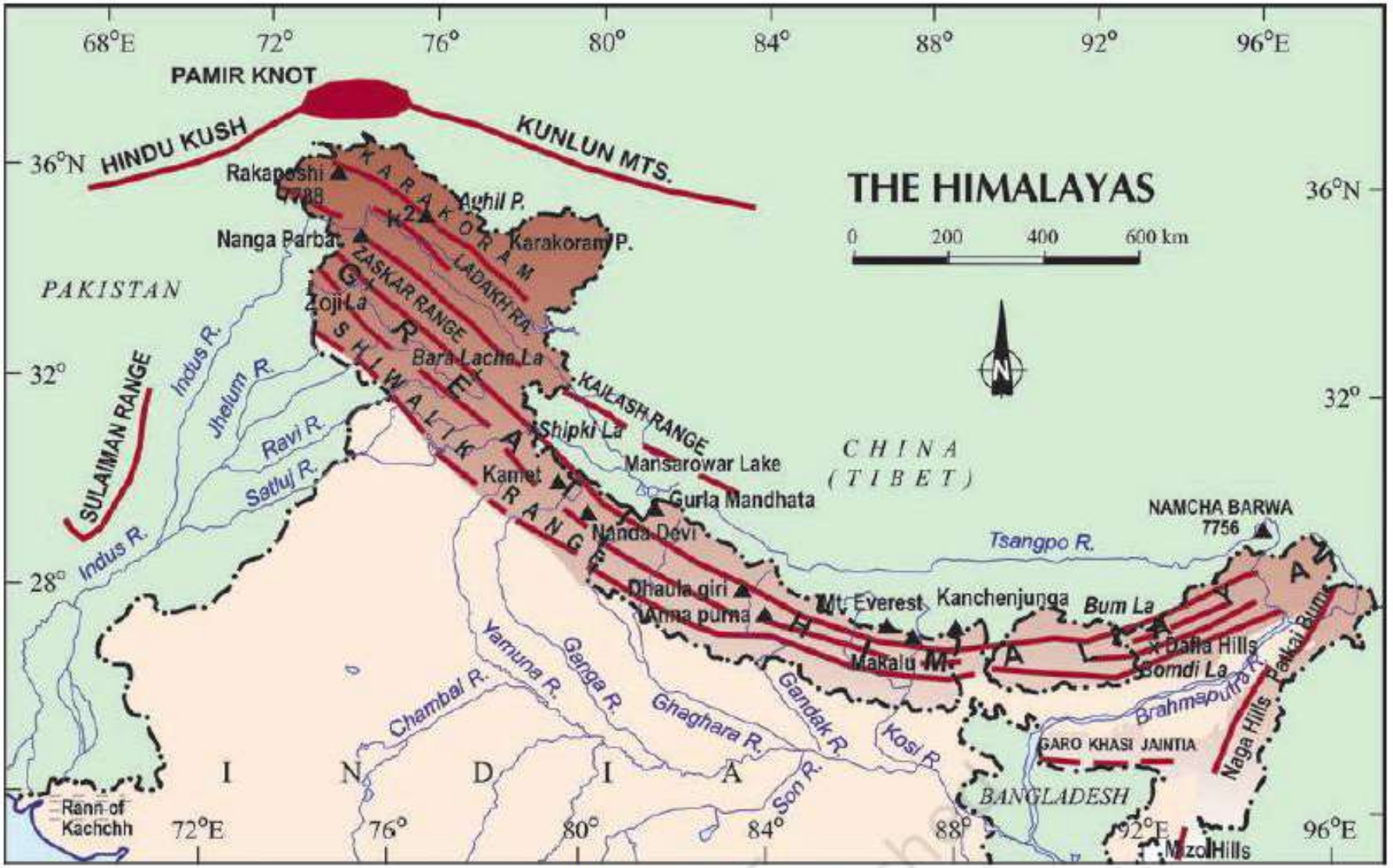
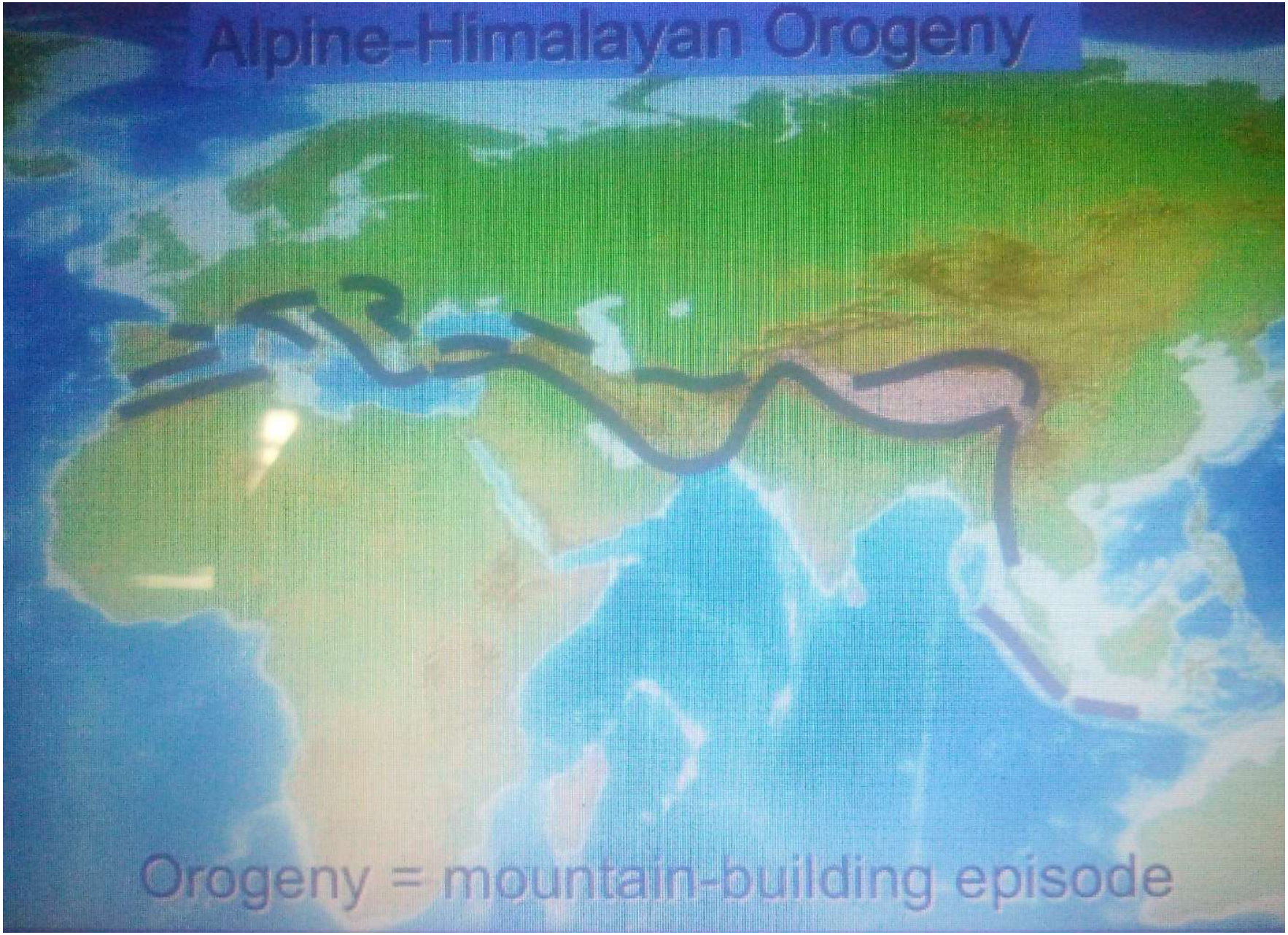
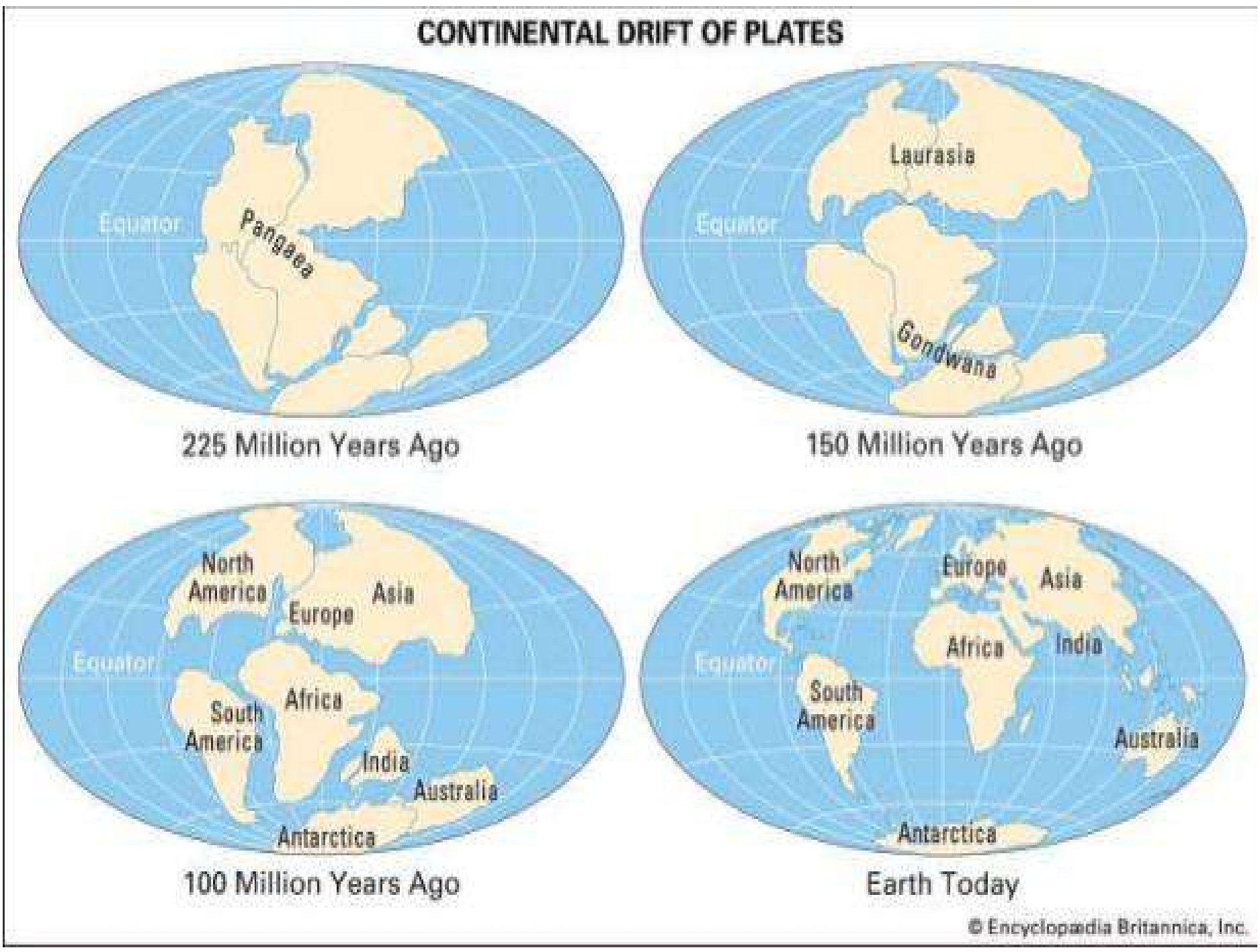


Figure 2.1 : Himalayas

ERA	PERIOD	EPOCH	AGE*	MAJOR EVENTS
CENOZOIC	Quaternary	Holocene	0.01	
		Pleistocene	1.8	Earliest *Homo sapiens*
	Tertiary	Pliocene	5.3	Earliest hominids
		Miocene	23.8	
		Oligocene	33.7	Dominance of mammals
		Eocene	55	
		Paleocene	65	*Widespread extinctions*
MESOZOIC	Cretaceous		145	First flowering plants
	Jurassic		200	Dinosaurs dominant
	Triassic		251	*Widespread extinctions*
PALEOZOIC	Permian		299	
	Carboniferous		359	First reptiles
	Devonian		417	
	Silurian		443	Fishes dominant
	Ordovician		490	First fishes
	Cambrian		542	*Appearance of fossils*
PRECAMBRIAN				Soft-bodied animals
			3000	First one-celled organisms
			4600	Origin of the earth

*Age in millions of years (Ma)


Alpine-Himalayan Orogeny
Orogeny = mountain-building episode


CONTINENTAL DRIFT OF PLATES
Equator
Pangaea
225 Million Years Ago
Laurasia
Equator
Gondwana
150 Million Years Ago
North America
Europe
Asia
Equator
Africa
South America
India
Australia
Antarctica
100 Million Years Ago
North America
Europe
Asia
Africa
India
Equator
South America
Australia
Antarctica
Earth Today
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Origin of the Himalayas

A continent – continent collision

- Indian continent
- Eurasian continent

Formed in three phases (Tertiary Period)

I Phase: 50 – 40 mya (The Himadri) -Eocene

II Phase: 25-30 mya (The Himachal)-Miocene

III Phase: 20 – 2 mya (The Shiwaliks)-Pliocene

- MCT (Main Central Thrust) – Between Himadri and Himachal
- MBT (Main Boundary Thrust)- Between Himachal and Shiwaliks
- HFF (Himalayan Front Fault) – Between Shiwaliks and the Northern Plains

- Young, fold mountain
- The general orientation is Northwest to Southeast
- Length – 2500 km; breadth – 160 to 400 km.
- Physical Barrier – Climatic barrier - Cultural barrier

Longitudinal Divisions of Himalayas

1.The Himadri –Inner Himalayas

2.The Himachal-Lesser Himalayas

3.The Shiwaliks-Outer Himalayas

The Himadri –Inner Himalayas

- Average height is 6000 metres; width – 25 km

Some Highest Peaks of the Himalayas

Peak	Country	Height in metres
Mt. Everest	Nepal	8848
Kanchenjunga	India	8598
Makalu	Nepal	8481
Dhaulagiri	Nepal	8172
Nanga Parbat	India	8126
Annapurna	Nepal	8078
Nanda Devi	India	7817
Kamet	India	7756
Namcha Barwa	India	7756
Gurla Mandhata	Nepal	7728

- Composed of crystalline igneous or metamorphic rocks (Granite, schist, gneiss)
- The basal complex is Archaean
- Continuous range, few gaps due to antecedent rivers
- Less rainfall as compared to other ranges
- Physical weathering is pronounced
- Very little forest area

The Himachal-Lesser Himalayas

- Height ranges between 3700-4500m; width – 80 km
- Known for its hill stations
- Kashmir valley, Kangra and Kullu are located
- Composed of unfossiliferous sediments or metamorphosed crystalline rocks

- Rocks are slate, limestone, quartzite
- In sourthern margin, lies autochthonous belt of highly compressed Paleozoic to Eocene rocks containing volcanic material
- Subject to extensive erosion due to heavy rainfall, deforestation and urbanization

The Shiwaliks-Outer Himalayas

- Height ranges from 900-1500m; width 10-50km
- Not a continuous range
- Longitudinal valleys ‘Duns’ or ‘Doons’ are found...Eg., Dehra Dun, Kotli Dun, Patli Dun, Kothri Dun, Chumbi, Kyarda, Kathmandu..
- Composed of Sandstone, Clay, Conglomerates, limestones—belonging to Upper Tertiary Period

Regional Divisions of the Himalayas

1. Punjab Himalayas (Indus and Sutluj)
2. Kumaon Himalayas (Sutluj and Kali)
3. Nepal Himalayas (Kali and Teesta)
4. Assam Himalayas (Teesta and Dihang)

Prof. S.P. Chatterjee's Classification (1973)

1. Kashmir Himalayas
2. Himachal Himalayas
3. Kumaon Himalayas
4. Central Himalayas
5. Eastern Himalayas

1. Kashmir Himalayas: Area – 3,50,000 Sq.Km.

- Length – 700 km; width – 500 km
- Average height – 3000m
- It comprise a series of ranges such as the Karakoram, Ladakh, Zaskar and Pir Panjal.
- In the N.E. Part of Kashmir Himalayas, lies the cold desert between Greater Himalayas and Karakoram.
- Kashmir Valley and Dal lake is located between Himadri and Pirpanjal range.
- Baltoro and Siachen glaciers are found here.

- Famous for Karewa deposits, which are helpful for the cultivation of Saffron, apple, peach, almond, walnut and apricot.
- *Karewa deposits are glacial deposits*
- Characterized with snow covered peaks, deep valleys, interlocked spurs, passes...
- Passes: Zoji La (Himadri), Photu La (Zaskar), Banihal (PirPanjal) and Khardung La (Ladakh)
- Peaks: K2 (8611m), Nanga Parbat (8119m), Nunkun (7135m).

- Freshwater lake: Dal and Wular
- Salt water lake: Pangong Tso, Tso Moriri
- Rivers: Indus, Jhelum and Chenab. Indus is flowing between Ladakh and Zaskar ranges.
- Pilgrimage centres: Vaishno Devi temple, Amarnath cave, Charar-e-Shariff.
- Srinagar, capital of Jammu & Kashmir UT, is located on the banks of Jhelum river.

2. Himachal Himalayas: Area – 45000 sq.km.

- Between Ravi and Satluj rives.
- All three ranges are found here.
- Shipki La, Rohtang – Passes
- Kangra, Kullu, Manali – valleys for orchards
- Shimla, Kullu-Manali, Dalhousie, Dharmasala, Chamba – Hill stations.

3. Kumaon Himalayas: 38000 sq.km.

- Between Satluj and Kali (a tributary of Ghaghara) rivers
- Nanda Devi (7817m), Kamath (7756m), Trisul (7127m) – peaks
- Badrinath, Kedarnath – Pilgrimage places
- Gangotri and Yamunotri glaciers
- Mussoorie, Nainital, Ranikhet, Almora – hill stations

4. Central Himalayas: 116,800 sq.km.

- Between Kali and Tista rivers
- All ranges are found
- Mostly in Nepal, few in Sikkim and Darjeeling Districts of West Bengal.
- Mr. Everest (8848m), Kanchenjunga (8598m), Makalu (8481m), Dhaulagiri (8172m), Annapurna (8078m), Manaslu (8154m) – Peaks
- Nathu La and Jelep La - Passes

5. Eastern Himalayas: 67500 sq. Km.

- Between Tista and Brahmaputra rivers
- Namacha Barwa (7756m)
- Kameng, Subansiri, Dihang, Dibang and Lohit – rivers
- Bomdi La Pass
- Fluvial erosion is more due to heavy rain
- Take a southward turn - Purvanchal

- Purvanchal : Patkai Bum (Arunachal Pradesh), Naga hills, Manipur Hills, Mezo hills or Lushai
- These ranges are separated by numerous small rivers
- Barak river (Manipur and Mizoram)
- Loktak lake in Manipur (surrounded by hills)

The Northern Plains

- Formed by the alluvial deposits brought by the Indus, the Ganges and the Brahmaputra and their tributary rivers.
- To the south of Shiwaliks separated by HFF (Himalayan Front Fault).
- 2400 km long from west to east;
- Average width – 150-300 km. It increases from east to west.
- Depth varies from 1000-2000 m
- Homogeneous with little variation in relief.

