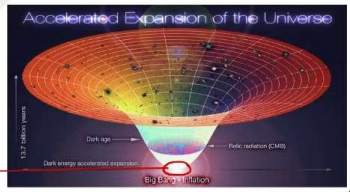
Solar System

Origin of UNIVERSE

Theories given:
- BIG BANG THEORY



Infinitely hot and dense single point → Exploded

CELESTIAL BODIES

- Luminous → Self-glowing
- Non-Luminous → Not self-glowing, but can reflect light from other sources
- Asteroids → small, rocky objects that orbit the Sun
- Meteoroids / Meteors → enters Earth's atmosphere and burn up in Mesosphere
- Comet → Small icy dirt balls that orbit the Sun, burn upon reaching Sun
- Stars
  - Constellation
    - Group of stars
    - Largest - Hydra
    - Urja Major - Sapta Rishi
  - Rigel - Brightest star in Orion Constellation
  - Sirius (Dog Star) - Brightest star in night sky
  - Closest star to Earth - Sun
    Distance: 150 million km (1.5 x 10^8 km)
  - Closest star to Sun - Proxima Centuri

Moon

- Earth's natural satellite
- Non-Luminous
- Radii - 1.74 x 10^6 km
- Time taken by light to reach Earth - 1.26sec.
- Distance b/w Earth & Moon = 3,84,000 km
- Earth's gravity = 6 times Moon's gravity
- Rotation = Revolution = 27.3 days (same)
- Only one side of the Moon is visible (far side)

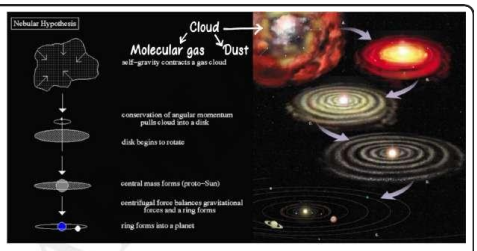
Sun

- only star in our solar system
- powerhouse of solar system
- Composed of Hydrogen (73%), Helium (25%) and other metals
- Carries 99% mass of our solar system
- Approx 109 times Earth size
- Light takes 8min. 30sec. to reach Earth
  Speed of light - 3 lakh km/sec
- Temperature at surface = 5800 K/5600 C
- Temperature at centre = 15.7 million K
- Outer layer - CORONA

Origin of SOLAR SYSTEM

Nebular Theory -

1755 - by Immanuel Kant
1796 - modified by Laplace

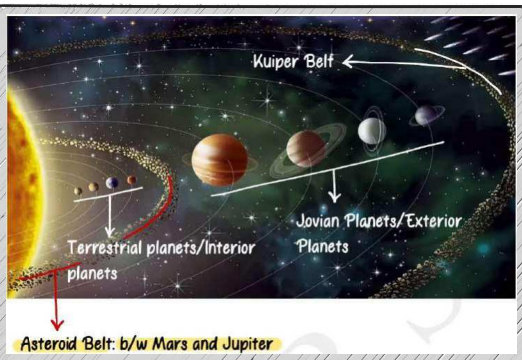


$H_2 + He \rightarrow$ Nuclear Fusion

$H + H \rightarrow He \rightarrow$ Formation of Sun (mostly made of H_2 and He

$H_2 \rightarrow 70\%$

Planets



Jupiter > Saturn > Uranus > Neptune > Earth > Venus > Mars > Mercury

Mercury

- Closest planet to Sun
- Smallest planet in solar system
- Diameter: 4900 km
- Fastest planet takes 88 days to complete revolution
- Planet with no satellite

Venus

- Hottest planet in solar system
- Brightest planet in Solar System known as - Evening Star & Morning Star
- No satellite
- known as - Earth's Twin (similar mass & size)
- Rotates clockwise

Earth

- only planet to give support to life
- known as - Blue Planet (70% water)
- one satellite - Moon
- Densest in the entire solar system

Mars

- Known as - Red Planet (Iron Oxide (FeO))
- 2nd smallest planet
- Two satellite - Phobos & Deimos
- Largest Volcano & tallest mountain - Olympus Mons

Jupiter

- Largest planet shortest rotation (10 hours)
- Atmosphere has Hydrogen, Helium, other gases
- Third brightest after Moon & Venus
- Largest satellites - Lo, Europa, Callisto & Ganymede (largest among all) (all discovered by Galileo)
- Has unclear ring around it

Saturn

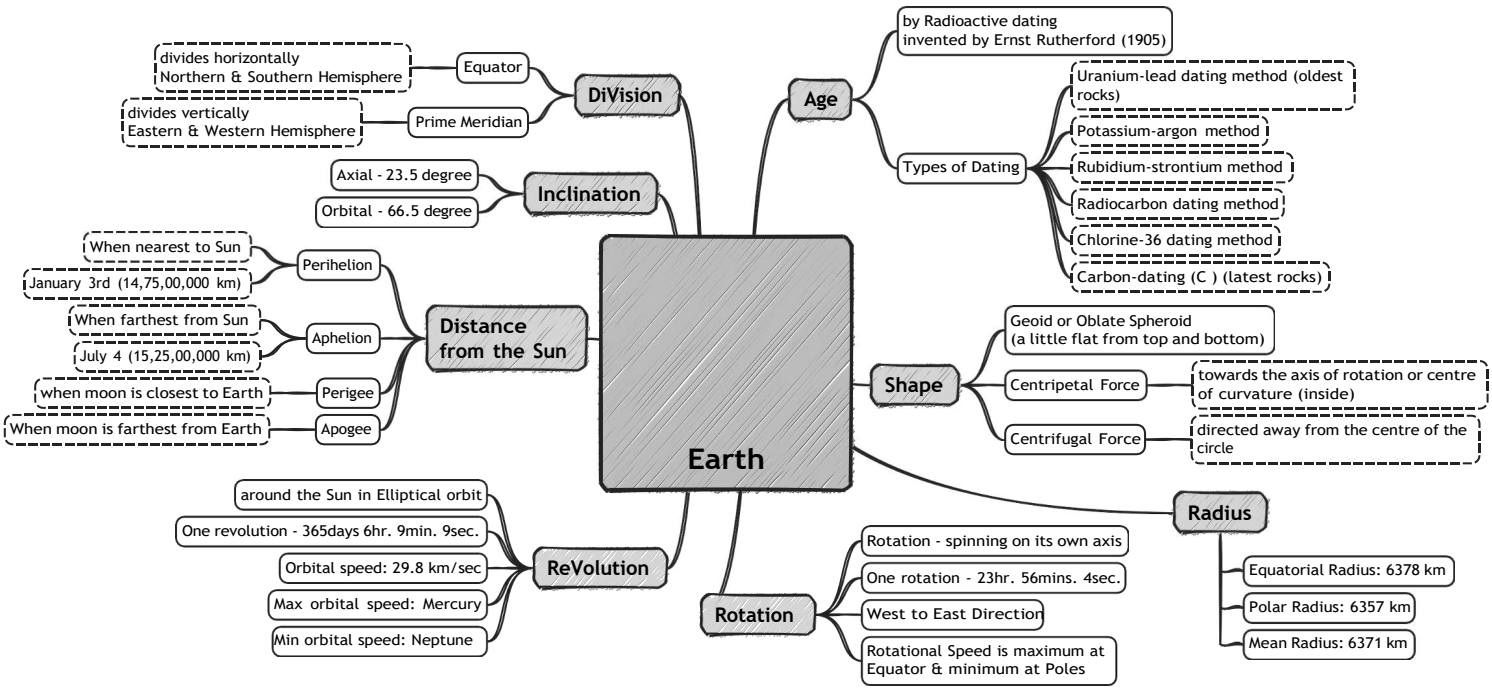
- Second largest planet
- Has bright & concentric rings made of tiny rocks, gas, dust, ice
- least dense planet
- Largest satellite - Titan
- 1655 - Huygenes (discover Saturn's rings)
- 1675 - Cassini (discovered Cassini divisions)

