Springboard ACADEMY

AN INSTITUTE FOR IAS & RAS

RAS PRELIMS

2024 – 2025

GEOGRAPHY OF INDIA

PRELIMS EXAM

LAKSHITA MA'AM

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Springboard ACADEMY

Syllabus

Geography of India

- ☑ Major Landforms – Mountains, Plateaus, Plains.
- ☑ Mechanism Of Monsoon & Rainfall Distribution.
- ☑ Major Rivers & Lakes.
- ☑ Major Crops – Wheat, Rice, Cotton, Sugarcan, Tea & Caffee.
- ☑ Major Minerals – Iron Ore, Manganese, Bauxite, Mica.
- ☑ Power Resources – Conventional & Non-Conventional.
- ☑ Major Industrial Regions.
- ☑ National Highways & Major Transport Corridors.

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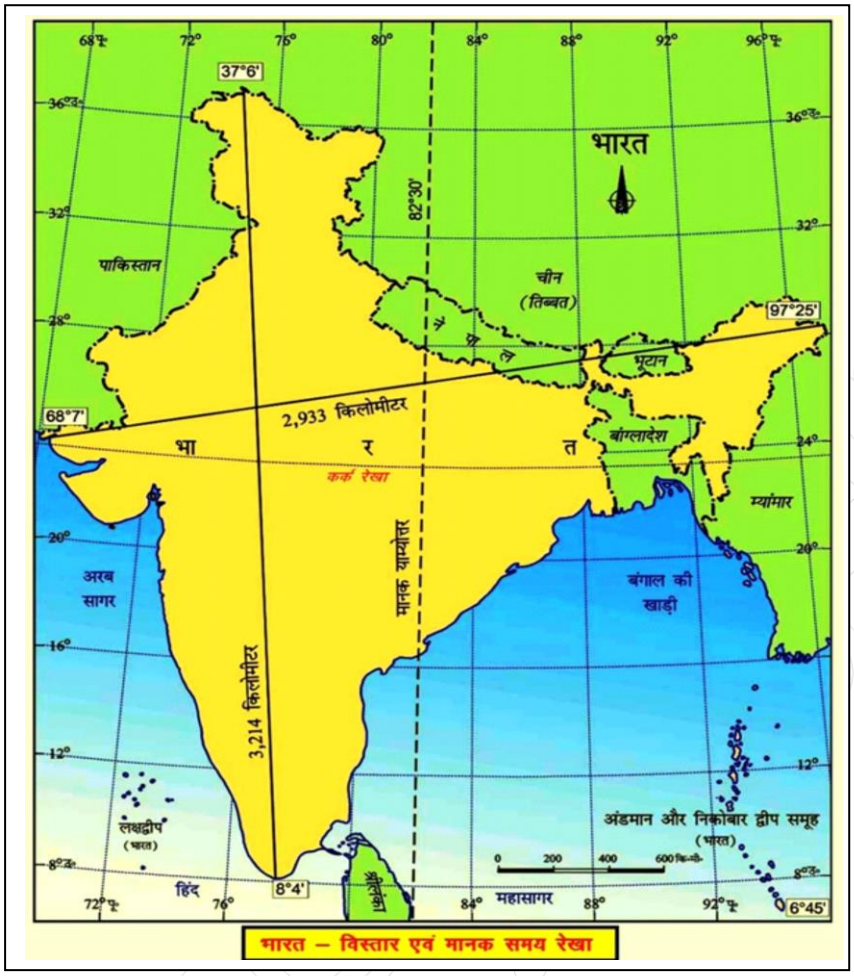
General Introduction Of India



- India is a major country of south asia located in northern & eastern hemisphere.
- Shape of India is quadrangular.

➢ **Size of India -**

1. Area
2. Papulation

1. **Area**- 32,87,263 Sq. km.
   - New Data – 3287469 Sq. km.
   - in short – 32.8 lakh Sq. km.
     3.28 Million Sq. km.
     328.7Million hectare
   - 2.4% of world's area
   - India **is on 7th position in terms of area.**
     1 Russia
     2 Canada
     3 USA

4 China
5 Brazil
6 Australia
7 (vii) India

2. **Population -**
   - According to census 2011, the population of India is around 121 crore
   - India is on 2nd position in terms of population.
   - India's population is 17.5% of world's total population.

➢ **Extension of India -**

The latitudinal & longitudinal extension of India is around 30^0 but North-South distance is more than East-West distance.
Because the distance between latitudes remains same whereas the distance between longitudes decrease while moving towards the poles.

➢ **Impacts of Latitudnal Extension:**
   - The latitudinal extension of India is of 30^0 therefore is diversity in terms of soil, vegetation, types & climatic condition.
   - tropic of cancer passes through centeral part of India & it divides India into 2 climatic zones.
   - India's Southern part is in tropical zone & Northern part is in subtropical/ warm temperate zone.
   - **Tropic of cancer passes through 7 States of India -**
     1 Gujarat
     2 Rajasthan
     3 Madhya Pradesh
     4 Chattisgarh
     5 Jharkhand
     6 West Bengal
     7 Tripura
     8 Mizoram

➢ **Capital cities close to tropic of cancer -**
     1 Ranchi (Closest capital)
     2 Aizawl
     3 Bhopal
     4 Gandhinagar
     5 Agartala
   - Udaipur city of tripura is closest city to tropic of cancer but it is nota state capital.

- **Other cities close to tropic of cancer area.**
  1. Ahmedabad (Gujarat)
  2. Ujjain, Jabalpur, Shahdol (Madhapradesh)
  3. Ambikapur (Chattisagarh)
  4. Hoogly (West Bengal)
  5. Banswara (Rajasthan)

➢ **Impact of Longitudnal Extension -**

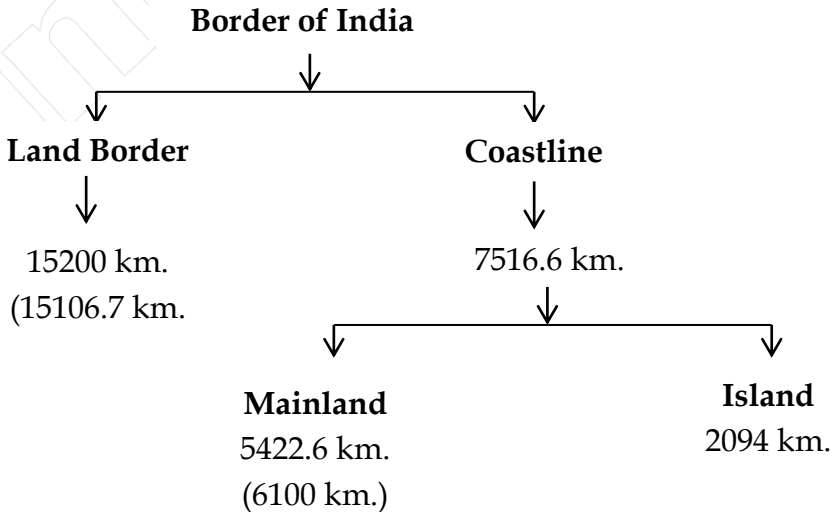
India's longitudinal extension is of 30^0, Therefore in north eastern states 2 sun rises 2 hrs. earlier than western states.

- India standard time (IST) is determined from $82½^0$ E. longitude.
- $82½^0$ E Longitude passed through Mirzapur (Naini) near Prayagraj (Allahabad, U.P.).
- IST is 5 hr. 30 min. ahead of GMT.

⇨ **$82½^0$ E longitude passes through 5 states.**

1. Uttarpradesh
2. Madhypradesh
3. Chhattisgarh
4. Odisha
5. Andhra Pradesh

- Tropic of cancer & $82½^0$ E longitude intersect at Koriya district in Chattisgarh.



- **Durand line** :- India – Afganistan
- **Radcliff line** :- India – Pakistan
- **Radcliff line** :- India – Bangladesh
- **Mac Mohan line** :- India – China

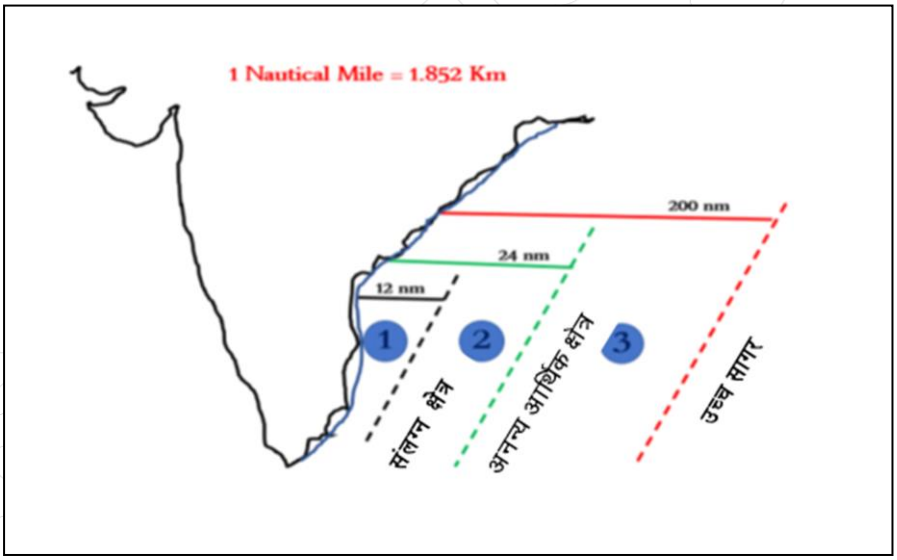
Countries	Length of border	States on th border
Bangladesh	4096.7 km	West Bengal, Assam, Meghalaya, Tripura, Mizoram.
China	3488 km.	Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh.
Pakistan	3323 km.	Gujarat, Rajasthan, Panjab, Jammu-Kashmir, Ladakh.
Nepal	1751 km.	Uttarakhand, Uttar Pradesh, Bihar, West Bengal, Sikkim.
Mynmar	1643 km.	Arunachal Pradesh, Nagaland, Manipur, Mizoram .
Bhutan	699 km.	Sikkim, West Bangal, Assam, Arunachal Pradesh
Afganistan	106 km.	ladakh

- Longest coastline - Andaman & Nicobar Island group.
- Smallest Coastline in states – Goa

☑ SEA EXTENSION

- The sea extension limit was determined under United Nation Convention on laws of Sea (UNCLOS) 1982.
- Sea extension is measured in Nauticle Miles.

1 Nauticle mile = 1.852 km.



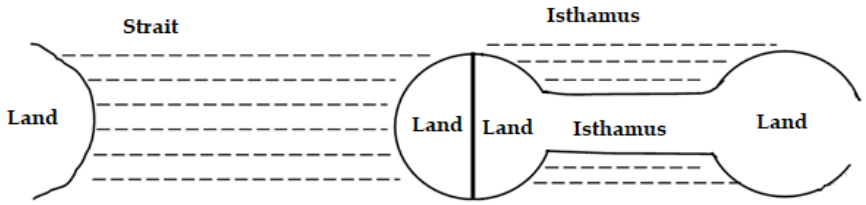
1. **Internal water** :- India has full soverignity over it.
2. **Territorial Sea** :- Absolute right of India but innocent passage is allowed.
3. **Contiguous Sea** :- Financial rights like custom duty etc.
4. **Exclusive Economic zone** :- Rights to access resources, built artificial islands conduct scientific research.

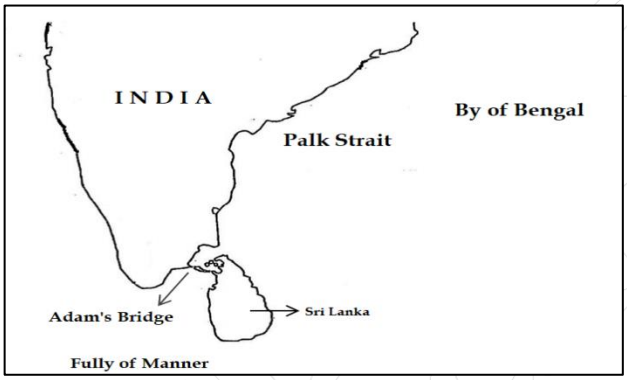
5. **High Sea** :- Beyond any national jurisdication.

Note:-

- Highest Point :- K2 (Godwin Austin) (8611 m.Height)
- Lowest Point :- Kuttanad Region (Kerala) -2m

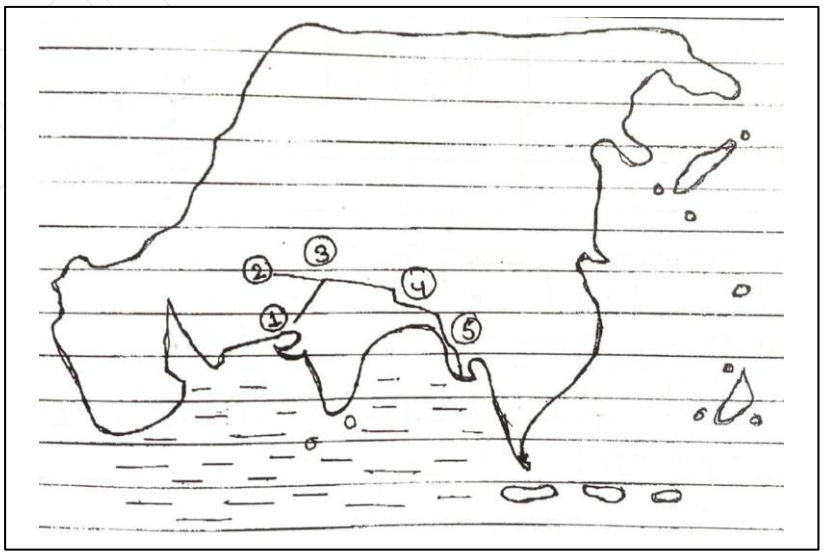
Rice cultivation is done below sea level.





- Palk strait it connects palk bay & bay of Bengal.
- It is located between India & Sri Lanka.

INDIAN SUBCONTINENT



- Any such part of a continent which has a separate geographical indentity is collect subcontinent.

- India has got the title of subcontinent because on the north-western, northern & north-eastern part of India mountain ranges are located such as.
  1 Sulaiman
  2 Hindukush
  3 Himalaya
  4 Purvanchal
  5 Arakan yoma
  & Indian ocean is located in the south.

India & nearby countries includes in Indian subcontinent.

➢ 7 Major contries are included in Indian Subcontinent.

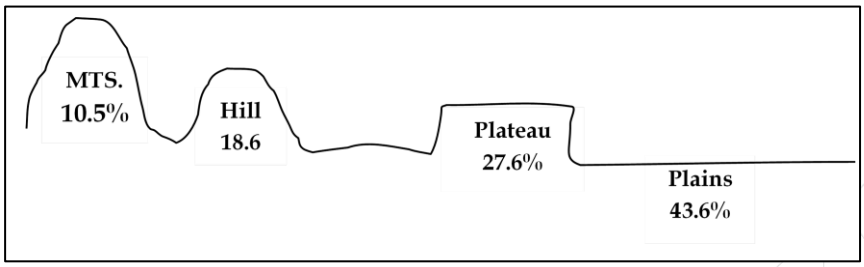
1 India
2 Pakistan
3 Nepal
4 Bhutan
5 Bangladesh
} **NCERT**
6 Sri Lanka
7 Mal deev

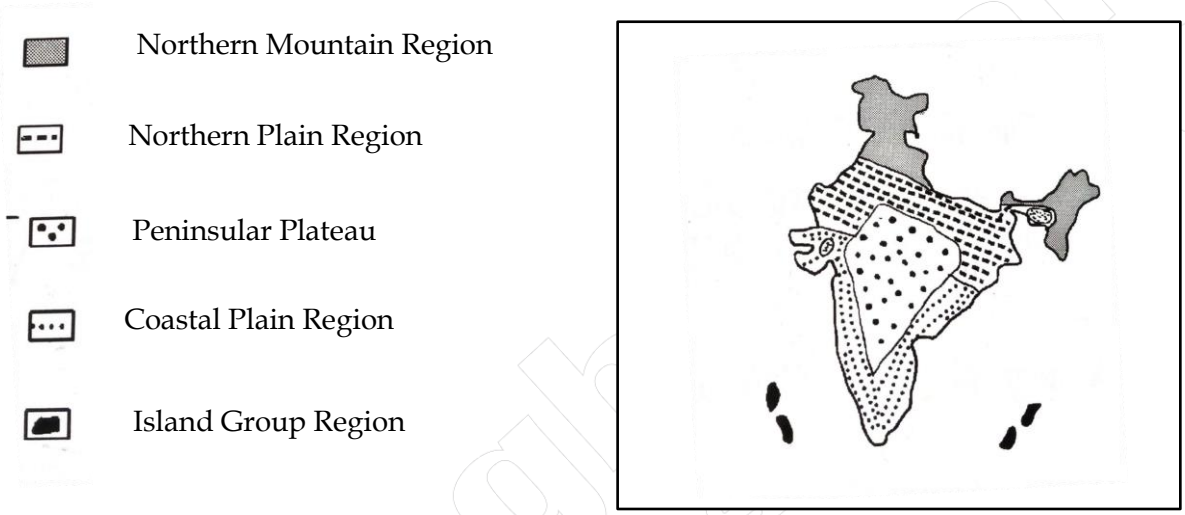
➢ **Mean Sea Level of India :-**

- India's MSL was taken from Karachi Before Independence .
- After independence, MSL was taken from Mumbai & at present it is taken from Chennai.
- The survey of India (SoI) Determines the mean sea level of India & elevation of different places is measured from mean sea level.

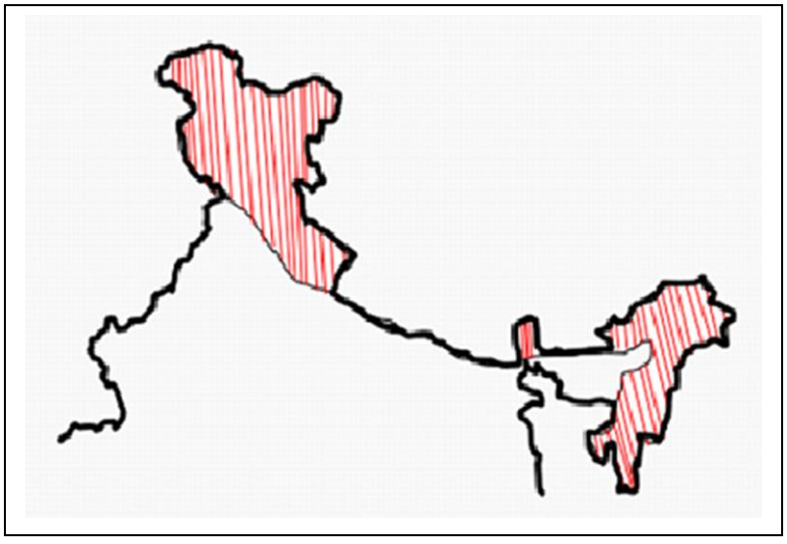
Physiographic Divisions Of India

- There is diversity in terms of geological structures & relief features.Therefore on the basis of relief feature India is divided into various physiographic divisions.





☑ **Northern Mountain Region-**

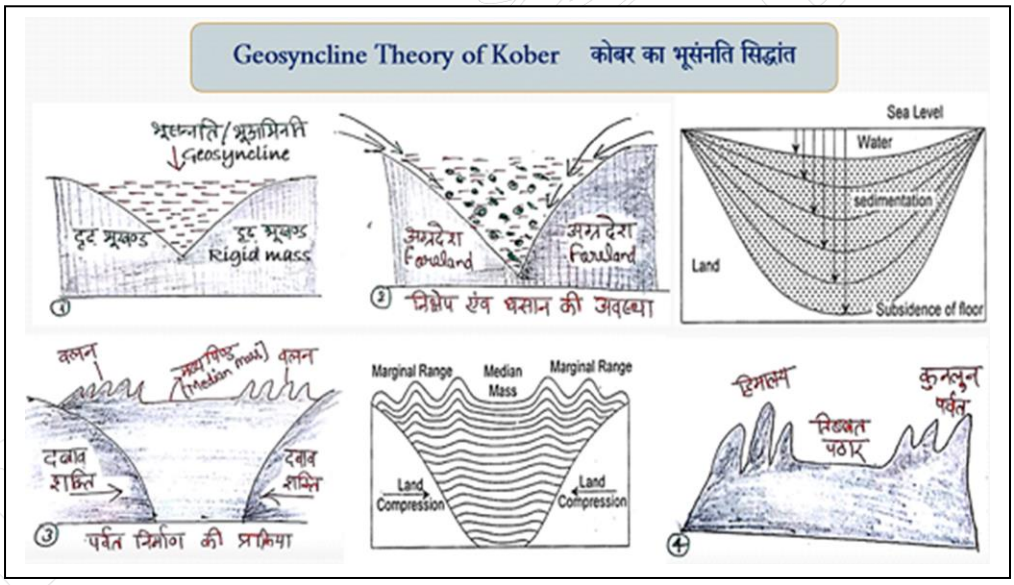


- This region extends over an area of 5 lakh sq. km. in the form of an area.
- this region extends from 74^0 E longitude upto 96^0E longitude.
- It's longitudinal extension is of 22^0 Himalayan Mountain is the major mountain of this region
- Himalaya is a Young fold mountain which was formed in teritary period.
- Many alpinc glaciers are found on Himalaya mts. from where the major rivers of India originate.
- Various theories have been proposed to explain the origin of Himalaya.

Theories Related to Origin

- **Geosyncline Theory of Kober**
- **Plate Tectonic Theory**

Geosyncline Theory Of Kober :-



- According to kober, geosyncline is the cradle of mountain.
- Geosyncline is long, narrow & shallow water body.
- On both the geosyncline foreland is located.
- 70 million years ago, in place of Himalays mountain tethis gensyncline was located.
- On one side of tethis sea, Angaraland on other side gondwanaland was located.
- The rivers coming from foreland area deposited sediments in tethis geosyncline.
- due to which the floor of geosyncline started subsiding.

- Due to the subsidence of the floor of geosyncline, compressional force started being exerted on foreland areas.
- Due to compressional force, the sediments of geosyncline got folded which lead to the formation of marginal ranges.
- The median mass which got unaffected by folding lead to the formation of plateau.
- In this way, Himalaya Mt. & Kununshan Mts. are formed & Tibbet plateau lie between these Mts.

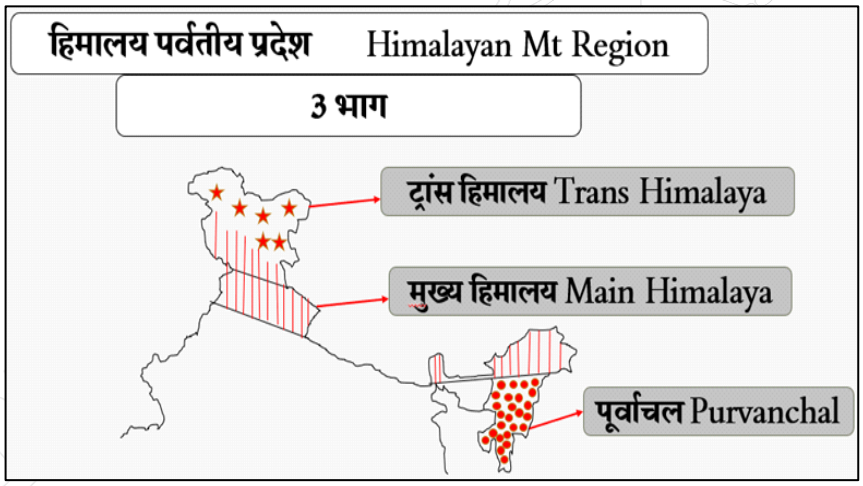
Himalayan Mt. Region

Geographical Division
- **Trans Himalaya**
- **Mains Himalaya**
- **Purwanchal**

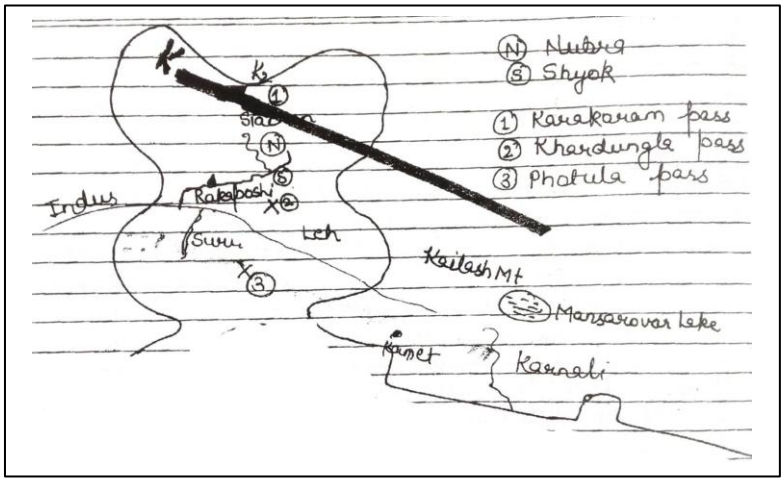
Regional Division
- **Kashmir Himalaya**
- **Kumadn Himalaya**
- **Nepal Himalaya**
- **Assam Himalaya**

➢ **Geographical Division :-**

☑ Trans Himalaya :-



- Trans Himalaya is mainly located in Ladakh &Tibbet.
- Also known as Tibbettan Himalaya.
- Trans Himalaya is located in Rainshadow region of main Himalaya. Therefore, arid land are found here & less growth of vegetation takes place in this region.
- Trans Himalaya extends over a distance over a 1000 Km. from west to east.
- The average width of this part is 250km & average height is 4000 km.
- **3 major ranges are included in trans Himalaya :-**
  (i) Karakoram
  (ii) ladakh
  (iii) Jaskar



1. **Karakoram :-**
   - It is northern most & highest range of trans Himalaya.
   - It's highest peak is K2 (Godwin Austin-8611m.)
   - It is India's highest & world-II highest peak.
   - Many glaciers are located in this range such as
     - Siachin
     - Hispar
     - Batura
     - Baltoro
     - Biafo glaciers etc.
   - Nubra river originates from siachin glaciers.
   - Karakorm pass of this range connects India & China.
   - India's top peaks :- 1. Kanchanjanga

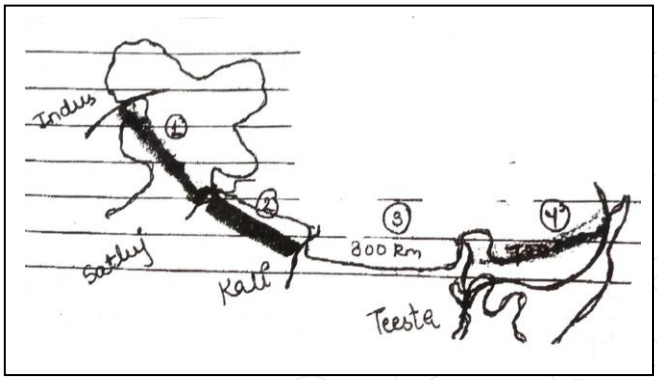
   ➢ **Nubra Valley :**
   - This triarmed valley is located at the confluence region of Nubra & Shyok river.
   - Arid conditions are found in this valley region.
   - Old/Ancient name – Doomra valley. which literally means 'valley of flowers'.
   - It is located between ladakh & Korakoram range.
   - In this valley 2 humped Bacterian camel are found.

2. **Ladakh Range :-**
   - This range is called Kailash Mountain in Tibbet Mansarovar Lake lies in south of it.
   - Highest peak of this range – Rakaposhi (7788 m.).
   - Khardungla pass is located in this range which connects Numbra & Shyok river valley to the Indus river valley.