Divisions of Northern Plains

- From north to south, the Northern Plains have been divided into...

1. Bhabar
2. Tarai
3. Alluvial plains – further divided into

   a) Bhangar and b) Khadar

4. Delta plains

1. The Bhabar Plain: lies to the south of Shiwaliks

- Wider in the west than the east
- 8 to 15 km wide
- Consists of unassorted sediments and gravel deposited by Himalayan rivers.
- Porosity is so high- small streams (chos & raos) disappear here.
- Not suitable for crops. Only big trees with large roots thrive.
- The inhabitants are the cattle keeping Gujjars.

2. Tarai tract - lies to the south of Bhabar, 15 to 30 km wide.

- Most of the streams and rivers re-emerge without having any demarcated channel.
- Creating a marshy and swampy conditions known as ‘tarai’
- Zone of excessive dampness, thick forest, rich wildlife and malarial climate (mosquito breeding)
- Cleared for cultivation – sugarcane, rice, wheat, maize, oilseeds, pulses and fodder crops.

3. Alluvial plain - to the south of Tarai, lies the old and new alluvial deposits

- Older alluvium – Bhangar
- Newer alluvium – Khadar
- These plains have characteristics features of sand bars, meanders, ox-bow lakes, braided channels..

Bhangar Plain: represents upland alluvial tract

- Formed during mid-Pleistocene period
- Dark in colour, rich in humus and productive
- Also known as ‘kankar’ as it contains nodules of Calcium Carbonate

- In drier areas, it exhibits small tracts of saline and alkaline efflorescences – reh, kallar or thur
- Has fossils of elephants, horses, man, rhinos, hippo...

Khadar Plains: Newer alluvium; Also known as ‘Bet’

- Fresh deposits of alluvium every year
- Consists of sand, silt, clay and mud
- Brought under cultivation – sugarcane, paddy, wheat, maize, oilseeds, legumes and fodder crops

4. Delta Plains: covers 1.9 lakh sq.km in lower Ganga

- In the delta region, the uplands are called ‘Chars’ and marshy areas are called ‘Bils’.

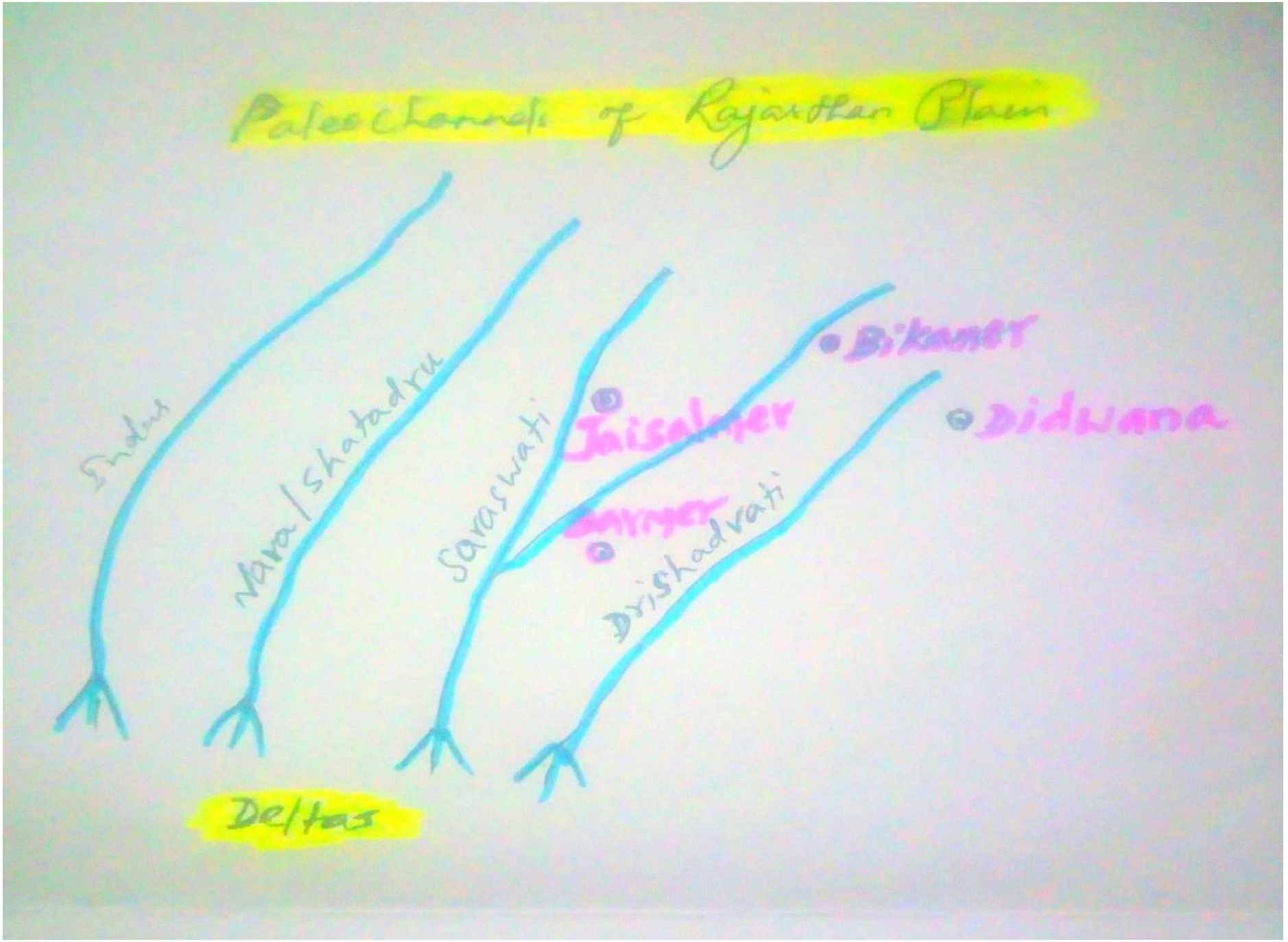
Regions of North Indian Plains

1. The Rajasthan Plains
2. The Punjab-Haryana Plains
3. The Ganga Plains
4. The Brahmaputra Plains

1.The Rajasthan Plains (1,75,000 sq.km)

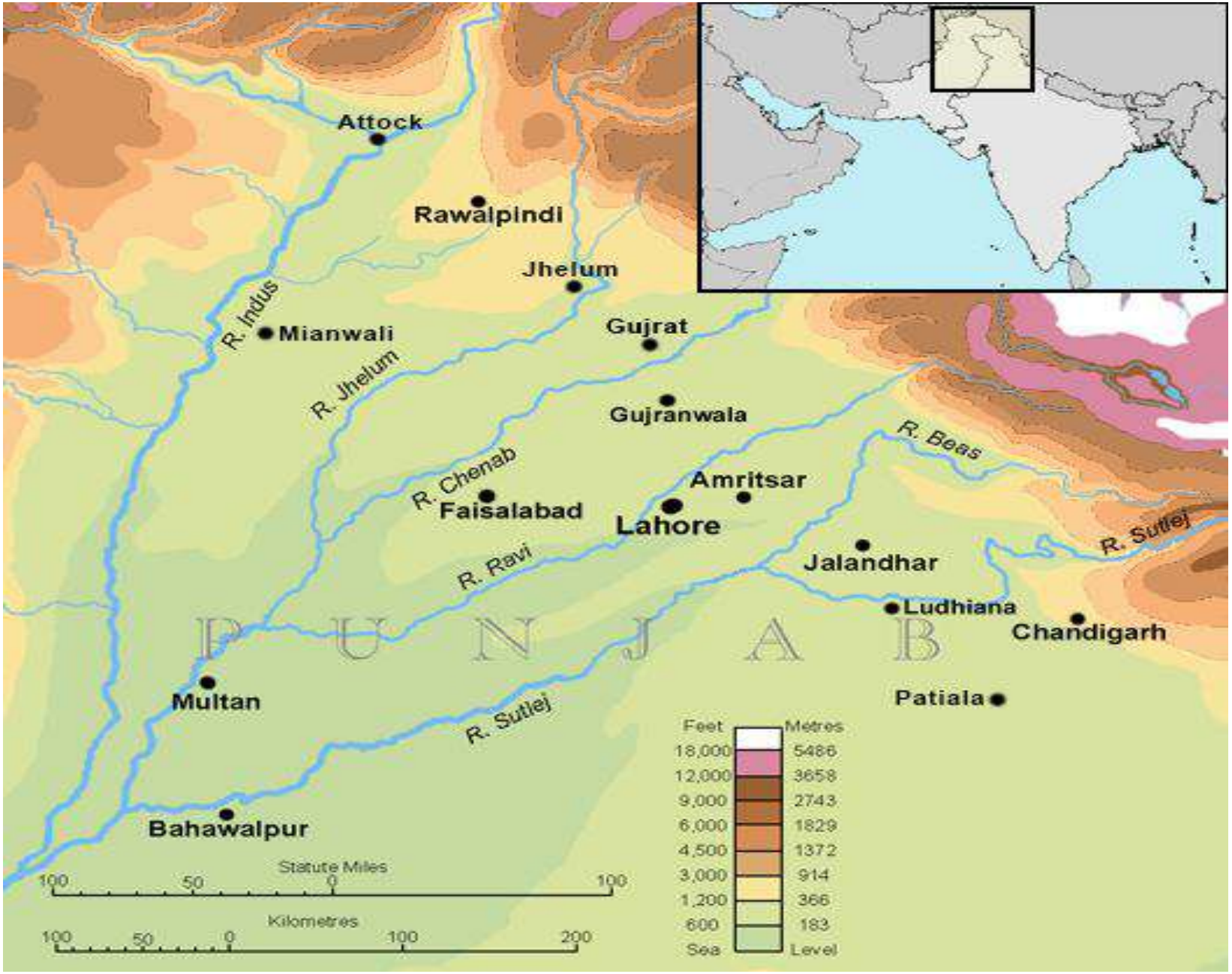
- Lies to the west of Aravallis including *Marusthali* and *Bagar* of Rajasthan
- Sloping from north east to south west
- The greater part of it was under the sea during Carboniferous period
- Formed by the recession of the sea as is evidenced by the presence of salt water lakes (Sambhar, Degana, Didwana, Kuchaman, Lunkaransar Tal, Pachpadra)
- Sambhar lake (300 sq.km in rainy season) is in north west of Jaipur

- It has several dry beds of rivers like Saraswati, Drishadvati and Shatadru
- Luni is the only river flowing at present
- Rohi: fertile plain in south west of Rajasthan plain
- Dharian: sand dunes in the western part of the plain
- Bagar: Semi arid plain between Thar and Aravallis.

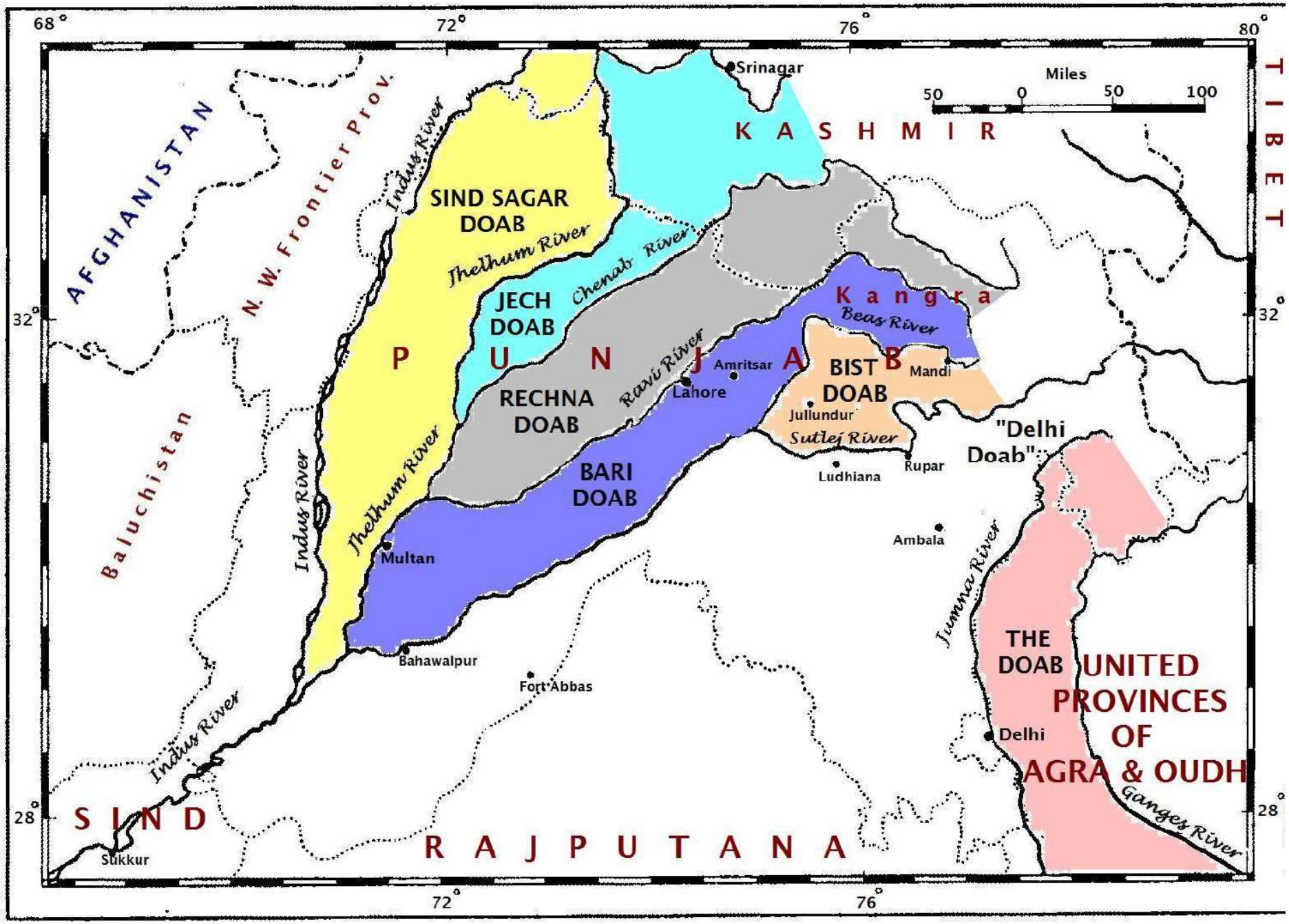

Palaeochannels of Rajasthan Plain
Indus
Nara / Shatadru
Saraswati
Jaisalmer
Bikaner
Barmer
Didwana
Drishadvati
Deltas

2.The Punjab-Haryana Plains (1,75,000 sq.km)

- 650km from N.E to S.W
- 300km from West to East
- Aggradational plain, deposited by the Satluj, Beas and Ravi
- Elevation varies from 300m in North to 200m in the S.E.
- Delhi Ridge separates it from Gangetic plain
- Sloping from NE to SW and South
- The main topographic features are ‘bluffs’, called ‘Dhaya’ (3m high) and Khadar belt, known as ‘bet’.


Attock
Rawalpindi
Jhelum
Mianwali
Gujrat
Gujranwala
Amritsar
Faisalabad
Lahore
Jalandhar
Ludhiana
Chandigarh
Patiala
Multan
Bahawalpur
R. Indus
R. Jhelum
R. Chenab
R. Ravi
R. Beas
R. Sutlej
R. Sutlej
PUNJAB
Statute Miles
100 50 0 100
Kilometres
100 50 0 100 200
Feet
Metres
18,000 5486
12,000 3658
9,000 2743
6,000 1829
4,500 1372
3,000 914
1,200 366
600 183
Sea Level

- Seasonal rivers are called ‘chos’ causing erosion in undulating topography
- Doabs:
- Sindhsagar – Indus & Jhelum
- Jech –Jhelum & Chenab
- Rechna – Chenab& Ravi
- Bari – Ravi & Beas
- Bist – Beas & Satluj


68°
72°
76°
80°
32°
28°
AFGHANISTAN
N. W. Frontier Prov.
Baluchistan
TIBET
Srinagar
Miles
50 0 50 100
K A S H M I R
Indus River
SIND SAGAR DOAB
Jhelhum River
Chenab River
JECH DOAB
Kangra
Beas River
P U N J A B
Ravi River
Amritsar
Lahore
RECHNA DOAB
BIST DOAB
Mandi
Jullundur
Sutlej River
"Delhi Doab"
Ludhiana
Rupar
BARI DOAB
Multan
Ambala
Jumna River
THE DOAB
UNITED PROVINCES OF AGRA & OUDH
Delhi
Bahawalpur
Fort Abbas
Ganges River
S I N D
R A J P U T A N A
Sukkur

3. The Ganga Plains (3,57,000 sq.km)

- From Yamuna in the west to Bangladesh border in the east
- 1400 km long; 300km wide
- Sloping from NW to SE (15cm/km)
- Elevations: Saharanpur (276m), Roorkee (274m), Agra (169m), Kanpur (125m), Allhabad (98m), Patna (53m), Kolkatta (6m)
- Topographical features: Bhabar, Tarai, Bhangar, Khadar, bluffs, bills, and badlands

(a) Upper Ganga Plain: includes Ganga-Yamuna doab, Rohilkhand division and parts of Agra division

- Yumuna on the West, Shiwaliks on the North and 125m contour in the South
- Its elevation varies from 100m to 200m
- Also traversed by Kali and Sharda rivers
- Unique feature is the presence of 'Bhur' (undulating aeolian sandy deposits)
- Sugarcane, rice, wheat, maize pulses, mustard, fodder, vegetable, orchards
- Green revolution is a big success here.

(b) Middle Ganga Plain: Central and eastern U.P., Bihar plains upto Muzaffarpur and Patna

- No part exceeds 150m elevation
- Gomathi, Gagra, Rapti, Gandak, Kosi and Son are important rivers
- They often change their courses.