Uranus

- Green Planet (Methane
- Discovered by William Herschel in 1781
- Known as - Ice Giant
- Atmosphere has Hydrogen, Helium, Water, Ammonia, Methane
- Coldest planet
- tilted 98 degree at its axis known as - Rolling/Lopsided Planet
- Rotates clockwise like Venus

Neptune

- Farthest planet
- known as - Ice Giant
- Atmosphere has Hydrogen, Helium
- Bluish in colour due to Methane
- Discovered by Johann Galle and Urbain Le Verrier in 1846 (only planet found by Mathematical Predictions)
- Has 14 satellites famous moon - Triton


Earth
DiVision
Equator
divides horizontally
Northern & Southern Hemisphere
Prime Meridian
divides vertically
Eastern & Western Hemisphere
Inclination
Axial - 23.5 degree
Orbital - 66.5 degree
Distance from the Sun
Perihelion
When nearest to Sun
January 3rd (14,75,00,000 km)
Aphelion
When farthest from Sun
July 4 (15,25,00,000 km)
Perigee
when moon is closest to Earth
Apogee
When moon is farthest from Earth
ReVolution
around the Sun in Elliptical orbit
One revolution - 365days 6hr. 9min. 9sec.
Orbital speed: 29.8 km/sec
Max orbital speed: Mercury
Min orbital speed: Neptune
Age
by Radioactive dating
invented by Ernst Rutherford (1905)
Types of Dating
Uranium-lead dating method (oldest rocks)
Potassium-argon method
Rubidium-strontium method
Radiocarbon dating method
Chlorine-36 dating method
Carbon-dating (C) (latest rocks)
Shape
Geoid or Oblate Spheroid
(a little flat from top and bottom)
Centripetal Force
towards the axis of rotation or centre of curvature (inside)
Centrifugal Force
directed away from the centre of the circle
Rotation
Rotation - spinning on its own axis
One rotation - 23hr. 56mins. 4sec.
West to East Direction
Rotational Speed is maximum at Equator & minimum at Poles
Radius
Equatorial Radius: 6378 km
Polar Radius: 6357 km
Mean Radius: 6371 km

Latitude & Longitude

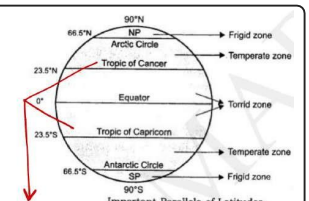
Longitude

- Imaginary vertical lines form North to South
- Angular Distance of a plane from Prime Meridian
- Distance from each longitude varies from poles towards equator
- Least distance at poles - 0 km
  Maximum distance at equator - 111.32 km
- Total longitudes: 360
- All longitudes divide Earth into 2 equal parts
- Prime Meridian - 0 degree (passes from Greenwich, London)
  - Passes through 8 countries - UK, France, Spain, Algeria, Mali, Burkina Faso, Togo & Ghana
- International Date Line - 180 degree (Zig-Zag line)

Latitude

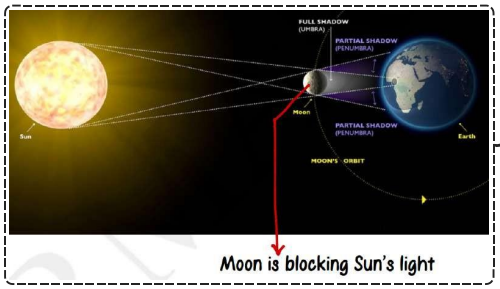
- Imaginary horizontal lines from East to West
- Angular Distance of a place from the equator
- Distance b/w each latitude is same
- 1 degree of latitude = 111 km (approx)
- Total latitudes - 181

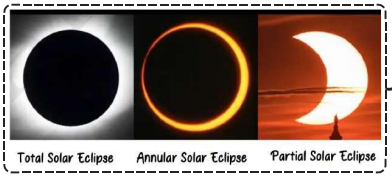
Largest - Equator
Smallest - Poles
(North & South)

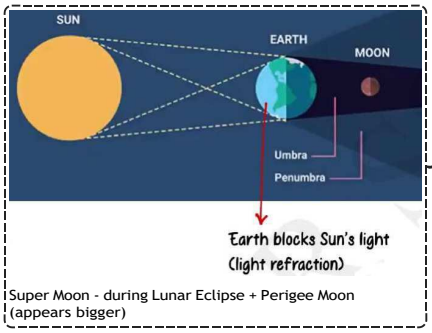


Eclipse

- Lunar
- Solar

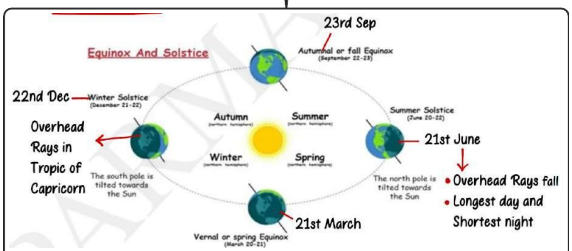






Super Moon - during Lunar Eclipse + Perigee Moon (appears bigger)

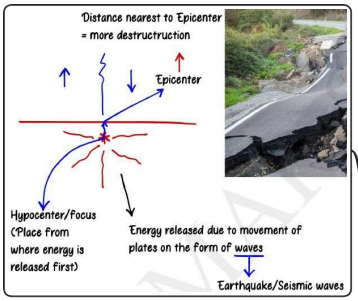
Solstice & Equinox



Summer Solstice - continuous Sun rays on North Pole for 6 months
Winter Solstice - continuous Sun rays on South Pole for 6 months
Equinox - direct Sun rays fall on the Equator

Earth's Interior

Earthquake



- Seismograph: an instrument that records earthquake waves
- Waves
  - Body Waves
    - First to reach on surface
    - 7–8 km/sec
    - P waves
      - Travels fastest
      - Longitudinal
    - S waves
      - Transverse
      - Can travel only in Solid medium
    - Speed ratio:
      - Solid > Liquid > Gas (through all mediums)
      - They resemble Sound Waves
  - Rocks
  - Surface Waves/Love waves/L-waves
    - 4–6 km/sec
    - causes more destruction
  - Rayleigh waves