- Between Karakoram & Ladakh range ladakh plateau is located which is India's highest plateau (4800m). cold desert condition are found on this plateau .
-

3. **Zaskar Range:-**
   - This range lies between Suru & Karnali rivers.
   - Highest peak – Kamet (7756 m.)
   - Indus river valley is located between Ladakh & Zaskar range.
   - Phatula pass is in this range which is located on Srinagar-leh route.
   -

☑ **Main Himalaya-**

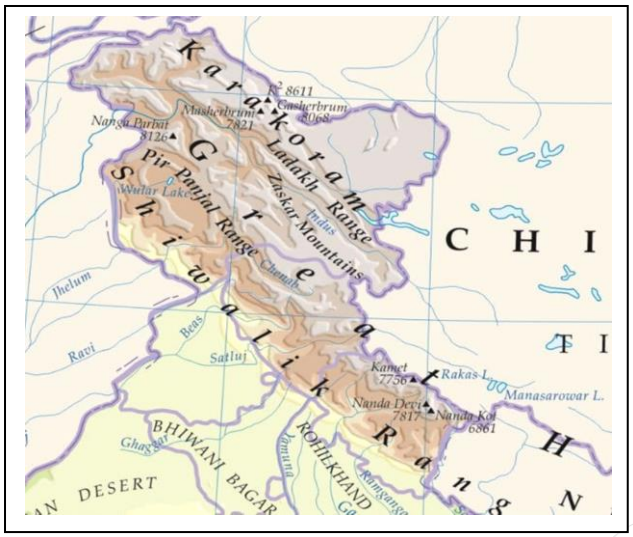


- This part of northern Mountain Region extends from Indus river upto Brahmaputra river over a distance of 2400-2500 km.
- The width of main Himalaya is around 400 km in west & 150km. in the east.
- There is Syntaxial bend on both the sides of main Himalayas.
- The northern slope of Himalaya is gentle (concave) & the southern slope is steep (convex) therefore more glaciers are found on its northern slope.
- The Snowline of western himalaya is 5500m & Snowline of eastern Himalaya is 4500m. because more rainfall is received in Eastern Himalaya

➢ **Main Himalaya includes 3 major Mountain rangs.**

1 Great Himalaya
2 Middle Himalaya
3 Shivaliks

1. **Great Himalaya :-**

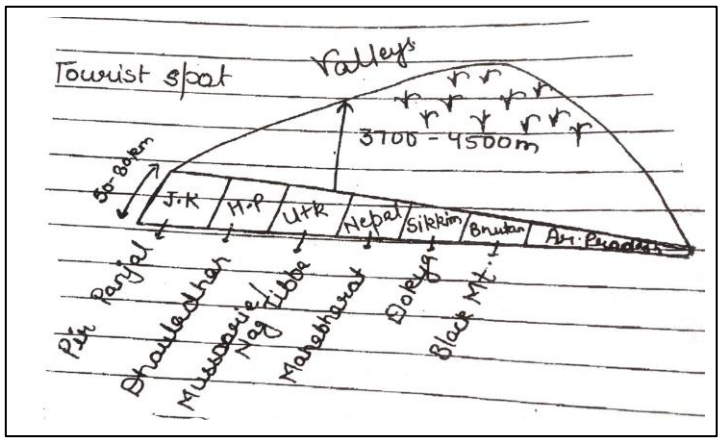


- This is the world's highest range which is extended from Nanga parbat upto Namcha Barwa over a distance of 2400 km.
- Average height of this range is 6100 km. & average width is 25 km.
- Most of the part of this range remains covered with snow throughout the year therefore it is also called himadri.
- In this range world's highest peak **Mount Everest** (8848.86m) is located. Mount Everest is known as Sagarmatha is Nepal & Chomolugma is Tibbet.
- In this range many Alpine glaciers are located such as Gangotri, Yamunotri, satopath, pindar, Milan(Uttarakhand), Zemu (Sikkim)etc.
- Major rivers of India originates from these glaciers.
- It is continuous range which is crossed through passes.
- In North India passes are called 'La' in Local languages.

➢ **Top peaks of India :**

1. K_2 (8611m.)
2. Kanchanjunga (8586m)
3. Nanga Parbat (8126m)
4. Gasherbrum I/K_5(8080m)
5. Broad Peak (8051m)
6. Gasherbrum II/K_4(8035m)
7. Gasherbrum III/K_{3a}(7946m)
8. Gasherbrum IV/K_3(7932m)
9. Masherbrum /K I (7821m)
10. Nanda Devi (7816m)
11. Batura Sar (7795m)
12. Rakaposhi (7788m)

2. Middle / Lesser / Himachal Himalaya:-

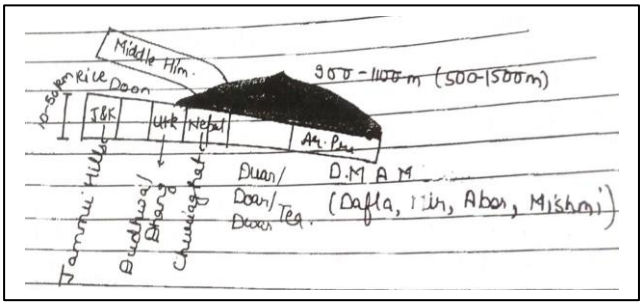


- The height of this range is 3700-4500m.
- The width of this range is 50-80 km.
- This range has various regional names Pir Panjal (Jammu & Kashmir) Dhoulagarh (Himachal Pradesh) etc.
- During summer season in this range temperate grasslands develop on this range which are called Merg in Jammu-Kashmir, Bugyal, Payala (pyara) in Uttrakhand.
- Many valleys are located between great Himalayas & middle Himalayas such as Kashmir, Kullu, Kangra, Kathmandu valleys.
- These grasslands are used by local communities for grazing their animals.
- In these range local communities practice transhumance/seasonal migration such as
    - Gurjar, Bakawal – Jammu &Kashmir ,
    - Bhotiya – Uttrakhand, Sikkam
    - lepcha – Sikkim
- Many tourist spots are located in this range.

Note

- **Karewa :-** Glacier, Riverine & Lacusterine sediments found in Kashmir valley region.
    - Karewa was formed during Pleistocene eporl.
    - Karewa is very fertile .
    - Karewa is used for saffron Cultivation.
    - In 'Kashmir' Zaffron variety of saffron is grown.
- when local communities travel from one place to another in search of fodder due to weather change is called Seasonal migration

3. Shivalik/Outer Himalaya :-

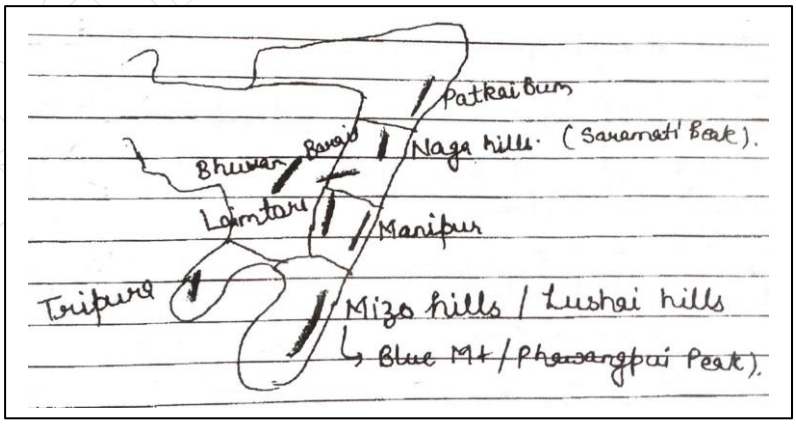


- The average height of this range is 900-100 m & its width is around 10-50 km.
- This range has various regional name.
- longitudinal valleys are located between Shivalik & Middle Himalayas. which are called Doon in Eastern Himalayas.
- Ex.:- Chandigarh – Kalka Dun, Nalagarh dun, Dehradun, Harike Dun, Kota Dun, Kotlidun, Patli dun,
- Dwar – Nihang dwar, Alipurdwar etc.
- 'Doon' is used for rice cultivation & 'Dwar' is used for tea plantation .

Note:-

- **Chos :-**
  - During Monsoon in Punjab, Himachalpradesh seasonal streams are formed on southern slopes of Shivalik range & these streams are called Chos is local language.
  - Because of chos, Shivalik Mountain get eroded.

3. Purvanchal :-



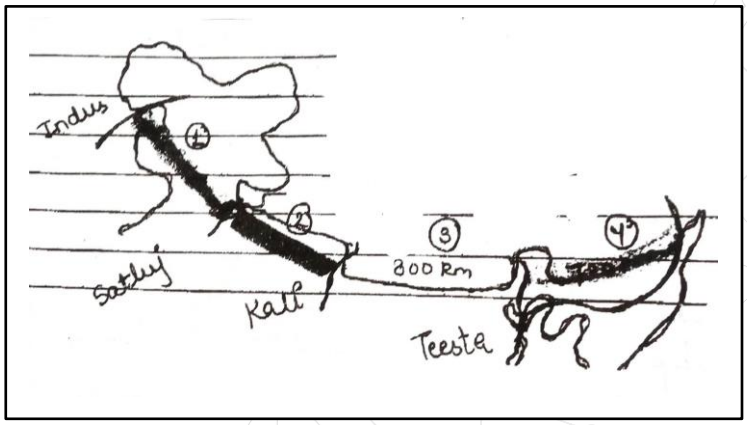
- In north eastern states the hills extending from north-south are collectively called Purvanchal.
- These hills were formed by the convergence of Indian & Burma plate.
- These hills are mainly made up of sandstone.

- Heavy rainfall is received here by monsoon wind therefore, tropical evergreen vegetation is found here.
- High biodiversity is found in this region & it is included in 36 biodiversity hotspots of the world.
- Saramati, Peak of Naga hills is highest peak of this region.
- The highest peak of mizo hills is blue Mountain which is also called phaungpui.
- Barail hills separate Naga & Manipur hills.

Note:- Mizoram is called as molossis basin because it is made up of Unconsolidated deposits/rocks.

☑ REGIONAL DIVISIONS OF HIMALAYA

- Regional Division of Himalayas is presented by **Sydney burrad.**
- Regional division is done on the basis of rivers.



1. Kashmir Himalaya (Punjab Himalaya) :-

- This part of Himalaya lies between Indus & satluj river over a distance of 560km.
- Width of Himalayas is maximum in this part (250 – 400Km.)
- Zaskar, Peer Panjal & Dhauladhar are the major ranges of this region.
- Nanga parbat is the highest peak of this part.
- Charar-e-sharif, Vaishno devi, Amarnath like religios places are located here.

2. Kumao Himalaya :-

- This part of Himalaya is extended from satluj to kali river over a distance of 320km.
- This part mainly lies in Uttarakhand.
- Highest peak of this part is Nanda devi.
- many glaciers are located in this part such as gangotri, yamunotri, satopanth, pinder, Milan etc.
- major rivers of India originates from these glaciers.
- Here pilgrimage places like Gangotri, Yamunotri, badrinath, kedarnath & Hemkund sahib, are located.

3. Nepal Himalaya :-

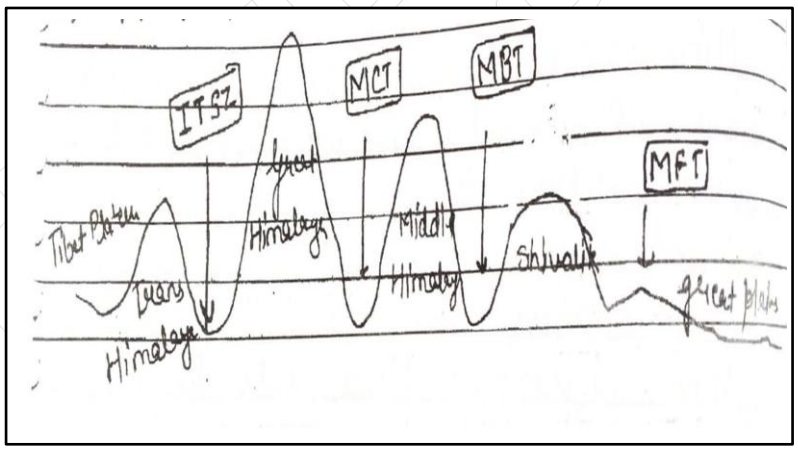
- It lies between kali & Teesta rivers over a distance of 800 km.
- In this part height of Himalayas is highest.
- Mount Everest is the highest peak of this part.
- Other major peaks of this parts are :- Dhaulagiri, Annapurna, Makalu, Gaurishankar, Kanchenjunga. (Kathmandu valley Mahabharat)

4. Assam Himalaya:-

- It lies between Teesta & Dihang river over a distance of 720km.
- Namcha Barwa (China) is highest peak of this part.
- Other major peaks of this region are Pauhunri (Sikkim- China), Kangto (Arunachal Pradesh-China)
- Width of Himalayas is least (Narrowest) in this part.

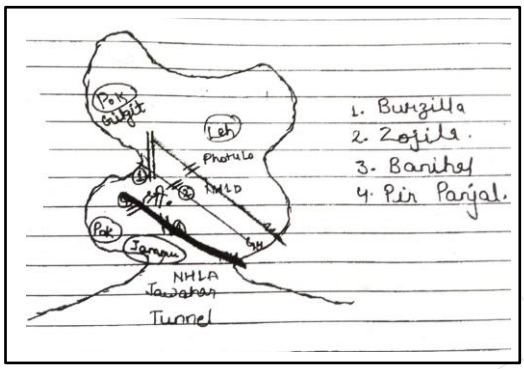
☑ **Major Thrust Of Himalaya**

- **ITSZ** (Indus Tsangpo Suture zone) :- Between trans Himalaya & Main Himalaya (Great Himalaya)
- **MCT (**Main Central Thrust) :-Between great Himalaya & Middle Himalaya.
- **MBT** (Main boundary thrust) :- Between middle himalay & Shivalik
- **MFT** (Main frontal thrust / Himalayan frontal fault) :-between shivalik & Great plains.



☑ **Major passes of himalaya**

1 Burzilla
2 Zojila
3 Banihal
4 Pir Panjal



1 Burzilla :-

- This pass connects Srinagar with Gilgit (POK)
- This pass is sensitive from security point of view.

2 Zojila :-

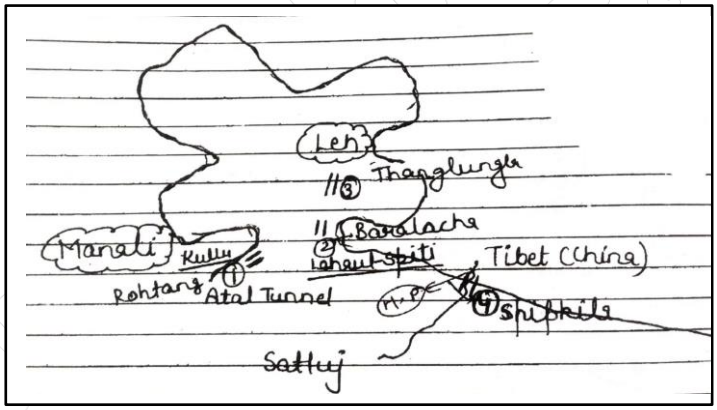
- This pass connects Srinagar with leh.
- NH-1D passed through it.

3 Pir panjal pass :-

- This pass connects Srinagar with PoK.

4 Banihal Pass:-

- This pass connects Srinagar with Jammu NH1A passes through it.
- Jawahar Tunnel also passed through it.



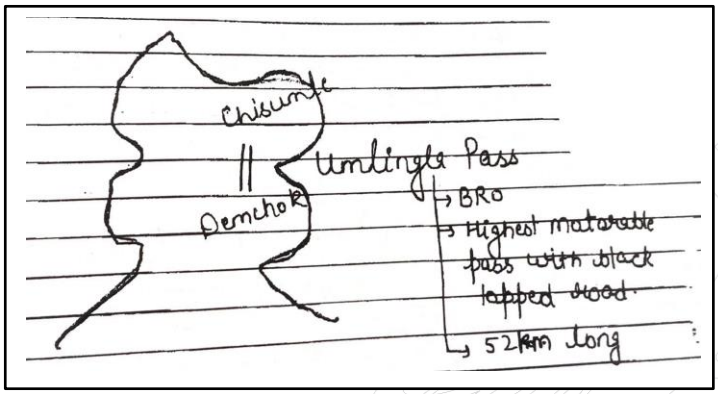
1. **Rohtang Pass:-** This pass is located in Manali- leh Route.
   - This pass connects kullu valley with lahaul – spiti valley.
   - Attal tunnel is located in this path.

2. **Baralachcha Pass:-**
   - This pass connects lahaul-spiti (Himachal Pradesh) with leh.
   - It is a major pass located on Manali-Leh route.

3. **Thanglangla Pass** :-
   - This pass is a major pass located on Manali-Leh route.

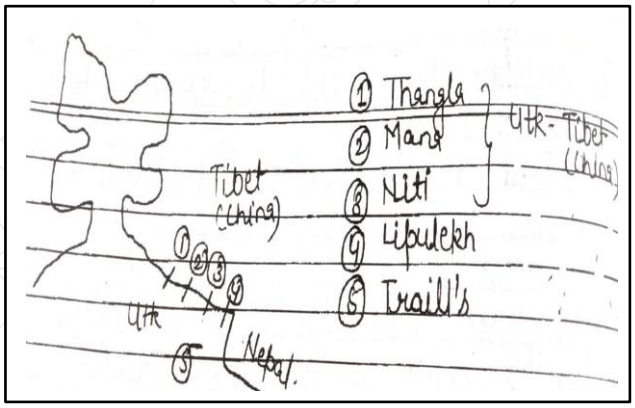
4. **Shipkila Pass** :- This pass connects Himachal Pradesh with Tibbet.
   - Satluj river enters India through this pass.
   - This pass is formed by satluj river.

➢ **Umlingla Pass :-**
   - This pass connects demchok with chisumle.
   - This pass has been built by Border Road Organization (BRO)
   - This is world's highest motorable pass with 52 km. long black topped road.



➢ **Lipulekh :-**
   - This pass is located on India, China & Nepal border region.
   - Kailash- mansarovar Pilgrimage is done through this pass so, it is also known as gateway to mansarover.

➢ **Traill's Pass :-**
   - This pass is located between Nanda devi & Nandkot peaks.
   - This pass connects Pindar Glaciar valley with Milan glaciar valley.



1 **Nathula Pass :-**
   - This pass connects Sikkim with Tibbet.
   - Ancient silk route used to pass through it.
   - Now a days, this pass is used for kailash mansarovar pilgrimage.
   - This pass is impartant from security point of view.

2 **Jaleepla :-**
- This pass connects 'Sikkim' with 'Tibbet' .

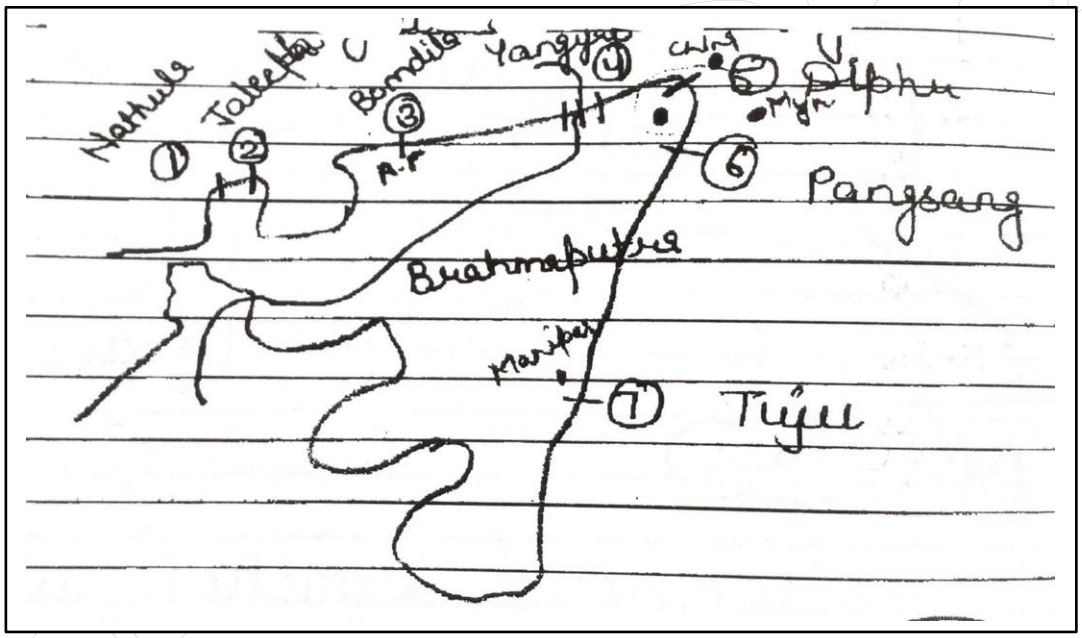
3 **Bomdila :-**
- Connects Arunachal Pradesh with 'Tibbet' .

4 **Yangyap :-**
- This pass is located between 'Arunachal Pradesh' & 'Tibbet'
- 'Brahmaputra River' Enters India through this pass.

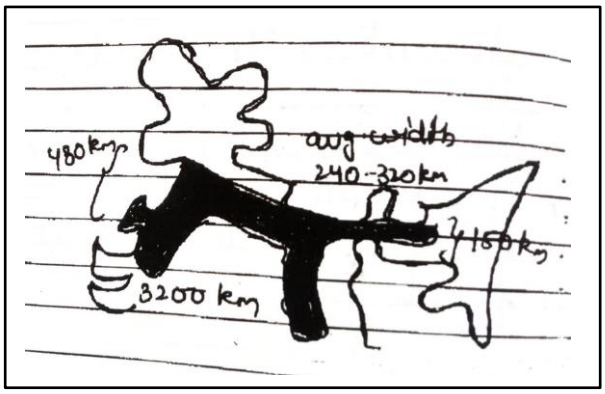
5 Diphu pass :-
- This pass is located on border region of India, China, Myanmar.
- This pass mainly connects Arunachal Pradesh with Myanmar.

6 Pangsang Pass :-
- This pass connects 'Arunachal Pradesh' with Myanmar.

7 Tuju Pass :-
- this pass connects Manipur with Myanmar.



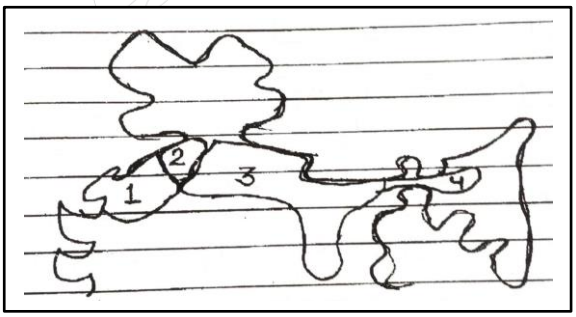
☑ Northern Plain Region :-



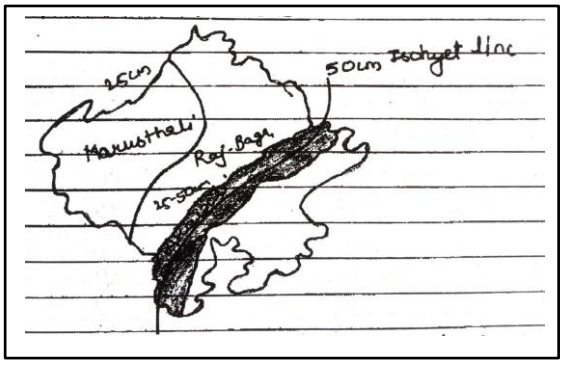
- This plane region is formed by the rediments deposited by rivers originating from Himalaya Mountain
- This region is formed in quaternary period.
- It is India's latest physiographic division.
- In this plain region sediments are deposited upto the depth of 2000m.
- The width of this plain region is around 240-320km & its height is around 185m.
- It is flat plain region with gentle slope.
- This plain region extends over an area of 7 lakh sq. km.
- It is world's largest alluvial region.
- It is very fertile & used for agriculture.
- Highest population is found in this plain region.

➢ **On regional bases is divided into 4 parts :-**

1. **Rajasthan Plains**
2. **Satluj Plains**
3. **Ganga Plains**
4. **Bramaputra Plains**



1. Rajasthan Plains : -



- This plain region is located to the west of Arawali Mountain .
- The slope of this plain region is north east towards south west.
- Luni is the major river of this region.
- many saline lakes are found here.
- On the basis of rain fall this region is divided into 2 parts:-

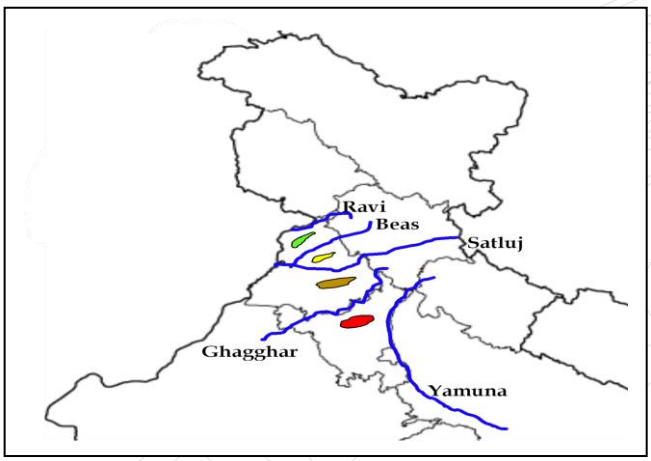
(i) Rajasthan Bagar :-

- This plain region lies between Arawali Mountain & 25cm.isohyte line.
- Semi arid condition are found here.
- here around 25-50 cm. rainfall is received.

(ii) Marusthali :-

- This plain region lies to the west of 25cm isohyte line.
- Less than 25cm rainfall is received here.
- Arid desert like conditons are found here.

2. Satluj Plains : -

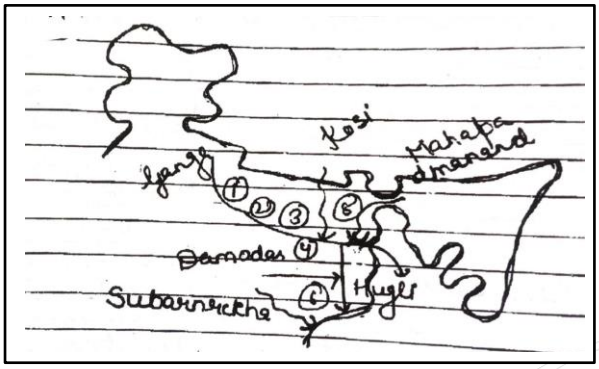


- This plain region lies is Punjab & Haryana.
- This plain is formed by Ravi, Beas & Satluj Rivers.
- The slope of this plain region is from north esast towards south west.
- 'Doab' are found in this plain region which are very fertile.
- Plains found between two rivers are called 'Doab'.
- 'Bari Doab' lies between Ravi & Beas river.
- 'Bist Doab' Lies between Beas & Satluj river.
- 'Malwa Plain' located between satluj &Ghagghar river.
- 'Hariyana – Bhiwani Bagar' is located between Ghagghar & Yamunariver.
- Highest productivity is found in this plain region.

  Note – **Cho :-** The uneven plains formed by erosional activities of seasonal streams found in the foothill region of Shivalik are called **Cho**in local language.
- In Panjab, Cho is found in Hoshiyarpur.