(c) Lower Ganga Plain: Chotanagpur Plateau in the West, Darjeeling Himalaya in the North, Bay of Bengal in the South, Assam & Bangladesh in the East

- The eastern part of plain is drained by the Tista, Jaldhakia, Sankosh
- The western part by the Mahananda, Ajay and Damodar
- Kasai & Subarnarekha are the main rivers
- Slope is towards south and southeast
- Rahr plain: drained by Damodar and Subarnarekha. It is covered by the lateritic alluvium soils
- Sundarbans: Largest mangrove swamp in the world. Home to Royal Tigers and Crocodiles

4. Brahmaputra Plains (56,275 sq.km)

- Originated in Chenayungdung glacier
- 700 km long; 80 km wide
- Surrounded by high mountains on all sides, except on the west
- Elevation ranging from 30m in the west and 130m in the east
- Steep slope on the North; gradual fall from Meghalaya Plateau in the South
- Highly braided channels as gradient is low – forming islands

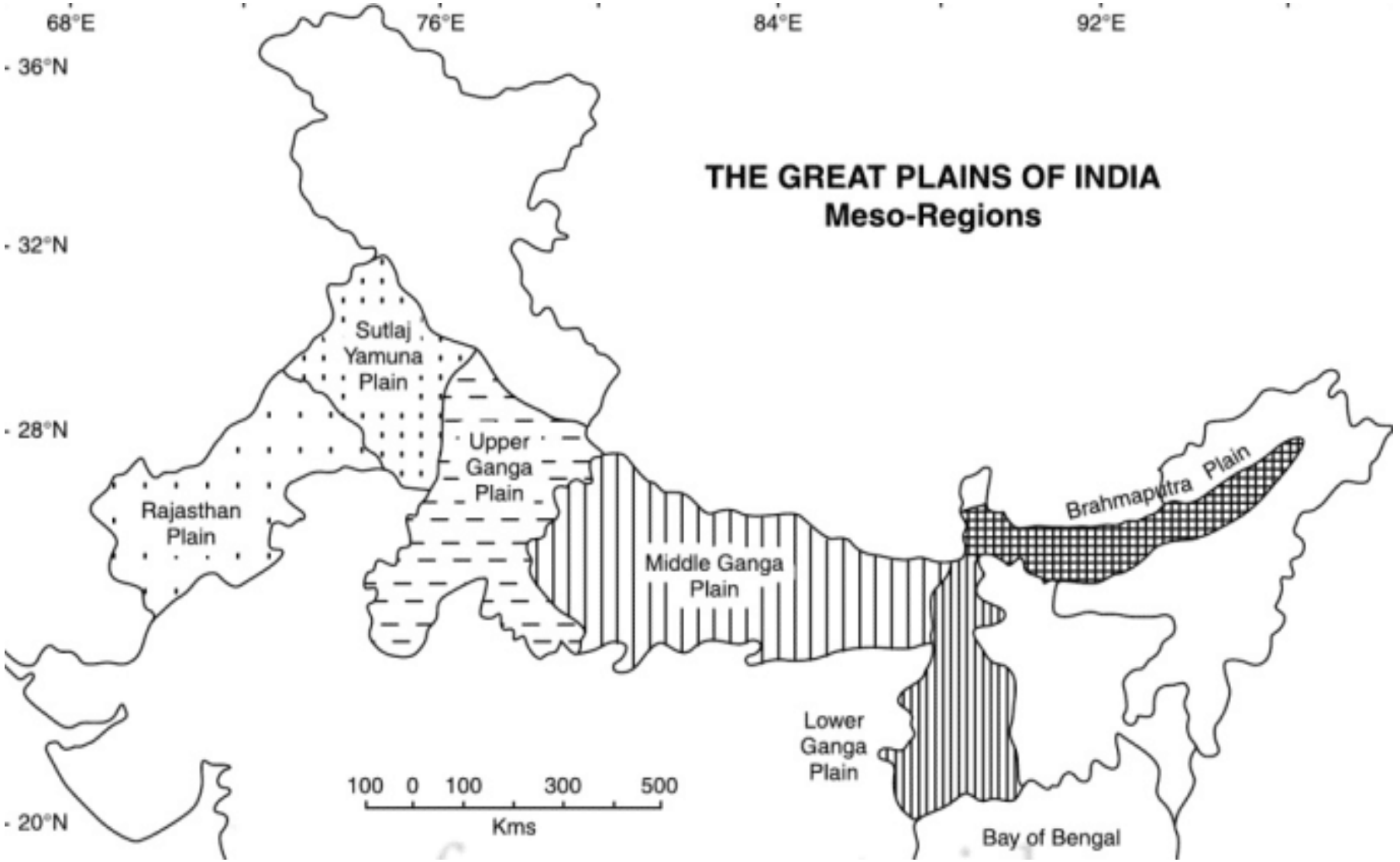
- Majuli island, second largest river island in the world after ‘Marajo island’ (Amazon River)
- Paddy and Jute – staple crops
- Marked changes in the Physiography of the north and south banks of the Brahmaputra river.
- North Bank plain: Descend from Arunachal Pradesh and Assam
- Form alluvial fans, obstruct the course of tributaries-run parallel to the main river

- Numerous levees
- Formation of Bils, ox-bow lake, marshy tracts, tarai lands with dense forest cover

South Bank plain Tributaries are larger

- Dhansiri, Kapili rivers. Through their headward erosion have almost isolated 'Mikir and Rengma' hills from Meghalaya Plateau
- 90 degree east longitude divides Assam plain into Upper Assam and Lower Assam
- Right bank tributaries form 'Trellis pattern'

- Left bank tributaries exhibit the ‘dendritic pattern’ of drainage.
- Kaziranga and Manas national parks are located


68°E
76°E
84°E
92°E
36°N
32°N
28°N
20°N
THE GREAT PLAINS OF INDIA
Meso-Regions
Sutlaj Yamuna Plain
Upper Ganga Plain
Rajasthan Plain
Middle Ganga Plain
Brahmaputra Plain
Lower Ganga Plain
Bay of Bengal
100 0 100 300 500
Kms

Peninsular Plateau

- It is roughly triangular in shape – the base coinciding with southern edge of the great plains.
- Area – 16,00,000 sq.km. (half the total land area)
- The base of the irregular triangle lies between Delhi ridge and Rajmahal hills and apex by Kanyakumari
- Bounded by – Aravalli in the NW, Maikal range in North, Rajmahal hills in the NE, Western Ghats in the west, Eastern Ghats in the east.
- The highest peak is Anaimudi (2695m)

- Prof S.P. Chatterjee (1964) classified peninsular plateau into 8 physiographic units.

1. The North central highlands
2. The South central highlands
3. The Eastern Plateau
4. The Meghalaya Plateau
5. The North Deccan
6. The South Deccan
7. The Western Ghats (Shayadris)
8. The Eastern Ghats

1.The North central highlands: It includes Aravallis, Malwa plateau and Vindhyan range

Aravallis: run from NE to SW for about 800 km between Delhi and Palanpur (Gujarat)

- Oldest fold mountains of the world
- Highest peak is Guru Sikhar (1722m)
- Composed of Quartzites, gneisses and schists of Precambrian period

Malwa Plateau: surrounded by Aravalli in the North, Vindhyan range in the south and Bundelkhand in the east.

- Two drainage systems are found – Narmada, Mahi (Arabian sea), Chambal, Sind, Betwa, Ken (Bay of Bengal)

2.The South central highlands: It includes Bundelkhand and Baghelkhand regions.

Bundelkhand is surrounded by Yamuna on the North and Vindhya on the South.

- It is a land of granite and gneiss
- Betwa, Dhasan and Ken rivers are flowing

Baghelkhand – east of Makal range, Son river on south

3.The Eastern Plateau (The Chotanagpur Plateau)

- It lies in West Bengal, Jharkhand, Chhattisgarh, Odisha
- It has a series meso & micro plateaux (Ranchi, Hazaribagh, Singbhum, Dhanbad, Palamu, Santhal, Parganas, Purulia)
- Archaean granite, gneiss, Gondwana rocks, Cretacious lava deposits
- ‘Pat’lands – the most elevated part
- Damodar, Subarnarekha, Koel rivers – carving out deep gorges, rapids, cataracts, waterfalls.

4.The Meghalaya Plateau

- Garo, Khasi, Jaintia hills, Mikir & Rengma hills
- Detached from Peninsular Plateau by Malda Gap
- Shillong is the highest point (1823m)
- Norkek (1515m) in Garo hills
- Mawsynram (25°15’N and 91°44’E) – 16 km west of Cherrapunji

5. The North Deccan Plateau (Maharashtra Plateau)

- Covers entire state of Maharashtra
- Covered by basalt of Cretacious period – 3 km thickness on the west, diminishing towards east and south east
- Korba coal fields of Chhattisgarh lies here
- Gondwana formations are rich in Bituminous coal, Dharwarian rocks are rich in iron ores
- Dhalli-Rajahara mines – supplies iron ore
- Bailadila range – iron ore deposits (Chhattisgarh)

6. South Deccan Plateau (Karnataka, Telengana, TN)

- Karnataka: Archaean and Dharwar formations – Baba-budan hills (highest peak is Mulangiri – 1913m & Kudremukh – 1892m)
- Telengana: Cuddapah and Dhawar formations
- Tamil Nadu: Archaean rocks, Charnockites are found in Javadi & Shervaroy hills

  - Between Coimbatore & Anamalais – Palakkad Gap (25km wide)

7. The Western Ghats (Shayadris)

- From the mouth of Tapi river to Cape Comorin
- Runs parallel to the west coast for 1600 km, in North to South direction
- Average elevation – 1000 m to 1300 m
- Western slope is steep; eastern slope is gentle
- These are block mountains formed due to down warping of part of the land into the Arabian Sea
- All rivers of Peninsular India rise from here
- Gerasoppa (Jog Falls) on Sharavati river is the highest waterfall in India – 250 m

- In Nilgiris, eastern ghats and western ghats join – Dodda betta (2637m) and Anaimudi (2695m)

Other Peaks:

1. Kudremukh – 1892m (rich in iron ore, haematite and magnetite, exported to Iran via Mangalore port)
2. Pushpagiri – 1714m
3. Kalsubai – 1646m
4. Salher – 1567m
5. Mahabaleshwar – 1438m
6. Harichandra – 1424m

Passes:

1. Bhor Ghat: connects Mumbai with Pune, busiest pass - 1000m elevation
2. Thal Ghat: Connects Mumbai with Nasik, NH3 passes through it, Bhopal – Indore railway line also passes...
3. Pal Ghat: connects Coimbatore with Kochi & Calicut

8. Eastern Ghats

- Average elevation – 600 m
- Eastern boundary of Deccan Plateau
- Detached hills – called by local names
- Between Mahanadhi and Godavari – average height is 1100m.

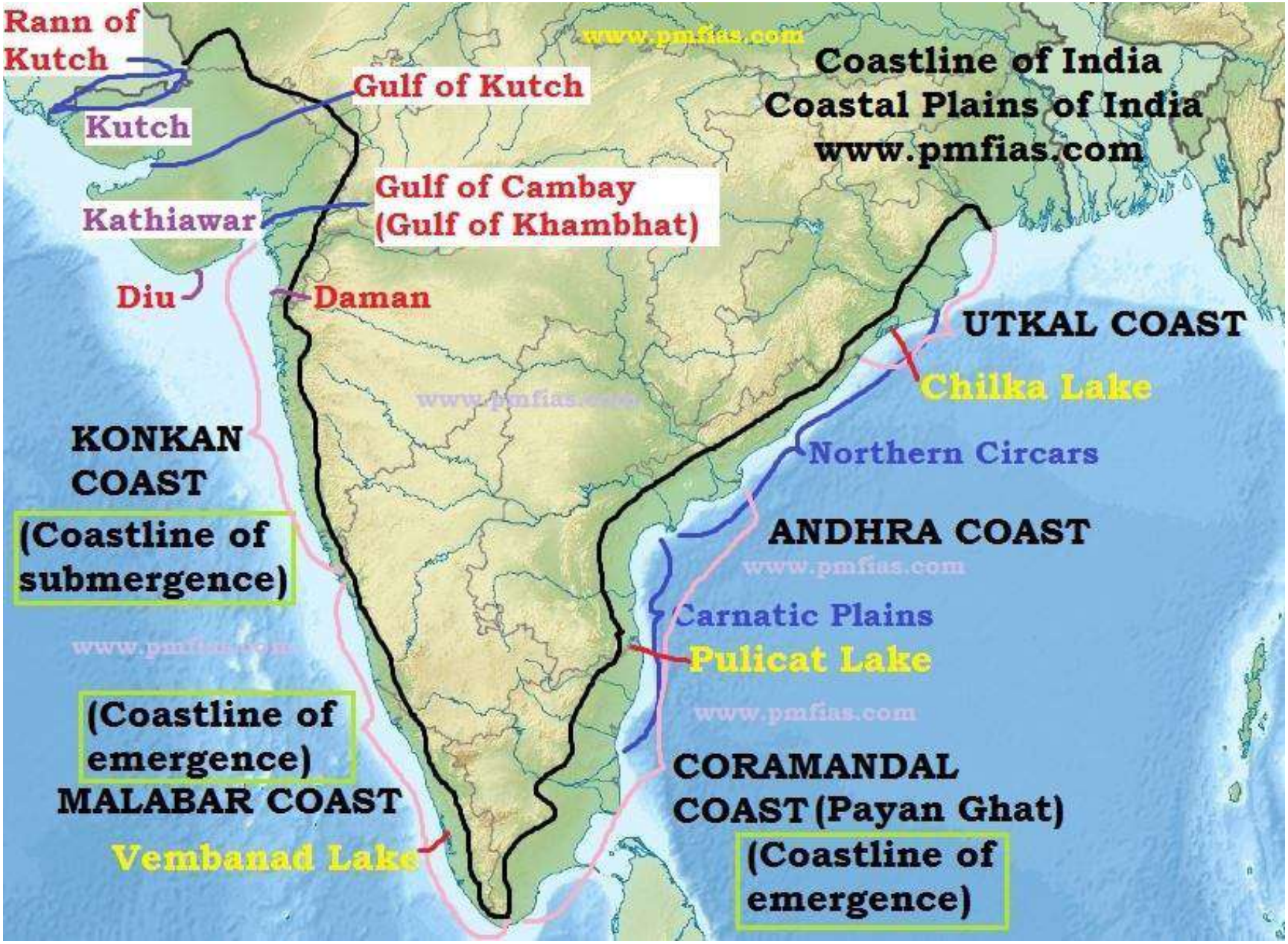
Peaks: 1. Aroya-konda (1680m), 2. Dewodi-Munda (1598m), 3. Singa-Raju (1516m), 4. Nimalgiri (1515m), 5. Mahendragiri (1501m)

- Between Krishna and Chennai – Kondavidu, Nallamalai, Velikonds, Palkonda
- Seshachalam (Cuddapah & Anantapur dts), Javadi, Shevaroy, Pachamalay, Sirumalai, Varushanad hills...

The Coastal Plains

West Coastal Plain:lies between Shayadris and the Arabian Sea. 1400 km long; 10-80km wide.

- Elevation upto 150m; At some places 300m
- Characterised by sandy beaches, coastal sand-dunes, mud flats, lagoons, estuary, alluvial tracts along rivers
- An example of submerged coast – e.g., Dwaraka submerged under water
- Natural conditions for the development of port and harbour – Kandla, Mazagoan, Nava Sheva, Cochin..
- Kachch and Kathiawar coast in Gujarat
- The northern part – Konkan coast – 530 km long; 30-50 km wide
- Karnataka plain (kannad coast) – 525 km long; 8-25 km wide. It is the narrowest part.
- Malabar Coast – 550 km long; 20-100 km wide.


Rann of Kutch
Kutch
Gulf of Kutch
Gulf of Cambay (Gulf of Khambhat)
Kathiawar
Diu
Daman
Coastline of India
Coastal Plains of India
www.pmfias.com
UTKAL COAST
Chilka Lake
Northern Circars
ANDHRA COAST
Carnatic Plains
Pulicat Lake
CORAMANDAL COAST (Payan Ghat)
(Coastline of emergence)
KONKAN COAST
(Coastline of submergence)
(Coastline of emergence)
MALABAR COAST
Vembanad Lake

- Characterized by sand dunes – numerous shallow lagoons are found – Kayals & Teris
- Backwaters are used for fishing, navigation, tourism
- Nehru Trophy 'Vallamkali' (boat race) in Punnamada Kayal
- Vembanad, Asthamudi are important lagoons

East coastal plain: Between Eastern Ghats and Bay of Bengal.

- Consists of Tertiary alluvial deposits and recent
- Emergent coast
- Gentle and Monotonous, rising gently towards westward
- Mariana Beach
- The northern part is Northern Circar, southern part is known as Coramandel Coast

- Chilka lake in S.W. of Mahanadhi delta is the biggest lagoon lake
- Kolleru lake – Between Godavari and Krishna delta
- Pulicat lake – Between Andhra & TN

The Islands

- 247 islands - of which 204 lie in the Bay of Bengal; 43 lie in Arabian Sea
- Only 36 islands are inhabited in A&N islands

Andaman & Nicobar islands

- 6°45’N to 13°45’N & 92°10’N to 94°15’N
- Tectonic and volcanic origin
- Elevated portion of submarine mountains
- Andaman islands are divided into 3 main islands. North, Middle and South – Great Andamans
- Little Andaman is separated by South Andaman by Duncan passage

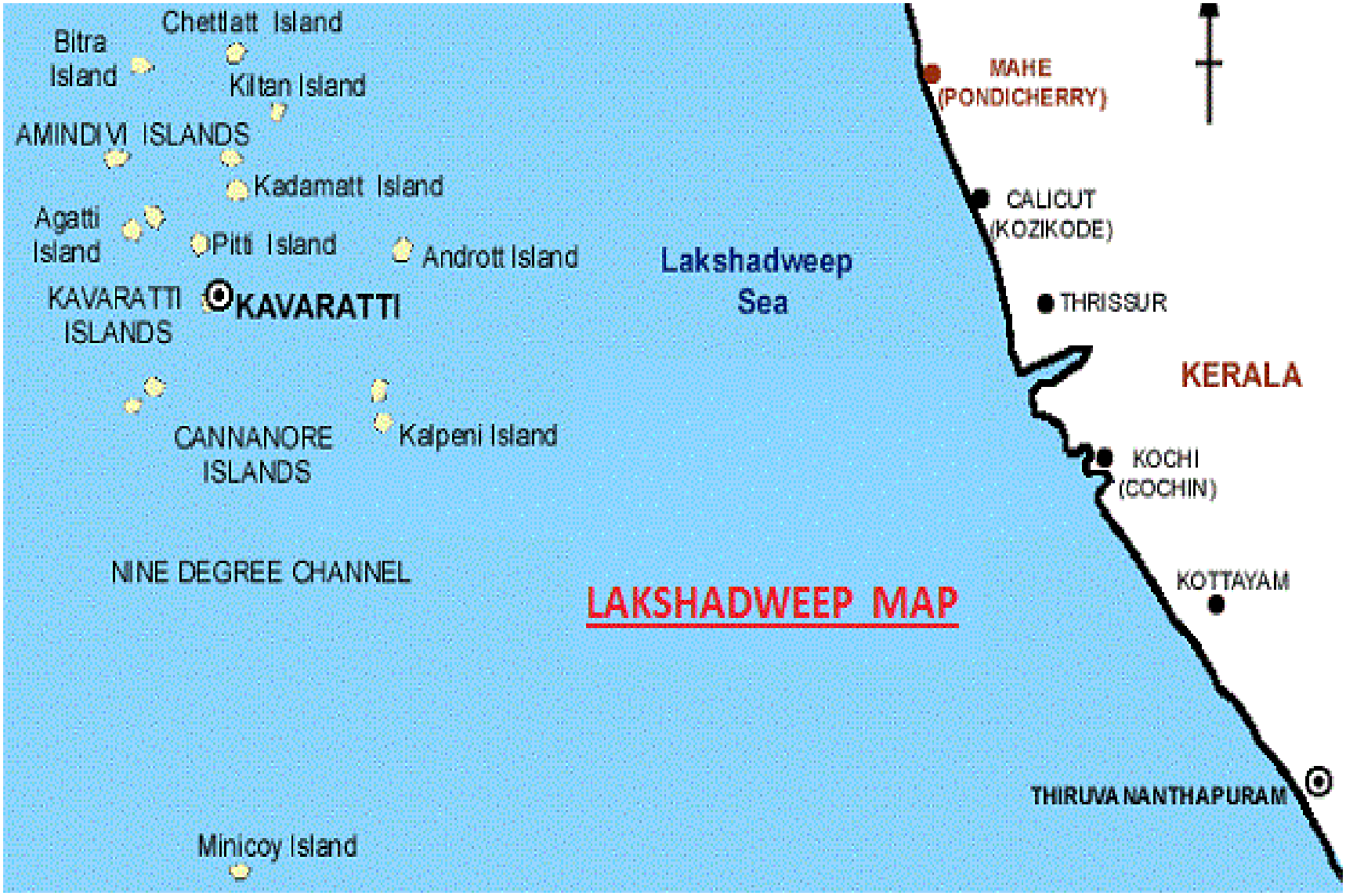

ISLANDS
LOW - HILLS
North Andaman
Middle Andaman
ANDAMAN ISLANDS
Lower Andaman
Port Blair
Andaman Sea
Indian Ocean
Little Andaman
Andaman and Nicobar Islands
100 mi
100 km
Car Nicobar
NICOBAR ISLANDS
Bompoka
Tarasa
Nancowry
Katchall
Little Nicobar
Great Nicobar

- Port Blair, the capital, is located in S. Andaman
- 10° channel separates Andaman & Nicobar islands
- Saddle Peak (737m) – North Andaman
- Mt. Diavolo (515m) – Middle Andaman
- Mt. Koyob (460m) – South Andaman
- Thuiller peak (642m) - Great Nicobar
- Narcondam and Barren islands are of volcanic origin
- The southern most point is Indhira point or Pygmalion point
- The distance from mainland is about 2000km

- These islands are extensions of Arakanyoma mountain chain
- Made up of Tertiary sandstone and limestone
- Equatorial and Tropical climate – 35°C - heavy rainfall – two monsoons – thick forest
- Rice is the staple food.
- Arecanut, coconut – cash crops
- Onges, Jarawas, Sentinelese – tribes
- Giant Robber Crab – found in Wandoor Marine Biosphere Reserve in S. Andaman & Great Nicobar islands – climb coconut tree and break the hard shell using claws.