- Scales to measure
  - Richter Scale
    - measure magnitude
    - Magnitude - 0-10
    - It is a limitless scale
  - Mercalli Scale
    - measure intensity
    - Magnitude - 1-11

- Method
  - Temperature - indirect source
  - Volcanoes and rock - direct source
  - Meteorites - indirect source
  - Earthquakes - indirect source

Crust

- made of Silica & Aluminium layer (SiAl)
- Thickness - 5-70 km
- Continental Crust
  - land part of crust
  - 30 km (thick/lighter)
  - made of Granitic rock
- Oceanic Crust
  - water part of crust
  - 5 km (thick/denser)
  - made of Basaltic rock

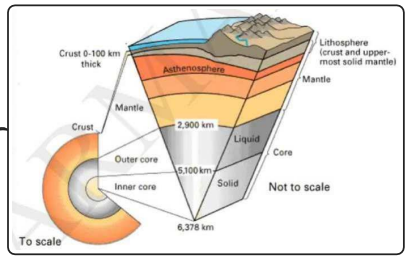
Mantle

- made of Silica & Magnesium (SiMa)
- Thickness - 2900 km
- Top layer - Solid form
- division
  - Upper Mantle
  - Lower Mantle
- Asthenosphere
  - semi-molten form

Core

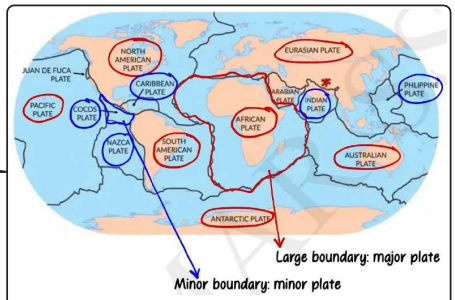
- made of Nickel & Iron (NiFe)
- division
  - Inner Core
    - Solid form - 2200 km
  - Outer Core
    - Liquid form - 1300 km
    (shows magnetic properties)

Discontinuity



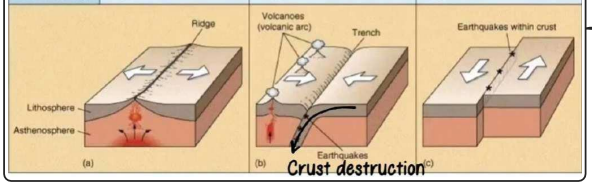
S. No	Discontinuity	Layers	Depth
1.	Conrad	Outer and Inner Crust	45 km
2.	Moho	Crust and Mantle	100 km
		Inner Crust and Outer Mantle	
		Inner Crust and Asthenosphere	
3.	Repiti	Outer Mantle and Inner Mantle	700 km
4.	Gutenberg–Weichart	Mantle and Core	2900 km
		Inner Mantle and Outer Core	
5.	Lehmann	Outer Core and Inner Core	5200 km

Tectonic plates



7 Major + few minor plates
Major plates marked in red & Minor plates marked in blue

Type of Margin	Divergent	Convergent	Transform
Motion	Spreading	Subduction	Lateral sliding
Effect	Constructive (oceanic lithosphere created)	Destructive (oceanic lithosphere destroyed)	Conservative (lithosphere neither created or destroyed)
Topography	Ridge/Rift	Trench	No major effect
Volcanic activity?	Yes	Yes	No



Lithosphere

- Crust + Upper solid part of Mantle
- Thickness - 10-200 km
- Asthenosphere is not part of Lithosphere

Continents & oceans

Corals

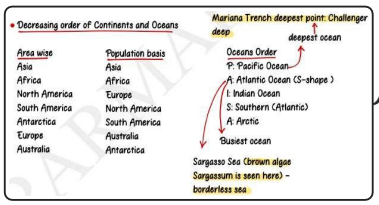
- when water is too warm, corals will expel the algae (Zooxanthellae) living in their tissues causing the corals to turn completely white
- **Coral bleaching**
- sea organisms, known as Rainforest of Sea
- Exists in symbiotic relationship with Zooxanthellae algae
- exists in colony
- Favourable conditions
  - Saline water (cannot survive in fresh water)
  - Sunlight
  - Clear water
  - Temperature (between 30-35 C)
- Barrier Reef
  - Great Barrier Reef, Australia (largest)

Rock

- Igneous Rock
  - formed when magma cools and solidifies
  - Types
    - Intrusive - solidifies inside
    - Extrusive - solidifies outside
- Sedimentary Rock
  - Sediments are broken, transported & deposited
  - They exists in layers/strata
  - In sedimentary compaction takes place - Lithifaction
  - Fossils are found in it
  - Types
    - Formed mechanically eg: Sandstone, limestone and shale
    - Formed organically eg: chalk, limestone, coal
    - Formed chemically eg: Limestone, halite
- Metamorphic RocK
  - formed by recrystallisation & reorganisation of materials within the original rocks
  - Igneous + Sedimentray (in Pressure, Volume & Temperature)
  - Types
    - Thermal — formed by sudden temperature change
    - Dynamic — formed without any chemical change

Continents

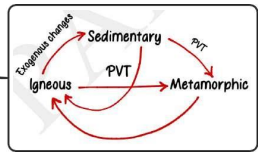
- Continental drift
  - by Alfred Wegener, in 1912
  - due to Tidal force & Polar fleeing force
  - due to development of convection cells
- Evidences
  - Jig Saw fit
  - Fossils deposits
  - Placer deposits



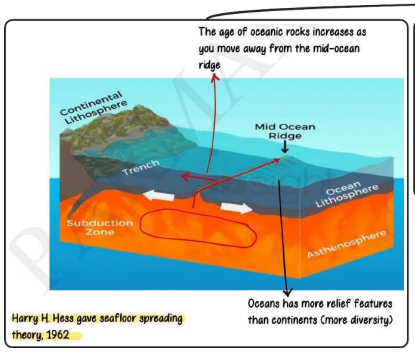
Volcano

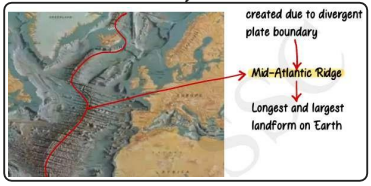
- most viscous lava — Composite
- low viscosity lava — Shield
- most explosive lava collapses on itself — Caldera
- Cinder