3. Ganga Plains :-

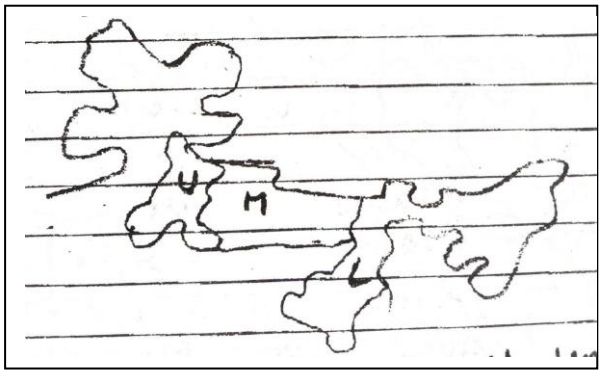
1. Rohilkhand Plains (Western U.P)
2. Awadh Plains (Lucknow U.P)
3. Mithila Plains (North Bihar)
4. Magadh Plains (South Bihar)
5. Barind Plains (Between Kosi & Mahananda)
6. Rarh Plains (Between Damodar – Subarnrekha)



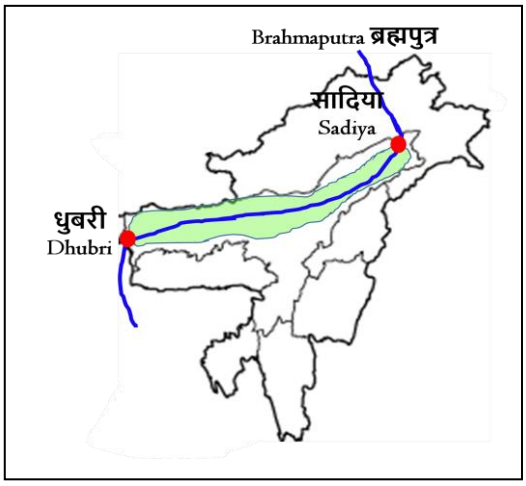
- This plain region mainly lies in Uttarpredesh, Bihar & West Bengal.
- the slope of this plain region is from North west towards south east.
- It is India's largest plain region.
- Highest production is found in this plain region.
- This population is found in this plain region.
- This plain region has various regional name such as.
    - **Rohilkhand** is western Uttarpradesh.
    - **Awad** Plains near Lucknow.
    - **'Mithila'** to north of Ganga river is Bihar.
    - **'Magadh'** to the south of ganga river in Bihar.
    - **'Barind'** Between Kosi & Mahananda rivers
    - **Rahr** between Damodar & Subarnrekha river in

➢ **Ganga plains are also classified as :-**

1 Upper Ganga Plains (Western Uttarpradesh & Easter Rajasthan)
2 Middle Ganga Plains (Uttarpradesh & Bihar)
3 Lower ganga plains (West Bengal)

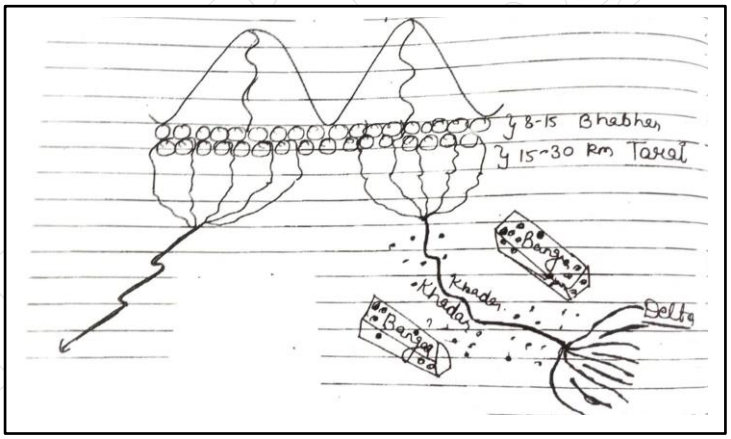


4. Brahmaputra Plains :-



- This plain region exterds from Dhubri to sadiya over a distance of 650 Km.
- Width of this plain region is around 100-150 Km.
- It is narrow plain region. Whose slope is from North East towards South West.
- Rice& jute cultivation is done in this plain region.
- Located in Assam.

☑ **Structural / Physiogrophic division of plains :-**



1. Bhabar :-

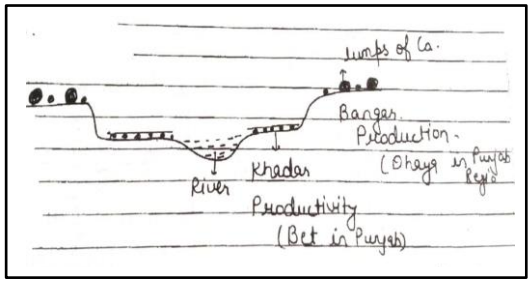
- Plain formed by big sediments in the foothills regions of mountains which extend over a width of 8-15 Km. is called bhabhar.
- In this plain region river flows under big sediments. Thesefore river becomes invisible on the surface.
- This plain region is not useful for agriculture.

2. Tarai :-

- Plain which extend upto the width of 15-30 Km. in front of Bhabhar are called Tarai plains.
- In this region irregular flow of water takes place.

- River again become visible on the surface in the surface.
- Dense vegetation & diverse wildlife.
- In Punjab & Uttarpradesh tarai region is used for agriculture.

3. Khadar :-



- Plains formed by new alluvial sediment in flood plain region of river is called khadar.
- They are called 'Bet' is Punjab.
- These are very fertile plains.
- Highest productivity is found in these plains.

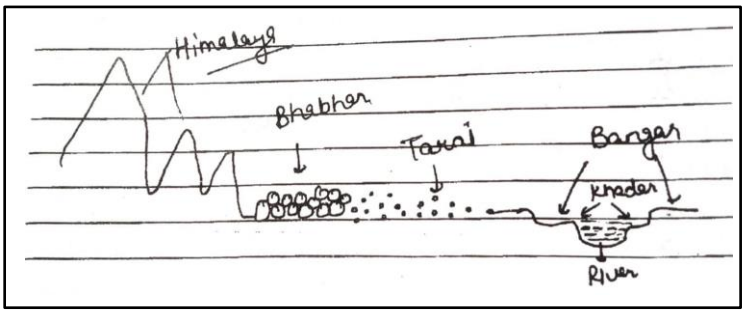
4. Bangar :-

- Plains formed by old sediments are called Bangar.
- Lumps of calcium are found in Bangar region which are called kankar.
- It is called 'Dhaya' in Panjab.
- these are fertile planes in which higher agricultural productions is found.

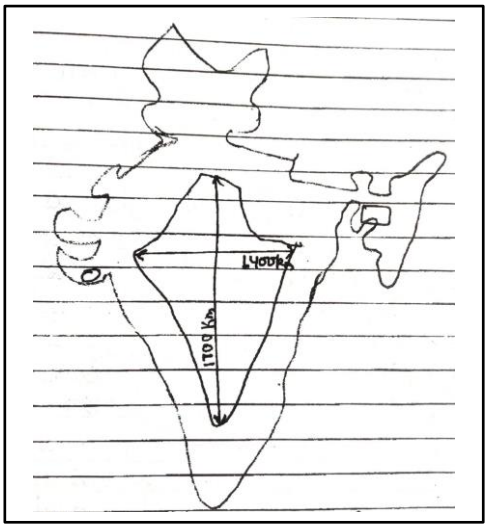
> **Bhur :-** Due to high erosion in Bangar region the upper fine soil get destroyed or removed then kankar lander granulated land remains behind which is called Bhur.

5. Delta :-

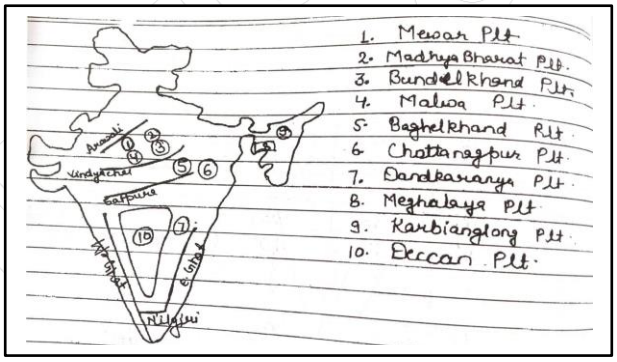
- Ganga –Brahmaputra delta extends in west Bengal which is called Sundervan Delta.
- The highland region found is this delta is called char & lowland found in Delta region is called Beel.
- During high tide, Beel region gets subnewdin water. Therfore beal region is used for wasting jute.
- **Human settlement is found in char region.**



☑ PENINSULAR PLATEAU REGION

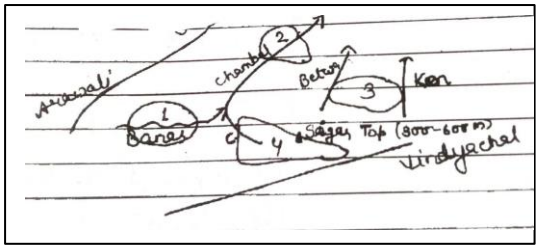


- It is India's largest & oldest physiographic division.
- This region extents over an area of 16 lakh²Km.
- It is a part of gondwana land.
- It is an example of shield (Old Plateau)
- It is India's most mineral rich region.
- This region is tectonically stable.
- Elevation/Height of this region is around 600-900 m.
- Mountains, hills & plateau are included in this region.



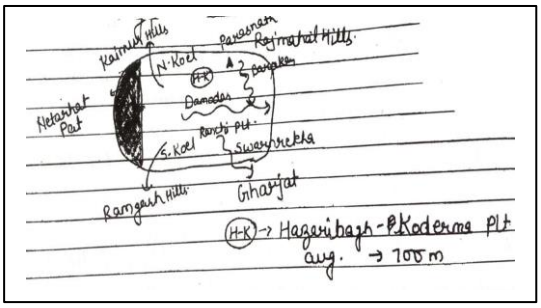
☑ PLETEAU OF PENINSULAR REGIONS :-

1. Central Highlands :-



- The plateau located between arawali & Vindyachal Mountain ranges are called central Highlands.
- It includes Mewar, Madhya Bharat, Bundelkhand& Malwa Plateau.

2. **Mewar Plateau :-**
   - This plateau is located to the east of Arawali Mountain
   - Banas river flows on this plateau.
   - The slope of this plateau is from west towards east.
3. **Madhyabharat Plateau : -**
   - This plateau is located in north western part of Madhyapradesh.
   - Chambal river flows on this plateau.
   - Chambal rivers forms Beehad in this region by gully erosion.
4. **Bundelkhand Plateau :-**
   - This plateau is locate extended in Madhyapradesh & Uttarpradesh.
   - 'Semi arid condition' are found on this plateau.
   - Betwa & Ken river flows on this plateau
   - These rivers form deep valleys in this plateau region.
   - These river also form 'waterfalls' on this plateau.
5. **Malwa Plateau :-**
   - It is 'triangular plateau' located is Madhyapradesh.
   - These plateau formed by lava.
   - Black soil is formed by the weathering of Lava rocks.
   - Black soil is useful for cotton cultivation.
   - Height of this plateau is 300-600 m.
   - highest peak of this plateau is Sigar Top
   - Chambal, Shipra, Kalisind, Parvati river flow on this plateau.
   - 'Ujjain city' is located at the bank of Shipra river.
6. **Baghelkhand Plateau:-**
   - This plateau is located is Madhyapradesh & Chattisgarh.
   - Vindhyachal & Satpura ranges meet in this plateau region.
   - This plateau seperates the drainage system of son & Mahanadi river.
7. **Chotanagpur Plateau :-**



   - This plateau extends in Jharkhand, Bihar, West Bengal, Oddisa& Chattisgarh.
   - It is India's most mineral rich plateau region.
   - Average height of this plateau is 700 m.

- It's highest peak is 'parasnath' (Sameet Mountain Jain religion)
- Many rivers originate from this plateau Damodar, Bokaro, Barakati, North Koel, Shankh.
- 'Coal' is found in Damodar valley region, So, Damodar river is called **'Ruhr valley of India'.**
- Damodar river seperates / divides this plateau into 2 parts :-
- Northern Part :- Hazaribagh & Koderma Plateau
- Southern Part :- Ranchi Plateau
- In the western part of this plateau lava capped pat region is found.

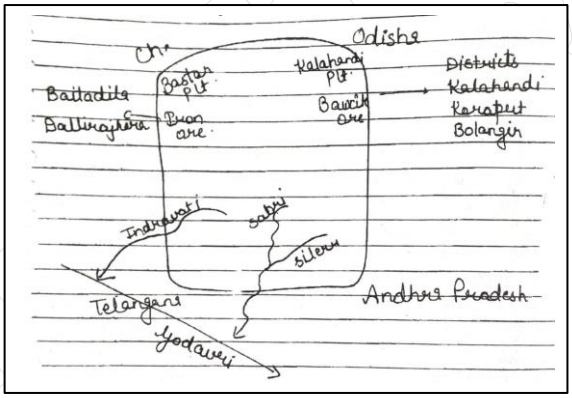
  Netarhat pat is the highest pat of this region

Note :- Mesa :-are isolated flat topped hills or eroded plateau.

- Mesa is steeped stoped.
- Mesa is formed by wealthering & erosion of plateau.
- Butte is formed by weathering & erosion of messa.
- Butte is a smaller landform as compared to mesa.
- Mesa is called 'pat' in local language.

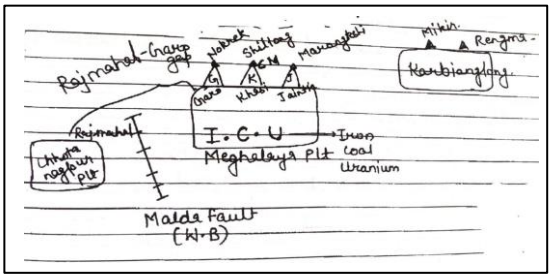
  Examples :- Jameera Pat, Netarhat pat, Khamar pat, Bagru pat, Raldani pat, Lota pat.

8. **Dandkaranya Plateau :-**



- This plateau mainly located in chattisgarh & odisha & partially this plateau is located in Telangana & Andhra Pradesh.
- In Chattisgarh this plateau is called Bastar plateau & it is called kalhandi plateau in Odisha.
- 'Indravati river' flows on Bastar plateau Bastar plateau is known for iron ore reserves. Here famous iron ore mines such as Dallirajhara & Beladila is located.
- 'Sabari' & 'Sileru' river flowon kalahandi plateau kalahandi plateau is known for Bauxite reserves.
- Oddisha's kalahandi koraput & Bolangir districts are known for Bauxite reserves.

9. Meghalaya Plateau :-

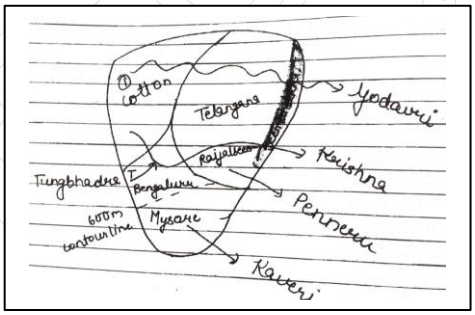


- Meghalaya plateau is extended extension of chottanagpur plateau.
- Malda fault is located between chottanagpur & Meghalaya plateau.
- Between these plateau Rajmahal garo gap is located.
- Garo, Khasi, Jayantia hills are located on Meghalaya plateau.
- Iron ore Coal & Uranium reserves are Found in Meghalays plateau region.
- Nokrek is the highest peak of garo hills.
- Nokrek is also a biosphere reserve.
- Shilong is the highest peak of Khasi peak. This is also the highest peak Meghalaya plateau.
- Marangshi is the highest peak of Jayantiya hills.
- Mawsynrum & Cherrapungi (Khasi Hills) – World's highest annual rainfall is received.

10. Karbianglong Plateau :-

- Located in :- Assam
- Mikir & Rengma hills are located in this plateau.

11. Deccan Plateau :-



- It is triangular plateau made of lava.
- The general slope is from west towards east.
- This plateau is divided into 3 parts.

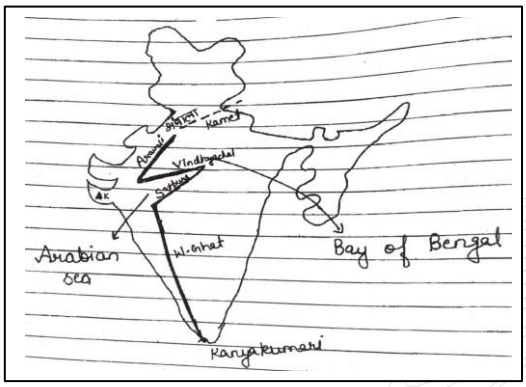
1. **Maharashtra Plateau :-**
   - ☞ Godavari & Krishna rivers flow on this plateau.
   - ☞ Black soil is found on this plateau.
   - ☞ This plateau is useful for cotton cultivation.
2. **Telangana Plateau :-**
   - ☞ Krishna river divides this plateau.

- ☞ Northern part is called telangana plateau & Souther part is called. rayalseena plateau.
- ☞ Penneru river flows on rayalseema plateau

3.**Karnataka Plateau :-**

- ☞ Contour line of 600 m. divides this plateau into 2 parts.
- ☞ It's northern part is called Bengaluru plateau & southern part is called Mysore plateau.
- ☞ The western part of Karnataka is called malnad & eastern part is call maidan.

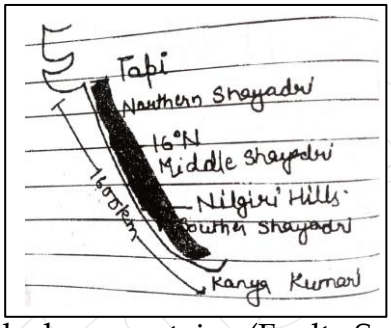
☑ MOUNTAINS OF PENINSULAR REGIONS :-



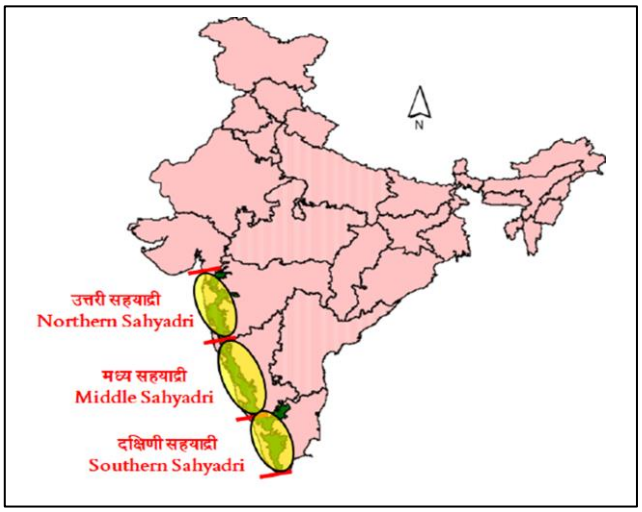
1. **Kathiyawar Hills :-**
   - Gir, Girnar, Mandav hills are collectively called kathiawad hills.
   - It's highest peak is gorakhnath peak.
   - These hills are known for Jain religious places.
   - Asian lions are found here.
   - Gir National park is located in this region.
2. **Arawali Mountain : -**
   - It is old fold mountain which was formed in Precambuian period.
   - It is an example of Residual / relict Mountain Aravali Extends from palanpur (Gujarat) upto raisina hills (Delhi) over a distance of 692 km.
   - Most of its part lies in Rajasthan (550 km.)
   - Average Elevation is 930 m.
   - Highest peak – Gurushikhar (1722 m.)
   - It is a part of GWD (Great Water Divde).
   - Many mainerals are found in this range such as lead, zinc, silver, iron ore, copper.
3. **Vindhyachal Mountain Range :-**
   - It is a block Mountain Formed of limestone which extends from South west to north east over a distance of 1050 km.
   - It seperates North India & South India.
   - It lies to North of narmada Rift valley.
   - Vindhyal, bharner & Kaimur hills are included in it.
   - It is a part of great water divide.

- It's highest peak is goodwill peak (752 m.)
- Panna is located in this state which is known for diamod reserve.
- Panna is also a biosphere reserve.

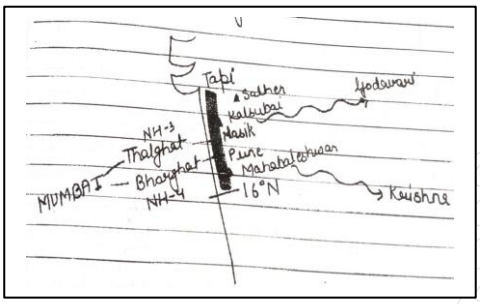
4. **Satpura Range : -**
   - It is a block Mountain made up of "sandstone"
   - From west to east this mountain range is extended over a distance of 900 Km.
   - It's average height is = 760 m.
   - In north of this range, 'Narmade Rift vally" lies & in south 'Tapi rift valley' lies to the south of it.
   - Rajpipla, Gawilgarh, Mahadev & Maikal hills lies in this range.
   - In Mahadev hills, highest peak of this range Dhoopgarh (1350 m.) & Panchmarhi. biosphere reserve is located.
   - In Maikal hills, 'amar Kantak' peak is located from where 'Son' & Narmada' river originates.
   - To the south of 'Mahadev hills', betul plateau.
   - Satpura lies in Madhyapradesh, Maharashtra, Chattisagarh is located from where 'Tapi river' originates.
5. **Western Ghat :-**



   - It is a block mountain (Fault Scar) which extends from Tapi river upto kanyakumari over a distance of '1600 km.'
   - Average Height = 1200m
   - The western slope of this Mountain is steep & its eastern slope is 'gentle'
   - heavy rainfall is received here by South- West monsoon winds.
   - Tropical evergreen vegetation is found here.
   - High biodiversity is found here.
   - It is included is 36 biodiversity hotspots of the world.
   - Western ghat is also called Sahyadri.
   - The major rivers of South India origin from this Mountain
   - Western Ghat lies in Gujarat, maharashtra, goa, Karnataka, Kerala, Tamilnadu.
   - It is divided into 3 regional parts :-
     1. Northern Sahyadri
     2. Middle Sahyadri
     3. Southern Sahyadri



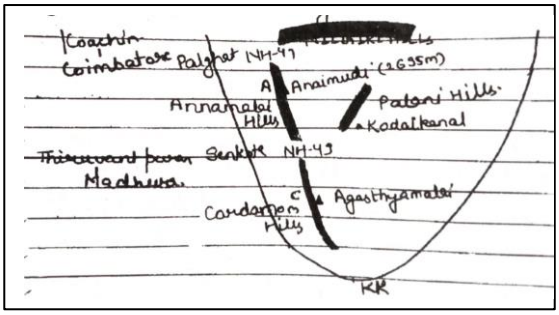
1. **Northern Sahyadri :-**



- This part extends from tapi river upto 16^{0}N latitude.
- It mainly lies in Gujarat & Maharashtra.
- Ist Highest peak – Kalsubai
- IInd Highest Peak of this region salher.
- Mahabaleshwar is anather major peak of this region & Krishna river originates from here.
- Godavari river originates from kalsubai peak region.
- 2 major passes are located is this part.
    a. **Thalghat :-**This pass connects Mumbai with nasik NH-3 passes through it.
    b. **Bhorghat :-**This pass connects Mumbai with pune NH-4 passes through it. (Godavari is known as Old Ganga)

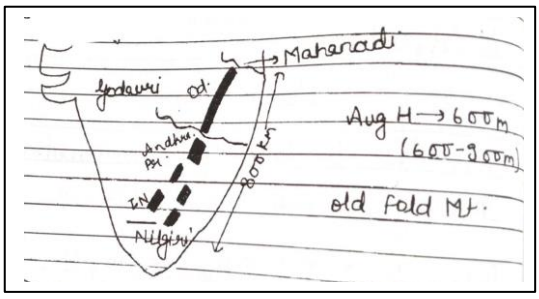
2. **Middle Shayadri :-**
- This part extends from 160N latitude upto Nilgiri hills.
- It manly lies is goa & Karnataka.
- Highest peak – Kudremukh (Known for Iron ore reserves)
- Baba budan hills are located in this path which are known for coffee cultivation

3. **Southern Shayadri :-**



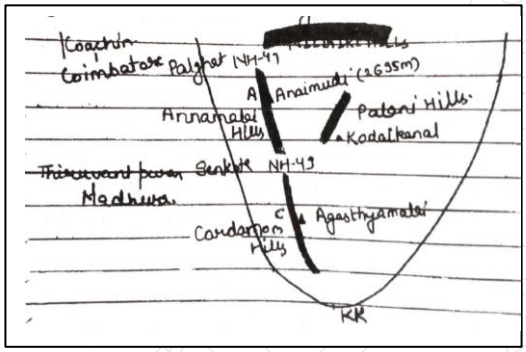
- This part extends from Nilgiri hills upto Kanya Kumari.
- It mainly lies in kerala & Tamilnadu.
- **3 major hills are included in this part**:-
    1. **Annamalai Hills :-**
        - ☞ The highest peak of south India Anaimudi(2695 m.) is located.
    2. **Cardamom Hills : -**
        - ☞ Highest peak of this hills is Agasthyamalai **(It is a biosphere reserve)**
        - ☞ This hill is know for spice cultivation mainly cardamom cultivation.
    3. **Palani Hills :-**In these hills, the famous hill station of Tamilnadu kodaikanal is located.
- **2 major passes are located is southern shayadri** :
    1. **Palghat Pass : -** Between Nilgiri & Anamalai Hills
        - ☞ NH-47
        - ☞ Connects Kochi (Kerala) to Coimbatore (Tamilnadu)
    2. **Senkota pass :-**
        - ☞ Between Annamalai hills to cardamom hills.
        - ☞ NH-49
        - ☞ Tiruvantpuram (Kerala) to Madhurai (Tamilnadu)
        - ☞ Mansoon winds enter through these passes cause rainfall in Tamilnadu.
        - ☞ Because of low height & its location away from monsoon winds it receives less rainfall.

6. **Eastern Ghats :-**



- Andhra Pradesh :- Mala, Gutta, Konda
- It is old fold Mountain which extends from Mahanadi upto nilgiri hills over a distance of 800 km.
- Elevation – 600 m. (Avarage) 600-300m.
- This range is continuous from 'Mahanadi to Godavari Afterwards it is discontinuous because of erosion caused by river.
- This Mountain extends in Odisha, Andhra Pradesh, Tamilnadu.
- Highest Peak :- Armakonda (1680 m.)
- The other major peaks of this regions are Jindagadha, Mahendragiri, Deomali.
- Many hills are included in eastern ghat:- Nallamala, Eramal, Velikonda, Palkonda, Adhra Pradesh, Seshchalan Pradesh,
- Javadi, sheveroy – Tamilnadu
- 'Sheshchalan hills'are known for 'Red Sandal wood tres.
- It is also a biosphere reserve.

7. Nilgiri Hills :-



- It is a block Mountain extending in Karnataka, Kerala,Tamilnadu.
- The highest peak of these hills ' Dodabeta.
- It is IInd highest peak of South India.
- High biodiversity is found in these hills.
- It has been declared as India's I biosphere reserve.
- here Tamil Nadu's famous hill station "Oaty" is located.
- These hills are known for tea plantation.
- 'Toda Tribe' reside in these hills. Which is known for 'Buffallo rearing'.

☑ **COASTAL PLAINS REGION :-**

- This region extends from 'Kutchha' – 'Subarnrekha river over a distance of 6000 km.
- These plain region is formed by the sediment deposited by rivers.
- This plain region is divided into 2 parts :-
  1) Western Coastal Plains **(W.C.P)**

2) Eastern Coastal Plains **(E.C.P)**

1 Western Coastal Plains (W.C.P.) -

- This plain region extends from kuchha –Kanyakumari
- The rivers of this region form Estuaries.
- It is narrow plain region whose widhth (50-100km.) around. (Av. – 64 Km.)
- It is an example of submerged coast.
- Favourable condition for part formation is found here.
- Estury means no deposition of sediments.
- Following are the reasons of Esturies formatting.
  (i) Speed
  (ii) Tides (High & Low)
  (iii) Short Course
  (iv) Hard rock bed

(A) **Kutchh Plains** – this plain region formed by sediments brought by indus river.