Lakshadweep & Minicoy Islands

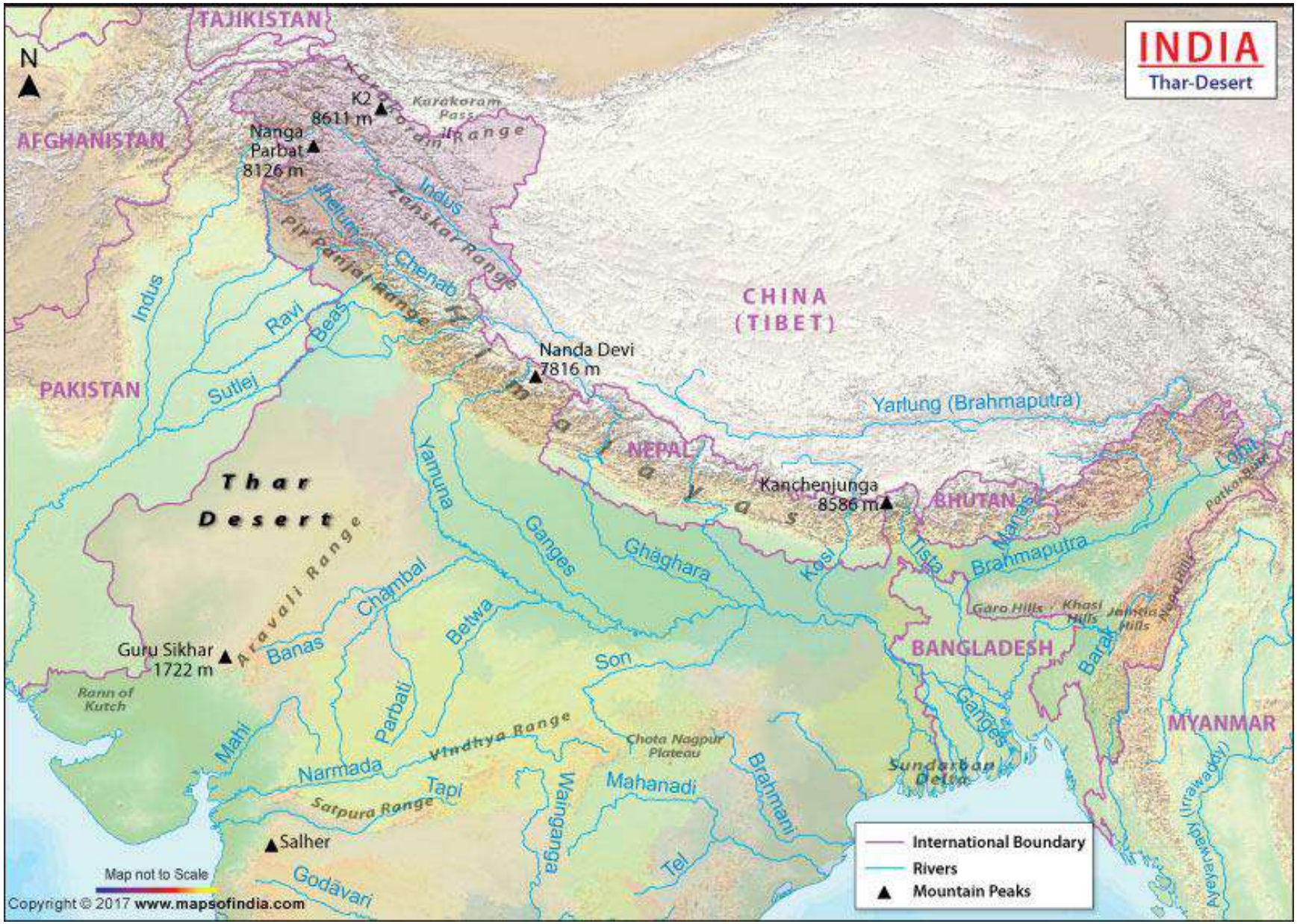
- 8° to 12° N latitudes & 71° to 74°E longitudes
- In Malayalam & Sanskrit – 100,000 islands
- 36 islands; 10 are inhabited
- They are of coral origin
- 220 to 440 km from Kochi
- The shortest distance is 109 km from Calicut
- Kavarati is the HQ
- Amindivis – Northern island
- Minicoy – Southern island
- Minicoy island is separated by 8° channel from Maldives island
- The Pitty island has a bird sanctuary


Chettlatt Island
Bitra Island
Kiltan Island
AMINDIVI ISLANDS
Kadamatt Island
Agatti Island
Pitti Island
Andrott Island
KAVARATTI ISLANDS
KAVARATTI
Lakshadweep Sea
CANNANORE ISLANDS
Kalpeni Island
NINE DEGREE CHANNEL
LAKSHADWEEP MAP
Minicoy Island
MAHE (PONDICHERRY)
CALICUT (KOZIKODE)
THRISSUR
KERALA
KOCHI (COCHIN)
KOTTAYAM
THIRUVANANTHAPURAM

- Fishing is the main occupation
- Hills and streams are absent
- Coconut is the only major crop
- Temperature 20° to 32°C
- 9° channel separates Minicoy from lakshadweep islands

The Desert

- Lies in the northwest of Aravallis
- Longitudinal dunes and Barchans
- Arid climate with low vegetaion cover
- Rainfall below 150mm/year
- Also known as Marusthali
- Mushroom rock, shifting dunes, oasis – features
- Believed that it was under sea during Mesozoic Era
- The northern part is sloping towards Sindh, the southern part is sloping towards Rann of Kachch
- Rivers are ephemeral – some disappear after flowing for a distance – forming inland drainage by draining into lakes or playas.


INDIA
Thar-Desert
N
TAJIKISTAN
AFGHANISTAN
PAKISTAN
CHINA (TIBET)
NEPAL
BHUTAN
BANGLADESH
MYANMAR
K2 8611 m
Karakoram Pass
Karakoram Range
Nanga Parbat 8126 m
Indus
Zanskar Range
Jhelum
Pir Panjal Range
Chenab
Ravi
Beas
Sutlej
Nanda Devi 7816 m
Himalayas
Yarlung (Brahmaputra)
Kanchenjunga 8586 m
Thar Desert
Aravali Range
Yamuna
Ganges
Ghaghara
Kosi
Gandak
Manas
Brahmaputra
Lohit
Patkai Range
Garo Hills
Khasi Hills
Jaintia Hills
Barak
Guru Sikhar 1722 m
Banas
Chambal
Betwa
Son
Rann of Kutch
Mahi
Parbati
Narmada
Vindhya Range
Chota Nagpur Plateau
Sundarban Delta
Tapi
Satpura Range
Salher
Waingana
Mahanadi
Brahmani
Tel
Godavari
Ayeyarwady (Irrawaddy)
Map not to Scale
International Boundary
Rivers
Mountain Peaks
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Drainage Systems of India

Terms

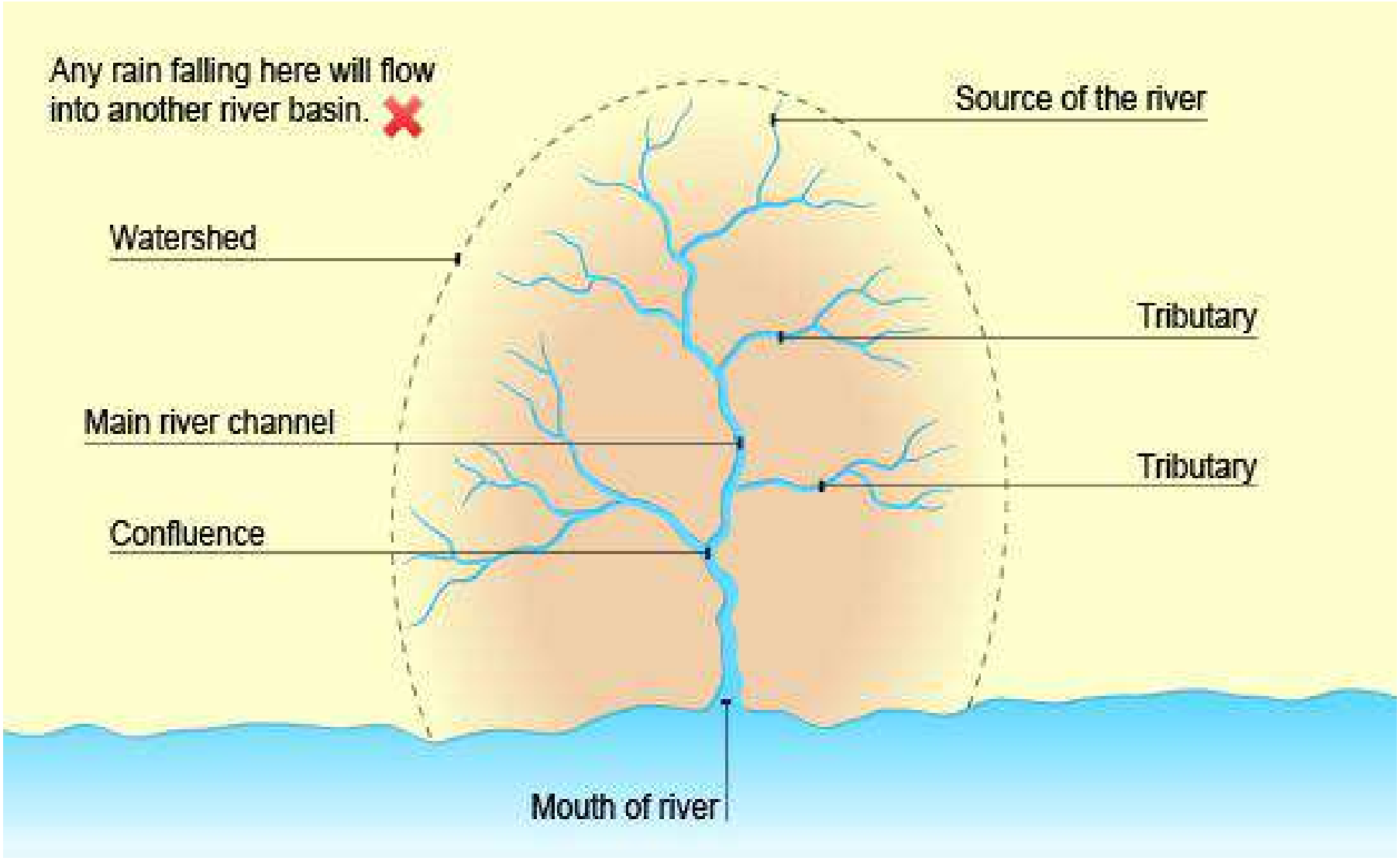
Drainage : the flow of water through well-defined channels

Drainage system: the network of such channels

Catchment: the area from where the river collects water

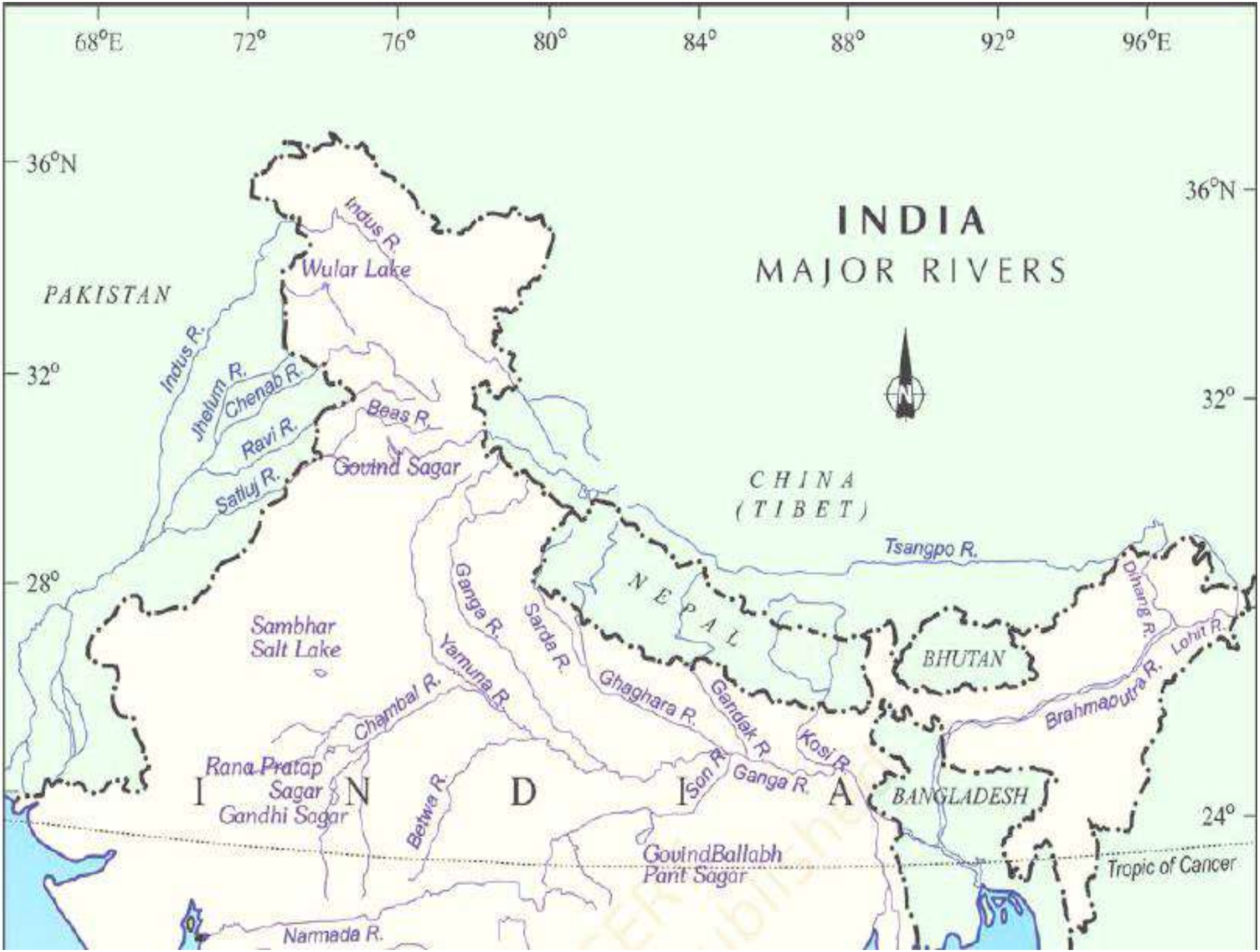
Basin: An area drained by a river and its tributaries. Normally, it is large in size

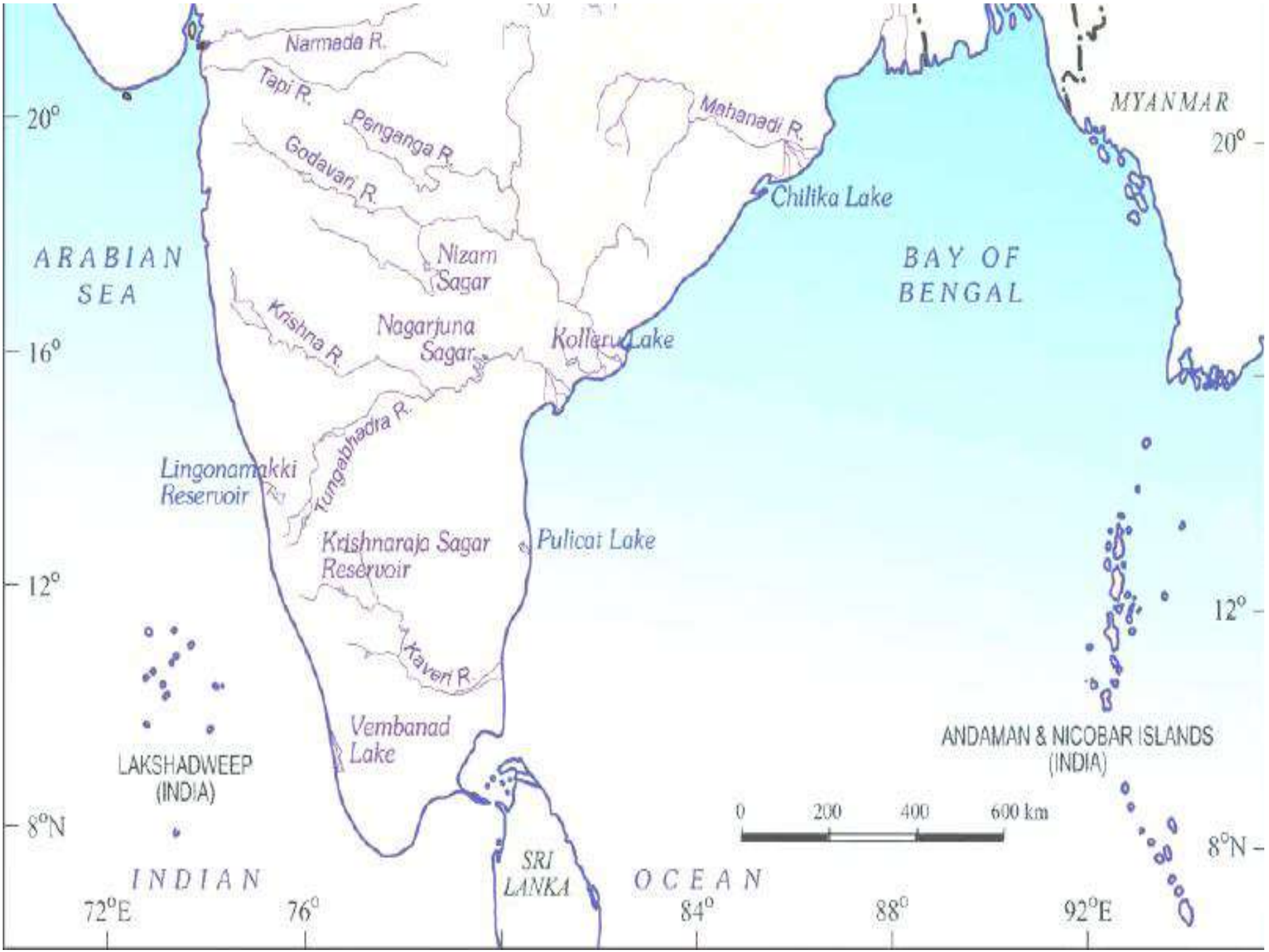
Watershed: The boundary line separating two drainage basins


Any rain falling here will flow into another river basin.
Source of the river
Watershed
Tributary
Main river channel
Tributary
Confluence
Mouth of river

- The drainage pattern of an area is the outcome of the geological time period, nature and structure of rocks, topography, slope, amount of water flowing and periodicity of flow
- The drainage system of Indian sub-continent is the result of evolutionary history of the physiographic divisions.