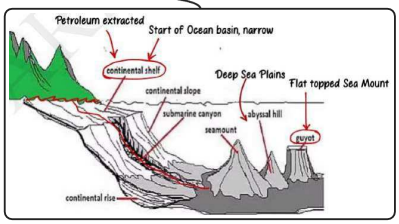
Rock Cycle



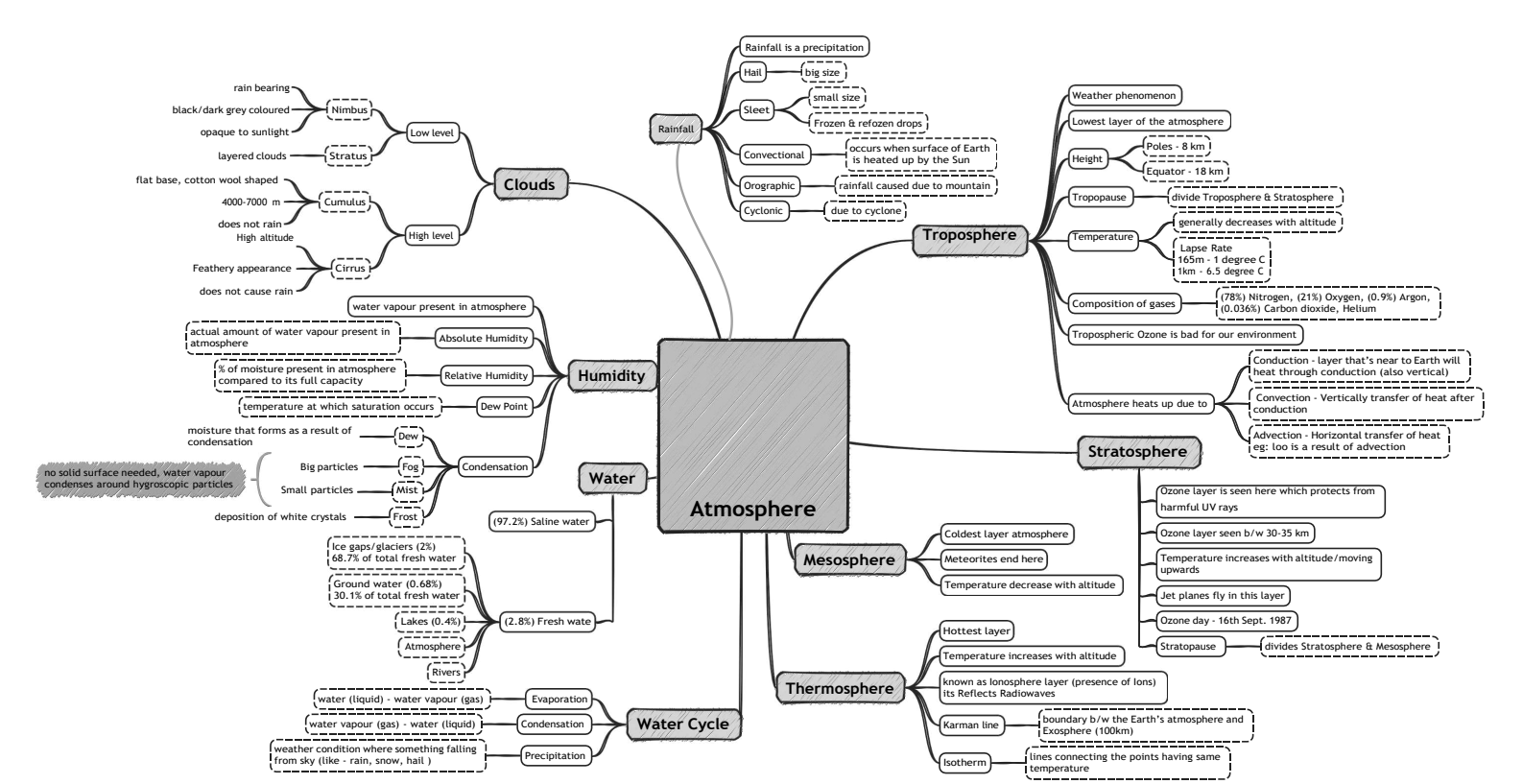
Oceans







- Minor relief feature: Atoll, sea mount, guyot


Atmosphere
Troposphere
Weather phenomenon
Lowest layer of the atmosphere
Height
Poles - 8 km
Equator - 18 km
Tropopause
divide Troposphere & Stratosphere
Temperature
generally decreases with altitude
Lapse Rate
165m - 1 degree C
1km - 6.5 degree C
Composition of gases
(78%) Nitrogen, (21%) Oxygen, (0.9%) Argon, (0.036%) Carbon dioxide, Helium
Tropospheric Ozone is bad for our environment
Atmosphere heats up due to
Conduction - layer that's near to Earth will heat through conduction (also vertical)
Convection - Vertically transfer of heat after conduction
Advection - Horizontal transfer of heat eg: loo is a result of advection
Stratosphere
Ozone layer is seen here which protects from harmful UV rays
Ozone layer seen b/w 30-35 km
Temperature increases with altitude/moving upwards
Jet planes fly in this layer
Ozone day - 16th Sept. 1987
Stratopause
divides Stratosphere & Mesosphere
Mesosphere
Coldest layer atmosphere
Meteorites end here
Temperature decrease with altitude
Thermosphere
Hottest layer
Temperature increases with altitude
known as Ionosphere layer (presence of Ions) its Reflects Radiowaves
Karman line
boundary b/w the Earth's atmosphere and Exosphere (100km)
Isotherm
lines connecting the points having same temperature
Water
(97.2%) Saline water
(2.8%) Fresh wate
Ice gaps/glaciers (2%) 68.7% of total fresh water
Ground water (0.68%) 30.1% of total fresh water
Lakes (0.4%)
Atmosphere
Rivers
Water Cycle
Evaporation
water (liquid) - water vapour (gas)
Condensation
water vapour (gas) - water (liquid)
Precipitation
weather condition where something falling from sky (like - rain, snow, hail)
Humidity
water vapour present in atmosphere
Absolute Humidity
actual amount of water vapour present in atmosphere
Relative Humidity
% of moisture present in atmosphere compared to its full capacity
Dew Point
temperature at which saturation occurs
Condensation
moisture that forms as a result of condensation
Dew
Fog
Big particles
Mist
Small particles
Frost
deposition of white crystals
no solid surface needed, water vapour condenses around hygroscopic particles
Clouds
Low level
Nimbus
rain bearing
black/dark grey coloured
Stratus
opaque to sunlight
layered clouds
High level
Cumulus
flat base, cotton wool shaped
4000-7000 m
does not rain
Cirrus
High altitude
Feathery appearance
does not cause rain
Rainfall
Rainfall is a precipitation
Hail
big size
Sleet
small size
Frozen & refozen drops
Convectional
occurs when surface of Earth is heated up by the Sun
Orographic
rainfall caused due to mountain
Cyclonic
due to cyclone

Geomorphology

Geomorphic process
- Changes in the configuration of Earth
- Land build/elevate — Endogenic forces
- Erosion — Exogenic forces
- If Endogenic > Exogenic — Himalayas continuously increasing
- If Exogenic > Endogenic — Aravalis continuously decreasing

Endogenic forces
- pressure within the earth, also known as internal forces
- Energy from
  - Radioactive decay
  - Primordial heat
- Changes
  - Diastrophism
    - kind of process that move/elevate/build up the process of Earth
    - Orogenic — process through which mountains are built
    - Epeirogenic — other changes except mountain build up
    - Earthquake — shaking of Earth
    - Plate tectonics
  - Volcano — openings/vents where lava or magma erupts