- It is broad & flat plain region.
- High salinity is found in soil of this plains region. Therefore this plain region is not useful for agriculture.

(B) **Kathiawad Plains –**

- This plain region is formed by rivers originating from 'Mandav hills'.
- This plain region is narrow but usefull for agriculture.

(C) Gujarat Plains –

- This plain region is formed by rivers like Sabarmati, Mahi, Narmada&Tapi.
- It is broad plain region located in southern Gujarat.
- This plain region is used for agriculture.

(D) Konkan Plains –

- This plain region mainly lies in Maharashtra.
- It is narrow rocky plain region.
- Mango, Cashew nut & coconut cultivation is done.
- The pre monsoon rainfall occurring in this region is called mango shower (According to NCERT, Mango Shower takes place in Karnataka & Kerala).

(E) Kannad Plains -

- This plain mainly located in Karnataka.
- It is narrowplain region.
- The rivers falling from western slopes of western ghats forms 'waterfalls' in this region. such as 'sharavati river' forms a waterfall called **'Jog fall'(is also known as 'Garsoppa waterfall'/Mahatma Gandhi Waterfall')** in this region.

- Pre monsson rainfall occurring in this region is called **'Cherry blossom'(Beneficiall for 'coffee cultivation.)**(According to NCERT, It oceurs in Kerala).

(F) Malabar Plains :-

- It is broad plain which is located in 'Kerala'.
- In this plain region 'Rice cultivation' is done below sea level.
- Near this coastal region many lagoon lakes are located. In local language, these are called kayal/backwater.
- Vembanad & Asthamudi are major lagoon lakes of this region in Punnamada Kayal of this range, Nehru Trophy Vallamkali Boat race is organiged every year.

2 Eastern Coastal Plains –

- These plain region extends from Subarnrekha – Kanya Kumari
- The rivers of this region form delta.
- It is broad plain region.
  It's width is about 100-150 km. or more.
- Example of emerged wast.
- In this coastal region, favourable condition for parts is not found.
- On the basis of rivers this plain region is divied into 2 parts.

(a) Northern Circar –

- This part lies between subarnrekha – Krishna river
- Mainly lies in oddisa & Andhra Pradesh.

(b) Cormoandal Coast –

- This part lies between Krishna river& Kanya Kumari.
- Mainly lies in Andhra Pradesh & Tamilnadu.
- In this coastal region rainfall is received during winter season by N-E Monsoon winds.

1. Utkal plains

- This plain region has been formed by 'Mahanadi river'
- 'Wheeler Island' is located near this Coastal plain region where 'India's missile testing launching center is located.
- Near this coast , a lagoon lake 'Chilka Lake' is located.
  Chilka lake – It is India's largest lagoon lakes.
- In Northern part of this coastal region 'Chandipur' is located where during law tide occanic water receives alot..
- This this region, 'Balasor' Named city is located which is known as 'Missile city'.

2. Andhra Plains -

- This plain region is formed by Godavari & Krishna rivers.
- In the delta region of these rivers a fresh water lake called 'Koleru' is located.
- Near this coastal region, Pullicut named lagoon lake is located.

i) Sriharikota Island is located in this.
ii) On this Island India's rocket launching Center,Satish Dhawan Space center is located

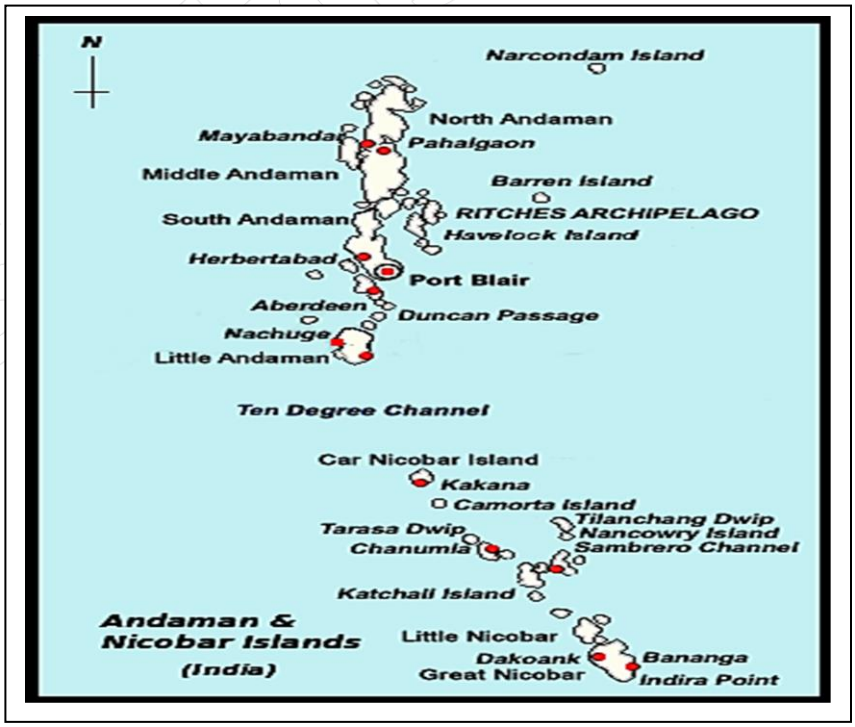
3. **Tamil Nadu Plains –**
   - This plain region is formed by kaveri river.
   - Rice cultivation is done is this plain region. therefore it is called food bowl of South India.

ISLAND GROUP REGION

1. **Andaman Nicobar Island Group –**
   - It is a group of 572 volcanic islands.
   - These islands are formed by the convergence of Indo-Austrailian &Burma Plates.
   - These islands are considered as an extansion of Arakonyoma Mountain.
   - Tropical evergreen vegetation' is found here.
   - 'High biodiversity' is found here & it is included in 36 biodiversity hotspots of the world.
   - Many 'Tribes' are found here such as :

Jarawa
Ong
Andamani
Sentinelese
} **Nagrito (Andman)**

Nicobari
Shompen
} **Mangoloid (Nicobar)**



2. Lakshwadeep island Group –

- It is a group of '36 coral islands'
- These islands octend over an area of 32 sq.km.
- 'Androth' is the largest island of this regla & smallest island of this region is 'Bitra'.
- 'Pakshipatti island' is located here. which is completely dedicated for birds.
- Lakshwadeep includes 3 major island group.

Amindivi -

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Minicoy

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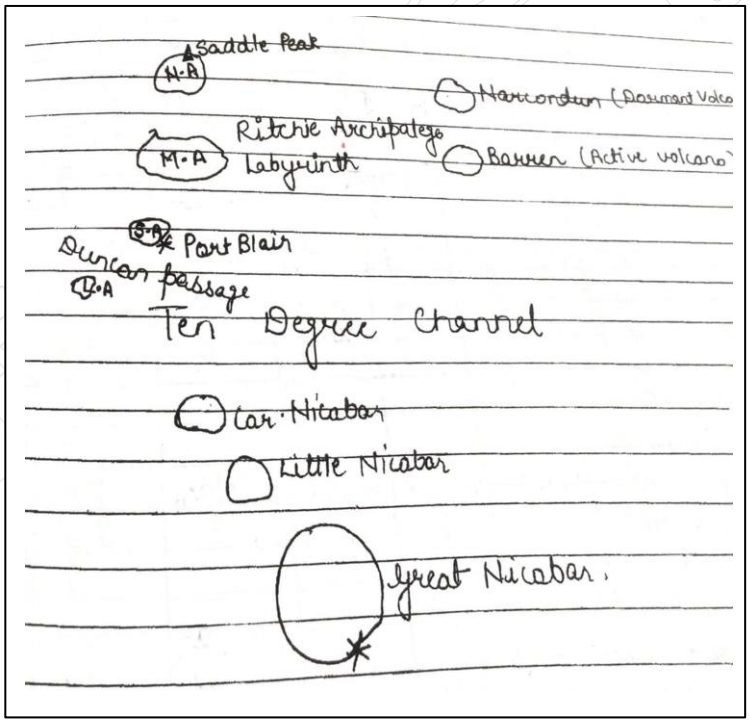
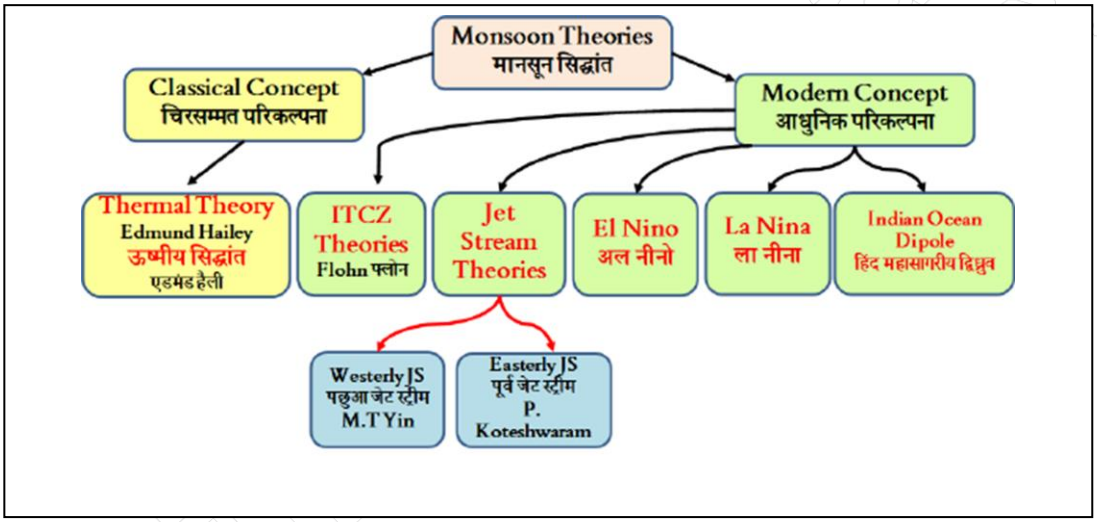
Maldives



MONSOON

Monsoon word has been derived from Arabian word 'Mausim'. Mausim Literally means season but actually monsoon is the name of semipermanent winds which change their directions in every 6 months.

- The Arbain traveller
- 'Al Masudi' has infarmed about the seasonal winds.
- The regions which are influenced by mansoon winds have monsoon climate.
- Monsoon climate has 2 major features –
  (i) Seasonal reversal of monsoon winds.
  (ii) Most of the annual rain fall is received during 2-3 months of summer season.
- Many theories have been proposed to explain monsoon which are classified as –



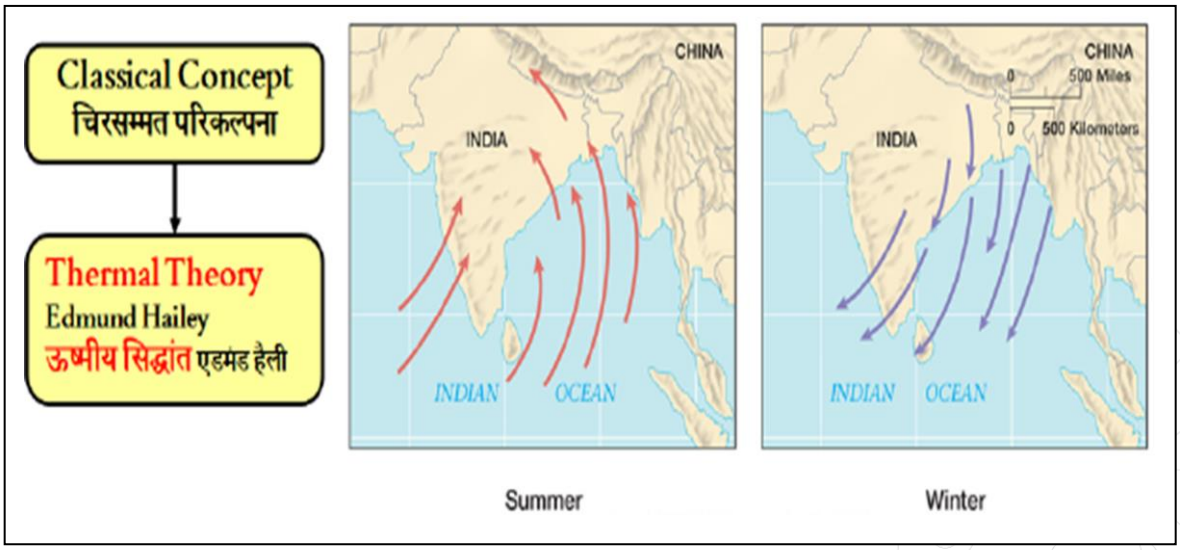
- Father of Indian Model of monsoon prediction – Vasant Gowarikar

Monex – Monsoon Experiment

- 1970's Decade (1979)
- At first Indian + Soviet Union
- Many Countries – Indian Ocean
- Summer Monex – Winter Monex

1. Classical Concept –

- Thermal Theory (Edmund Hailey)

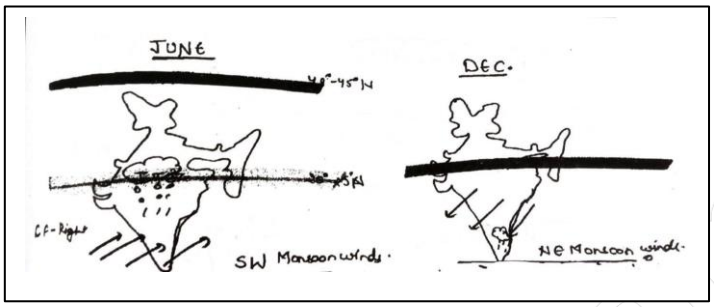


- According to 'Hailey', major reason for monsoon formation is differential heating of land & water.
- As compared to water, land region quickly heats up & cools down fast. therefore there is always a difference in the pressure of land & water.
- During summer season, Indian subcontinent gets extremely heated up.
- Therefore low pressure condition are formed there.
- As compared to it high pressure is found in Indian ocean.
- Therefore wind blows from Indian subcontinent. These are called south west Monsoon winds.
- these winds fpick up moisture from Indian ocean & Cause rainfall in India. Therefore more rainfall is received during summer season is India.
- During winter season, high pressure condition are formed on Indian subcontinent & low pressure condition are found in Indian ocean.
- Therefore winds starts blowing from Indian subcontinent towards Indian ocean.
- These are called North East Monsoon winds.
- These winds blow from land towards water.
- Therefore they generally donot cause rainfall one of the branches of these winds pick up moisture from bay of Bengal & causes rainfall in coromandal coastal region during winter.
- drawbacks / Limitations of this theory – This Theory could not explain the following phenomenon :
  - (i) During the month of April & May. Despite low pressure rainfall is not received in India.
  - (ii) There is no fixed date of arrival &retueting of monsoon.
  - (iii) Every year there is different in the amount of rainfall.

To overcome the limitations of this theory new theories were proposed.

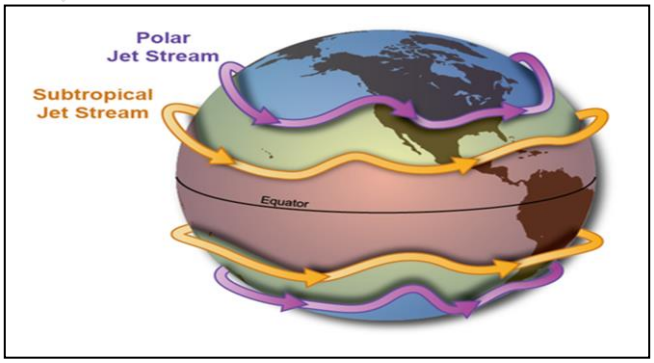
2. MODERN CONCEPT-

- ITCZ Theory / Theory of Equatorial westerlies /airmass theory/ dynamic theory- this theory was proposed by Flohn in the decade of 1950.
- According to Flohn, the major reason of monsoon formation is shifting of pressure belts.

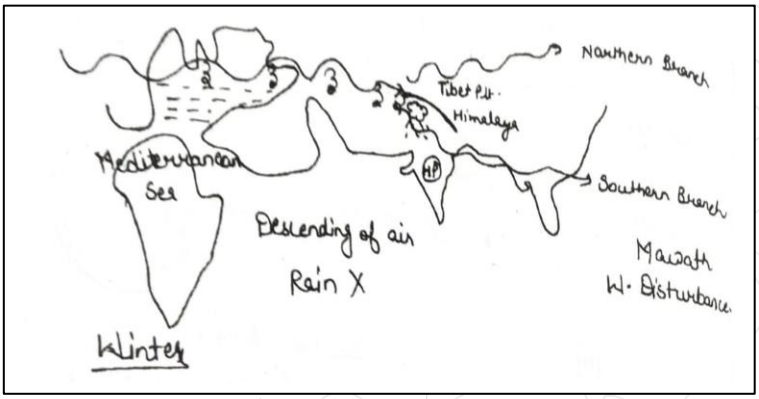


- In the month of June, ITCZ get established in the central part of India.
- STHPB of NH shifts to the north of Inaia & STHPB of SH gets abolished between 10-15^0 south latitude.
- In the form of ITCZ, a low pressure through is found in India.
- Easterlies of SH gets attracted towards these low pressure.
- As soon as these winds enter NH, due to coriolis force they turns towards right & take the form of SW monsoon winds.
- SW mansoon winds pickup moisture from Indian ocean& cause rainfall in Inaia.
- During winter season, ITCZ is located in SH & on India STHPB of NH is found.
- From this STHPB trade winds of NH Move towards ITCZ. These are called NE Monsoon winds.
- These winds blow from land towards water & do do not cause rainfall during winter.

1. Jet Stream -



- Jet stream is high speed wind blowing from west towards east on meandering path a height of 8-12 km. in troposphere.
- During winter, the speed & intensity of jet streams is high because in this season the differente in temperature air cell is higher.
- Because of meandering jet streams are called rassby waves.
- There are 4 permanent jet streams in the world.
- Jet streams blow parallel to isobar lines. Therefore they are also called geostrophic winds some jet streams are temporary
- Theory of sub-tropical westerlies jet stream Mountain yin informed about the impact of this jet stream on Indian monsoon with the shifting of pressure belts this jet stream also shifts.



- During winter, this jet sterm strikes Himalayan Mountain & gets divided into 2 branches.
- It's southern branch moves over India. because of this southern branch, the high pressure condition found over India becomes strong.
- descending of air takes place in India due to which cloud formation & rainfall condition is not formed in India.
- Atmospheric stability is found in India.Therefore during winter, generally rainfall does not occur.
- This jet stream carries this temperate cyclones formation Mediterranean sea & brings them towards India.
- Because of this cyclones rainfall is received in north western India it is called mawath.
- It is beneficial for Rabi Crops. These cyclones & this phenomenon is called western disturbance.

☑ **Impact of 'Western disturbance / Mawath' -**

(i) If Mawath rain occurs during the month of Dec, Jan,Feb then it is useful for Rabi Crops. But if this rain occurs during the month of March, April & May then it has desteructive impact.

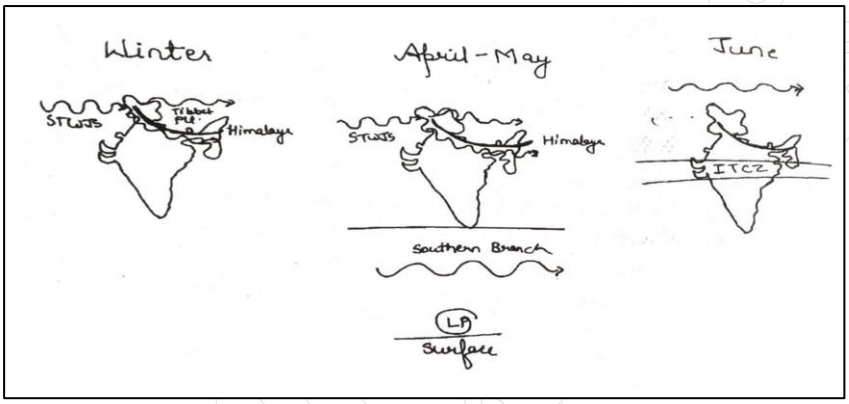
(ii) Because of mawath, somethimes some disaster occur such as flash floods, landslides, Cloud burst etc.

(iii) In western Himalayan Region, Mawath rain occurs in the form of rainfall. due to which cold waves start blowing in northern India. It increases the intensity of winter season.

(iv) Because of western disturbance, temperature reduces & Humidtiy increases. Due to which more fog amount of moisture condition is formed.

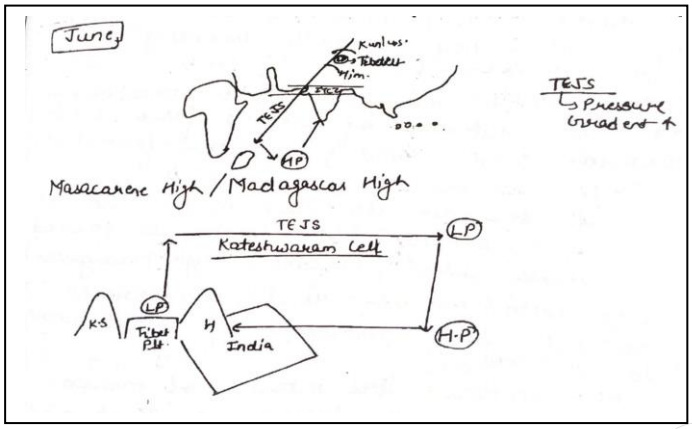
(v) Because of western disturbance sometime frost also occurs.

- With the arrival of summer season, jet streams starts shifting towards north.
- In the month of April & May, the southern branch of jet stream is present over India. Despite low pressure condition, rainfall is not received in India.
- In the month of June, When ITCZ gets established over India then this jet stream gets completely removed from India & shifts towards north. Therefore, this jet stream influences the arrival of monsoon in India.
- In India, monsoon rain begins on the date when this jet stream gets removed from India.

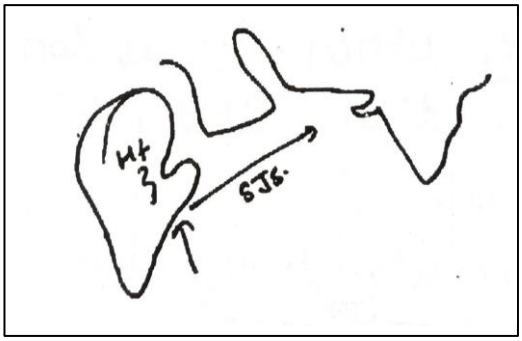


2. **Tibet Plateau & Tropical Easterly Jet stream (TEJS)** :– P.Koteshwarm had informed about the impact of Tibet plateau & tropical easterlies jet stream on India.
   - TEJS are temporary jet stream. Which is formed during the month of June, July, August.
   - In the month of June, when sun is located above tropic of cancer then Tibet plateau gets extremely heated up.
   - Air becomes warm & starts rising from Tibet plateau. Due to which low pressure condition are formed of Tibet Plateau.
   - Air rising from Tibet plateau gets accumulated in higher atmosphere & this air moves in higher atmosphere eventually descending in souther Indian ocean.
   - The winds moving in higher atmosphere gets under the influence of coriolis force & turns towards right leading to the formation of TEJS.
   - Because of the air descending in southern Indian ocean, a strong high pressure is formed which is called mascarene High/ Madagascar high.
   - Along with monsoon winds, the winds generated from mascarence high strat moving towards India. This increases the intensity of monsoon TEJS increases the

pressure gradient found between India & Inain ocean. Due to which the speed of monsoon winds increases. Therefore, Tibet plateau & TEJS has a positive impact of Indian monsoon.



3. Somali Jet Sterms –



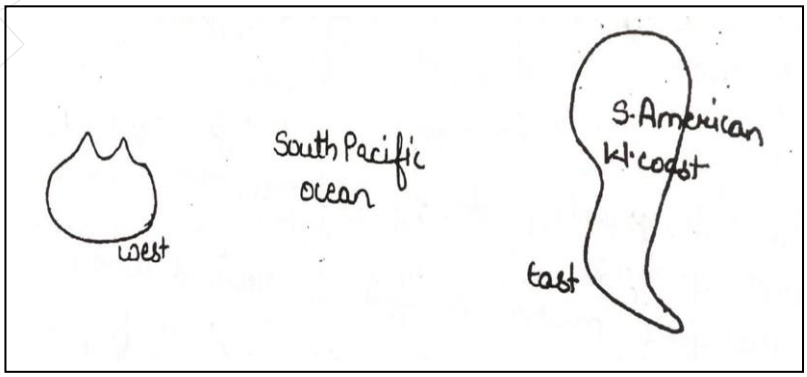
- It is lower atm. Jet stream. This jet stream turn towards India after striking the mountain of eastern Africa. This jet stream pushes the monsoon winds moving in Arabian sea towards India. This jet stream has positive impact on Indian Monsoon.

➢ **Cyclonic Hypathesis of Spate -**

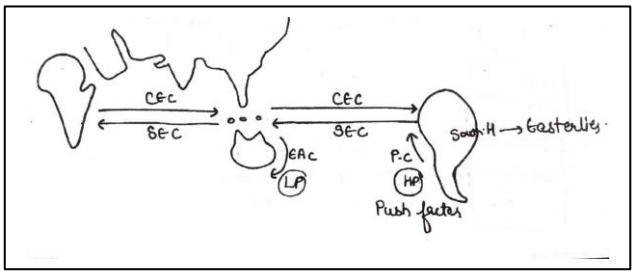
- Spate was Autralian geographer.
- According to spate, mansoon formation is a cycliclic phenomenon.
- These cyclones are formed by the convergence of 2 different airmasses.
- In the meeting region of airmasses.
- In the meeting region of air masses front is formed.
- Rainfall is received in the region of front.
- According to spate, during summer, more fronts are formed. Therefore more rainfall is received during summer.
- During winter, less front is formed & less rainfall is received.

☑ **EL Nino & LA Nina Phenomenon –**

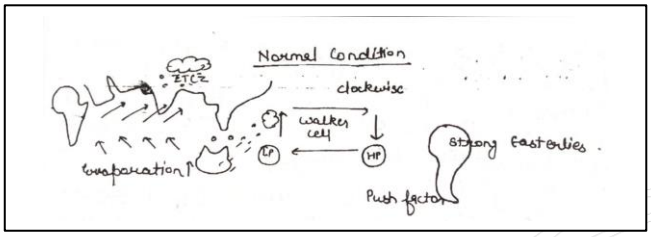
- According to some scientists, the temp. of oceanic water eastern side of southern pacific ocean.
- When the temp. of the region is higher than normal then it is called EL Nino phenomenc EL Nino has a negative impact on monsoon.
- When the temp. of that region is lower than normal then it is called La Nina phenomene La Nina has a positive impact on monsoon.



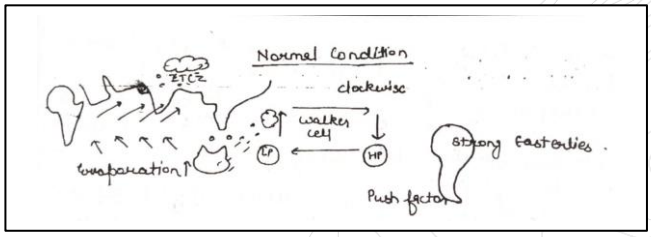
➢ **Oceanik currents during normal condition :-**



Normal condition



EL NINO



- EL Nino is a Spanish word which literally means little boy/ male child.
- EL Nino Condition is formed after every 2-5 years (2-7 years).
- After formation, El Nino remains there for 9-12 months.
- EL Nino is a warm oceanic current which gets established in place of cold peru current.
- EL Ninophenomenon is formed generally during the month of December on Christmas period.
- Therefore EL Nino is called Christ child.
- It is also called oceanic fever.
- During EL Nino, warm water lies on the eastern side of southern pacific ocean. Therefore in this region, air becomes warm & starts rising. Due to which low pressure condition are formed on the surface.
- Direction of walker cell becomes anticlockwise. near the coast of peru, in the form of low pressure, pull factor of wind is effective. Therefore, the trade winds of this region becomes weak.