- Indian drainage system may be divided on the bases of
  1. Discharge of water (orientation to the sea)
     - Bay of Bengal Drainage (77% of area)
     - Arabian Sea Drainage (23% of area)
  2. Size of the watershed
     -Major basin - >20,000 sq.km.
     -Medium basin – 2,000 to 20,000 sq.km
     -Minor basin - <2,000 sq.km.
  3. Source of the river
     - The Himalayan drainage
     - The Peninsular drainage


INDIA
MAJOR RIVERS
68°E
72°
76°
80°
84°
88°
92°
96°E
36°N
32°
28°
24°
PAKISTAN
CHINA
(TIBET)
NEPAL
BHUTAN
BANGLADESH
Indus R.
Wular Lake
Jhelum R.
Chenab R.
Ravi R.
Beas R.
Satluj R.
Govind Sagar
Tsangpo R.
Dihang R.
Lohit R.
Brahmaputra R.
Ganga R.
Sarda R.
Ghaghara R.
Gandak R.
Kosi R.
Yamuna R.
Chambal R.
Sambhar
Salt Lake
Rana Pratap
Sagar
Gandhi Sagar
Betwa R.
Son R.
Govind Ballabh
Pant Sagar
Narmada R.
Tropic of Cancer
N


Narmada R.
Tapi R.
Penganga R.
Godavari R.
Mahanadi R.
MYANMAR
Chilika Lake
ARABIAN SEA
BAY OF BENGAL
Nizam Sagar
Krishna R.
Nagarjuna Sagar
Kolleru Lake
Tungabhadra R.
Lingonamakki Reservoir
Krishnaraja Sagar Reservoir
Pulicat Lake
Kaveri R.
Vembanad Lake
LAKSHADWEEP (INDIA)
ANDAMAN & NICOBAR ISLANDS (INDIA)
0 200 400 600 km
SRI LANKA
INDIAN OCEAN
20°
16°
12°
8°N
72°E
76°
84°
88°
92°E

Evolution of River systems

- The rivers of India have acquired their peculiar features in the course of a long process of evolution

The Himalayan Rivers

- The Himalayan rivers, the Indus – the Ganges – the Brahmaputra, have evolved through a long history
- Geologists believe that a mighty river called Shiwalik or Indobrahma traversed the entire longitudinal extent of the Himalaya from Assam to Punjab and finally discharged into Gulf of Sind near lower Punjab during Miocene period
- The alluvial deposits and conglomerates support this view point

- The mighty stream was dismembered into

  (a) the Indus and its tributaries

  (b)the Ganga and its tributaries

  (c) the Brahmaputra and its tributaries
- It was due to

  1. the Pleistocene upheavals of the Western Himalayas, including the uplift of Potwar Plateau (Delhi Ridge),

  2. the down thrusting of Malda Gap between Rajmahal hills and the Meghalaya Plateau during mid-Pleistocene period
- These two major events diverted the course of the original Mighty river

The Indus system

- Covering an area of 3,21,290 sq.km in India (total area:11,65,000 sq.km)
- Length 1,114 km in India (total 2,880 km)
- Also known as ‘Sindhu’
- Originates from a glacier near ‘Bokhar Chu’ (31° 15’ N latitude and 81° 40’ E longitude) at an altitude of 4,164 m in the Kailash Range in the Tibetan region
- In Tibet, it is known as ‘Singi Khamban’ or lion’s mouth
- Flowing between Ladakh and Zaskar ranges
- It cuts across Ladakh range and forming a spectacular gorge near Gilgit in Jammu and Kashmir
- It enters into Pakistan near Chilas in the Dardistan region

- 20% of total waters can be used by India (4,195million cubic metres) according to Indus Water Treaty between India and Pakistan
- Himalayan tributaries : the Shyok, the Gilgit, the Zanskar, the Hunza, the Nubra, the Shigar, the Gasting and the Dras
- It finally emerges out the hills near Attock where it receives the Kabul river on its right bank
- Sulaiman Range tributaries: the Khurram, the Tochi, the Gomal, the Viboa, the Sangar
- It receives five rivers of Punjab near Mithankot
- They are the Satluj, the Beas, the Ravi, the Chenab and the Jhelum

- It finally discharges into Arabian Sea, east of Karachi
- Indus river flows through India only in Jammu and Kashmir
- The Jhelum rises from a spring at Verinag at the foot of Pir Panjal range. It flows through Sri Nagar and Wular lake. It joins the Chenab river near Jhang in Pakistan.
- The Chenab river is the largest tributary of the Indus. It is formed by two streams, the Chandra and the Bhaga which join at Tandi near Keylong in Himachal Pradesh. It is also known as *Chandrabhaga*. It flows for 1,180km before entering into Pakistan

- The Ravi river rises west of Rohtang pass in the Kullu hills of Himachal Pradesh. It flows through Chamba valley. It joins Chenab river near Sarai Sindhu. It drains the area between the southeastern part of the Pir Panjal range and Dhauladhar range
- The Beas river originates from Beas Kund near Rohtang pass at an elevation of 4000 m. It flows through Kullu valley. It joins the Satluj near Harike.
- The Satluj river originates in the 'Raksas tal' near Mansarovar at an altitude of 4,555m in Tibet. It is known as Langchen Khambab. It passes through Shipki La pass and enters into Punjab plain. It is an antecedent river. Bhakra Nangal Dam is built across it.

The Ganga System

- Covering an area of 8,61,404 sq.km.
- Length 2,525 km
- Formed by the meeting of two head streams – Bhagirathi and Alaknanda at Devaprayag.
- Bhagirathi river rises in the Gangotri glacier near Gaumukh (3,900m) in Uttarkashi district of Uttarkhand.
- The Alaknanda has its source in the Satopanth glacier above Badrinath.
- The Ganga enters the plains at Haridwar

- The total length is shared by Uttarkhand (110 km), Uttar Pradesh (1,450 km), Bihar (445 km) and West Bengal (520 km)
- The Ganga river system has a number of perennial and non-perennial rivers (Peninsular Plateau)
- Left Bank tributaries: the Ram Ganga, the Gomati, the Ghaghara, the Gandak, the Kosi and the Mahananda
- Right Bank tributaries: the Yamuna, the Son
- The Ganga discharges into Bay of Bengal near Sagar Island

- Yamuna river is the longest tributary of the Ganga. It originates from Yamunotri glacier It joins the Ganga at Prayag (Allahabad).
- It is joined by the Chambal, the Sind, the Betwa, the Ken on its right bank
- The Hindan, the Rind, the Sengar and the Varuna join the Yamuna on its left bank

- The Chambal: rises near Mhow in the Malwa Plateau and flows northwards
- Gandhisagar Dam has been constructed near Kota in Rajasthan
- It is famous for its badland topography
- The Gandak: rises in Nepal Himalayas and drains the central part of Nepal
- It enters the Ganga Plain in Champaran district of Bihar
- It joins the Ganga at Sonpur near Patna

- The Ghaghara: originates in the Mapchachungo glacier. The river Sarda (Kali) joins it before it finally meets the Ganga at Chhapra
- The Kosi: is an antecedent river originates from the north of Mt. Everest in Tibet
- The Mahananda: rising in Darjeeling hills. The last left bank tributary of the Ganga. It joins in West Bengal
- The Son: the right bank tributary originating in Amarkantak Plateau. After forming series of waterfalls, it reaches Arrah, west of Patna, to join the Ganga.

The Brahmaputra System

- Originates in the Chemayungdung glacier of Kailash Range near Mansarovar lake
- It is known as ‘Tsangpo’ in Tibet which means ‘purifier’
- It flows for 1200 km eastwards longitudinally
- Rango Tsangpo is the major right bank tributary in Tibet
- It emerges from the foothills of Namacha Barva (7,745m) in the name of Siang or Dihang
- It enters into India west of Sadia town of Arunachal Pradesh
- Flowing southwestwards, it receives its left bank tributaries Dibang or Sikang and Lohit –thereafter it is known as ‘Brahmaputra’

- It flows for 750 km in India
- Receives numerous tributaries in its journey
- Burhi Dihing and Dhansari are the important left bank tributaries
- Subansiri, Kameng, Manas, Sankosh are the major right bank tributaries
- The Subansiri originates in Tibet is an antecedent river
- The Brahmaputra enters into Bangladesh near Dhubri and flows southwards
- River Tista joins the Brahmaputra on its right in Bangladesh from where it it known as Jamuna
- It finally merges with river Padma which falls in the Bay of Bengal

Peninsular Drainage System

- It is older than the Himalayan system
- It is evident from the broad, largely graded shallow valleys and maturity of the rivers
- The Western Ghats act as a major water divide for east flowing and west flowing rivers
- Major rivers such as the Mahanadhi, the Godavari, the Krishna and the Cauvery flow eastwards and drain into the Bay of Bengal.
- These rivers form huge deltas near their mouths
- The west flowing rivers are very small. But....
- Narmada and Tapi rivers flow through troughs formed due to faulting – are exceptions.

Evolution of Peninsular Drainage System

Three Geological events took place in the past have shaped the present system

1. Subsidence of the western flank of the Peninsula during early Tertiary Period led to the submergence of the land under sea

   - this has disturbed the symmertrical plan of the river on both sides of the watershed

2. The upheavel of the Himalayas led to the subsidence of the northern flank of the Peninsular block and consequent trough faulting.

   - the Narmada and Tapi rivers flow through the trough-fault and fill up original cracks with their detritus

   - lack of alluvial and deltaic deposits in these rivers

3. Slight tilting of the block from NW to SE

- The Mahanadhi: rises near Sihawa in Raipur District, Chhattisgarh
- Covers 1,42,000 sq.km – length: 851 km
- 53% of the river lies in the Madhya Pradesh and Chhattisgarh and 47% in Odhisha
- Drains into Bay of Bengal
- The Seonath, Hasdo, Mand and the Ib – left bank tributaries
- The Jonk Ung and Tel – right bank tributaries

- The Godavari: rises in Nasik district of Maharashtra
- Also known as ‘Vridha Ganga’ or ‘Dakshin Ganga’
- Area: 3,12,812 sq.km and length: 1465 km
- Longest and largest river of Peninsular river system
- Its tributaries run through Maharashtra, M.P., Chhattisgarh, Odisha, Andhra Pradesh
- 49% of the river lies in Maharashtra, 20% in M.P. & C.G., the rest in A.P.

- The Pravara, the Purna, the Penganga, the Wainganga, the Wardha, the Pranhita, the Maner, the Sabari, the Indravati, and the Manjra are the important tributaries
- Among them, the Manjra, the Penganga, Wainganga are the largest and account for 1,15,832 sq.km.
- Subject to heavy floods to the south of Pollavaram
- After Rajamundri, the river splits into several branches forming large delta
- The Krishna: rises near Mahabaleshwar in Sahyadri
- Area: 2,58,948 sq.km. Length is 1,401km – second longest river
- The Koyna, Ghatprabha, Malprabha, Musi, Muneru, Tungbhadra and Bhima are the major tributaries
- 27% lies in Maharashtra, 44% in Karnataka, 29 in A.P. And Telengana

- The Cauveri/Kaveri: rises in Brahmagiri hills (1,341 m) in Kodagu district of Karnataka
- Area: 87,900 sq.Km
- Length: 800 km
- Receives water from both the monsoons
- 3% in Kerala, 41% in Karnataka and 56% in Tamil Nadu
- The Lakshmanatirta, Kabini, Suvarnavati, Bhavani and Amaravati – right bank tributaries
- Herangi, Hemavati, Shimsha, Arkavati – left bank tributaries

- The Narmada: originates in the western flank of Amarkantak Plateau (1,057 m)
- Area: 98,796 sq.km
- Length: 1,312 km
- Flowing in a rift valley between Vindhya and Satpura ranges
- Forms Dhuandhar Waterfall near Jabalpur
- Drains into Arabian Sea near Bharuch, forming a 27 km long estuary
- Orisan, 300km long, is the longest tributary
- Sardar Sarovar Project is on this river
- Namami Devi Narmade is the Narmada river conservation mission

- The Tapi: rises in Multai in the Betul district of M.P.
- Area: 65,145 sq.km
- Length: 724 km
- The Purna, Veghar, Girna, Bori, Panjhra – left bank tributaries
- The Aner river – right bank tributary
- 79% in Maharashtra; 15% in M.P. & 6% in Gujarat
- The Luni: originates near Pushkar in two branches, namely, the Saraswathi and the Sabarmati
- These two rivers join with each other at Govindgarh and flow as Luni
- It flows towards west till Telwara and takes a southwest direction to join Rann of Kuchch
- The entire river system is ephemeral

- The Sabarmati: rises in Aravalli hills and flowing towards south and south west
- Area: 21,674 sq.km
- 300 km in length
- Flowing in Rajasthan and Gujarat
- Drains into Gulf of Khambat
- The Mahi: rises in the east of Udaipur
- Area: 34,842 sq.km
- Length: 533 km
- Flowing in M.P., Rajasthan and Gujarat
- Drains into Gulf of Khambat

- The Subarnarekha and Brahmani rivers drain an area of 19,296 sq.km and 39,033 sq.km respectively
- Found between Ganga and Mahanadhi deltas
- Lie in Jharkhand, Odisha, WB and Chhattisgarh
- Brahmani is also known as South Koel

- Small west flowing rivers
- Gujarat: the Shetruniji, the Bhadra, the Dhadhar, the Sabarmati, the Mahi
- Maharashtra: the Vaitarna
- Karnataka: Kalinadi, Bedti, Sharavati (2,209 sq.km) – Jog falls (Gersoppa)
- Goa: Mandovi, Juari
- Kerala: Bharathapuzha is the longest river of Kerala rising near Anaimalai hills, also known as Ponnani, drains an area of 5,397 sq.km. Periyar river is the second longest, area of 5,243 sq.km. Pamba river is flowing for 177 km and falls in Vembanad lake.

West flowing rivers

River	Catchment area sq. km
Sabarmati	21,674
Mahi	34,842
Dhandhar	2,770
Kalinadi	5,179
Sharavati	2,029
Bharathapuzha	5,397
Periyar	5,243

East flowing rivers

River	Catchment area sq. km
Subarnarekha	19,296
Baitarni	12,789
Brahmani	39,033
Penner	55,213
Palar	17,870

Table 3.1 : Comparison between the Himalayan and the Peninsular River

Sl. No.	*Aspects*	*Himalayan River*	*Peninsular River*
1.	Place of origin	Himalayan mountain covered with glaciers	Peninsular plateau and central highland
2.	Nature of flow	Perennial; receive water from glacier and rainfall	Seasonal; dependent on monsoon rainfall
3.	Type of drainage	Antecedent and consequent leading to dendritic pattern in plains	Super imposed, rejuvenated resulting in trellis, radial and rectangular patterns
4.	Nature of river	Long course, flowing through the rugged mountains experiencing headward erosion and river capturing; in plains meandering and shifting of course	Smaller, fixed course with well-adjusted valleys
5.	Catchment area	Very large basins	Relatively smaller basin
6.	Age of the river	Young and youthful, active and deepening in the valleys	Old rivers with graded profile, and have almost reached their base levels

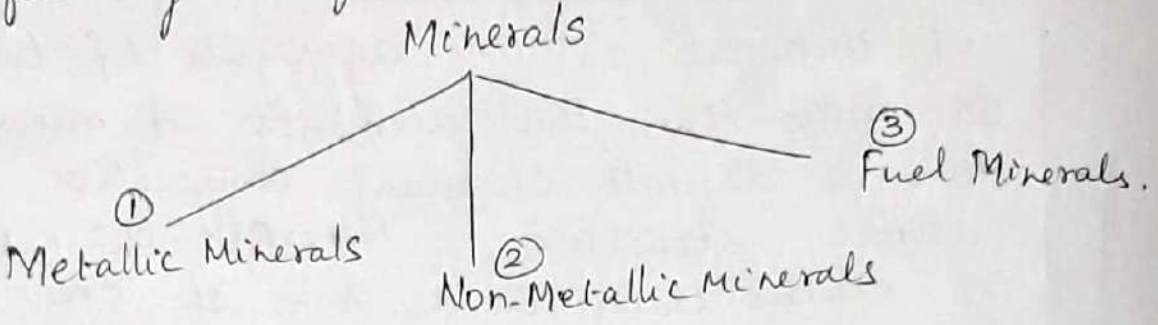
River Regimes

- The pattern of flow of water in a river over a year is known as its regime
- The discharge is the volume of water flowing in a river over time
- It is measured in Cusecs or Cumecs
- Cusecs – Cubic feet per Second
- Cumecs – Cubic metres per Second
- The quantity of water flowing in the Himalayan rivers and the Peninsular rivers differ
- The Himalayan rivers are perennial, as they are fed by glaciers – Glacial and Monsoonal regimes
- The Peninsular rivers are seasonal
- It is better depicted by Hydrograph

UNIT IV- MINERALS & INDUSTRIES

Classification of mineral resources:

Minerals may be classified under the following categories :-



① Metallic Minerals: Metallic minerals constitute the second most important of minerals after fossil fuels. These minerals provide a strong base for the development of metallurgical industry and helps in industrialisation and urbanization. India has a good reserve of these minerals.

② Non-Metallic Minerals: India is rich in the non-metallic reserves. They are also called 'industrial minerals'.

③ Fuel Minerals: This group includes energy resources like coal, petroleum, natural gas and atomic minerals.

Distribution of Metallic Minerals

(A) Introduction: They are classified on the basis of predominant metal. These include —

(i) ferrous minerals including various types of iron ores like hematite, magnetite, limonite, siderite etc.

(ii) ferro-alloys like chromium, cobalt, manganese, nickel, tungsten etc.

(iii) precious metals like gold, silver, platinum etc

(iv) semi-precious metals like copper, aluminium, zinc, lead, tin etc.