Exogenic forces
- Exogenic Processes — due to Exogenic forces, causes wearing and tearing
- Gradation — wearing down of relief features of Earth
- Collectively Exogenic forces are called Denudation
- Exogenic Agents — running water, wind, waves, ground water
- Ultimately sources of energy for all exogenic forces - Sun

Weathering
- Action of elements of weather and climate over Earth Materials
- In-situ process
- Types
  - Chemical — erosion or disintegration of rocks, building materials, etc.
  - Physical/Mechanical — disintegration without chemical change
  - Biological — caused by movement of plants and animals
- Effect — Exfoliation — process when large, curved plates or slabs of rocks are stripped away from the outer surface of a rock mass

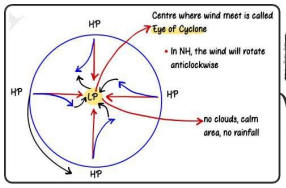
Mass Movement
- weathering is not a pre-requisite for Mass Movement, it aids the Mass Movement
- Main force involved - Gravity
- Creep — slow downslope movement of particles
- Solifluction — slow progressive movement of mass down a slope
- Types
  - Landslide
  - Avalanche
  - Earthflow
  - Mud flow

Landforms
- by Groundwater
  - usually seen in places where rock is soft (Dolomite/Limestone)
  - Dolomite/Limestone → Chemical weathering
  - Karst Topography (in groundwater) → Found in Karst region in Mediterranean Sea where rocks are made of Limestone and Dolomite
  - In India, mainly in South India
  - Erosional: pools, sink holes, dolines, lapies, uvalas, limestones
  - Depositional: Stalactite, Stalagmite, Pillars
- by Sea Waves
  - Erosional: cliff, caves, stack , arch
  - Depositional: beaches, dunes, bars, barrier, spits
- by Wind
  - Erosional: Pediplain, Playas, Mushroom rock, Pedestal rocks
  - Depositional: Sand Dunes (Barchan/Seif)
- by River
  - Youthful stage: river flows in speed → Erosional Feature dominates
  - Mature stage
  - Old stage → Depositional feature dominates
  - Youth stage - V-shaped valley, Gorges, Canyon, Waterfalls, Rapids, entrenched meander
    Mature stage - Meanders
    Old - Ox-bow lakes, delta, levees, flood plain
  - Erosional features: V-shaped valley, Gorges, Canyon, Waterfalls, Pothole, Plunge pools, River terraces
  - Depositional features: flood plains, Delta, ox bow lakes, meanders, Alluvial fans
- by Glacier
  - Erosional: Cirque, Ridges/Arête, Horn, Hanging Valley, Glacial Valley
  - Depositional: Moraine, Eskers, Drumlins, Outwash plains

Wind

Pressure difference causes wind

- Warm air rises - Low pressure
- Cold air sink - High pressure
- High pressure - Low pressure



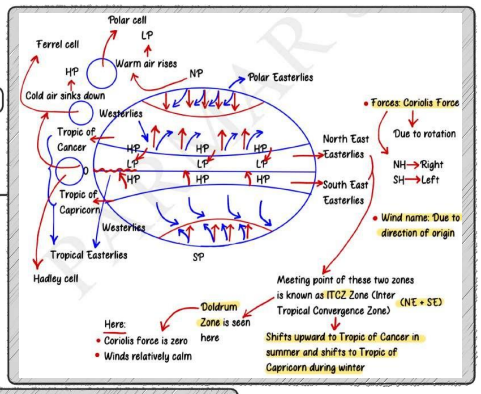
Cyclone

Favourable conditions:

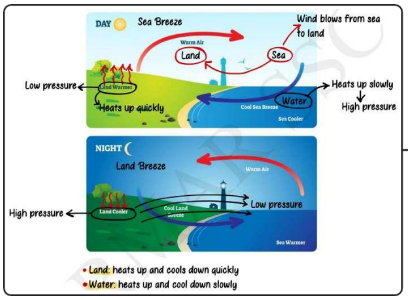
- Large Sea Surface temperature
- Coriolis force
- Small variation in vertical wind speed
- Pre-existing weak LP area

During cyclone, Cumulonimbus clouds are formed & causes heavy rain & thunderstorms

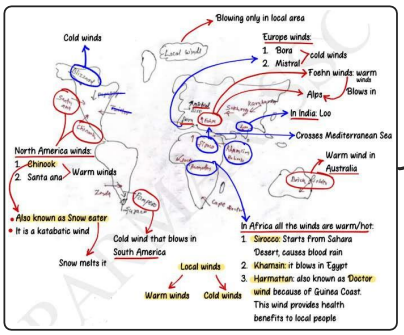
Cyclone at High Latitudes are caused due to Frontogenesis



Land & Sea breeze



Local wind

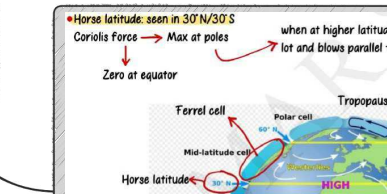


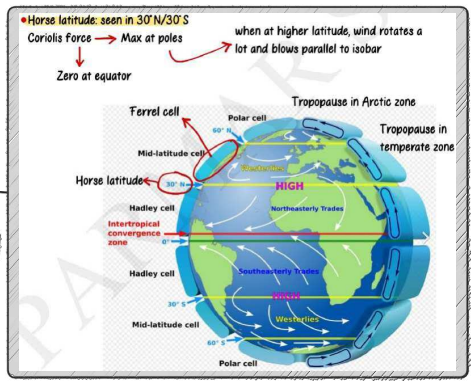
Geostrophic winds

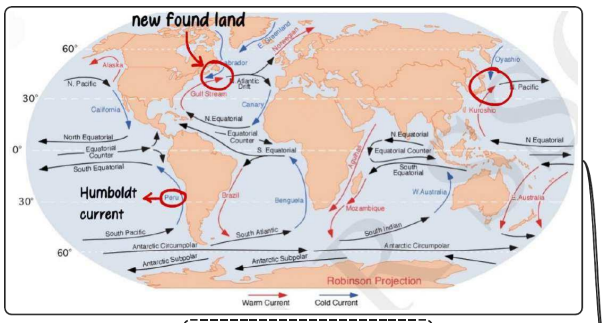
winds that blow parallel to isobars

Isobars

line connecting the points having same pressure

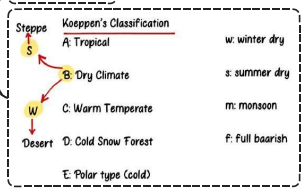


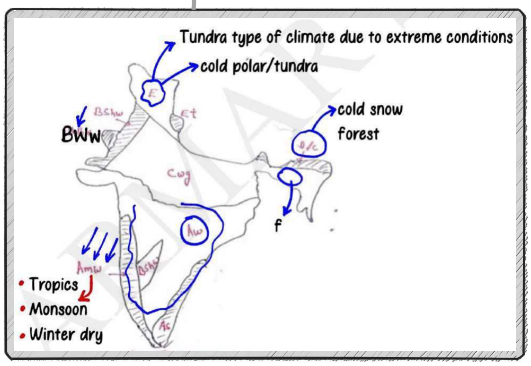




- Ocean Currents
  - Cold Ocean Current
    - Benguela, Peru, Greenland, Oyashio, Labrador, Falkland, West Australian Drift, Canary & California
  - Reasons of origination
    - Heating by Sun
    - Wind
    - Density different
    - Coriolis force
    - Coastline of continents
  - Types
    - Surface - 10%
    - Deep Sea - 90%
  - Effects
    - Warm ocean current + cold ocean current = Best fishing zones
      - Creates foggy conditions: worse for Harbouring
    - Cold ocean current - creates desert
      - Max. desert seen on Western side of the continent