- Therefore the winds moving towards India, also become weak. Near the coast of peru, rainfall is received because of convection of air. Near the eastern coast of Australia, due to descending of air, arid condition are formed.
- During EL Nino. amount of evaporation decreases in Indian ocean. Threrefore, the monsoon winds passing through this region become less moisture so the amount of rainfall decreases in India & monsoon affected region.
- Note – NOAA (National Oceanic & Atmospheric administrat declared EL Nino & La Nina condition.

➢ **Impact of EL Nino –**

1. Distortion in the equatorial atmospheric circulation (Direction of walker cell changes)
2. There is irregularity in the evaporation of oceanic water.
3. Pressure condition changed in southern pacific ocean.
4. Trade winds of southern hemisphere becomes weak.
5. The growth rate of Phytoplanktons less near the coast of peru. Therefore no. of fishes also reduces in this region.
   - It has a negative impact fishing industry of south America.
6. Amount of rainfall decreases in monsoon affected region. Therefore, drought condition is formed in some regions.
   - It increases the possibility of wild fire.
7. Heavy rainfall is received in the coastal region of Ecuador &peru which causes flooding problems in these regions.
   - Due to flooding, problem of soil erosion occurs.
8. Agricultural production decreases in monsoon affected region. It has negative impact on economy of the country.
9. Because of EL Nino, Arrival of monsoon get delayed.

➢ **ENSO -**

1. EL Nino southern oscillation.
2. The change in the direction of walker cell because of EL Nino is called ENSO.
3. During normal condition, the direction of walker cell is clockwise.
4. During EL Nino, It becomes anti-Clockwise.

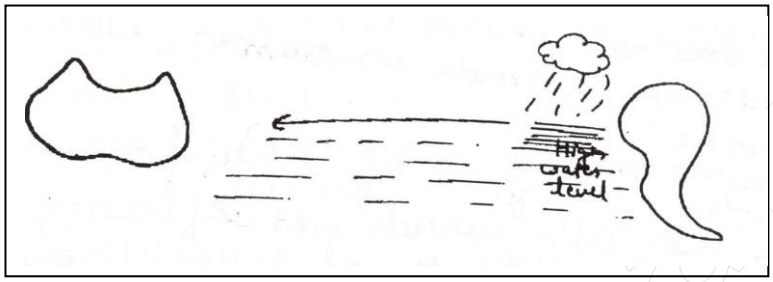
Southern Oscillation Index –
SOI = Tahiri Pressure – Darwin pressure
Normal – 1000Mb – 950 Mb = +50 Mb.
EL Nino – 900Mb – 950Mb = -50mb.

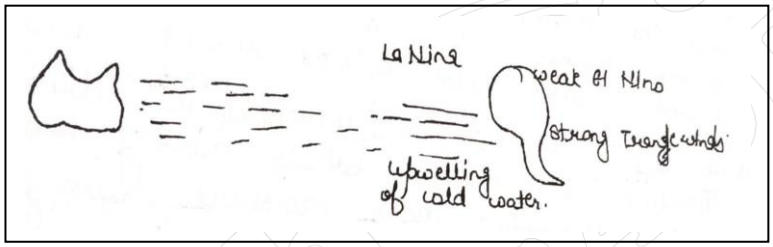
5. Under this index, pressure of dawin is subtracted from the pressure of Tahiti.
6. If the answer of this index positive then it indicates normal condition
7. If the answer of this index is positive then it shows EL Nino condition.

Altantic Nino – little brother of EL Nino

☑ **LA Nina –**

- La Nina is a shpanish word which mean**Little Girl /Girl Child**.
- La Nina is a oceanic current older then normal which gets established is eastern part of southern pacific ocean.
- La Nina is formed by up welling of cold water.
- La Nina has a positive impact on monsoon.





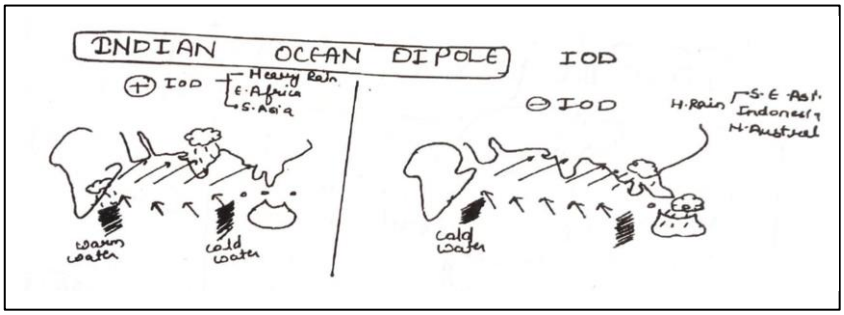
☑ **EL Nino –**

- La Nina condtion is generally formed after EL Nino.
- During the condition of EL Nino, Heavy rainfall is received on the eastern side of southern pacific ocean. Therefore, near the coast of peru, water level of ocean increases. Due to which oceanic water starts flowing from east towards west with the displacement of warm water towards west, EL Nino becomes weak.
- When EL Nino become weak, Trade winds of southern hemisphere become strong.
- Trade winds completely displace warn water towards west. Therefore, upwelling of cold water takes place in the eastern side of s. Pacific ocean.
- With the upwelling of water, La Nina is forced.
- During the condition of La Nina, strong high pressure condition are found on eastern side of southern pacific ocean. Therefore, in the form of high pressure a push factor in the winds is effective due to which, trade winds of S. hemisphere become strong. Monsoon winds also become strong.
- Amount of evaporation, increases in Indian ocean. Therefore the monsoon winds moving towards India pick ups more moisture ocursing heavy rainfall. Therefore La Nina has positive impact on India mansoon.

Triple Dip of La Nina-

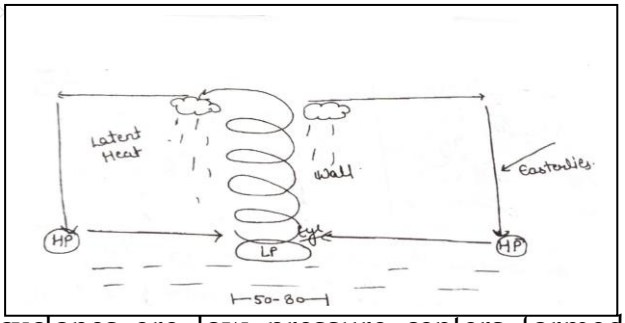
- La Nina continued for 3 years 2020, September, 2021, September, 2022, September.

☑ Indian ocean dipole



- There is the difference in the Tempreture.of oceanic water eastern & western side of Indian ocean.
- When warm water lies on the western side of Indian ocean. Then as compared to it cold water is found on eastern side of Indian ocean. It is called Positive dipole condition.
- During this condition, the monsoon winds moving towards India blow over warm water. Therefore thise winds pickup more moisture & cause heavy rainfall in India, South Asia & East Africa.
- During this condition, if EL Nino is present then it has no negative impact on India mansoon.
- If warms water lies on the eastern side of Indian ocean then it is called negative dipole condition.
- During this condition, heavy rainfall is received in SE Asia, Indonesia, Northern austrailia If EL Nino is present during this condition, then it has negative impact on India monsoon.
- Sometimes, dipole is neutral when water lies is the central part of Indian ocean.

➢ Tropical cyclone



➢ Tropical cyclones are low pressure centers formed in ocean around which air circulates in cyclonic motion & rise up forming clouds causing heavy rainfall.

- **Process of cyclone formation –**
  (i) The island found in tropical ocean gets extremely heated up after receiving solar radiation. Therefore low pressure is formed on the island as compared to it high pressure is found in ocean.
  (ii) Wind start moving from high pressure towards low pressure coriolis force bewmes effective on these winds due to which winds starts circulating around low pressure. There in northern hemisphere, direction of cyclones is anticlockwise & in SH, Direction of cyclone is clockwise.
  (iii) The air which comes is contact with low pressure gets heated up & rises. Process of condersation takes places in higher atmosphere. During condensation latent heat is released.
  (iv) Bacause to latent heat, cyclonic motion of air becomes fast.
  (v) Tropical cyclone receives energy from latent. Therefore tropical cyclone is called heat engins.
    - In this way on island a low intensity cyclone is formed. it is called depression/vorter.
    - After forming on island cyclone comes under the influence of easterlies because of easterlies cyclones shift from island towards ocean. on oceanic region, more water vapour & latent heat is received. therefore the intensity of cyclone increase & it becomes around 180km./hh- 240 km./hh
    - under the influence of easterlies, cyclones mainly strike the eastern coast.
    - When cyclone strikes the coast, then it is called landfall of cyclone.
    - After causing rainfall on the coast in the interna part of the continent, cyclone gradudly dissipate because of the lack of water vapour & latent sea.

- **Name of tropical cyclones in different ocean**.

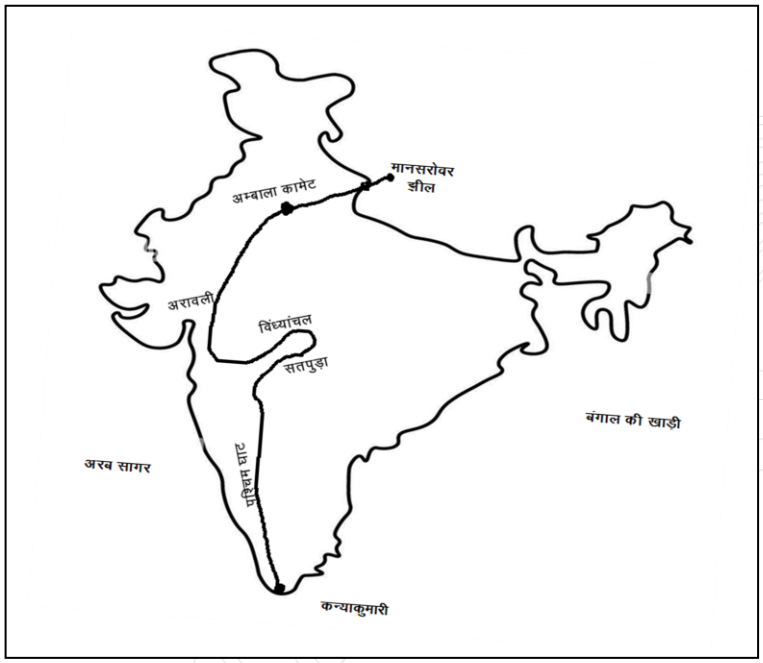
Ocean		Name of Tropical Cyclone
Indian ocean	→	cyclone
Atlantic ocean	→	Hurricane
Pacific ocean	→	Typhoon
Australia	→	Willy willies

- **Structure of Cyclone –**
  1. **Wall of Cyclone –** The Perifhery region of low pressure where air circulates & rises up is called wall of cyclones.
     (a) The rainfall caused during cyclone occurs in the region. Most of the distruction caused by cyclone occurs in this region.

  2. **Eye of cyclone –** The internal part of low pressure center formed during cyclone is call eye of cyclone.
     (b) Calm condition found in this region.

RIVERS

- The flow of water in a fixed path is called drainage.
- The network of river & its tributaries is called drainage system.
- The area from which the river receives rain & glaciar water is called catchment area or basin of river.
- **Great Water Divide :-**
  - The great water divide of India starts from Mansarovar lake in Tibbet and extends through Kamet mountain peak and Ambala to Kanyakumari in the form of Mountain ranges like Aravali, Vindhayachal, Satpura, Western Ghats.
  - The great Water Divide separates the Bay of Bengal and Arabian Sea draingage



DRAINGE SYSTEM OF INDIA –

Based on ocean orientation	Based on Origin
• Bay of Bengal Drainage System (77%)	• Himalaya Drainage System
• Arabian Sea Drainage System (18%)	• Peninsular Drainage System
• Inland drainage system (5%)	

Himalayan Drainage System	Peninsular Draingae System
• Consists of rivers originating from the Himalayas & their tributaries Ex. Indus, Ganga, Brahmaputra.	• Consists of rivers originating form peninsular India & their tributaries. Ex. Krishna, Godavari, Kaveri
• Antecedent & consequent rivers.	• Consequent & superimposed river
• Perennial rivers – receives water from both glaciers & waterfall	• Seasonal rivers – Receive water only from rain.
• Long river	• Shorter rivers
• In their young stage as they flow from young fold Mountain region	• In their mature stage as they flow from peninsular Plateau region.
• High erosion capacity	• High deposition capacity.
• From 'V' shaped valleys gorges, Canyons rapids waterfalls	• form wide valleys.
• Amount of sediment is high so forms large plains.	• Amount of sediment is low, so limited plains.
• Bed is formed of Alluvial sediments	• Bed of rivers is formed of hard rocks.
• Meander while flowing through the plains.	• Meander only in delta region
• Due to high amount of water & flowing through deep valleys, the hydro Electricity generation capacity of these rivers is high	• Due to limited amount of water flowing through shallow valleys the Hydro electricity generation capacity of these rivers is low.

Himalayan Drainage System

- Indus Drainage System
- Ganga Drainage System
- Brahmaputra Drainage System

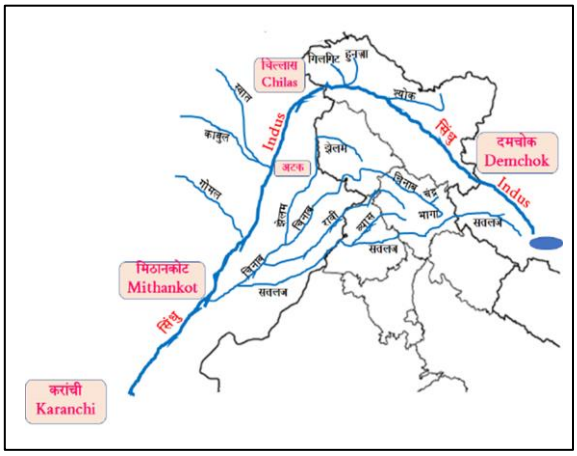
Features	Total Length	Length India (Km.)	Total Catchment Area (Lakh Sq. Km.)	Catchment Area In India (Lakh Sq. Km.)
Indus	2880	1114	11.65	3.21
Ganga		2525	10.6	8.6
Brahmaputra	2900	900	5.8	1.94

Indus Drainage System –

- **Origin –** from a glacier near Bhokhar Chu in kailash Mountain region near Mansarovar lake in Tibbet.
- Other name in Tibbet – Singi Khamban (Lion's Mouth)
- Drainage area – Ladakh, Jammu-Kashmir, Punjab, Himachal Pradesh
- Enters India from Damchok.
- How's between Ladakh & Zaskar range.
- On bank – Leh (Ladakh)
- Forms bunzi Garge near Nanga Parbat.
- Enters Pakistan from chilas.
- Enters the plains from attock (Pakistan)
- Panjnad (Panchnad) Joins Indus near Mithankot
- Falls in – Arabian sea, Forming a delta near Karachi.

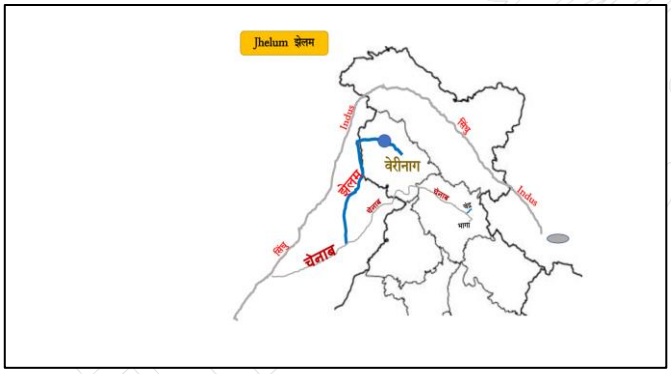
Right Side Tributaries	Left Side Tributaries
Shyok	Zaskar
Hunza	Suru (Dras)
Gilgit	Jhelum
Kabul	Chinab
Swat	Ravi
Gomal	Beas
Sangar	Satluj
Khurrom	
Tochi	
Viboa	
Shigar	

Note –Length – Satluj > Chinab > Ravi > Jhelum > Beas



JHELUM –

- Origin – Verinag Spring (Pirpanjal Range)
- Falls in – Joins Chenab in Jhang (Pakistan)
- Flows through the India- Pakistan border .
- Major Tributary – Krishanganga (Neelam)
- Forms the (Wular lake) (Largest fresh water lake in India)
- On bank = Srinagar
- Project = Kishanganga, Tulbul, Uri



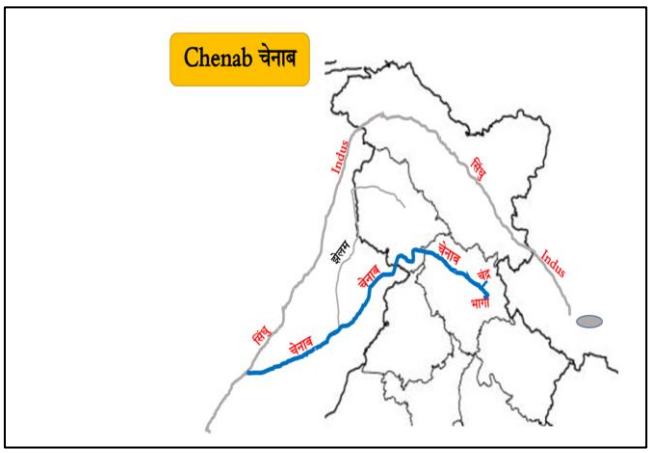
CHINAB –

- Origin – By confluence of Chandra & Bhaga Streams near Baralachha Pass in Keylong (Tandi)
- Recieves water from Barashigri glacier.
- Largest & major Tributory of Indus.
- Passes through Himachal Pradesh, Jammu-Kashmir & meets the Indus river at Mithankot (Pakistan)
- Major Tributeries – Marusundar –Pakaldul Project)
    1. Tawi –

Project :-

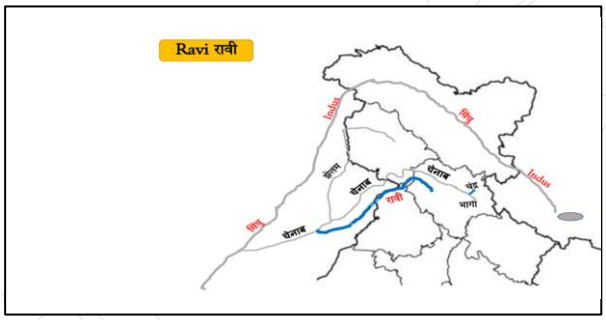
1. Chennai Project)
2. Dulhasti
3. salal
4. Baglihar

} Jammu & kashmir



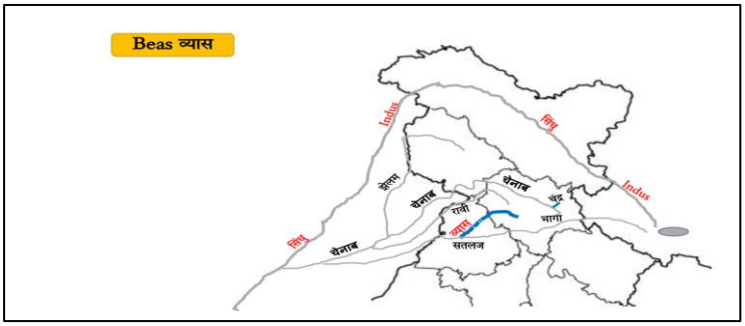
RAVI -

- Origin – From Bara Bhangal Village near Rohtang Pass (Himachal Pradesh)
- passes through Chamba Valley (Himachal Pradesh)
- Flows Through, Himachal Pradesh , Jammu-Kashmir, Punjab on Indo- Pak border.
- Falls in – In Chenab river in Sarai Sindhu (Pakistan)
- On Bank city – Lahore
- Projcet – Chamera (Himachal Pradesh), Thein Dam (Ranjit Sagar) (Punjab), Shahpurkandi (Punjab)



BEAS -

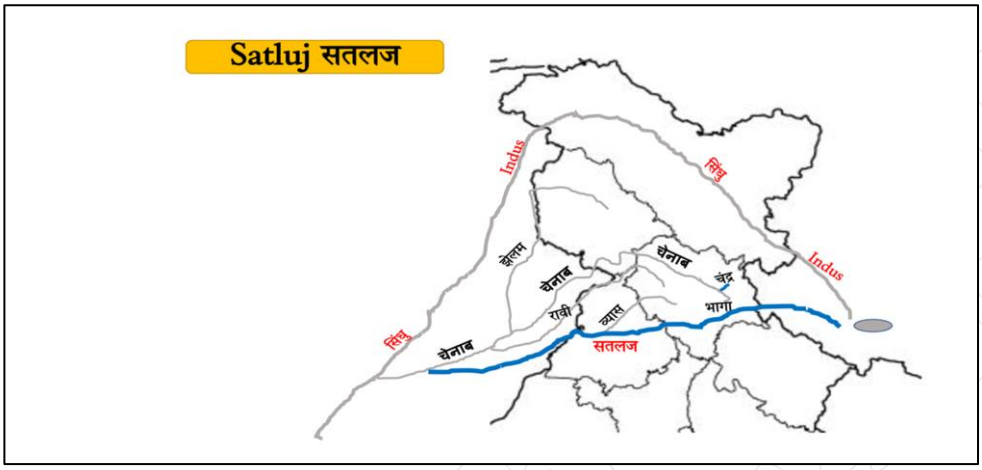
- Origin – From Beas Kund near Rohtang pass (Himachal Pradesh)
- Meets Satluj River at harike (Punjab)
- Indira Gandhi Canal originates from Harike.
- Passes through Kullu Valley.
- Project – Pong (maharana Pratap Sagar) Pandoh (Himachal Pradesh).



SATLUJ -

- Origin – From Rakas/ Rakshas Taal in Tibbet.
- Name in Tibbat – Longchen Khambab (Elephant's Mouth)
- Enters India through Shipkila pass.
- Meets Chenab river at uch sharif (Pakistan).
- Longest tributory of Indus (Antecedent river)
- Project – Nathpa Jakhadi (Himachal Pradesh)
  Bhakra (Himachal Pradesh – Govind Sagar Reservoir)
  Nangal (Punjab)

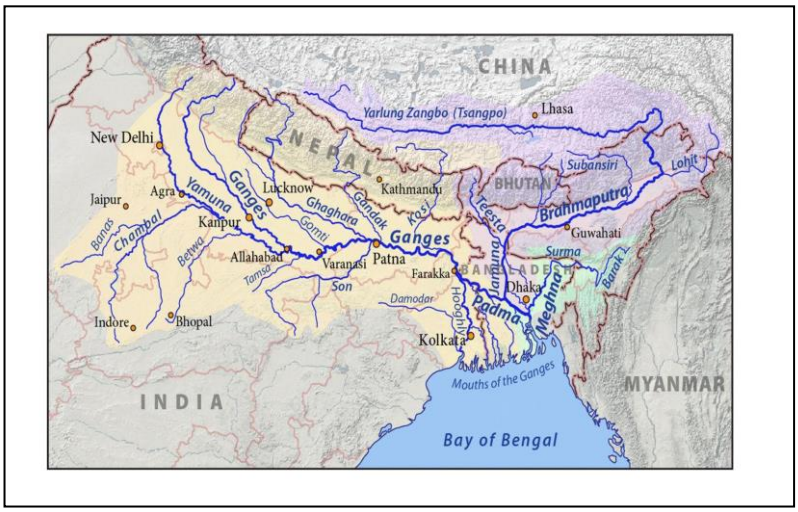
  On Bank Cities – Ludhiana, Firozepur



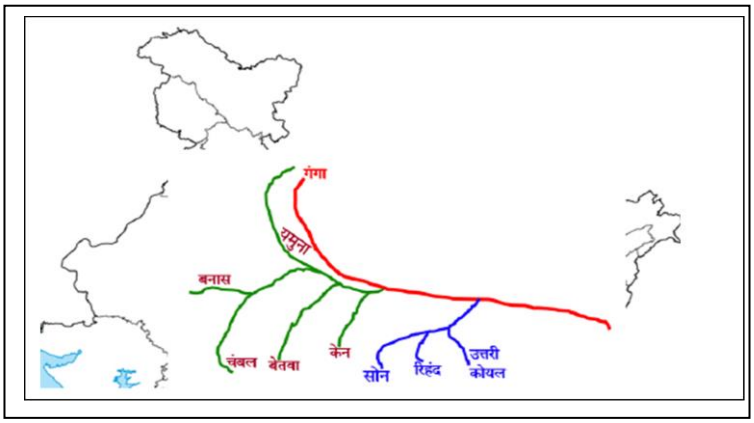
Ganga drainage system

- Origin – From the confluence of Alaknanda & Bhagirathi rivers in Dev prayag. (Uttrakhand)
- India's Longest river. (2525 Km.)
- Formation of India's largest drainage system (8.6 Lac. Sq Km.)
- Dam located at confluence of Bhagirathi & its tributory Bhilangna = Tehri (Highest in India)
- Ganga enters the plains at Haridwar.