(v) light metals like bauxite, magnesium

(vi) Electronic metals like cadmium, mercury

ⓐ Iron-ore

Iron ore is the most important mineral and forms the back bone of modern civilization. It is a durable and cheap metal which can be moulded into different forms. It is not found in pure form in the earth's crust. But it is found with lime, magnesium, silica, sulphur and copper.

Types of iron ores:- There are four main types of iron-ores found in India. They are Haematite, Magnetite, Limonite & Siderite.

Haematite – ore content varies from 60-70%. and called 'oxide of iron'.

Magnetite – ore content varies between 60-65%. It is known as 'Black ore'. The ore is either igneous or metamorphic origin

Limonite – It is inferior ore containing 35-50%. Known as 'Hydrated iron oxide'.

Siderite – It contains 10-40% of ore. An inferior variety and it is called 'iron carbonate'.

Reserves of iron-ore in India:

According to the Geological Survey of India, the total reserves of all types of iron-ore in India are 25,500 mil. tonnes, out of which 14630 mil. tonnes is of good quality. Karnataka is the leading producer, contributing 25% of the total production. Orissa contributes 22% and is second in production. Chhattisgarh and Goa with about 20% and 18% are third and fourth in terms of production.

Distribution of Iron ore

(A) **Karnataka** is the leading producer of iron-ore. High grade deposits belonging to haematite and magnetite catagories are found in Kemmangundi in Bababudan Hills of Chickmagalur district. The other districts like Chitradurga, Dharwar, North Kannad, Shimoga, Bellary and Tumkur produces iron-ore.

1) **Bababudan Hills**: Streting over 22 km in length and 20 km in width covers Chickmagalur district. It has rich ferrous content of haematite ore with 60-65 % of ore. The ore is exported to Iran through the port of Mangalore.

2) **Kudermukh Deposits**: It lies in Chickmagalur district. It contains 50-65 % of magnetite ore. The iron deposits were developed Under agreement with Iran. Iron ore is exported through Mangalore.

3) **Sandur Range**: Stretches in Bellary and Hospet districts. Ferrous content is 50-65 %. Iron-ore is supplied to the Vijayanagar Plant.

(B) **Orissa**: It ranks second in the country

1) **Badampahar**; Situated in Mayurbhanj district, it has rich deposits of iron-ore. Iron-ore is supplied to Bokaro, Durgapur, Rourkela and Jamshedpur Iron & Steel Plants.

2) **Bonaigarh**: It is one of the most important iron ore bearing range. Iron ore is of haematite variety and is supplied to the near by Steel plants.

3) **Mayurbhanj**: It is well known for haematite iron-ore of 65 % ore content. Near by Iron & Steel plants are benefited by this iron-ore mine (Bokaro, Jamshedpur, Durgapur, Rourkela)

(C) Chhattisgarh: The two ore producing mines are:
Bailadila — Bastar District
Dalli-Rajhara — Durg District.

Iron-ore belongs to haematite & magnetite with content of 60-70 %. ore.
Bailadila is the largest mechanized mine in India. Pipeline has been constructed to bring ore from Bailadila to Vishakhapatnam Steel plant. Bailadila ore is exported to Japan through Vishakhapatnam port.

Dalli-Rajhara has ore content of 70%. This is worked by Hindustan Steel plant of Bhilai.

(D) Goa: It is the fourth largest producer of iron ore in India. Ore is of superior quality here and is exported to Iran and Japan from the near by port of Mangalore.

(E) Jharkhand: It accounts for 14 % of our country's production. Singhbhum, Bonai, Noamundi, Daltonganj, Dhanbad, Hazaribagh, Ranchi are the mining regions.

(F) Other States: Iron-ore is mined in small quantities in the following states.

Maharashtra — Chandrapur, Ratnagiri
Tamil Nadu — Coimbatore, Madurai, Salem, Trichy
Andhra Pradhesh — Anantapur, Cuddapah, Guntur, Kurnool, Nellore
Rajasthan — Alwar, Bilwara, Jaipur, Udaipur
Uttar Pradesh — Mirzapur
Uttarkhand — Almora, Nainital
W. Bengal — Burdwan, Darjeeling
J & K — Jammu
Kerala — Kozhikode
Gujarat — Bhavnagar, Vadodra

Distribution of Manganese:-

1. **Orissa:** Orissa is the single most important state in the production of manganese accounting for 38% of production. Deposits in Sundargarh, Kalahandi, Koraput are rich in manganese ore. It is also mined at Bolangir, Sambalpur districts of Orissa.

2. **Maharashtra:** It is the second largest producer of manganese accounting 23%. Bhandara, Nagpur, Ratnagiri are the mining centres. The Ratnagiri ore is of superior quality.

3. **Madhya Pradesh:** About 20% of the production is from Madhya Pradesh. Balaghat and Chhindwara are the main districts of mining.

4. **Karnataka:** This state produces about 13% of the total production. Its main deposits are from North Kannada, Shimoga, Bellary, Chitradurga and Tumkur.

5. **Andhra Pradesh:** 4½% of the production comes from this state. Srikakulam and Vishakhapatnam are the leading producers. Cuddapah, Guntur and Vijayanagaram also produces manganese.

6. **Other States:** Manganese is mined in small quantities in the following states.

   Rajasthan – Udaipur
   Gujarat – Panchmahal, Vadodra
   Jharkhand – Dhanbad, Singhbhum.

Trade:- Nearly 80% of the manganese production is consumed with in the country. The remaining is exported to USA, UK, Germany, France, Italy, Netherlands, Belgium, Slovakia and East European countries.

3. Bauxite

Bauxite is an oxide of aluminium. Aluminium is obtained from Bauxite. It is not a specific mineral but a rock consisting mainly of hydrated aluminium oxide. It is a clay like substance which is pinkish, whitish or reddish in colour depending on the amount of iron content.

Uses: Bauxite is an essential ore of aluminium which is one of the most important metal used in the modern industry. Aluminium is all around us in everyday life in buildings, boats, planes and cars, household appliances, packaging, computers, cell phones, containers for food and beverages. Aluminium will continue to be an important metal for the future because of its strength, low weight, toughness, cheapness and good potential for recycling. Aluminium used for making aircraft.

Distribution of Bauxite

1. **Orissa:** Orissa stands first in the production of bauxite, producing more than 50% of the total bauxite. The Kalahandi–Koraput belt extends into Andhra Pradesh as the main bauxite deposit region. Bauxite is also obtained from
   - Bolangir
   - sambalpur
   - sundargarh.
2. **Gujarat:** About 16% of the total bauxite production is from the state of Gujarat. The main bauxite deposits are from Gulf of Kutch and the Gulf of Khambhat. It is through the districts of Bhavnagar, Junagarh, Kheda and Sabarkantha.

3. Jharkhand - Bihar: Jharkhand is mined from Dumka, Munger, Palamu and Ranchi districts.
4. Maharashtra: Kolhapur, Pune, Ratnagiri, Satara and Thane accounts for 10% of bauxite.
5. Chhattisgarh: Bauxite is mined from Maikala range, Amarkantak Plateau, Bilaspur. The share of 6% is from this state.
6. Tamil Nadu: Madurai, Nilgris and Salem districts are known for 2.75% of the production.
7. Madhya Pradesh: Balaghat, Jabalpur has ore reserves.

Trade: 80% of the bauxite produced is used for the production of aluminium.
Italy and UK are the largest importers. Also it is exported to Germany, Belgium, Japan.

Important Aluminium Plants of India:

Balco - Bharat Aluminium Company Ltd (BALCO) a public sector undertaking at Korba (Chchattisgarh).

Renukoot - HINDALCO is in Uttarpradesh

Mettur - Madras Aluminium Company (MALCO) is in Salem district of Tamil Nadu.

Koraput - NALCO is in Koraput district of Orissa.

Availability of cheap and abundant power (electricity) is essential for the development of aluminium industry as extraction of aluminium from the bauxite ore is very power-intensive.

Geography of India

Non-metallic Minerals - ① Mica

Minerals which are not metalliferous are called 'industrial minerals'. Non-metallic minerals are a special group of chemical elements from which no new product can be generated if they are melted. These minerals are best known for the production of cement, ceramics, glass and lime products. Non-metallic mineral reserves consists of stone quarries, clay and sand pits, Chemical and fertiliser mineral deposits, deposits of quartz, gypsum, natural gem stones etc.

Mica: Mica is an important non-metallic mineral used mainly in electrical industry as it has great insulating properties, it can withstand high voltage and has low power loss.

Types of mica: It represents a group of minerals like —

1. Muscovite (potash mica)
2. Biotite (iron magnesium mica)
3. Phlogopite (magnesium mica)
4. Lepidolite ores.

Muscovite and Biotite are of great economic value. Muscovite mica occurs in coarse-grained dykes of igneous rocks and is colourless and transparent.

Biotite mica is black in thick crystals found in igneous and metamorphic rocks.

Phlogopite mica occurs in igneous rock and is yellow to brown in colour.

Mica occurs in the form of veins or in the form of 'books'. Mica reserves in India is found in three main producing states — Andhra pradesh, Bihar-Jharkhand and Rajasthan. Rajasthan accounts for about 51% of the resources followed by Andhra Pradhesh, Maharashtra and Bihar.

Distribution: About 95% of India's mica is distributed in three states of Jharkhand, Andhra Pradesh and Rajasthan. According to British Geological Survey, the world's largest depost of mica is at Koderma district in the state of Jharkhand.

1. Jharkhand: This has the richest mica belt and accounts for 60% of India's production in terms of value. Mica is found in a belt extending for about 150 km in length and 32 km in width from Gaya district of Bihar to Hazaribagh and Koderma districts of Jharkhand. Jharkhand produces 50% of the total mica production in India. Ranchi, Singhbum, Giridhi are the mining regions. This is the second largest producer and accounts for 25% of India's mica. The main belt lies in Nellore district. Nellore mica is light green in colour. Khammam, Krishna, West Godavari and Vishakhapatnam are the mining regions. The main mica-bearing belt extends from Jaipur to Udaipur. It is also mined at Bhilwara, Ajmer, Sikar, Tonk etc.

2. Andhra Pradesh:

3. Rajasthan:

4. Other Producers: Mica is mined in the following places of different states.

Gujarat - Vadodra, Sabarkantha
Tamil Nadu - Nilgiris, Coimbatore, Salem, Tiruchirappalli, Tirunelveli
Chhattisgarh - Bilaspur, Bastar, Surguja
Madhya Pradesh - Balaghat
Uttar Pradesh - Mirzapur
Some deposits are found in Haryana, Himachal Pradesh, Orissa and W. Bengal.

Production: Out of the total production, about 10% is utilised in the country mainly in electrical and electronic industries. There has been gradual decline in the production of mica. The decline is due to low demand of the mineral in the international market. Artificial mica has also played major role in this respect.

Uses & significance:

* Mica is used as an insulating material in electrical goods and as a substitute for glass.
* As it is impervious to heat, it is used in tanks and fighting planes.
* It is used in radio industry and in radar.
* Large sheets of muscovite are used in stoves, windows, lamps and marine compass.
* Small pieces of mica are powdered and used in paints, lubricants, wall-paper, rubber and fire-resisting wall boards.

Trade: Mica is exported in the form of block mica, splittings, films, mica powder, mica waste and scrap. Mica is exported to earn valuable foreign exchange.

Mica is exported to Japan, USA, UK, Norway, Russia, Germany, France,

Kolkata and Vishakhapatnam are the main ports handling the export.

There has been decline in export of mica due to severe competition from Brazil and also due to growing use of plastic, synthetic mica, rising cost of production, heavy export duty and growing demand in the country itself.

There is need for quality control and research on new uses of mica to promote export from India.

Geography of India

② Gypsum distribution

Gypsum is a hydrated sulphate of calcium which occurs as a white opaque mineral in beds of bands of sedimentary rocks like sandstone, limstone and shale. It is widely used in industries because of its special property of losing 3/4th of the combined water when moderately heated to about 130°c. On drying, it sets into a hard-rock like form.

Uses: Cement, fertilizer and Plaster of paris are the three important industries in which gypsum is utilised. It is also used in fertilizers, ceramics industry, nitrogen-chalk, partition blocks, sheets, tiles and plastics. High purity gypsum may be used for the making of ammonium sulphate fertilizer. White gypsum is used as a filler in paper, paints and textile goods. It is also used in pharmaceutical and asbestos products.

Distribution: Rajasthan is the leading producer of gypsum accounting for 99% of the total production of the country. Remaining 1% was contributed by Jammu & Kashmir, Tamilnadu, Gujarat, Andhra Pradesh, Karnataka, Himachal Pradesh. In Rajasthan it is mined in the districts of ——.

Barmer, Bikaner, Ganganagar, Jaisalmer, Jodhpur etc.

The deposits are found at shallow depths and scattered over large areas. Gypsum is mined out by opencast manual mining and few semi-mechanised mines.

Trade: China was the largest producer accounting for 25 %. followed by Iran (10%), USA and Thailand (7%. each), Iraq & Mexico (6 %. each), Spain (4%.) and Australia, Brazil, Canada, France, India & Russia (2 %. each).

From India Gypsum and plaster were exported in bulk to neighbouring countries mainly Nepal (62 %.) and Bangladesh (34 %.)

Gypsum was imported mainly from Thailand, Oman, Iran & USA.

Conclusion:- India's resources of gypsum are large enough to meet increased demand. Steps would be necessary to find out suitable mining technology to exploit deep-seated deposits.

I- M.Sc - Geography

Mineral Resources - Fuel Minerals

Coal

2 marks

Fuel minerals are fossil fuels - coal, petroleum and natural gas. The fossil fuels are exhaustible; once consumed, they cannot be replaced. They are also called conventional or non-renewable resources.

Coal is a sedimentary rock composed of decayed vegetative matter of Carboniferous period (350 million years ago). According to the carbon content and hardness, coal is classified as (i) anthracite (hardest), (ii) bituminous (iii) lignite and (iv) peat.

Coal is the major industrial fuel. It is also an industrial raw material. In India coal accounts for 67 % of the commercial requirement of the country.

Classification of Indian Coal fields:

The coal of India may be classified under two categories: (1) Gondwana coal fields and (2) Tertiary coal fields

(1) Gondwana Coal fields:

It is found in the Damodar, Mahanadi, Godavari and Narmada valleys.

Important coal mines of Gondwana formations

★ Raniganj ★ Jharia ★ Bokaro ★ Ramgarh ★ Giridhi ★ Chandrapur ★ Talcher ★ Korba ★ Wardha Valley ★ Singareni ★ Singarauli;

Over 98 % of the total coal reserves of India belong to the Gondwana period. It is mainly of bituminous or anthracite. Carbon content varies between 60 to 90 %.

Tertiary Coal field :- The tertiary coal is known as 'the brown coal'. It is an inferior type of coal. The carbon content varies between 30% to 50%. This tertiary period coal is of lignite type. It is found in Assam, Arunachal Pradesh, Gujarat, Kerala, Jammu & Kashmir, Uttar Pradesh, West Bengal and Tamil Nadu. The largest lignite deposits of the country are at Neyveli in Tamil Nadu. ★ Neyveli ★ Palna ★ Lakhimpur ★ Pondicherry are the well known lignite mines.

Distribution of Coal fields in India

The major states having large proportion of coal in India are —

★ Jharkhand ★ Orissa ★ Chattisgarh
★ N. Bengal ★ Madhya Pradhesh ★ Andhra Pradesh

Jharkhand — accounts for 29% and has the first rank in India. Most of the coal belongs to Gondwand.

Orissa — has more than 24%.

Chattisgarh and Madhya Pradesh — has the third largest (17%) but first in production.

W. Bengal — has 11% of coal.

Madhya Pradhesh — has 8% of coal

Andhra Pradhesh — accounts 7% of coal

Coal is used in the Iron & Steel industry as a fuel, in carbo-chemical industries. Coal is burnt and is used for the production of thermal energy.

Coal is unevenly distributed in India. Most of the mines produce poor quality coal. The mining technology is outdated and transport cost is high and expensive.

Petroleum

Mineral oil is known as petroleum. It is an important fuel. It is used in producing power, running automobiles, trains, flying aeroplanes, lubricating machines etc. It is a raw material in chemical industries. Its products include Kerosene, diesel, petrol, synthetic rubber, synthetic fibre, polyster, detergents, colours and dyes, explosives, printing ink, film-photography, greases, cosmetics, paints, wax etc

Petroleum is obtained as crude oil from the sedimentary rocks. It is originated from the decayed living organisms like marine fish and vegetal matter which got buried under the earth. Due to pressure and heat, it undergoes chemical changes and form natural gas and petroleum rich in hydro-carbon after millions of years.

For the first time oil was discovered at Digboi in Assam in the year 1889. After independence in 1956, ONGC (Oil and Natural Gas Commission) was established to search for oil in India.

Oil bearing area in India occurs in Northern plains, Coastal plains, plains of Gujarat, Thar Desert, Andaman and Nicobar Islands. Oil deposits also exist in the off-shore areas.

Distribution of Petroleum or Mineral oil

I- The Brahmaputra valley: Crude oil was first discovered here. Digboi, Sibsagar, Bappapung, Hansapung, Surma valley of upper Assam. Digboi has completed 100 years

II) Gujarat Coast : This is the second largest oil producing area of the country.
* Ankleshwar * Cambay - Luni Basin
* Ahmedabad * Kalol * Lunej * Baroda
* Surat

III - The Western Coast Off-shore oil fields:
This is the largest petroleum producing oil field (65 % of crudd oil production). The off-shore oil field was struck under sea bed of Bombay-High. This was named as 'Sagar Samrat', an oil drilling platform established with the help of Japan. It is 175 Km. away from the shore. Oil occurs at a depth of 1900 mt. It has rich oil and natural gas.

IV - The Eastern Coast oil fields: Oil and natural gas is discovered in marine delta regions of Mahanadi, Godavari, Krishna and Cauvery. Narimanam of Cauvery basin in Tamil Nadu has good reseaves. Off shore regions of Krishna - Godavari basins have good future for petroleum production.

India is not self-sufficient in the production of petroleum. 60 % is supported by imported crude oil and petroleum. The countries like Saudi Arabia, Kuwait, UAE, Iran, Oman and Sudan supply petroleum to India on contract basis.

Oil refineries are the processing factories of crude oil. Crude oil from wells or refineries are generally transported by pipelines. This is cheap, effective and safe method. Pipelines transports imported crude oil from Gujarat to various places.

Non-Conventional Energy

The non-conventional energy is also called as 'renewable energy'. The non-conventional sources of energy include solar energy, wind energy, biomass energy, fuels, electric vehicles, tidal energy and geothermal energy. These resources of energy have been identified recently. They do not cause pollution and they are inexhaustible. They are freely available, less expensive and easy to maintain.

Solar Energy

Sun is the most abundant source of energy in the world. Energy received across the earth from the sun is termed as solar energy. Chief characteristics of solar energy are:

(1) It is abundant
(2) It is inexhaustible
(3) It is universal
(4) It has a huge potential
(5) It is reliable
(6) It is pollution-free.

India has been able to use solar energy in cooking, water heating, crop drying, air conditioning and power generating devices. etc. Being extracted in the sub-tropical latitudes, India receives higher amount of solar energy. The greater part of the country has more than 300 solar days. The total amount of energy received from the sun is about 5000 trillion KWh per year.