- Climate
  - Weather
    - short term
  - Climate
    - long term (Roughly 30 years data is taken)
  - Empirical Climatic Classification
    - by Koeppen, in 1918





India

Coastal Boundary

- 9 States: Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, West Bengal
- 4 UTs: Andaman & Nicobar, Lakshadweep, Daman & Diu, Puducherry
- Longest coastline
  - UTs - Andaman and Nicobar (1912 km)
  - State - Gujarat (1214 km)
- Shortest coastline: Goa
- Total: 7516.6 km
- Mainland: 6100 km

Boundries

- Bangladesh
  - 4,096.7 km (longest)
  - Border - Radcliffe Line
  - Meghalaya, Assam, Mizoram, Tripura & West Bengal
  - BSF
- China
  - 3,488 km
  - Ladakh, Himachal Pradesh, Uttarakhand, Sikkim & Arunachal Pradesh
  - 

  - ITBP (under Ministry of Home Affairs)
- Pakistan
  - 3,323 km
  - Gujarat, Rajasthan & Punjab
  - BSF
- Nepal
  - 1,751 km
  - Sikkim, Uttar Pradesh, Bihar, West Bengal & Uttarakhand
  - SSB (under Ministry of Home Affairs)
- Myanmar
  - 1,643 km
  - Arunachal, Nagaland, Manipur & Mizoram
- Bhutan
  - 699 km
  - West Bengal, Assam, Sikkim & Arunachal Pradesh
  - SSB (under Ministry of Home Affairs)
- Afghanistan
  - 106 km (least)
  - Ladakh
- Sri Lanka
  - by Palk Strait

Facts

- India was part of Gondwanaland
- India in terms of area is in the 7th position
- India occupies 2.4% of total world's land area
- Indian Population is 17% world's total population

Facts

- State sharing boundary with maximum no. of state: Uttar Pradesh = 8 states + 1 UT (Delhi)
- State sharing boundary with least no. of states
  - Sikkim (West Bengal)
  - Meghalaya (Assam)
- States sharing boundary with 3 countries
  - Sikkim (Nepal, Bhutan, China)
  - Arunachal (Bhutan, China, Myanmar)
  - West Bengal (Nepal, Bhutan, Bangladesh)
- 1 UT that shares boundary with 3 countries: Ladakh (Pakistan, China, Afghanistan)

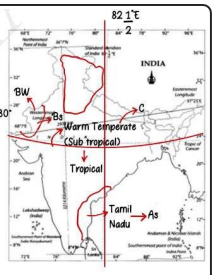
Expention

Extremes	State	Point
Northernmost:	Himachal Pradesh	Indira Col
Southernmost:	Tamil Nadu	Kanyakumari/Cape Camorin/ Indira Point
Easternmost:	Arunachal Pradesh	Kibithu
Westernmost:	Gujarat	Guhar Moti/Sir Creek

- India has total state: 28
- Total UTs: 8
- North-South extent: 3214 km
- West-East: 2933 km
- Latitudinal extent: 8°4'-37°6' → Difference: ~30°
- Longitudinal extent: 68°7'-97°25' → Difference: ~30°
- Difference b/w every latitude is same: 111 km
- Difference b/w every longitude is varying
  - Max. at the equator
  - Zero at the poles

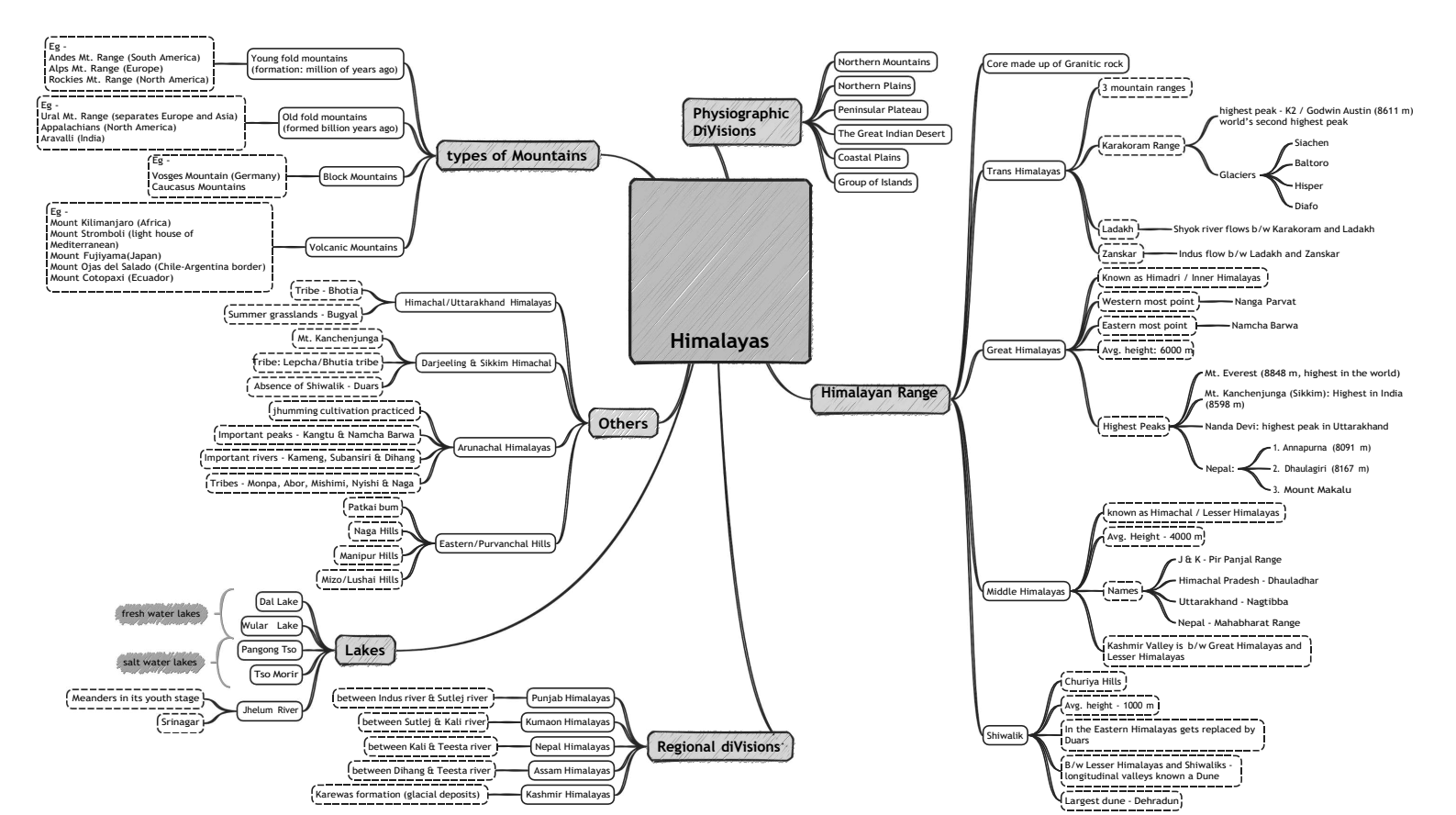
Time difference between Gujarat and Arunachal: 30°
= 30 x 4
= 120 mins = 2 hrs