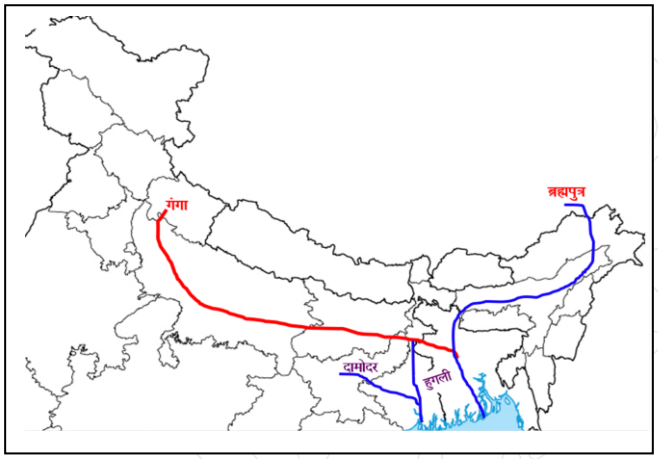
Tributories of Ganga –



➢ **Right Side Tributories -**

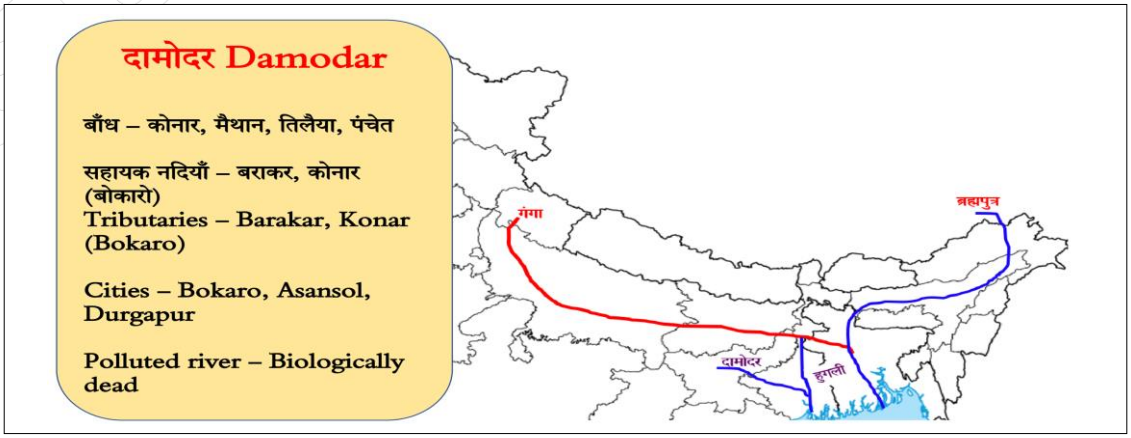


Hooghly/Hugli -



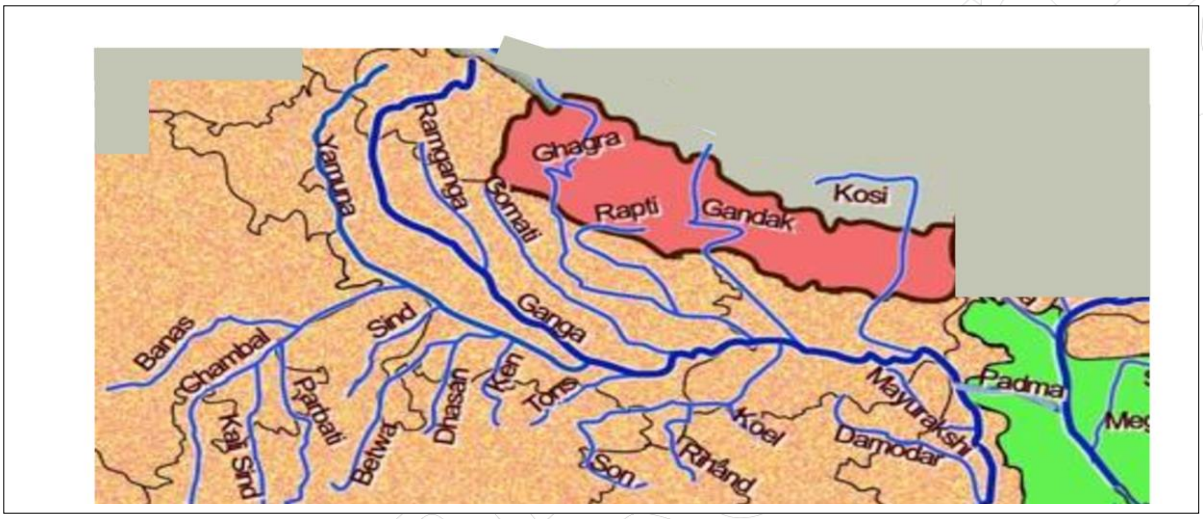
- Distributory of Ganga
- Origin – Farraka (West Bengal)
- Tributory – Damodar , Mayurakshi
- Sediments deposited at bed – Flooding Problem treacherous river.
- Farraka Barrage is used to clean sediments.
- On bank Kolkata.
- Port – Kolkata, Haldia.

Damodar -



- Origin – Chhota Nagpur Plateau.
- Joins the hoogly river in west Bengal.
- Main tributary – Barakar
- Flows in rift valley.
- Coal reserves in valley (Ruhr Valley of India)
- Flood problem in Bengal – Sorrow of Bengal
- Damodar Valley project is the first multi-purpose Project of India based on Tennessee project.
- Dam – Konar, Maithon , Tilaiya and Panchet.
- Highly polluted river (Biologically Dead)

Yamuna River



- **Origin -** Yamunotri glacier (Bandar Punch Peak) (Uttarakhand)
- Meets Ganga in Pragagraj.
- Longest tributary of Ganga (1375 Km.)
- On Bank Cities– Delhi, Agra, Mathura.
- Polluted – Biologically dead.

Left Side Tributeries – Hindon, Rind, Sengar, Varuna.
Right Side Tributeries – Tons, Giri, Chambal, Sindh, Betwa, Ken
Proposed Project – Kisau(Tons), Renukaji(Giri), Lakhwar (Yamuna)

Son –

- **Origin – A**markantak Plateau.
- Meets Ganga at Sonpur (Arrah) near Patna in Bihar.
- Placer deposits of gold.
- Tributaries Rihand, North Koel.
- On Rihand dam largest man made lake of India = Govind Vallabh Panth Sagar Reservoir (Uttarpradesh –Madhyapradesh)

Left Side Tributories –

1. **RAMGANGA –**
   - Origin – From garhwal hills near gairson (Uttarakhand)
   - Join the Ganga Near Kannauj.
   - Enters into Rohilkhand plains from Najibabad(Uttar Pradesh)
   - Jim Corbett National Park.
2. **Gomati –**
   - Major river of Awadh Plains.
   - On Bank Cities – Lucknow & Jaunpur.

3. **Ghaghra –**

- Origin – Mapchachungo Glacier (Tibbet).
- Collect water from Tila, Seti & Beri streams.
- Name in Nepal – Karnali
- Form Gorge at Shishapani (Nepal)
- Joins Ganga at Chhapra (Bihar)

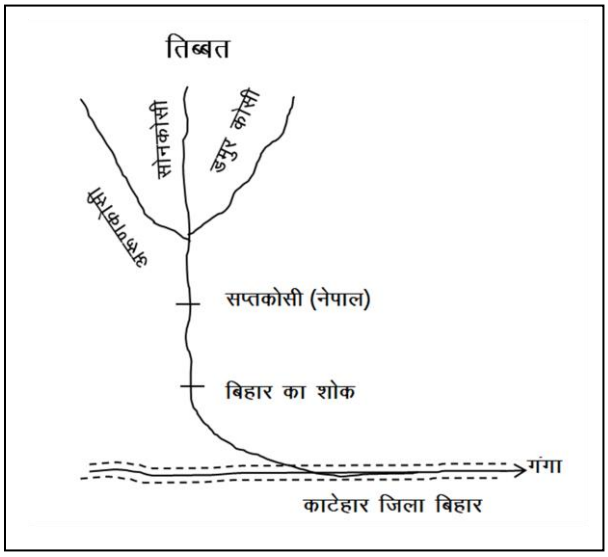
TRIBUTORIES :-

1. **Sharda** – Flow on Uttarakhand = Nepal Border (Name of Kali/Chauk).
   Tributory – Saryu (Ayodhya)

2. **Rapti –** Gorakhpur

3. **Gandak –**
   - Origin – From confluence of Kaligandak & Trishulgandak Streams (Nepal)
   - Enters into plains from champaran (Bihar)
   - Join Ganga at Sonpur near Patna.

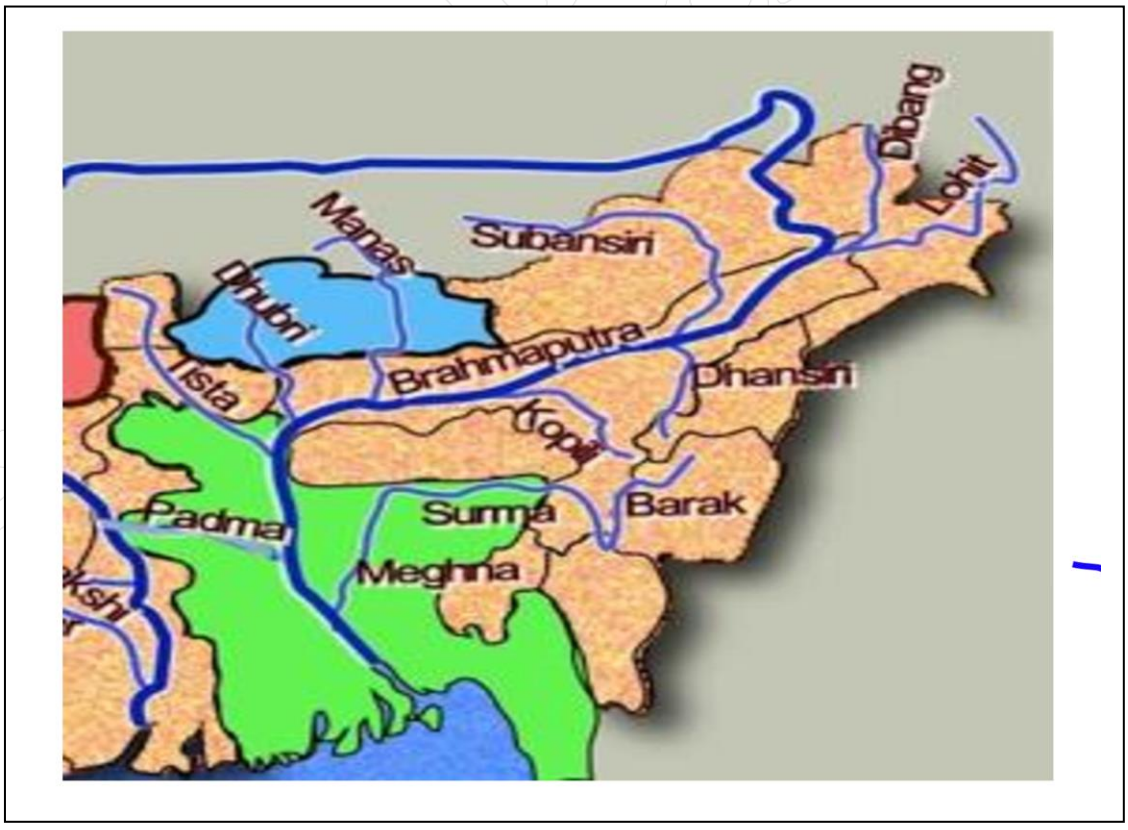
4. **Kosi –**



- Origin – Tibbat (Antecedent River)
- Name after meeting of Aruna Kosi, Son Kosi & Tamur Kosi = Saptkosi (Nepal)
- High amount of sediments – Flood problem sorrow of Bihar.

5. **MAHANANDA –**
   - Origin – From Darjeeling Hills
   - Join Ganga on Indo-Bangladesh Border.

BRAHMPUTRA DRAINAGE SYSTEM



- Origin – From Chemayungdung glacier near Mansarover Lake.
- Enter from Arunachal Pradesh by forming Dihang Gorge near Namcha Barwa.

Different Names –

- **Tibbet** – Yarlung Tsangpo (Meaning – Purifier)
- **Arunachal Pradesh** -Dihang
- **Assam** – Bharmaputra
- **After Entering Bangladesh -** Jamuna
- **After Meeting Ganga –** Padma
- **After Meeting Meghna –** Meghna
- Formation of riverine islands due to flow in braided channel in Assam valley. Like –MajuliIsland (world's largest river island).
- Most water bringing river in India.
- Highest hydro power generation capacity present in India.

TRIBUTORIES :-

Right Side Tributories - Teesta, Sankosh, Manas, Kameng, Subansiri[Bharali, Barnadi, Siyang, Jaldhaka, Raidak].

Left Side Tributories - Dibang, Lohit, Dhansiri, Kapili(Kolong), Dikhou.

PENINSULAR DRAINAGE SYSTEM

SUBARNREKHA –

- Origin - From Ranchi plateau. (Jharkhand)
- From estuary
- Placer deposits of gold.
- Form Hundru falls (Jharkhand)
- On Bank City - Jamshedpur (Steel Production)

Baitarani – Brahmani -

- Collectively form a delta in which Bhitarkanika mangroves (Olive Ridley Turtles) are located.

Mahanadi –

- Origin – Sihawa Hills (Raipur, Chhattisgarh)
- Due to the formation of a bowl-shaped basin in Chhattisgarh, in which rice is cultivated, Chhattisgarh is called the rice bowl of India.
- Dam - Hirakund(Odisha) (India's Longest Dam)
- National Waterway 5 (NH-5) is located in delta region.
- On Bank Cities – Cuttack Puri, Bhuvneshwar(Odisha)

TRIBUTORIES :-

- **Left Side Tributories** –Ib, Mand, Hasdo, Shyonath
- **Right Side Tributories** – Tel, Ong

Godavari –

- Origin – From Triyanbak Plateau located in Kalsubai peak area of western ghats (Nashik).
- Drainage Area – Maharashtra, Telangana, Andhra Pradesh
- Second Longest river of India (1465 km.)
- Formation of second largest drainage system in India. (3.13 Lac Sq. Km.)
- Other Name – Dakshin Ganga / Vriddha Ganga.

TRIBUTORIES :-

- **Left Side Tributories** –Purna, Pranahita(Penganga, Wardha, Venganga), Indravati,Sabari(Sileru/ Machkund)
- **Right Side Tributories** – Pravara and Manjara

Dam –

- Polavaram – Godavari River (Arunachal Pradesh)
- Balimera – Sileru River (Odisha)
- Nizam Sagar – Manjara River(Telangana)
- Waterfall on Indravati = Chitrakoot (Chhatisgarh)

Krishna –

- Origin – Mahabaleshwar Peak of western ghats (Maharashtra)
- Drainage Area – Maharashtra, Karnataka, Telangana Andhra Pradesh.
- Second longest River of South India. (1401 Km.)

TRIBUTORIES :-

- **Left Side Tributories** –Bhima, Musi (Hyderabad)
- **Right Side Tributories** – Koyna, Ghatprabha, Malaprabha, Tungabhadra

Dam –

- Nagarjunasagar(Arunachal Pradesh –Telangana)
- Srisailam(Arunachal Pradesh –Telangana)
- Almatti(Karnataka)
- On Koyana river – Koyna dam (Maharashtra) (Sivasagar Lake)
- On Tungbhadra Dam on Tungbhadra River (Karnataka)

Kaveri –

- Origin = BrahmagiriHillsof Western Ghats(Karnataka)
- Drainage Area = Karnataka, Tamil Nadu.
- "Ganga of South India"
- Perennial river because it receives water from the south-west and north-east monsoons.
- Rice cultivation in the basin.
- 3 times the river divides into two streams to form islands.
- **Example –**Shrirangapattnam(Karnataka), Shivsamudram
- (Karnataka),ShrirangamIsland (Tamil Nadu).

TRIBUTORIES :-

- **Left Side Tributories** –Hemavati, Shimsha, Arkavati
- **Right Side Tributories** – Lakshmanathirtha, Kabbani, Bhavani,Amravati.

Dam –

- KrishnarajaSagar (Karnataka)
- Shivasamudram(Karnataka) (1902)
- Mettur(Stanley Reservoir) (Tamil Nadu)

Waterfalls –

- Shivasamudram (Karnataka)
- Hogenakkal(Tamil Nadu)

Vaigai –

- On bank = Madurai (Tamilnadu)

Narmada –

- Origin = AmarkantakPlt. (1312 km.)
- Confluence / Falls in - Gulf of Khambat.
- Flows in rift valley between vindyachal – Satpura.

TRIBUTORIES :-

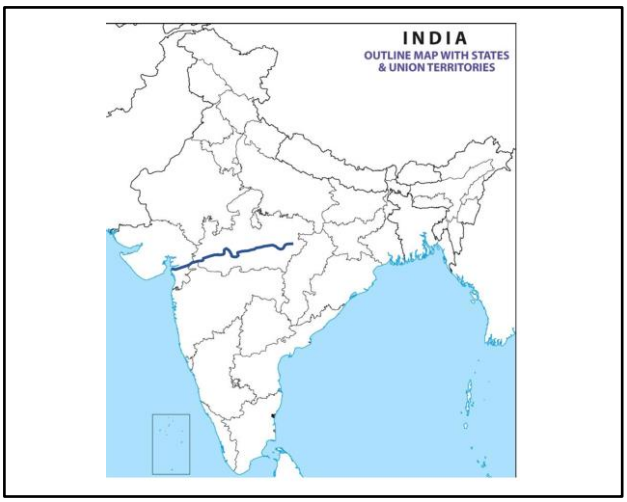
- **Left Side Tributories** –Hiran
- **Right Side Tributories** – Tawa, Chota Tawa, Kundi

Waterfalls –

- Dhuadhar(near Jabalpur), Kapildhara(Madhyapradesh)

Projects –

- Madhyapradesh - Indira Sagar, Omkareshwar, Maheshwar
- Gujarat - Sardar Sarovar
- Sadhu Bet island (Statue of Liberty) is located on it.
- On Bank City – Bharuch (Gujarat)



Tapi –

- Origin - From Multaiplace on BetulPlateau in Madhya Pradesh.
- Falls in - In Gulf of Khambhat forming an estuary passing through Maharashtra and Gujarat.
- Flows through rift valley between Satpura & Ajanta hills.
- Ajanta hills
- **Project –** Ukai , Kakrapar (Gujarat)
- **On Bank City –** Surat

Mandovi –

- Life line of Goa.
- Longest river of Goa.
  (a) Atal Setu on the river.
  (b) Drift from BheemgarhWildlife Sanctuary.
  (c) ChoraoIsland on the river on which Salim Ali Bird Sanctuary is situated.
  (d) Doodhsagarfall.
- On bank City – Panaji

Ponnani/ Bharatpuzha –

- Origin - From Annamalai Hills.
- Nile of Kerala.
- Largest river of Kerala.

Periyar –

- Origin - From Annamalai Hills.
- Lifeline of Kerala.
- Project - Idukki Dam (Kerala)

Other River

- Gujarat – Shetruniji, Bhadra, Dhadhar
- Maharashtra – Vaitarna
- Karnataka – Bedhti/ Gangavali
- Kerala – Pamba

LAKES

1. **Tso Kar Lake-**
   - India's Highest lake located in Sikkim.
   - This lakes receive water from zemo glacier.
   - Testa river originate from this lake.
2. **Kanwar Lake(Bihar) –**
   - This lake is formed by meandering & Gandak river.
   - It's is Asia's Largest fresh water Qxbow Lake.
   - It is also included in Ramsar Site.
3. **Vembanad Lake (Kerala)**
   - It is Kerala's Largest & India Longest lake.
   - Migratery Birds come in this lake region.Therefore Kumarkom is localted here.
   - Wellingdon Island is located in this lake.
   - Kotchi port is located on this island.
   - A salt barrier has been created in this. Which is called Thanneermukkom.
   - This lake is included in national wetland conservation programme.

   Thanneermukkom Lake –
   - Some rivers pore water in this lake.
     Like – Pamba, Periyar, Manimala, Meenachil, Achenkovil, Muvattupuzha
   - This lake is included in ramsar site.

4. **Sasthamcotta lake (Kerala) –**
   - It is Kerala's largest fresh water lake.
   - It is included in Ramsar site.
   - Kerala's Asthamudi Langoon Leke also included in Ramsar Site.

5. **Loktak Lake (Manipur) –**
   - It is largest fresh water lake of North-East India. located in Manipur.
   - This lake is included in Ramsar site's& montreux record.
   - In this lake floating island are formed by vegetation & organic matter which are called Phumdi. .
   - In this lake world's one & only floating National Park Kaibol Lamjao is located.
   - Sangai deer is conserved in this National Park.
6. **Kolleru lake-**
   - It is largest fresh water lake of Andra Pradesh which is located in Krishna Godavari delta region.

- This lake receives water from.
- This lake connected
- This lake region is an notified wildlife sanchury.
- This lake is included in Ramsar Site.

7. **Chilka Lake (Odisha) –**
   - It is India's largest brackish water lagoon lake located in Odisha.
   - Iravati dolphin is found in this lake. Nalabam Lake regionis located in this.
   - This lake is included in ramsar site.
   - This lake was also included in montreux recored.

   Other Odisha Lakes which are included in Ramsar Site –

   (i) Ansupa Lake
   (ii) Bhitarkanika mangroves
   (iii) Chilka Lake
   (iv) Hirakund reservoir
   (v) Satkosia Gorge
   (vi) Tampora Lake

8. **Wular Lake (Jammu & Kashmir) -**
   - It is India's largest fresh water lake.
   - This lake receive water from Jhelam river.
   - Thul- Bul project is located at the Bank of this lake.
   - This lake is included in Ramsar Site.
   - This lake is formed by Tectonic activities.

   5 Ramsar site of Kashmir –

   1. Hokra Wetland
   2. Hygan Wetland
   3. Shallbugh Wetland
   4. Surinsar – Mansar Lake
   5. Wular Lake

Dal Lake –

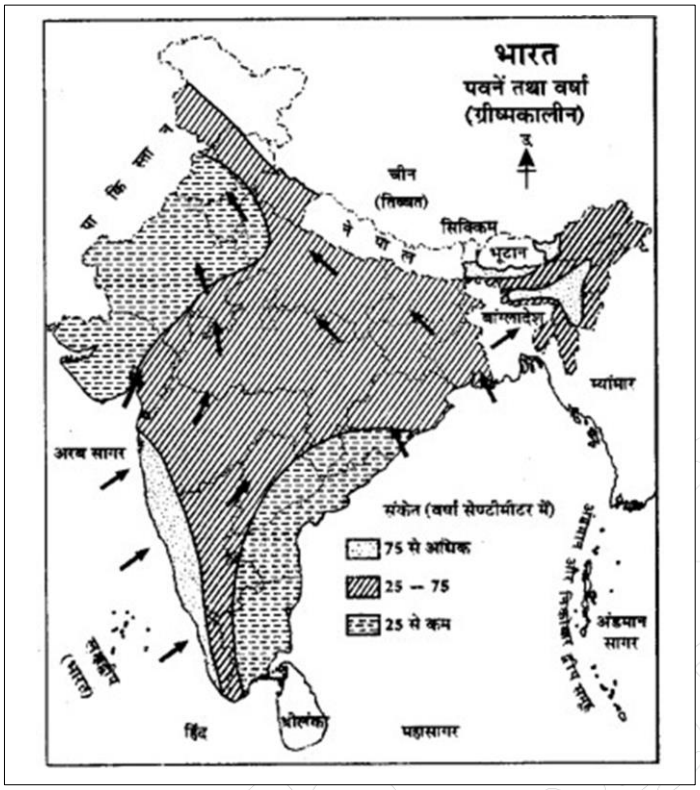
- It is 2nd largest lake of Jammu Kashmir.
- In this lake char chinar (Roopalank)And nami (sonalank) Island is located.
- This lake known for house boat & floating vegetable market.
- It is major to are….
- It is also called Jwel of Sri-Nagar.

Manasbal lake–

- It is the deepest lake of Jammu Kashmir.
- This lake is known for lotous flower.

Note – Salim alilake is in – Maharastra salim ali bird sanctuary is in - Goa

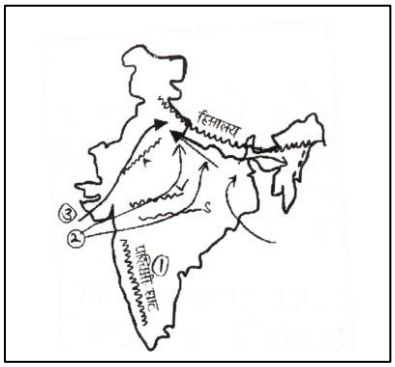
RAINFALL DISTRIBUTION



- Most of the rainfall occuring in India is received by South-West Monsoon winds.
- Around 75% of annual rainfall is received by these winds.
- These winds enters India in the form of 2 branches.

☑ **Monsoon Branches –**

1. Arabian sea branch
   - **a.** Himachal Branch
   - **b.** Chotanapur Branch
   - **c.** Western Ghats Branch
2. **Bay of Bengal Branch –**
   - **a.** Northern Plain Branch
   - **b.** Eastern Branch



1. **Arabian sea branch –**
    1. **Himachal branch (Northern branch) –**
        - This branch enters India through Kathiawad peninsula.
        - It cause less rainfall in Gujarat & West Rajasthan because it moves parallel to Arawali Mountain.
        - In Punjab – Haryana this branch meets bay of Bengal branch.
        - Both the branches becomes strong & cause rainfall in western Himalayas.

    2. **Chotanagpur Branch (Middle branch) –**
        - This branch enters India through Narmada & tapi rift valley.
        - This branch causes rainfall in central India & it meets bay of Bengal branch in Bihar.

    3. **Western Ghat Branch (Southern Branch) –**
        - This branch strikes the windward slope of Western Ghats & rises upto the height of 900-1200 m.
        - It leads to the formation of clouds & western slope.
        - less rainfall is received on leeward slope of western Ghat.
        - A rainshadow region is formed behind West Branch.

2. **Bay of Bengal branch –**
    - This branch gets deflected towards India after striking arakan yoma Mountain.
    - This branch enters India from south – eastern direction.
    - After entering India it strikes Himalayan Mountain & gets divided into 2 branches.
    - It's eastern branch causes rainfall in north eastern India.
    - A sub branch of eastern branch cause heavy rainfall in Garo, Khasi, Jaintia which extends in funnel shape.
    - In these hills mausynram & cherrapunji are located where world's highest average annual rainfall is received.
    - The Northern plain branch of BOB branch gets attracted towards low pressure formed in west India.
    - This branch causes rainfall in Ganga plains & eastern Rajasthan.
    - This branch meets Arabian sea branch in Bihar & Punjab – Haryana.
    - Note – On coromandal coast rainfall is not received by South-West Monsoon winds because this coast is located in rainshadow region of Arabian sea branch and BOB branch moves parallel to this coast.

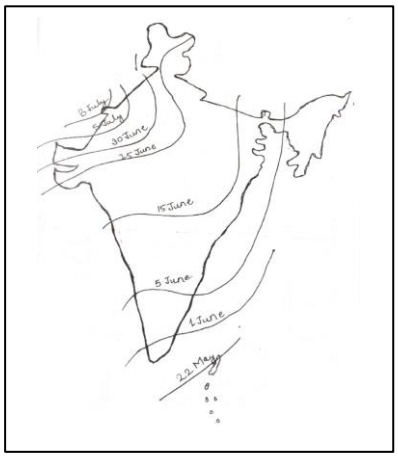
☑ **Speical features of Rainfall in India –**

1. The rainfall occurring in India is seasonal.
2. Most of the rainfall is received by south-west monsoon winds but after entering the internal part of India, the diretion of these winds changes because of pressure condition & relief features.
3. In India, rainfall begins suddenly with thunderstorm & lightening which is called burst of monsoon.
4. This rainfall occurs during wet spells & between these wet spells dry intervals are found which is called break of monsoon in north india, break of monsoon occurs when the rain bearing storms becomes less frequent due to changing position of ITCZ.

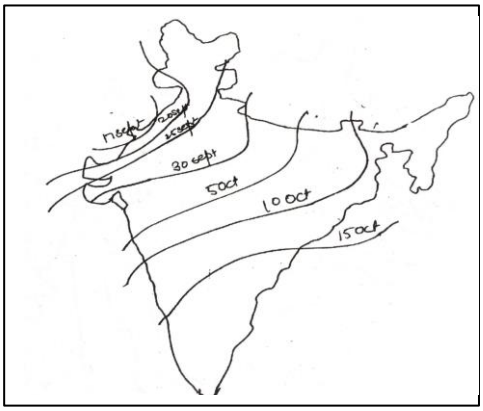
   Break of monsoon occurs in western coastal region when monsoon winds move parallel to the coast.
5. Distribution of rainfall is uneven in India, where around 1200cm. rainfall is received in Cherapunji & Mausynram & only 12cm rainfall in ladakh.
6. Amount of rainfall reduces with increasing distance from the coast.
7. There are less no. of rainy days in India.
8. There is Uncertainity is Indian rainfall.
9. Variability of rainfall is less in the region where rainfall is less .
   - Rajasthan 30%
   - Kanpur 20%
   - Kolkata 11%

☑ **Arrival of Monsson –**

- In India, arrival of monsoon occurs on 22 may in Andaman &Nicobar Island.
- In the mainland of India, arrival of monsoon occurs on 1 june from Malabar coast (Kerala)
- In Rajasthan arrival of monsoon occurs on 25 june (old date of arrival was 15 june)



☑ RETREATING OF MONSOON



Seasons	Reason & Place	cm.	mm.	%
winter	North west India – Mawath Coromandal – North-East winds Arunachal Pradesh – Syntorial	3.98 cm	39.8 cm.	3.4%
Pre monsoon	West Coast – Mango Shower, Cherry Blossom West Bengal + Assam East Coast – Tropical cyclones	13.06 cm	130.6 cm	11.3%
Monsoon	South west monsoon winds cyclones	86.86 cm	868.6 cm	74.9%
Post monsoon	Cyclones East Coast	12.1 cm	121 cm	10.4%
	Avrage Annual Rainfall	116 cm	1160.1 cm	

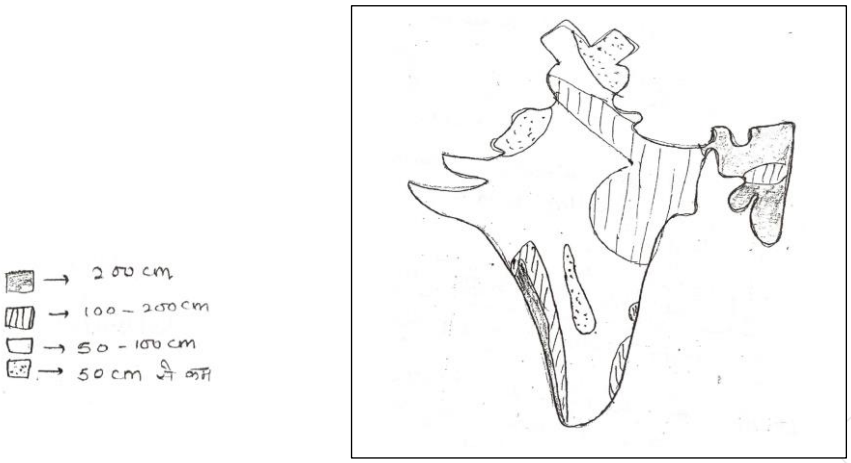
Koal Baisakhi –

- It is a vialen evening thunderstorm which is very destructive.
- It occurs in west Bengal & Assam in April & May.
- This thunderstorm causes rainfall which is beneficial for rice, jute & tea crops kal baisakhi is also called Norwester.
- It is considered as calamity of baisakh.
- In Assam, it is called bardoli chherra in local language.