The Solar Photovoltaic Technology enables the conversion of solar radiation into electricity. In many parts of the country solar energy programs have been implemented - (eg) Rural energy Co-operative at Sagar Island in the Ganga Delta of West Bengal.

Jodhpur of Rajasthan desert, Kalyanpur of Aligarh and Coimbatore of Tamil Nadu has solar energy production. Subsidy for solar lanterns, solar pumping systems, subsidy for solar cookers, loans made available for solar water heaters are the facilities extended by the government.

Solar energy is used in water desalination, space heating, development of pisciculture and in refregiration. It is said that solar energy is the future source of energy when fossils are totally exhausted and we shall have to depend on the sun for energy.

Indian Solar Loan Programme supported by the United Nations Environment Programme has won the "Energy Globe World Award" for financing solar home power systems.

India is the home to the world's first and only 100% solar powered airport, located at Cochin, Kerala.

Wind energy

Wind is an important source of non-conventional energy. It is cheap, pollution free, eco-friendly. Since from the past Wind energy was utilised in sailing ships and wind mills.

For the generation of wind energy, a wind speed of more than 5 km. per hour is considered to be suitable. Wind speeds above 10 km per hour are prevalent over parts of the coastal regions of Gujarat, Andhra Pradesh, Karnataka, Madhya Pradesh, Rajasthan, Tamil Nadu, Maharashtra, Kerala, Orissa, N. Bengal, Uttarkhand, Jammu & Kashmir, Andaman & Nicobar islands.

Wind energy projects have been introduced in 22 states of the country. Maximum potential of wind energy lies in the states of Gujarat and Tamil Nadu. Asia's largest wind farm of 28 megawatts capacity is located at Gujarat.

Tamil Nadu has the largest installation of wind turbines in the country in the Muppandal Perungudi near Kanniyakumari. This is one of the largest concentrations of wind farm. Aralvaimozhi, Kayatharu, Coimbatore are other examples in Tamil Nadu. Gujarat, Tamil Nadu, Maharashtra and Orissa are better places for wind energy production. Wind farms of India are as follows :—

Ratnagiri - Maharashtra
Okha - Gujarat
Tirunelveli - Tamil Nadu
(Kayathar)

Advantages of Wind energy:

- ★ No pollution
- ★ Lowest prices
- ★ Renewable resource
- ★ Eco friendly

Disadvantages:

- ★ Depends on wind speed
- ★ Wind energy cannot be stored
- ★ Located in remote areas.
- ★ Has to compete with other energy production
- ★ Needs technology.

Conclusion: In wind energy production no fuel is burnt. Wind turbines requires less space than power stations.

Factors Influencing the Location of Industries

An **industry** is a branch of an economy that produces a closely related set of raw materials, goods, or services. Many important geographical factors involved in the location of individual industries are of relative significance, e.g., availability of raw materials, power resources, water, labour, markets and the transport facilities. Industries are part of the secondary activity. Secondary activities or manufacturing converts raw material into products of more value to people.

Classification of Industries

1. Raw material

- *Agro-based industries:* These industries use plants and animal-based products as their raw materials. Examples, food processing, vegetable oil, cotton textile, dairy products, and leather industries.
- *Mineral based industries:* Mineral-based industries are based on mining and use 'mineral ore' as raw material. These industries also provide to other industries. They are used for heavy machinery and building materials.
- *Marine-based industries:* Marine-based industries use raw materials from sea or ocean. Examples, fish oil.
- *Forest-based industries: T*hese industries use raw materials from the forest like wood. The industries connected with forest are paper, pharmaceutical, and furniture.

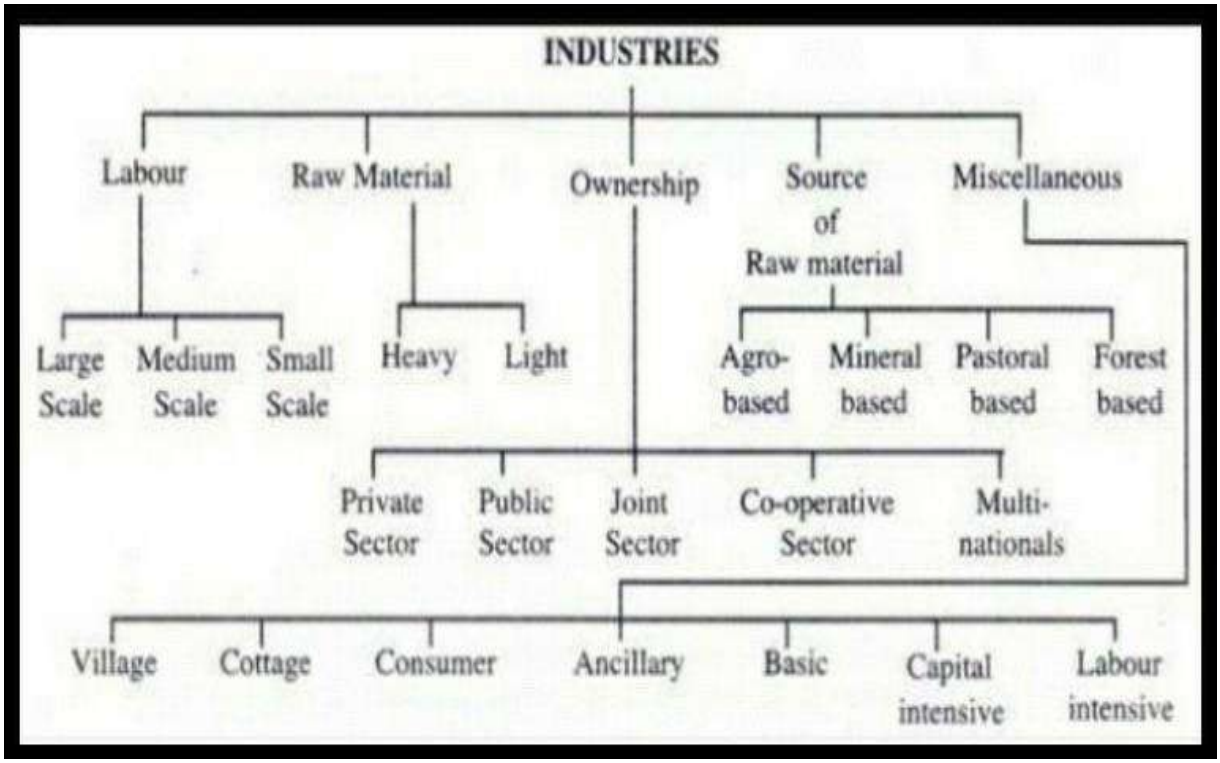
2. Size

Size of industries are measured by how much money is invested and goods produced.

- *Small-scale industries*: Small-scale industries have less capital and technology invested in them. There is often manual labour noticed here. Example, Basket weaving, pottery, and handicrafts.
- *Large-scale industries*: Large scale industries are the exact opposite of small-scale industries. Here the capital invested is large and advanced technology is in use here. Example, Automobiles and Heavy Machinery.

3. Ownership

- *Private sector*: Private industries are businesses that are owned and operated by an individual or group of individuals.
- *Public sector*: Public industries are owned and managed by the government. Example, Hindustan Aeronautics Limited (HAL)
- *Joint sector industries:* These industries are jointly operated by the state and individuals. Example, Maruti Udyog.
- *Cooperative sector industries***:** Cooperative industries are operated by the suppliers, producers or workers of raw material. Example, Amul India.



I. Geographical Factors

Following are the important geographical factors influencing the location of industries.

1. Raw Materials

The jute mills in West Bengal, sugar mills in Uttar Pradesh, cotton textile mills in Maharashtra and Gujarat are concentrated close to the sources of raw materials. Industries like iron and steel, which use very large quantities of coal and iron ore, losing lot of weight in the process of manufacture, are generally located near the sources of coal and iron ore. Pig iron, produced by smelting industry, serves as the raw material for steel making industry.

Some of the industries, like watch and electronics industries use very wide range of light raw materials. The result is that such industries are often located with no reference to raw materials and are sometimes referred to as ***'footloose industries'*** because a wide range of locations is possible within an area of sufficient population density.

2. Power

Regular supply of power is a pre-requisite for the localisation of industries. Coal, mineral oil and hydro-electricity are the three important conventional sources of power. Most of the industries tend to concentrate at the source of power. The iron and steel industry mainly depend on large quantity of coking coal. Aluminium industry is generally found in the areas of hydro-power production.

3. Labour

Labour supply is important in two respects (a) workers in large numbers are required for all kinds of work (unskilled labour)

(b) People with skill or technical expertise are needed in planning, execution of work(skilled labour)

4. Transport

Transport by land or water is necessary for the assembling of raw materials and for the marketing of the finished products. The development of railways in India, connecting the port towns with hinterland determined the location of many industries around Kolkata, Mumbai and Chennai.

5. Market

Ready market is most essential for perishable and heavy commodities. Dairy industry, Glass industry, Sugar industries prefer nearness to market. Perishable products need quick delivery to the market. Weight losing products lie close to market to avoid transportation charges.

6. Water

Water is another important requirement for industries. Many industries are established near rivers, canals and lakes, because of this reason. Iron and steel industry, textile industries and chemical industries require large quantities of water, for their proper functioning.

7. Site

Sites, generally, should be flat and well served by adequate transport facilities. Large areas are required to build factories.

8. Climate

Climate plays an important role in the establishment of industries at a place. Harsh climate is not much suitable for the establishment of industries. There can be no industrial development in extremely hot, humid, dry or cold climate.

II. Non-Geographical Factors

The non-geographical factors are those including economic, political, historical and social factors. These factors influence our modern industries to a great extent. Following are some of the important non- geographical factors influencing the location of industries.

1. Capital

Big cities like Mumbai, Kolkata, Chennai and Delhi are industrial centres because big industrialists live here.

2. Government activity

Government plans for the spreading of industries, eliminating water and air pollution and establishes large industrial estates all over the country.

3. Banking Facilities

Establishment of industries involves daily exchange of crores of rupees which is possible through banking facilities only. So the areas with better banking facilities are better suited to the establishment of industries.

Industries of India

Cotton Textiles industry

Textile industry includes cotton, jute, wool, silk and synthetic fibre textiles. India is one of the leading producers of textile goods. It is one of the largest and most important sector in the economy in terms of output, foreign exchange earning and employment in India.

Growth and development:

India was well known for cotton goods from 1500 BC to 1500 AD. The entry of British and the Industrial revolution destroyed the industry in India. The British took away the raw cotton and brought manufactured goods into India.

The first textile mill in India was established in 1854 in Mumbai. The industry faced a setback in 1947 (after partition of India and Pakistan) as good quality cotton growing areas went to Pakistan. So India imported cotton from other countries. Later, cotton growing areas were expanded to increase the production of cotton.

Factors affecting the location of Cotton Textile I

It is a raw material oriented industry. There is a great demand for cotton textiles in India due to its tropical climate so, the cotton textile mill develops either in the cotton growing areas or in the market areas.

The location of cotton textile industry is affected by the following factors:

(i) raw material (raw cotton)
(ii) nearness to market
(iii) moist weather for spinning
(iv) capital
(v) skilled and cheap labour
(vi) transport
(vii) sea port
(viii) domestic and international market

Cotton textile industry run as a large scale, small scale and village and cottage level industry. Modern large scale industries engage in mass production. Hand spun and hand woven Khadi cloth is produced at cottage level units. In between these two, powerlooms are also producing cotton cloth.

Distribution of Cotton Textile Industries:

1. Maharashtra: - It is the largest producer.
   * The state produces more cotton
   * Mild climate with enough moisture
   * Mumbai offers good market
   * Mumbai is close to Egypt, Sudan for importing the best cotton
   * Cheap labour is available (Parsi People)
   * More capital from the local people.
   * Cheap electricity for the industries
   * Mumbai has harbour for export & import

Products: Light cloth, long cloth, shirting, dhotis and coloured clothes.

Centres: * Mumbai has more textile mills. It is known as 'Manchester of India' and also called 'Cottonopolis of India'.

* Sholapur (second largest producer)
* Pune * Nagpur * Sangli * Kolhapur
* Kalyan * Thane.

2. Gujarat: 35% of India's cotton goods comes from here. Ahmedabad is the second largest centre after Mumbai.

Products: Fine quality of dhotis, saris, bleached, coloured or printed fabrics.

Centres: ★ Bhavnagar ★ Kalol ★ Kadi ★ Porbandhar ★ Rajkot ★ Surat ★ Vadodra

3. Tamil Nadu: Tamil Nadu has the largest number of cotton mills in India. It is the 2nd largest producer.

Products: Dhotis, Sarees, yarn for spinning, knitwear etc.

Centres: The largest number of mills are in the city of Coimbatore which is known as the 'Manchester of South India'.
★ Chennai ★ Madurai ★ Perambur ★ Salem ★ Tirunelveli ★ Tuticorin ★ Tiruchirappalli

4. Uttar Pradesh:

★ Kanpur is the most important centre. ★ Agra ★ Aligarh ★ Lucknow ★ Modinagar ★ Varanasi ★ Mirzapur are the centres.

5. W. Bengal: ★ Kolkata is the most important cotton textile centre. ★ Howrah ★ Hoogli ★ Sirampur are the other centres.

Other States:

Madhya Pradesh: Indore, Gwalior, Bhopal
Andhra Pradesh: Guntur, Hyderabad, Secunderabad
Rajasthan: Ajmer, Jaipur, Kota, Udaipur
Bihar: Pata, Gaya
Punjab: Ludhiana, Amritsar
Karnataka: Bangalore, Mysore, Mangalore
Kerala: Trivandrum, Kollam, Trichur

SHIP BUILDING INDUSTRY OF INDIA

Shipbuilding is the construction of ships and other floating vessels. It normally takes place in a specialized facility known as a ***shipyard***.

India has a long coast line extending over 3000 miles having access to sea on the three sides. India's geopolitical position in the Indian Ocean naturally makes heavier demands on the naval fleet. India had a glorious maritime tradition going back to 2,500 BC when the ships of the Indus Valley Civilization traded with the civilizations of the Persian Gulf. Through centuries India built ships in large numbers which enabled her people to develop commercial and cultural contacts with Red Sea, Egypt, South East Asian countries and beyond.

India was one of the largest ship building countries in the world. Indian shipbuilding industry is an old and matured one. Indian shipbuilding was centered along the Western Coast in Kalyan, Bhivandi and Mumbai, in South India at Narsapurpeta (near Masulipatnam) and in Bengal at Chittagong and Hooghly. The "modern era" began with the building of a dry dock at Bombay about 1750; a second was erected in Calcutta about 1780. During the 19th century, the industry was in a period of expansion and prosperity. At present, India ranks second among the Asian countries next only to Japan in shipping.

Shipbuilding industry is a large and complicated industry. It requires the following essential requirements

(1) A suitable site – sheltered position and fine weather

(2) Huge capital

(3) Deep waters

(4) Proximity to raw materials (timber, iron)

(5) Large space

(6) Adequate supply of labor

(7) Dry-docking facilities

(8) Road and rail connections and

(9) Adequate supply of fresh water

(10) Free from silt deposits

The Indian Shipbuilding has all the resources and low labor cost to stand competitive in the World Shipbuilding. The Indian shipbuilding is mainly centered on 27 shipyards comprising of public sector under central and state Governments and Private sector shipyards. India's overall shipbuilding industry comprises of 27 shipyards, of which 6 are under central government, 2 under state government and 19 in the private sector domain. Out of these, India's four Defence Public Sector Undertaking (DPSUs) shipyards, namely, Mazagaon Docks Limited (MDL), Garden Reach Shipbuilders and Engineers (GRSE), Goa Shipyard Limited (GSL) and Hindustan Shipyard Limited (HSL), and one Central Government owned Cochin Shipyard are primarily responsible in building most of the naval warships/vessels for the Indian Navy. Major Private Shipyards include ABG Shipyard, Adani, and Bharati Shipyard.

Significance of Indian Ship Building Yards

The first Ship Building Yard – **Hindustan Ship Yard**, Vishakhapatnam, Andhra Pradesh- founded in 1941. It caters to the needs of ship building, repairs and maintenance and submarine construction.

Cochin Shipyard Ltd (CSL)-The largest Ship Building Yard – Cochin, the port city of Kerala. The yard was designed and constructed under the technical collaboration of M/s Mitsubishi Heavy Industries, Japan. It produces oil tankers and ships for the Indian Navy.

Mazagon Dock Shipbuilders Limited, aptly called "**Ship Builder to the Nation",** is one of India's leading Defence public sector undertaking shipyards under the Ministry of Defence. Main activities are construction of warships and submarines with facilities situated at Mumbai and Nhava.

Goa Shipyard Limited (**GSL**) is an Indian Government owned ship building company located on the West Coast of India at Vasco da Gama, Goa. It was established in 1957.GSL is undergoing a modernization of its yard to adapt to the latest technology in shipbuilding.

Garden Reach Shipbuilders and Engineers Ltd - GRSE is a government of India Undertaking shipbuilding company in India under the administrative control of the MoD (Ministry of Defence), primarily catering to the shipbuilding requirements of the Indian Navy and the Indian Coast Guard. GRSE, is one of India's leading **shipyards**, located in Kolkata, West Bengal. It builds and repairs commercial and naval vessels. Presently GRSE has also started building export ships in a mission to expand its business.

The strengths of Indian Ship Building Industry

- Long coastline in India
- Low cost of labor
- Strong labor force
- Government allows subsidy for yards
- Foreign based assistance
- Suitable weather

- Native raw materials are used in fishing vessels
- Critical equipment and machinery are imported
- Becoming significant in global level by providing ship repair facilities is an attractive opportunity
- Ships of different sizes and specifications like product carriers, passenger cum cargo vessels etc are manufactured.

AUTOMOBILE INDUSTRY IN INDIA

The history of automobile industry in India is also quite old. Simpson & Co established in 1840 were the first to build a steam car and a steam bus in India. The first car ran on India's roads in 1898 in Bombay. At the end of the World War a large number of military vehicles come on the roads in India in 1919. In 1942 Hindustan Motors Ltd (Ambassador Cars) was started. In 1944 Premier Automobiles Ltd (Fiat Cars) was opened up. In 1947 Bajaj started assembling of Auto (replacing cycle rickshaw by auto) with assistance from Piaggio(Italy) was opened.

After independence, the Government of India and the private sector launched efforts to create components manufacturing industry to supply to the automobile industry. The growth was relatively slow in the 1950s and 1960s. After 1970, the automotive industry started to grow. The growth was mainly in the production of tractors, commercial vehicles and scooters. Till the early eighties, the automobile industry had very slow growth.

The Government allowed foreign technology participation with Indian companies. In 1982 Maruti Udyog Limited (MUL) came up as a Government initiative in collaboration with Suzuki of Japan. In early 1990s reforms were made by Government in the automobile sector. Several Indian automobile manufacturers such as Tata Motors, Maruti Suzuki and Mahindra and Mahindra, expanded their domestic and international operations. India's economic growth led to the further expansion of its automobile market which has attracted investment by multinational automobiles manufacturers.