1° = 4 mins
15° = 1 hr



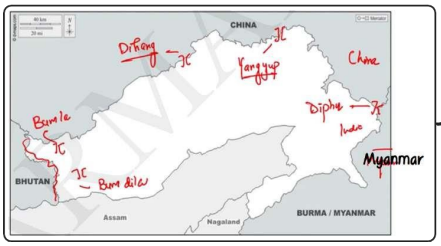
- 15° = 1 hr
- 7.5° = 30 mins
- Total time: 24 hrs
- Indian Standard Time (IST): 82.5° E
- IST passes through: 5 states
  - M: Madhya Pradesh
  - O: Odisha
  - U: Uttar Pradesh (Naini, Mirzapur)
  - C: Chattisgarh
  - A: Andhra Pradesh

- Tropic of Cancer
  - Pass through 8 states
  - Gujarat, Rajasthan, Madhya Pradesh, Chattisgarh, Jharkhand, West Bengal, Tripura & Mizoram
  - capital cities of these 8 States are above - Jaipur, Rajasthan Aizawl, Mizoram Agartal,aTripura

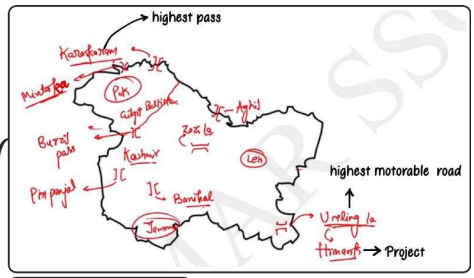

Himalayas
types of Mountains
Young fold mountains (formation: million of years ago)
Eg - Andes Mt. Range (South America) Alps Mt. Range (Europe) Rockies Mt. Range (North America)
Old fold mountains (formed billion years ago)
Eg - Ural Mt. Range (separates Europe and Asia) Appalachians (North America) Aravalli (India)
Block Mountains
Eg - Vosges Mountain (Germany) Caucasus Mountains
Volcanic Mountains
Eg - Mount Kilimanjaro (Africa) Mount Stromboli (light house of Mediterranean) Mount Fujiyama(Japan) Mount Ojas del Salado (Chile-Argentina border) Mount Cotopaxi (Ecuador)
Physiographic DiVisions
Northern Mountains
Northern Plains
Peninsular Plateau
The Great Indian Desert
Coastal Plains
Group of Islands
Himalayan Range
Core made up of Granitic rock
Trans Himalayas
3 mountain ranges
Karakoram Range
highest peak - K2 / Godwin Austin (8611 m) world's second highest peak
Glaciers
Siachen
Baltoro
Hisper
Diafo
Ladakh
Shyok river flows b/w Karakoram and Ladakh
Zanskar
Indus flow b/w Ladakh and Zanskar
Great Himalayas
Known as Himadri / Inner Himalayas
Western most point
Nanga Parvat
Eastern most point
Namcha Barwa
Avg. height: 6000 m
Highest Peaks
Mt. Everest (8848 m, highest in the world)
Mt. Kanchenjunga (Sikkim): Highest in India (8598 m)
Nanda Devi: highest peak in Uttarakhand
Nepal:
1. Annapurna (8091 m)
2. Dhaulagiri (8167 m)
3. Mount Makalu
Middle Himalayas
known as Himachal / Lesser Himalayas
Avg. Height - 4000 m
Names
J & K - Pir Panjal Range
Himachal Pradesh - Dhauladhar
Uttarakhand - Nagtibba
Nepal - Mahabharat Range
Kashmir Valley is b/w Great Himalayas and Lesser Himalayas
Shiwalik
Churiya Hills
Avg. height - 1000 m
In the Eastern Himalayas gets replaced by Duars
B/w Lesser Himalayas and Shiwaliks - longitudinal valleys known a Dune
Largest dune - Dehradun
Others
Himachal/Uttarakhand Himalayas
Tribe - Bhotia
Summer grasslands - Bugyal
Darjeeling & Sikkim Himachal
Mt. Kanchenjunga
Tribe: Lepcha/Bhutia tribe
Absence of Shiwalik - Duars
Arunachal Himalayas
jhumming cultivation practiced
Important peaks - Kangtu & Namcha Barwa
Important rivers - Kameng, Subansiri & Dihang
Tribes - Monpa, Abor, Mishimi, Nyishi & Naga
Eastern/Purvanchal Hills
Patkai bum
Naga Hills
Manipur Hills
Mizo/Lushai Hills
Lakes
fresh water lakes
Dal Lake
Wular Lake
salt water lakes
Pangong Tso
Tso Morir
Jhelum River
Meanders in its youth stage
Srinagar
Regional diVisions
between Indus river & Sutlej river
Punjab Himalayas
between Sutlej & Kali river
Kumaon Himalayas
between Kali & Teesta river
Nepal Himalayas
between Dihang & Teesta river
Assam Himalayas
Karewas formation (glacial deposits)
Kashmir Himalayas

Passes

Arunachal Pradesh

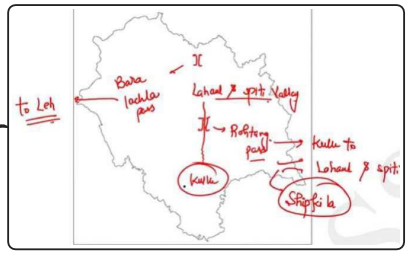


Jammu & Kashmir



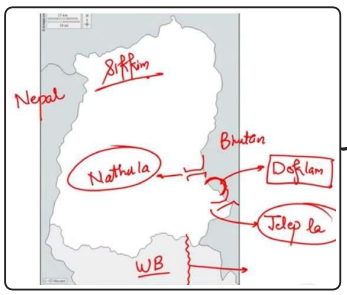
- Jammu to Kashmir/Srinagar - Banihal & Pir Panjal
- Kashmir to Gilgit - Burzil
- Kashmir to Leh - Zoji La