Annual Rainfall distribution in India –

- In India, 116cm average annual rainfall is received.
- Distribution of rainfall is uneven in India.
- According to the distribution of rainfall, there are 4 regions in India.

Distribution of Rainfall in India



- Distribution of rainball in India is uneven.
- In India average annual rainball is 116 cm.

1. **High Rainfall Region –**
   - In this region more than 200 cm rainfall is received.
   - This Region include's of Maharastra, Goa, Karnataka, Kerala, Andman-Nikobar, Lakshadeep & North-eastern state.
   - This region includes places cherapunji & Mausinram in which world's highest average annual rainfall is received.
2. **Moderate Rainfall Region–**
   - In This region around 100-200 cm rainfall is received.
   - This region include's easterm slope of westerm ghat, coromandal coast, sub-Himalayan region, northern part of ganga plains.
   - Jammu & Kashmir, Punjab, Haryana, Himachal Pradesh, Uttarakhand, Uttarpradesh, Bihar, Eastern M.P., Jharkhand, West Bengal, Chattisgarh, Odisha, Andra Pradesh, Tamilnadu, Gujarat, Maharastra, Goa, Karnataka, Keral, Manipur & Kachar Valley of Assam.
3. **Law Rainfall Region –**
   - In this region 50-100cm rainfall is received.
   - This region Extends over most of the part of India.
   - This region include following states.
   - Ladakh, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Punjab, Haryana, Delhi, Rajasthan Uttarpradesh, Western Madhyapradesh, Gujarat and most of the part of peninsullau India.
4. **Inadequate** Rainfall Region –
   - In this region less than 50 cm rainfall.
   - This region is located in rain shadow region

- This region includes semi-arid & arid region.
- This region includes following states ladakh, Punjab, Haryana, Rajasthan, Gujarat, Maharastra, Karnataka, Telangana& Andhra Pradesh.
- This region includes that than desert and cold ladakh desert is included.

AGREECULTURE

Major Crops – Wheat, Rice, Catton, Sugarcone, Tea and Coffee.

S.No.	Crops	Global Production	Production in India 2022-23	Maximum Productivity 2022-23	Maximum Area 2022-23
1.	**RICE(25%)**	1st China 2nd India	1st-Uttar Pradesh 2nd - Telangana 3rd - West Bengal	Punjab	U.P
2.	**Wheat (15%)**	1st China 2nd India	1st - Uttarpradesh 2nd – Madhyapradesh 3rd - Punjab	Punjab	U.P
3.	**Cotton**	1st China 2nd India	1st - Gujarat 2nd - Maharashtra 3rd - Telangana	Gujarat	Maharashtra
4.	**Sugarcan (20%)**	1st Brazil 2nd India	1st - Uttar Pradesh 2nd - Maharashtra 3rd - Punjab	Tamilnadu	U.P
5.	**Tea (20%)**	1st China 2nd India	1st - Assam 2nd – West Bengal 3rd - Tamilnadu	Assam	Assam
6.	**Coffee (3%)**	1st Brazil **9nd India**	1st - Karnatak 2nd - Kerala 3rd - Tamilnadu	Karnataka	Karnataka

% Area = Rice> Wheat>Cotton>Sugarcane

- **Rabi – Wheat -Temperate Climate (15^0-20^0C)**
- **Kharif– Rice, Sugarcan, Coffee, Tea, Cotton - Tropical Climate (15^0-20^0C)**

➢ **RICE –**

- Rice is a type of Kharif Cropes.
- Temperature = $20^0$to 27^0C
- Rainfall = 150 - 200 cm.
- Claimate Zone – Tropical - Indica, Temperate – Jeponica
- Landform – Flat
- Swampy Low Land Region – Tasty & Highland region – Small & Red
- In west Bengal three type of rice cropes production.
  - Aus (Autumn)
  - Aman (Winter)
  - boro (Summer)
- Varieties of rice – Jaya (IstDwarf Variety), Jamana, Padma, Krishna, Ratna, Chak, IR-8.

- Major disease in rice – Brown spot (Fungal Disease)
- Among food grain , production of rice is highest.
- **Central Rice Research Institute – Cuttack (Odisha)**
- **Indian Institute of Rice and Research – Hyderabad**

➢ **WHEAT –**

- Wheat is a type of Rabi Cropes.
- Temperature = $15^0$to 20^0C
- Rainfall = 50 - 75 cm.
- More Rainfall during winter 100 frost free days
- Soil – Sandy loam
- Cultivated upto an altitude upto 2700 meter.
- Amongst food crops highest productivity.
- 100 Cm. Isohaline seperats wheat & rice.
- Varieties of wheat – Girija, Arjuna, Malviya-12, Sonalika (Dwraf variety)

➢ **COTTON –**

- Cotton is a type of Kharif Cropes.
- Temperature = 20^0C to 30^0C
- Rainfall = 50 - 100 cm. (Dry condition During Reaping)
- 210 frost free days.
- Climate – Semi arid part of tropical region.
- Soil – Black Soil (formed by Lava)
- Well drained field is required.
- Salhatti –North Karnataka, Black Soil
- Daudhatti – South Karnataka, Red Soil
- Varieties –vikas, vikaram, vijay, Kalyan, Narmada

Note – Narma :- American cotton (Long staple Fiber) in North-West part of country.
Indian Cotton – Small staple .

➢ **SUGARCAN –**

- Temperature = $20^0$to 30^0C
  - During reapining – Low
  - During growing - High
  - During Sowing – Normal
- Rainfall = 125 cm. (dry condition before harwesting)
- Climate – Tropical (humid & sub-humid Climate)
- Frost is harmful
- Matures in 11 to 12 months
- Productivity & Sucrose is high in South India.
- Black Soil is required.
- **Indian Institute of Sugarcan Research – Lucknow (Uttar Pradesh)**
- **Sugarcan Breeding Institute – Coimbatore (Tamilnadu)**

- **TEA -**
  - Temperature = 25^0 to 30^0C
  - Rainfall = 200 cm. (Must be evenly distributed through out the year for continuous development of leaves)
  - Climate – Tropical &Sub-TropicalHumid Climate
  - Tea cultivation in India started in Brahmputra valley of Assam in 1840 AD.
  - Grows on well drained slopes.
  - Black Tea Leaves are fermented, Green tea leaves are unfermented.
  - **Toklai Tea research Institute - Jorhat (Assam)**
- **COFFEE –**
  - Temperature = 20^0 to 25^0C
  - Rainfall = 200 cm.
  - Climate – Hot & Humid Climate
  - Soil – Laterite
  - Coffee plant can't tolerate direct sun light and is growan under the Shade of other trees in India Production of Robusta coffee is more.
  - coffee production started in India started from Baba Budan Hills.
  - 3 main varieties -
    - Arabica
    - Robusta
    - Liberica
  - **Central Coffee Research Center – Balehonnur (Karnataka)**

- Global Production (Update Data – 2022-23)

Cropes	**Production**
Rice	136 Million Tonne
Wheat	111 Million Tonne
Cotton	34 Million Bales
Sugarcan	491 Million Tonne
Tea	1375 Million Kg.
Coffee	3,52,000 Mitric Tonne

ENERGY RESOURCES

Conventional Source	Non- Conventional Source
Have been in use since a long time	Have been developed only in last few decades or are still being developed.
No need for new technology to get energy	Need for new technology to get energy.
Problem of pollution from use	Does not cause Pollution
generally non renewable(exc. hydroelectric)	Generally Renewable
Sources -	**Sources**
- Coal	- Nuclear Energy
- Petroleum	- Solar Energy
- Natural gas	- Wind Energy
- Thermal Power	- Biomass Energy
- Hydral Power	- Tidal Energy
	- Geothermal Energy
	- Coal Bed Methane
	- Shale Gas
	- Small hydro Projects

Renewable Source	Non Renewable
these sources of energy can be used again & again.	These source of energy cannot be used again & again.
Theses types of sources are inexhaustible	these type of sources are exhaustible & cannot be renewed.
It does not Pollute Atmosphere	It causes Atmospheric Pollution
Ex. – Solar energy Wind Energy	Ex. - Coal Petrolem

Energy Sources	Potential Capacity (GW)	Installed Capacity (GW) (31 August, 2024)
Thermal Power	-	243
Hydro Power	148	47
Nuclear Energy	-	8.2
Solar Energy	748	90
Wind Energy	695	47.2
Biomass Energy	42	11
Small Hydro Project	-	5
Total Renewable Energy	-	200 (44%)
Total Energy	-	**451.4 GW**

Installed capacity's

Thermal > Solar > Wind > HEP > B.M.
([illegible]) ([illegible]) ([illegible]) (10.4%) (2.5%)

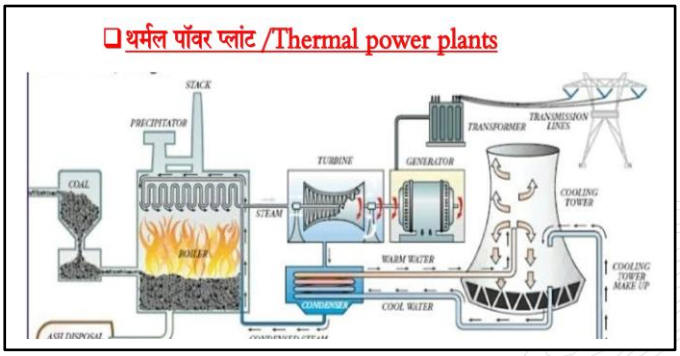
Sector

- **Nuclear Energy –**
  - **Major Projects –**
    - Tarapur (Maharashtra)
    - Rawatbhata (Rajasthan)
    - Kalpakkam (Tamilnadu)
    - Kudankulam (Tamilnadu)
    - Kaiga (Karnataka)
    - Narora (Uttarpradesh)
    - Jaitpur (Maharashtra)
    - Kakrapar(Gujarat)
- **Solar Energy –**
  - **Major Projects –**
    - Bhadla (Rajasthan)
    - Pavagad (Karnataka)
    - Kurnool (Andhrapradesh)
    - Rewa (Madhyapradesh)
    - Kamuthi (Tamilnadu)
- **Wind Energy –**
  - **Major Projects –**
    - Muppandal (Tamilnadu)
    - Jaishalmer (Rajasthan)
    - Brahmanvel (Maharashtra)
    - Dhalgaon (Maharashtra)
    - Vankushwade (Maharashtra)
- **Geothernal Energy**
  - **Major Projects –**
    - Puga Valley (Ladakh, First Project being developed by ONGC)
    - Chumathang (Ladakh)
    - Tatapani (Chattisgarh)
    - Surajkund (Jharkhand)
    - Manikaran (Himachal Pradesh)
    - Khammam (Telangana)

- Rajgir (Bihar)
- Sohana (Hariyana)
- Cambay(Gujarat)

➢ Thermal Power Plant –

Source	Installed Capacity
Coal	210 GW
Gas	25 GW
Diesel	0.5 GW
Total	**236 GW**



Note-

1920AD.– Hussain Sagar Thermal Power Plant (Hyderabad) (India's First)

1975AD. – NTPC (National Thermal Power Corporation)

1. **Mundra**
2. **Sikka**
3. **Ukai**

} **Gujarat**

4. **Vindyanchal**
5. **Sasan**

} **Madhyapradesh**

6. **NTPC**
7. **Rihand**

} **Uttarpradesh**

8. **Sipat** - **Chattishgarh**
9. **Talchar** - **Odisha**

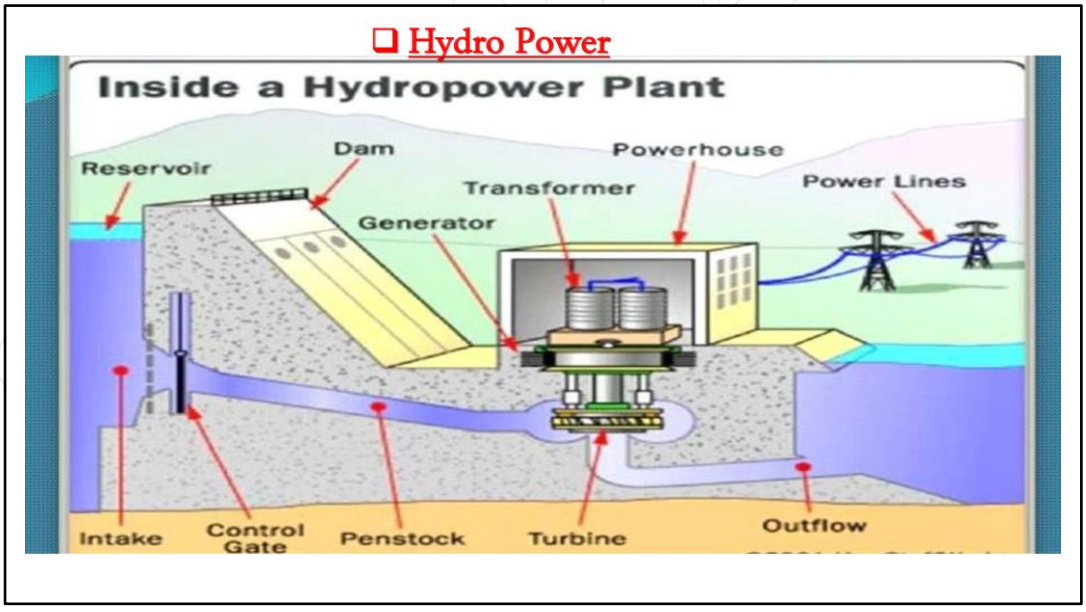
10. **Tiroda**
11. **Chandrapur**

} **Maharashtra**

➢ HYDRO POWER –

- Potential Hydropower Capacity at 60% load Factor – 148.7 GW (August,2022)
- Installed capacity – 46.8 GW

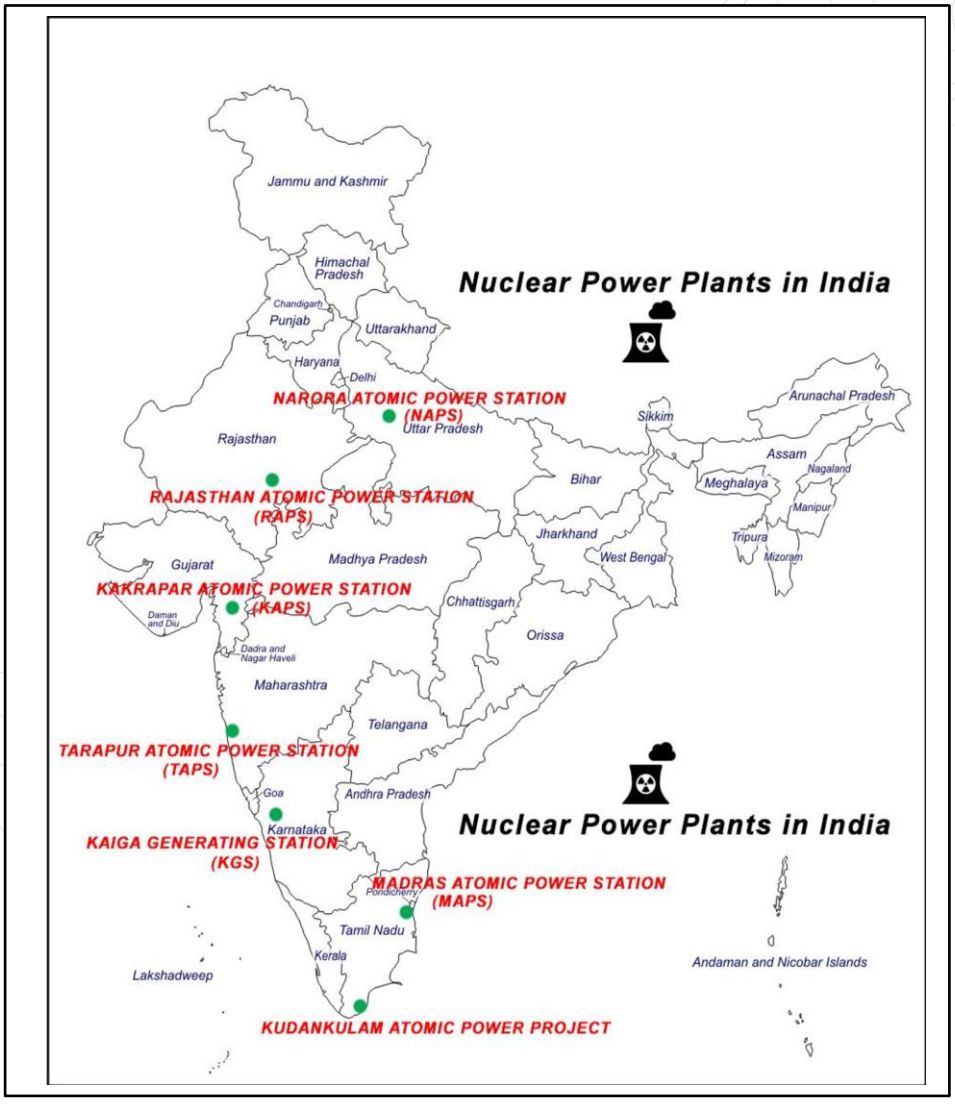
- 1897AD.–Sidrapong Hydropower plant – Darjeeling (Small)
- 1902AD.– Shivsamudram (Kaveri) – Karnataka
- 1975 AD.– NHPCn(National Hydro Power Corporation)
- Koyana Project (Koyana river) (Maharashtra) – Largest Hydro Electric Power plant in India.
- Tihari Dam – Bhagirathi (Uttarakhand) – Highest project in the country.
- Nathpa Jhakri - Satluj River (Himachal Pradesh)- Biggest underground project in the country.
- Sardar Sarovar Dam(Narmada Nadi) Narmada (Gujarat) - World second largest concrete dam.
- Banswara Project – Son (Madhyapradesh)
- Teesta Project (Teesta) (Sikkim)
- Rangeet Project – Rangit (Sikkim)
- Loktak Project – Lematak (Manipur)



➢ **NUCLEAR ENERGY –**

- **1948 AD.** – Atomic Energy commission.
- Dr. Homi Jahangir Bhabha - Father of Atomic Energy in India.

- **1954 AD.** – Department of Atomic energy.
- **1987 AD.** – NPCIL (Nuclear Power corporation of India.
- Installed capacity – 6.76 Gw (1.7 %)
- **1969 AD**. – Tarapur (Maharashtra)
- India's First atomic power plant. (Assistance of USA)
- **1973 AD**. – Rawatbhatta (Rajasthan)
- Established by assistance of Canada.
- Kalpakkam (Madras, Tamilnadu) – First project which used indigenous project.
- Kudankulam (Tamilnadu) – Established by the assistance of Russia. (200 MW)
- Kaiga (Karnataka)
- Narora (U.P.)
- Kakrapar (Gujarat)
- Jaitpur (Maharashtra) – proposed project to be developed by the assistance of france.



Solar Energy		Wind Energy	
Patential	**Installed**	**Patential**	**Installed**
Capacity	Capacity	Capacity	Capacity
748 GW	90 GW	695 GW (120M.) 302 GW (100 M.)	41.2 GW.
Rajasthan (142)	Rajasthan	Gujarat (142)	Tamilnadu
Jammu-Kashmir	Gujarat	Rajasthan	Gujarat
Maharashtra	Karnataka	Karnataka	Karnataka
			Rajasthan (5th)

➢ SOLAR ENERGY –

- Around 5000 trillion Kwh per year energy is incident over India's land areas.
- India's Solar energy potential capacity = 748 GW

  Top states

  1. Rajasthan 142 GW
  2. Jammu Kashmir (with Ladakh) 111 GW
  3. Maharashtra 64 GW
- Installed capacity = 59 GW

  Top states (May 2022)

  1. Rajasthan - 14062 MW
  2. Gujarat - 7782 MW
  3. Karnataka - 7597 MW
  4. Tamil Nadu - 5572 MW
  5. Andhra Pradesh - 4390 MW

- **Top Solar Plants in India**
  1. Bhadla - Rajasthan (2245 MW)
  2. Pavagad - Karnataka (2000 MW)
  3. Kurnool - Andhra Pradesh
  4. Rewa - Madhya Pradesh
  5. Kamuthi – Tamil Nadu
- **Floating solar power plant –**
  1. Omkareshwar Dam (Madhyapradesh)
     Narmada River – 600MW
     World's largest floating solar project (constructred by 2023AD.)
  2. Ramagundam, Telangana.
     100 MW
     Developed by NTPC

3. Kayamkulam (Kerala)
   101 MW
   Developed by Tata power.

➢ WIND ENERGY –

1. China
2. USA
3. Germany
4. India

➢ **New & Renewable energy Ministry has set up a target of installing of offshore, capacity -**
- 5 GW by 2022 AD.
- 30 GW by 2030 AD.
- India can generate 127 GW offshore wind energy.

➢ BIOMASS ENERGY -

- Biomass potential from agriculture & agro industrial residues -28GW
- Biomass potential from bagasse = 14 GW
- Totasl biomass potential = 42GW
- Installed Capacity – 10.2 GW
- Top State – Maharashtra , Uttar Pradesh, Karnataka

Note –Renewable Energy Target by 2022– 175 GW

1. Solar Energy = 100 GW
   Rooftop Solar – 40 GW , Photovaltaic = 60 GW
2. Wind Power = 60 GW
3. Biopower = 10 GW
4. Small hydro power = 5 GW
   Target – Mission 500 GW by 2030

➢ TIDAL ENERGY –

- Tidal Power potential = 12.5 GW

Potential Areas –

1. Gujarat – Gulf of Khambat , Gulf of Kutchh
2. Tamilnadu – Palk bay , Gulf of Mannar
3. West Bengal – Hoogly river, South haldia , Sunderban

➢ SHALE GAS –

- Shale gas is being explored in 6 Basins.
  1. Cambay Basin
  2. Indo-Gangetic Basin
  3. Cawery Basin
  4. KG Basin
  5. Gondwana Basin
  6. Assam Arakan Basin

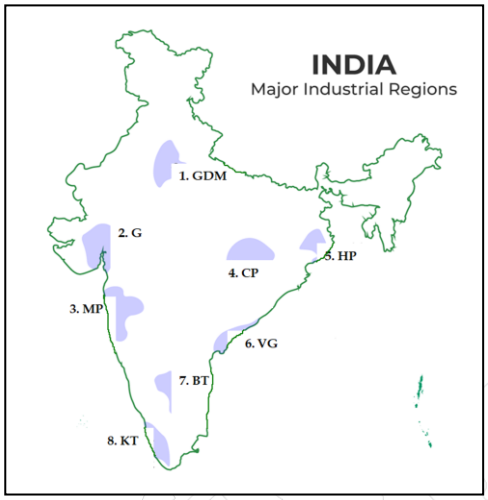
➢ Coal Bed Methane–

1. West Bengal (Raniganj)
2. Madhyapradesh
3. Jharkhand

INDUSTRIAL REGIONS OF INDIA

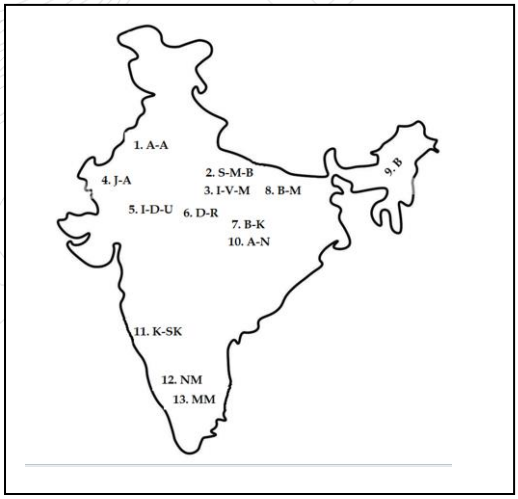
➢ Major Industrial Region (8)

1. Gurugram – Delhi – Meerut
2. Gujarat Region
3. Mumbai – Pune
4. Chotanagpur Region
5. Hugli Region
6. Vishakhapatanam – Guntur
7. Bengaluru – Tamilnadu
8. Kollam - Tiruvanantpuram



➢ Minor Industrial Regional (13)

1. Ambala – Amritsar
2. Saharanpur – Muzaffurnagar-Bijnor
3. Allahabad - Varanasi – Mirzapur
4. Jaipur – Ajmer
5. Indore – Dewas – Ujjain
6. Durg- Raipur
7. Bilaspur – Korba
8. Bhojpur –Munger
9. Brahmaputra valley
10. Aadilabad – Nizamabad
11. Kolhapur – South Kannada
12. Northern Malabar
13. Middle Malabar



▪ INDUSTRIAL DISTRICTS (15) –

U.P(6)	M.P (3)	Telangana	Rajasthan	Maharashtra	Bihar	W. Bengal	Odisha
Lucknow	Bhopal	Hyderabad	Kota	Nagpur	Purniya	Jalpaigudi	Katak
Gorakhpur	Jabalpur						
Agra	Gwaliar						
Aligarh							
Kanpur							
Baraley							

1. **Mumbai – Pune Industrial Region –**
   - **1854 AD. -** Cotton Textile Industry (Kavasji Dagar)
   - **1869 AD. -** Suez Canal (Growth of Mumbai Port)
   - **Energy –** H.E.P. In western ghats**.**
   - Mumbai high (Oil) + Nuclear Plant (1969 AD. Tarapur)
   - TATA Motors (Pune)
   - Mazagaon Dockyard lmt. (Ship Building)
   - **Major Centres**–

Mumbai	Pune
Thane	Trombay
Nashik	Solapur
Raigarh,	Ahmednagar
Satara	Sangli
Jalgaon	Kalayan
Kolaba	Pimpari
Manmad	

2. **Hugli Industrial Region –**
   b. Extenion – Bansberia – Birlanagar
   c. Indigo Processing + Tea Plantation + Jute resources+ Cheap Labour + Iron ore deposits of chotanagpur plateau + coalfields of damodar valley.
   d. British Capital Investment
   e. 1832 AD. – Serampur – Paper Mill
   f. 1832 AD. – Rishra – First Jute Mill
   g. Jute Industry – Howrah, Bhatapara
   h. Konnagar – Hindustan Motors Limited.
   i. Chittaranjan –Diesel engine factory
   j. Haldina – Refinary
   k. Due to decline of jute industry growth has slowed down.
   l. Major Centres -

Shivpur	Sodepur
Naihati	Budge Budge
Shyam Nagar	Belgurriah
Titagarh	Triveni
Guriyah	Belur

3. **Chotanagpur Region –**
   - Extended in Jharkhand, Odisha, West Bengal.
   - Known for heavy metallurgical industries.
   - Damodar Valley (west Bengal) – Coal
   - Jharkhand, Northern Odisha – Metallic & Non Metallic Minerals.