Continuous economic liberalization since 1991 witnessed a rapid growth of automobile industry in India. Due to continuous growth of the industry in India, the automobile sector has been called as '***the sunrise sectors of the Indian economy'***. Number of Multinational Companies are now operating in India. They are operating in collaboration with their Indian partners. India is the seventh largest vehicle manufacturer, second largest two wheeler manufacturer and the fifth largest commercial vehicle manufacturer in the world. India produces-

- Passenger Vehicles
- Commercial Vehicles
- Three Wheelers
- Two Wheelers

The automobile industry has earned a strong reputation in the export market. Indian vehicles and their components are in great demand all over the world. Now more and more foreign manufacturers are coming to India and existing companies are coming up with new models. Super-luxury car makers are beginning to enter the Indian market. The Indian automobile sector is expected to grow faster than US, Japan and Germany in the coming years.

The majority of India's car manufacturing companies are located around Chennai, near Mumbai, along the Chakan in Pune, Nashik, in Aurangabad, around the National Capital Region and Gurgaon. Based on Total sales Tata Motors is the largest and the best automobile company in India.

Manufacturers of Automobiles India

- Ashok Leyland
- Bajaj Auto
- Chinkara Motors
- Force Motors
- Hindustan Motors
- Mahindra & Mahindra
- Reva
- Premier
- Tata International
- TVS

Foreign manufacturers in a joint venture in India

- BMW India
- Jeep India
- Ford India
- Honda Cars India
- Hyundai Motor India
- Kia Motors India
- Maruti Suzuki
- Mercedes-Benz India
- Renault Nissan India
- Toyota Kirloskar Motor
- Volkswagen Group India
- Audi India
- Škoda India

Cities associated with Automobile production

- **Pune**
- **New Delhi**
- **Mysore**

- **Chennai**
- **Satara**
- **Kanpur**
- **Bangalore**
- **Noida**
- **Jamshedpur**
- **Gurgaon**
- **Faridabad**

Jeeps – Jabalpur (Nissan Company of Japan)
Mumbai – (Mahindra & Mahindra)

Scooters – Mumbai, Pune, and New Delhi, Kanpur (Bajaj Auto and LML Vespa)-Public sector units are at Bangalore, Hyderabad, Lucknow and Satara.

Commercial vehicles – Produced by Tata Engineering and Locomotive (TELCO) – Hyderabad, Pithampur, Rupnagar and Surajpur are the centres.

Sakthiman trucks are manufactured under the ministry of Defence.

Chennai is nicknamed as **'*The Detroit of Asia'*** due to the presence of major automobile industries around the city. 30% of India's cars are produced here. Ashok Leyland, Nissan, BMW, Ford, Hindustan Motors, Hyundai, Mitsubishi, Renault, Royal Enfield, Yamaha are the varying varieties produced here. Chennai's location near to the coast makes it easy to export covering South East Asia. From sporting bikes, luxury cars, lorries to battle tanks (Avadi), every type of vehicle is made at Chennai. It has grown as a favourite spot among investors for automobile manufacturing.

Thus, the Automobile industries of India are located near the iron and steel producing centres, as steel is the basic raw material used. It is also located near the markets and sea ports. Some industries have been located in the underdeveloped areas of isolation.

MULTINATIONAL CORPORATIONS OF INDIA

A multinational company is an organization that provides its services in multiple countries through its subsidiaries in different regions. The operations are coordinated from headquarters in the parent country. A multinational corporation (MNC) has facilities and other assets in at least one country other than its home country. A multinational company generally has offices and/or factories in different countries and a centralized head office. Multinational corporations are large companies with operations in several countries across the world. For example - Apple, Ford, Coca-Cola, Google and Microsoft. Multinationals can enjoy lower taxes in other countries for exports and imports.

Characteristics of a Multinational Corporation

The following are the common characteristics of multinational corporations:

1. Very high assets and turnover

To become a multinational corporation, the business must be large and must own a huge amount of assets, both physical and financial. The company's targets are high, to make profits.

2. Network of branches

Multinational companies maintain production and marketing operations in different countries. In each country, the business may have multiple offices and several branches.

3. Control

The management of offices in other countries is controlled by one head office located in the home country.

4. Continued growth

Multinational corporations keep growing. They work to grow their economic size.

5. Sophisticated technology

In order to achieve growth, they need to make use of capital-intensive technology.

6. Right skills

Multinational companies aim to employ only the best managers, those who are capable of handling large amounts of funds, using advanced technology, managing workers.

7. Forceful marketing and advertising

Multinational corporations are spending a great deal of money on marketing and advertising.

8. Good quality products

Because they use capital-intensive technology, they are able to produce top-of-the-line products.

India is an investment-friendly nation and has attracted the attention of leading multinational organizations and many of the multinational companies are coming to India to extend their business because of the following reasons –

- Population resources
- Potential of our workforce
- Dynamic consumer-oriented market
- India's growing economy
- Globalization and
- Potential market

India benefits from the best multinational companies through their investments, new technology, capital and foreign exchange and rising economy. Employment generation is also a major aspect.

Below is the list of top 10 MNCs in India.

1. Microsoft

Microsoft Corporation India is a subsidiary of Microsoft Corporation Microsoft Corporation began its operations in 1990 with its headquarters in Hyderabad.

2. IBM

IBM (International Business Machines Corporation) is the second MNC in our list of multinational companies in India with its headquarters in Bangalore (IBM India Private Ltd). It started in the year 1992 in India and has its credits with a range of products and services including business consulting, storage solutions, etc.

3. Nestle

3rd on the list of MNCs in India is Nestle. Nestle India which is a food and beverage company from Switzerland is a part of Nestle. It is considered as one of the largest food company in India with its best food products.

4. Proctor & Gamble

Procter & Gamble (P&G) is a worldwide developer MNC and entered India in 1964 and currently has products such as Olay, Gillette, Vicks, Tide etc. It has a wide range of products including beauty, health and household care etc.

5. Coca-Cola

Coca-Cola is another widely acclaimed MNC in India. Coco-cola is the marketer of non-alcoholic beverage. The company operated in India as a subsidiary of Coca-Cola India Private Ltd.

6. Pepsico

PepsiCo MNC India is a well-known manufacturer of snacks and beverages. Pepsico India Holding Private Limited and is a leading manufacturer of popular brands such as Lays, Pepsi, Slice, etc.

7. CITI Group

CITI Group, founded in 1998, is an American Banking services Corp. It operates in India through the subsidiary, Citibank, which presently has more than 40 branches in over 30 cities in India.

8. SONY Corporation

Sony is a well-known Japanese multinational company. Sony Corporation began its operations in the year 1994 and is well acclaimed for its products in various categories: electronics, media and entertainment. Televisions, mobile phones, cameras, PlayStations, headphones, memory card, etc. are the major products of the Sony Corporation. It's headquarter is situated in Delhi,

9. Hewlett Packard

HP has also made its way into the list of MNCs in India with its products ranging from laptops, monitors, desktops and other electronic items. HP, an American Electronics and Information Technology Company have its headquarters in Bangalore. HP produces line of printers, digital cameras,

scanners, PDAs, calculators, servers, workstation computers, and computers for home and small-business use.

10. Apple Inc

The company is well-renowned for electronic consumers and some of their best selling products such as iPhone, iPod, iPad, and Mac. This is one of the largest MNC's companies in India which develops and sells computer, laptops, software and online services.

The other Multinational companies are-

- Amazon
- Wipro
- Citigroup
- Infosys
- Cognizant
- Accenture
- Intel
- TCS
- Cognizant Technology Solutions
- Larsen & Toubro
- Thyssen Krupp
- Siemens

Advantages of Multinational Corporations

1. Multinational corporations provide an inflow of capital.
2. Multinational corporations allow countries to purchase imports.
3. Multinational corporations provide local employment.
4. Multinational corporations improve the local infrastructure.
5. Multinational companies create consistent consumer experiences.
6. Multinational corporations encourage more innovation.
7. Multinational corporations increase cultural awareness.

Disadvantages of Multinational Corporations

1. Multinational corporations import skilled labor.
2. Competition
3. Inappropriate technology
4. Economic exploitation
5. Socio-cultural evils

INDUSTRIAL REGIONS OF INDIA

Industrial regions emerge when a number of industries locate close to each other and share the benefits of their closeness. They tend to concentrate on certain locations because of the favorable locational factors. Industrial region or industrial area refers to a geographical region with extremely dense industry. It is usually heavily urbanized. Industrial regions are those areas, where concentration of industries has occurred due to favorable geo-economic conditions. These are areas within which manufacturing industry is carried out on a relatively large scale and employs a relatively large proportion of population.

1. Large population engaged in industrial complexes
2. Large industrial complex in hierarchical order
3. Integration of some main industries with a group of subsidiary industries,
4. Large banking and credit facilities,
5. A network of communication lines, and
6. A large market for labour supply, etc

Following are the major industrial regions of India

1. Mumbai-Pune Industrial Region
2. Hugli Industrial Region.
3. Bangalore-Tamil Nadu Industrial Region
4. Gujarat Industrial Region

5. Chotanagpur Industrial Region

6. Vishakhapatnam-Guntur Industrial Region

7. Gurgaon-Delhi-Meerut Industrial Region

8. Kolfam-Thiruvananthapuram Industrial Region.

1. Mumbai-Pune Industrial Region:

This region extends from Thane to Pune and in adjoining districts of Nashik and Solapur. Industries have grown at a rapid pace in Kolaba, Ahmednagar, Satara, Sangli and Jalgaon districts also. Kurla, Thane, Andheri, Kalyan, Pimpri are the leading industrial centres.

The growth of this industrial region is fully connected with the growth of cotton textile industry in India. As the coal was available in far, hydel power was developed in Western Ghats. Cotton was cultivated in the black cotton soil area of the Narmada and Tapi basins.

Cheap labor-force came from the hinterland, the port facilities for export-import and communication links with the peninsular hinterland made Mumbai the ***'Cottonopolis of India'***.

Opening of the Mumbai High petroleum field and erection of nuclear energy plants added magnetic force to this region. In addition to cotton textile and chemical industries, engineering goods, leather, oil refineries; petrochemicals, synthetic and plastic goods, chemicals, drugs, fertilizers, electrical, electronics, software, ship-building, transport and food industries have also developed here.

2. The Hugli Industrial Region:

Located in West Bengal, this region extends as a narrow belt running along the river Hugli for a distance of about 100 km. Industries have also developed in Midnapur district in the west. The river Hugli offered the best site for the development and the inland river port act as nucleus for the development of Hugli industrial region.

Kolkata-Howrah forms the nucleus of this region. It is very well- connected by the Ganga and its tributaries with the rich hinterland of Ganga-Brahmaputra plains. Besides navigable rivers, roads and the railways provided links to the great benefit of Kolkata port.

The discovery of coal and iron ore in Chotanagpur plateau, tea plantations in Assam and northern parts of West Bengal and the processing of deltaic Bengal's jute led to the industrial development in this region. Cheap labor could be found easily from the thickly populated states of Orissa, Bihar, Jharkhand and eastern part of U.P.

A chain of jute mills and other factories could be established on either side of Hugli River with the help of Damodar valley coal. The port site was best-suited for export of raw materials to England and import of finished goods from that country.

Kolkata's industries have established by getting the raw materials from adjoining regions and distributing the finished goods to consuming points. Thus, the role of transport and communication

network has been as important as the favourable locational factors in the growth of this region

Paper, engineering, textile machinery, electrical, chemical, pharmaceuticals, fertilizers and petrochemical industries have also developed in this region. Factory of the Hindustan Motors Limited at Konanagar and diesel engine factory at Chittaranjan are landmarks of this region.

Location of petroleum refinery at Haldia has facilitated the development of a variety of industries. The major centres of this industrial region are Kolkata, Howrah, Haldia, Serampur, Rishra, Shamnagar, Titagarh, Sodepur, Budge Budge, Birlanagar, Bansbaria, Triveni, Hugli, Belur, etc.

3. Bangalore-Tamil Nadu Industrial Region:

Spread in two states of Karnataka and Tamil Nadu, this region experienced the fastest industrial growth in the post-independence era.

This region is a cotton-growing tract and is dominated by the cotton-textile industry. It has large number of silk-manufacturing units, sugar mills, leather industry, chemicals, rail wagons, diesel engines, radio, light engineering goods, rubber goods, medicines, aluminium, cement, glass, paper, cigarette, match box and machine tools, etc.

This region is away from the main coal-producing areas of the country but cheap hydroelectric power is available from Mettur, Sivasamudram, Papanasam, Pykara and Sharavati dams. Cheap skilled labour and proximity to vast local market as well as good climate have also favoured the concentration of industries in this region.

Coimbatore has grown rapidly mainly based on Pykara power, local cotton, coffee mills, tanneries, oil presses and cement works. Coimbatore is known as "***Manchester of Tamil Nadu***" because of its large-scale cotton textile industry. The establishment of public sector units at Banglore like Hindustan Aeronautics, Hindustan Machine Tools, Indian Telephone Industry and Bharat Electronics etc. has further pushed up the growth of industries in the region. Madurai is known for its cotton textiles.

Visvesvarayya Iron and Steel Works is located at Bhadravati. The other important centres of this region are Sivakasi, Tiruchirapalli, Mettur, Mysore and Mandya. Petroleum refinery at Chennai and Narimanam and iron and steel plant at Salem are recent developments.

4. Gujarat Industrial Region:

The nucleus of this region lies between Ahmedabad and Vadodara known as Ahmedabad-Vadodara industrial region. The region corresponds to the cotton growing tracts of the Gujarat plains and the development of this region is associated with the location of textile industry since 1860s.

Ahmedabad is nearer the sources of raw material as well as the marketing centres of the Ganga and Satlui plains. Availability of cheap land, cheap skilled labour and other advantages helped the cotton textile industry to develop.

The discovery and production of oil at a number of places in the Gulf of Khambhat area led to the establishment of petrochemical industries around Ankleshwar, Vadodara and Jamnagar. Petroleum refineries at Koyali and Jamnagar provide necessary raw materials for the proper growth of petrochemical industries.

The Kandla port, which was developed immediately after independence, provides the basic infrastructure for imports and exports and helps in rapid growth of industries in this region.

Besides textiles (cotton, silk and synthetic fibres) and petrochemical industries, other industries are heavy and basic chemicals, dyes, pesticides, engineering, diesel engines, textile machinery, pharmaceuticads, dairy products and food processing.

The main industrial centres of this region are Ahmedabad, Vadodara, Bharuch, Koyali, Anand, Surendranagar, Surat, Jamnagar, Rajkot.

5. Chotanagpur Industrial Region:

This region is located on the Chotanagpur plateau and extends over Jharkhand, Northern Orissa and Western part of West Bengal. The birth and growth of this region is linked with the discovery of coal in

Damodar Valley and iron ore in the Jharkhand-Orissa mineral belt. As both are found in close proximity, the region is known as the ***'Ruhr of India'.***

Besides raw materials, power is available from the dam sites in the Damodar Valley and the thermal power stations based on the local coal. This region is surrounded by highly populated states of Jharkhand, Bihar, Orissa and West Bengal which provide cheap labour.

The Kolkata region provides a large market for the goods produced in the Chotanagpur region. It also provides the port facility to the region. The Tata Iron and Steel Company at Jamshedpur, Indian Iron Steel Co., at Burnpur-Kulti, Hindustan Steel Limited at Durgapur, Rourkela and Bokaro are the important steel plants located in this region.

Heavy engineering, machine tools, fertilizers, cement, paper, locomotives and heavy electrical are some of the other important industries in this region. Important nodal centres of this region are Ranchi, Dhanbad, Sindri, Hazaribagh, Jamshedpur, Daltonganj.

6. Vishakhapatnam-Guntur Industrial Region:

This industrial region extends from Vishakhapatnam district in the north-eastern part of Andhra Pradesh to Kurnool and Prakasham districts and covers most of the coastal Andhra Pradesh. The industrial development of this region mainly depends upon Vishakhapatnam and Machilipatnam ports.

Developed agriculture and rich mineral resources in the hinterlands of these ports provide solid base to the industrial growth in this region. Coal fields of the Godavari basin are the main source of energy. Hindustan Shipyard Ltd. set up at Vishakhapatnam, set up in 1941 is the main focus.

Petroleum refinery at Vishakhapatnam facilitated the growth of several petrochemical industries. Vishakhapatnam has the most modern iron and steel plant in India having coastal location.

The other industries of this region include sugar, textiles, paper, fertilizers, cement, aluminium and light engineering. The important industrial centres of this region are Vishakhapatnam, Vijaywada, Vijaynagar, Rajahmundry, Kurnool and Guntur are the industrial centres. Recent discovery of natural gas in Krishna- Godavari basin has helped in the growth of this industrial region.

7. Gurgaon-Delhi-Meerut Industrial Region:

This region developed after independence, but is one of the fastest growing regions of India. It consists of two industrial belts adjoining Delhi. One belt extends over Agra-Mathura-Meerut and Saharanpur in U.P. and the other between Faridabad-Gurgaon- Ambala in Haryana.

The region is located far away from the mineral and power resources, and therefore, the industries are light and market oriented.

The region owes its development and growth to hydro-electricity from Bhakra-Nangal complex.

Sugar, agricultural implements, vanaspati, textile, glass, chemicals, engineering, paper, electronics and cycle are some of the important industries of this region. Software industry is a recent addition, Agra and its environs have glass industry. Mathura has an oil refinery with its petro-chemical complex. One oil refinery has been set up at Panipat also.

Gurgaon has Maruti car factory. Faridabad has a number of engineering and electronic industries. Ghaziabad is a large-centre of agro-industries. Saharanpur and Yamunanagar have paper mills. Modinagar, Sonipat, Panipat are other important industrial nodes of this region.

8. Kollam-Thiruvananthapuram Industrial Region:

This is comparatively small industrial region and spreads over Thiruvananthapuram, Kollam, Alwaye, Emakulam and Allapuzha districts of south Kerala. The region is located far away from the mineral belt of the country but dominated by agricultural products processing and market oriented light industries.

Plantation agriculture and hydroelectricity provide the industrial base to this region. The main industries are textiles, sugar, rubber, match box, glass, chemical fertilizers, food and fish processing, paper, coconut coir products, aluminium and cement. Oil refinery set up in Kochi

provides solid base to petrochemical industries. Important industrial centres are Kollam, Thiruvananthapuram, Alluva, Kochi, Alappuzha and Punalur.

Besides the above mentioned eight major industrial regions, India has 13 minor industrial regions and 15 industrial districts. Their names are mentioned below:

Minor Industrial Regions:

1. Ambala-Amritsar in Haryana-Punjab.

2. Saharanpur-Muzaffamagar-Bijnaur in Uttar Pradesh.

3. Indore-Dewas-Ujjain in Madhya Pradesh.

4. Jaipur-Ajmer in Rajasthan.

5. Kolhapur-South Kannada in Maharashtra-Karnataka.

6. Northern Malabar in Kerala.

7. Middle Malabar in Kerala.

8. Adilabad-Nizamabad in Andhra Pradesh.

9. Allahabad-Varanasi-Mirzapur in Uttar Pradesh.

10. Bhojpur-Munger in Bihar.

11. Durg-Raipur in Chhattisgarh.

12. Bilaspur-Korba in Chhattisgarh.

13. Brahmaputra Valley in Assam.