- **Steel Plants –** Jamshedpur , Bokaro (Jharkhand)
- Burnpur, Kulti, Durgapur (West Bengal)
- Rourkela (Odisha)
- **Major Center –**

  Ranchi
  Dhanbad
  Chaibasa
  Sindri (Fertilisers)
  hazaribag
  Asansol
  Dalmianagar (Cement)

4. **Bengaluru Tamilnadu Industrial Region –**
   - Developed in post independence period.
   - Till 1960AD., Industries were limited to Bengaluru, Salem &Madhurai districts but now spread over all the districts of Tamilnadu except Villupuram.
   - Pykara , hydroelectric plant (1932)
   - Cotton textile + loom industry.
   - Bengaluru – Heavy Engineering Industries.
   - Chennai – Refinery
   - Salem – Steel + Fertilizers.
   - Important Industries –
     - Automobile
     - Aircroft (H.A.L)
     - Telephones
     - Electronics (Bharat Electronics)
     - I.T
     - Machine Tools
5. **Gujarat Industrial Region -**
   - Ahmedabad, Vadodara, Valsad, Surat, Jamnagar.
   - 1860 AD – Start – Cotton Textile Industry
   - Refinery – Jamnagar (Largest), Koyali
   - Petrochemical Industries - Ankleshwar , Vadodara, Jamnagar.
   - Kandla Port
   - Porbandar – Cement
   - Major Centers –
     - Bharuch
     - Anand
     - Khera
     - Rajkot
     - Surendrangar

6. **Vishakhapatnam –Guntur Region**
   - Extened in – Vishakhapatnam, Kurnool, Prakasam
   - Port- Vishakhapatnam, Machilipatnam
   - Agriculture &Reserves of Minerals in Interlands
   - Coal – Godavari Basin
   - 1941 AD. – Vishakhapatnam – Steel (Bailadila (Chattishgarh)- Iron ore)
   - Guntur – Lead, Zinc Smelter
   - Major Centers –
     - Vijaywada
     - Vijaynagar
     - Rajamundry
     - Eluru
7. **Gurugram Delhi Meerut Region -**
   - Very fast growth in the recent past .
   - Light & market oriented industry.
   - Agra – Mathura – Glass & leather goods.
   - Mathura – Refinery + Petrochemical
   - Agricultural Instruments, Software, Fabrics.
   - **Major Centres –**
     - Ambala (Haryana)
     - Ghaziabad (Uttar Pradesh)
     - Modinagar (Uttar Pradesh)
8. **Kollam Tiruvantpuram –**
   - Extended in Kollam, Tiruvantpuram, Alwaya, Ernnakulam, Alappuzha[punalur
   - Base – Plantation Agriculture, hydropower.
   - Agriculture processing + Light & Market oriented industry
   - Kochi – Refinery

TRANSPORTATION

- Total road network of India – 62.16 Lakh Km. (2nd largest in the world after USA)
  Maximum – Maharashtra
  Minimum – Sikkim

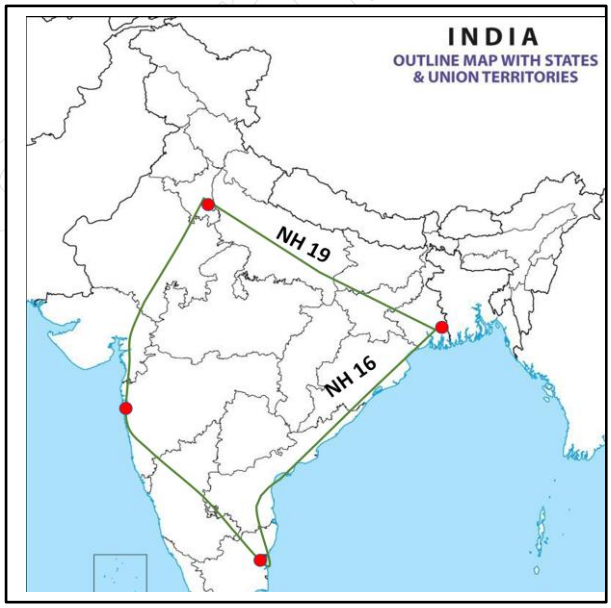
- **National Highway = 1.46** Lakh Km. (2.2%) Latest figures as of November 2023
  - **Maximum** – Maharashtra > Uttarpradesh > Rajasthan
  - **Minimum - Goa**
- **State Highway – 1.8 Lakh Km. (**2.7%)

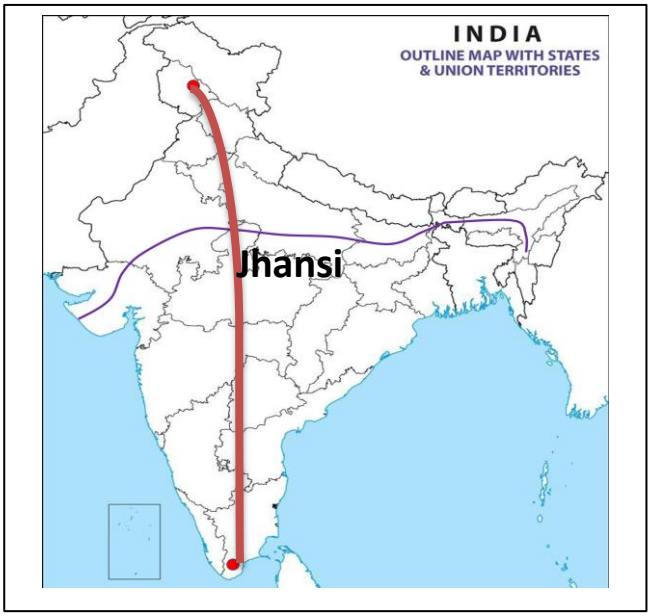
National Highway- 2.07%
State Highway – 3%
District Roads – 10.17%
Urban Roads - 8.76%
Village Road – 72.97%

- 1988 AD.– NHAI (National Highways Authority of India.
- 1998 AD. – NHDP (National Highway Development Programme)
- 2015 AD.– Bharatmala Project
  Ist Phase = 34,800 Km. road to be built by 2021-22
  (24,800 Km. new road + 10,000Km. Remaining Project of NHDP)

➢ Golden Quadrilateral –

- **1999 AD. –** Foundation laid
- **2012 AD.** – Completed
- **Total length –** 5846 Km.
- **13 States of India**





☑ North- South Corridor –(3,717 km.)

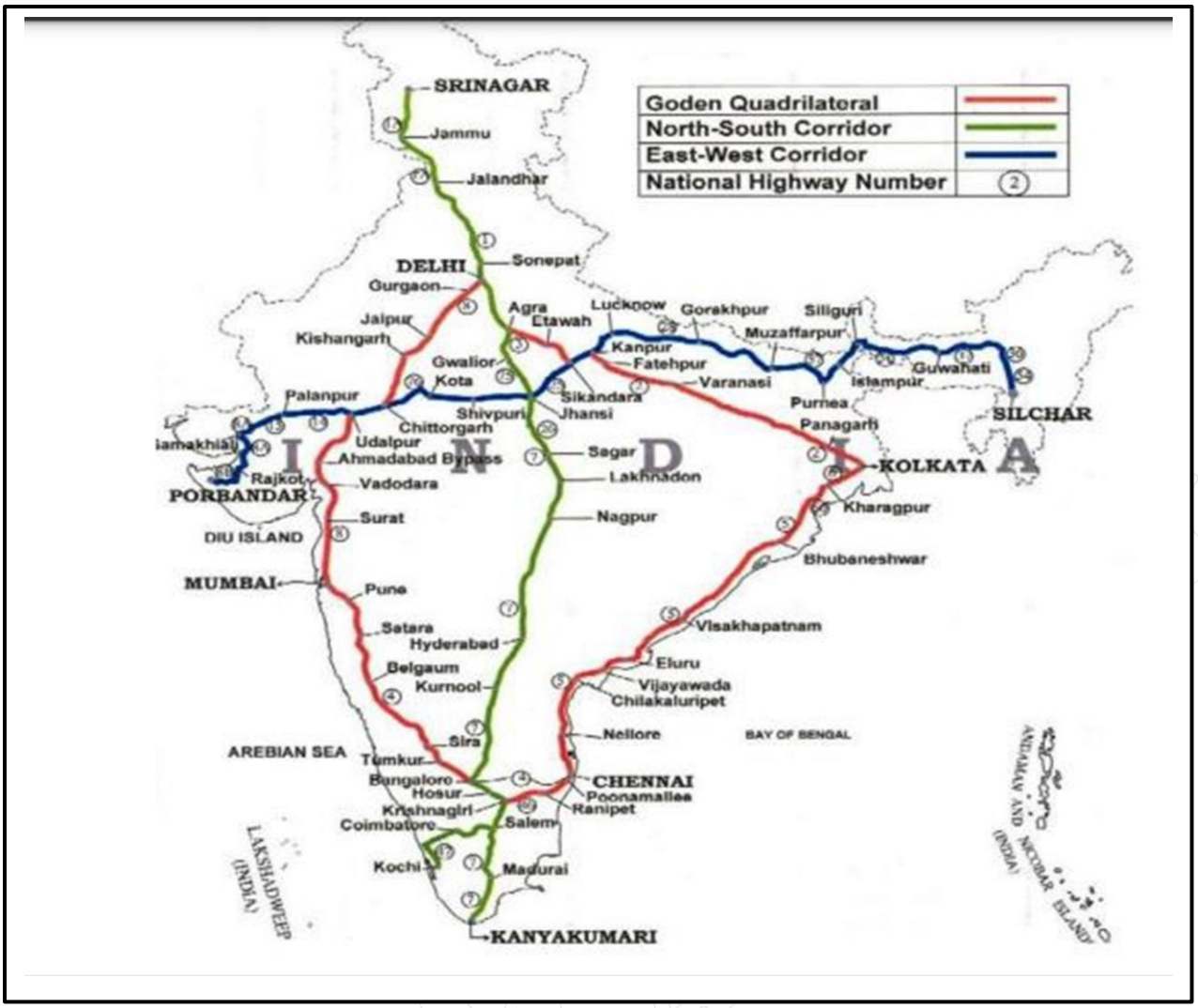
- NH-44
- Srinagar(Jammu & Kashmir) to Kanyakumari (Tamil Nadu)
- Passes through 13 states
  - ✓ Tamilnadu > Madhya Pradesh > Jammu-Kashmir..... Rajasthan > Delhi > Himachal Pradesh
  - ✓ Rajasthan (3rd Last) – 28 Km.
- **Major Cities–**

1. **Jammu &Kashmir –** Shrinagar, Anantnag, Udhampur, Jammu, Samba, Kathua.
2. **Himachal Pradesh**
3. **Punjab** – Pathankot, Jalandhar, Ludhiana, Rajpura.
4. **Haryana** – Faridabad, Palwal, Hodal, Ambala, Karnal, Panipat.
5. **Delhi**
6. **Rajasthan** – Dholpur
7. **Uttar Pradesh** – Mathura, Jhansi, Agra, Lalitpur
8. **Madhya Pradesh** – Morena, Gwalior , Sagar, Seoni
9. **Maharashtra** – Nagpur
10. **Telangana** – Nirmal, Adilabad, Nizamabad, Hyderabad
11. **Andhra Pradesh** – Kurnool, Gooty, Anantpur
12. **Karnataka** – Bangalore
13. **Tamil Nadu** – Krishnagiri, Salem, Madurai, Tirunelvali, Kanyakumari

☑ East-West Corridor –(4,112 km)

- Porbandar(Gujarat) – Silchar (Assam)
- NH-27
- 7 State :Gujarat> Assam > Rajasthan (640), West Bengal, Bihar, Uttar Pradesh Madhya Pradesh
- **Major Cities -**
  1. Gujarat – Porbandar, Rajkot, Morbi, Radhanpur, Palanpur
  2. Rajasthan – Udaipur, Chittorgarh, Bundi, Baran, Kota, Sirohi, Bhilawara
  3. Madhya Pradesh – Shivpuri, Ganj
  4. Uttar Pradesh– Jhansi, Kanpur, Lucknow, Faizabad, Ayodhya, Gorakhpur
  5. Bihar – Gopalganj, Muzzaffarpur, Darbhanga, Araria, Purnia
  6. West Bengal – Siliguri, Jalpaiguri, Salsabari
  7. Assam – Bongaigaon, Naugaon, Nalbari, Halflong, Dispur, Lumding, Silchar

Note – The North South &East West Corridor meet at Jhansi



Longest Highway – NH-27 (2020-21) (till 2020, NH-44)

Shortest Highway –

- NH-548 (Maharashtra – 5 Km.)
  (Kalamboli to NH-348)
- NH-118 (Jharkhand – 5 Km.)
  (Assambni to Jamshedpur)

Shortest Highway – NH 327 B

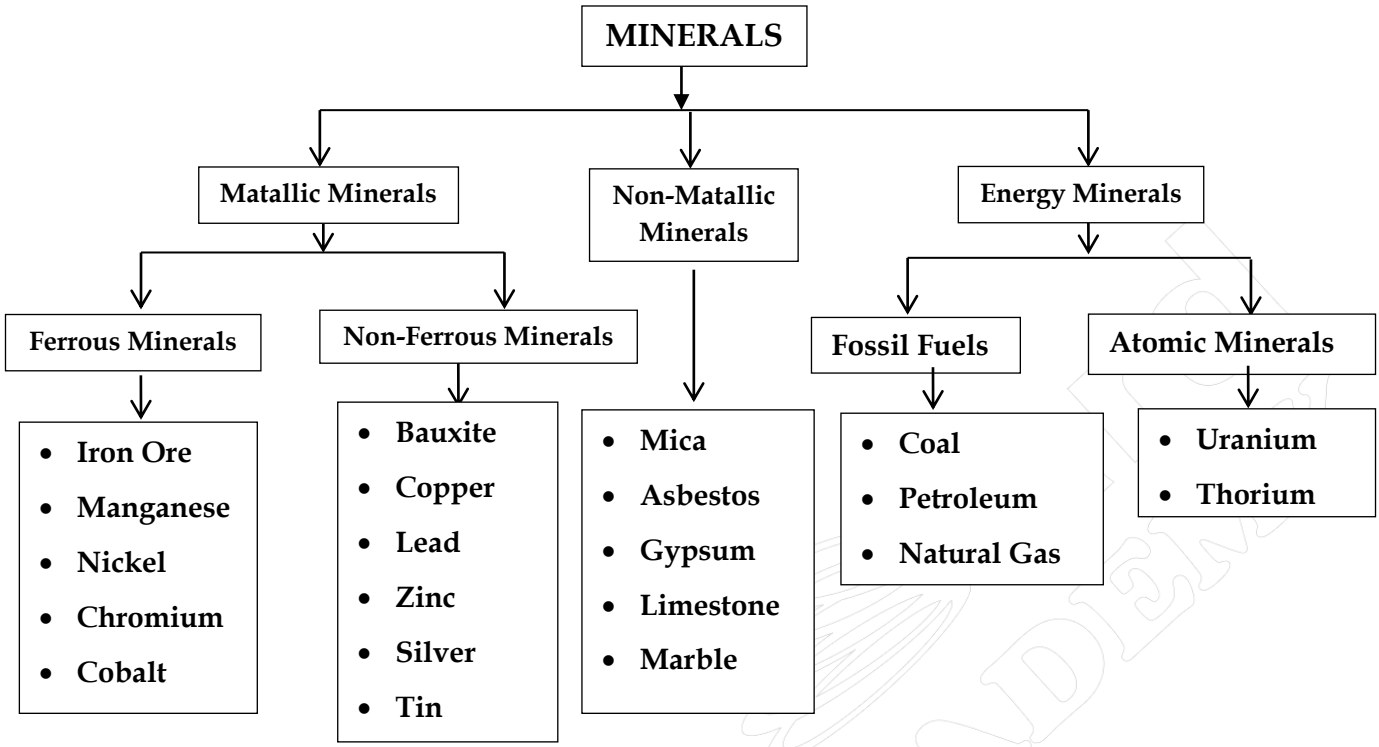
Panitanki in West Bengal towards Kakarbhitta in Nepal (1.2 km)

(Earlier – NH-47A/966B (Kerala) was shortest

☑ **Common Sections –**

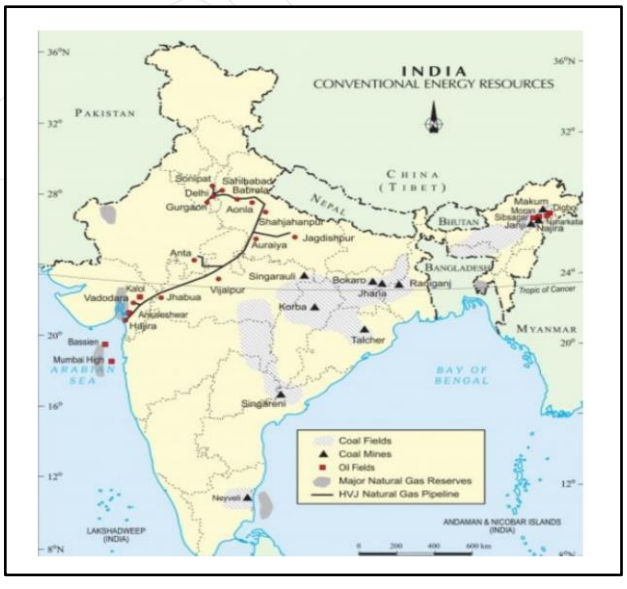
1. Delhi-Agra - Golden Quadrilateral + North South Corridor
2. Bangalore - Golden Quadrilateral + North South Corridor
3. Akbarpur- Kanpur - Golden Quadrilateral + East West Corridor
4. Udaipur –Chittorgarh - Golden Quadrilateral + East West Corridor

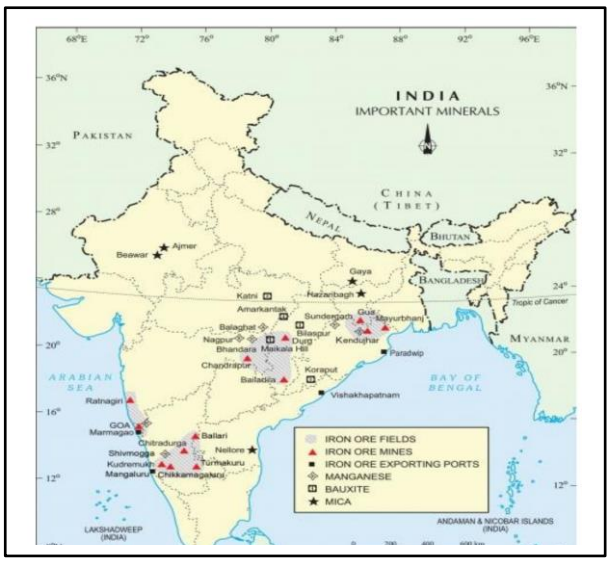
MINERALS



MINERALS IN INDIA

- Distribution of minerals is uneven in India.
- Most of the minerals are found in peninsular India.
- On both side of peninsular India petroleum is found in Gujarat and Assam in sedimentary rocks.
- Extraction of minerals is not possible in Himalayan mountain region.
- Largest mineral reserves are found in Jharkhand.
- Rajasthan is second most mineral rich state.





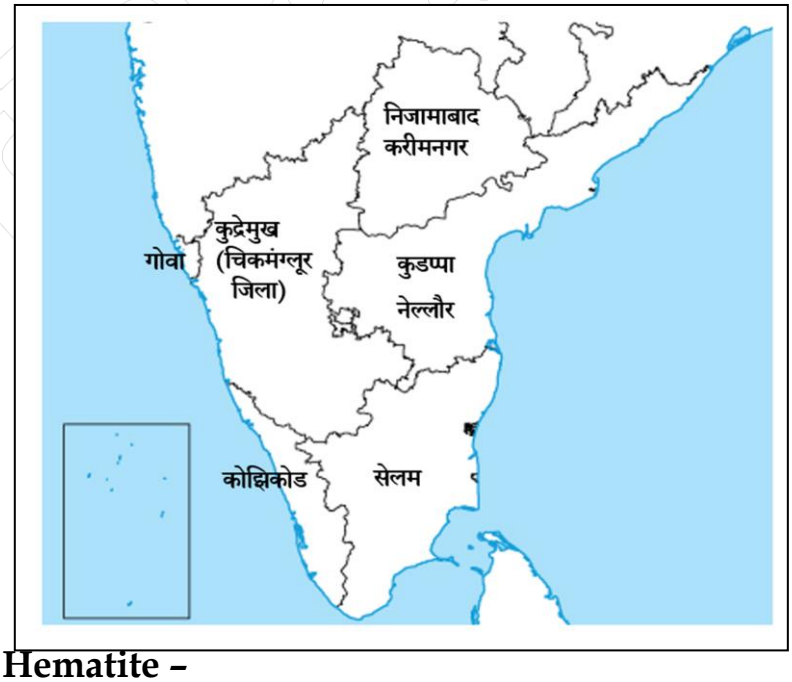
➢ Iron Ore –

High quality iron ore reserves are found in India in Dharwar rock system.

Types of iron ores on basis of amount of iron :-

Magnetite	Hematite	Limonite	Siderite
70% iron content	60% iron content	40 to 50% iron content	Iron content less than 40%
Silica and lime found as impurities.	Silica, Lime, oxides found as impurities.	Silica, lime, oxides and water as impurities.	Silica, Lime, Oxides, Water, Carbon
Magnetic properties are found.		Hydrated iron ore	Also known as **Iron Carbonate**
Colour- Black.	Colour- Red	Colour- Yellow	Colour- Brown
25% of tatal iron ore reserves of India are of magnetite	Around 75% of the total reserves of iron ore of hematite type.		
Mainly found in southern states of India And Rajasthan, Jharkhand.	Mainly found in Odisha, Jharkhand, Chhattisgarh, Karnataka, Maharashtra, Goa.	Mainly found in North India. Kangra Valley (Himachal Pradesh) Mirzapur (Uttarpradesh) Raniganj (West Bengal)	Found in North India

Distribution of Magnetic –



Distribution of Hematite –

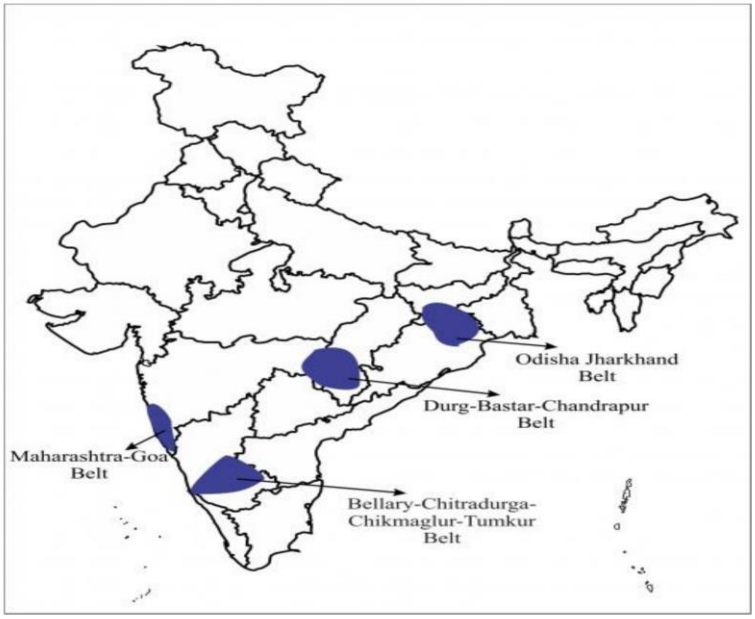
- **Odisa –**
  - Mayurbhanj – Gorumahisani, Badam Pahar, Sulepat

- Sundargarh – Bonai hills
- Keonjhar – Barbil Koira valley

- **Jharkhand –**
  - Singhbhum – Noamandi, Gua, Chiria, Barajmada
- **Chhattisgarh–**
  - Durg – Dalli Rajhara
  - Bastar –
  - Dantewada – Bailadila
- **Karnataka –**
  - Bellary – Sandur Hills
  - Chikmagalur – Kudremukh, Bababudan Hills, Kemmangundi
  - Chitradurg –
- **Maharashtra –**
  - Ratangiri
  - Chandrapur
- **Goa –**

☑ **Iron Belts**

1. Odisha-Jharkhand Belt
2. Durg-Baster-Chandrapur Belt
3. Maharashtra-Goa Belt
4. Bellary – Chitradurg, Tumakuru, Chikmagalur, Belt



☑ **Largest Reserves of Iron –**

- **Magnetite –**
  1. Karnataka

2. Andhra Pradesh
3. Rajasthan

- **Hematite –**
  1. Odisha
  2. Jharkhand
  3. Chhattisgarh

☑ **Largest Producer of Iron Ore -**

1. Odisha (60%)
2. Chhattisgarh
3. Karnataka
4. Jharkhand
5. Madhya Pradesh

➢ **Manganese–**

- Found in Gondite & Kodurite rock series of Archean group of rocks.

☑ **Ore**

1. Pyrolusite
2. Psilomelane
3. Cryptomelane
4. Manganite

Distribution –

- **Odisha-** Sundergarh, Keonjhar, Sambalpur, Ganjam, Koraput
- **Madhya Pradesh-** Balaghat, Jabalpur, Jhabua, Chhindwara
- **Gujarat-** Panchmahal
- **Maharashtra-** Nagpur, Ratnagiri, Bhandara
- **Goa**
- **Karnataka-** Bellary –Hospet, Shimoga
- **Andhra Pradesh-** Srikakulam, Visakhapatnam

Manganese –

- Largest Reserves –
  1. Odisha (44%)
  2. Karnataka (22%)
  3. Madhya Pradesh (12%)
- Largest Producer –
  1. Madhya Pradesh (33%)
  2. Maharashtra (25)
  3. Odisha (19%)

➢ **Bauxite :–**

- Odisha- Kalahandi, Koraput (Panchpatmali), Bolangir, Sundergarh, Sambalpur
- Jharkhand- Lohardaga, Latehar , Dumka, Gumla, Palamu

- Chattisgarh- Bastar, Bilaspur, Sarguja, Kabirdham
- Gujarat- Jamnagar, Kheda, Devbhoomi, Dwarka
- Andhra Pradesh- Vishakhapatnam, East Godavari
- **Largest Reserves –**
    1. Odisha (51%)
    2. Andhra Pradesh
    3. Gujarat
- **Largest Producer –**
    1. Odisha (71%)
    2. Gujarat
    3. Chattisgarh

➢ Mica :-

- Bihar – Munger, Gaya
- Jharkhand – Koderma (Hazaribag)
- Tamilnadu - Coimbatore
- Andhra Pradesh - Nellore
- Rajasthan - Bhilwara
- Odisha - Kalahandi, Koraput, Bolangir, Sundargarh
- **Largest Reserves** -
    1. Andhra Pradesh
    2. Rajasthan
    3. Odisha
    4. Maharashtra
- **Largest Producer –**
    1. Andhra Pradesh
    2. Rajasthan
    3. Jharkhand