Himachal Pradesh

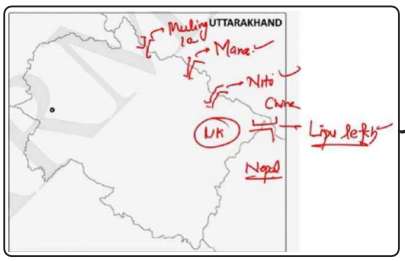


- Rohtang pass connects - Kullu to Lahaul and Spiti Valley
- Baralacha La - Lahaul and Spiti to Leh
- Atal Tunnel in Rohtang Pass

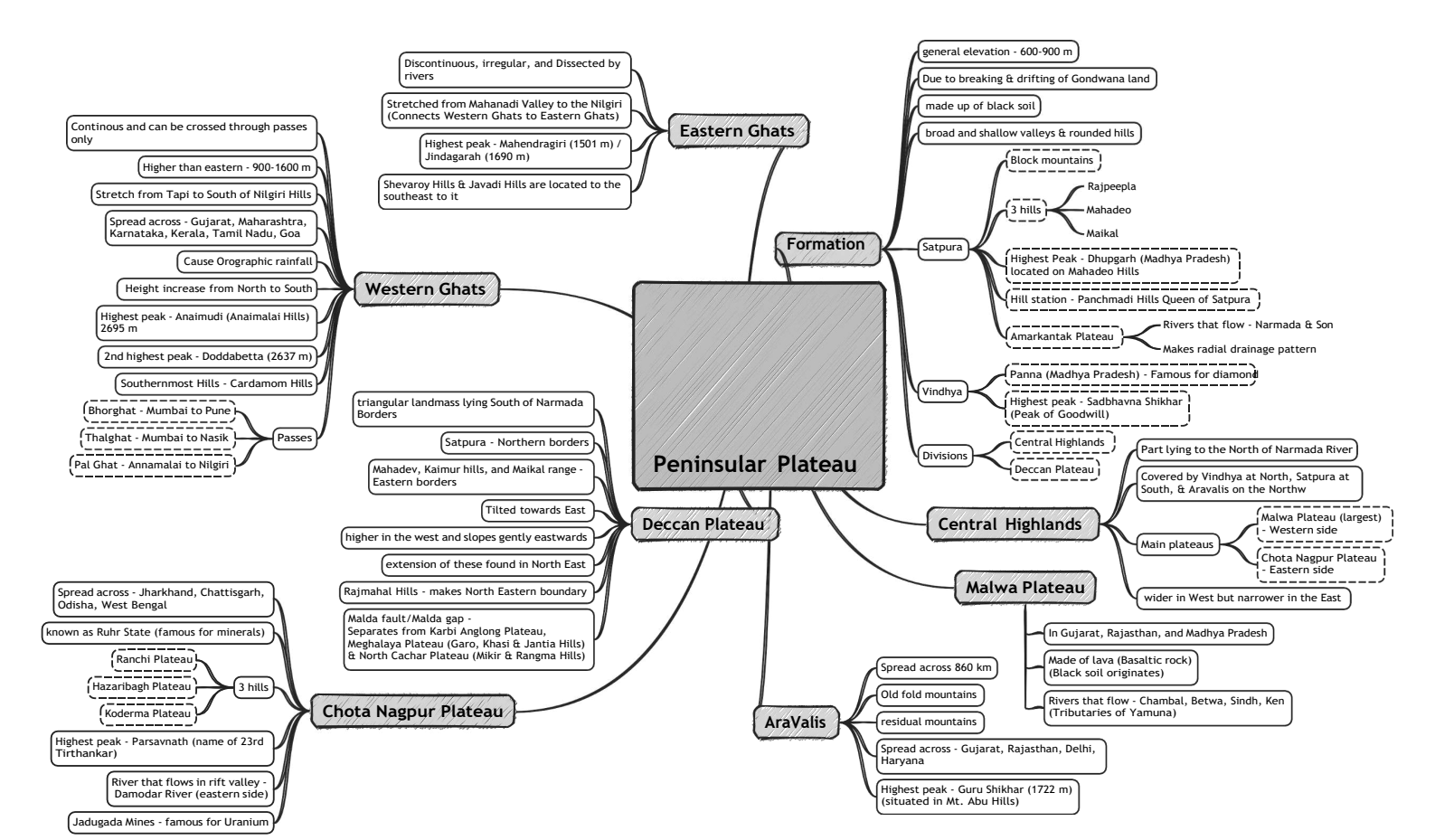
Sikkim



Uttarakhand



- Lipu Lekh located at Trijunction

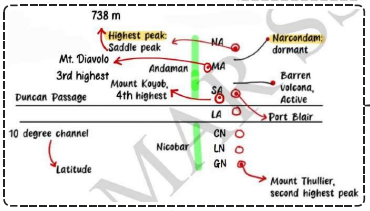

Peninsular Plateau
Formation
general elevation - 600-900 m
Due to breaking & drifting of Gondwana land
made up of black soil
broad and shallow valleys & rounded hills
Satpura
Block mountains
3 hills
Rajpeepla
Mahadeo
Maikal
Highest Peak - Dhupgarh (Madhya Pradesh) located on Mahadeo Hills
Hill station - Panchmadi Hills Queen of Satpura
Amarkantak Plateau
Rivers that flow - Narmada & Son
Makes radial drainage pattern
Vindhya
Panna (Madhya Pradesh) - Famous for diamond
Highest peak - Sadbhavna Shikhar (Peak of Goodwill)
Divisions
Central Highlands
Deccan Plateau
Eastern Ghats
Discontinuous, irregular, and Dissected by rivers
Stretched from Mahanadi Valley to the Nilgiri (Connects Western Ghats to Eastern Ghats)
Highest peak - Mahendragiri (1501 m) / Jindagarah (1690 m)
Shevaroy Hills & Javadi Hills are located to the southeast to it
Western Ghats
Continous and can be crossed through passes only
Higher than eastern - 900-1600 m
Stretch from Tapi to South of Nilgiri Hills
Spread across - Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu, Goa
Cause Orographic rainfall
Height increase from North to South
Highest peak - Anaimudi (Anaimalai Hills) 2695 m
2nd highest peak - Doddabetta (2637 m)
Southernmost Hills - Cardamom Hills
Passes
Bhorghat - Mumbai to Pune
Thalghat - Mumbai to Nasik
Pal Ghat - Annamalai to Nilgiri
Deccan Plateau
triangular landmass lying South of Narmada Borders
Satpura - Northern borders
Mahadev, Kaimur hills, and Maikal range - Eastern borders
Tilted towards East
higher in the west and slopes gently eastwards
extension of these found in North East
Rajmahal Hills - makes North Eastern boundary
Malda fault/Malda gap - Separates from Karbi Anglong Plateau, Meghalaya Plateau (Garo, Khasi & Jantia Hills) & North Cachar Plateau (Mikir & Rangma Hills)
Chota Nagpur Plateau
Spread across - Jharkhand, Chattisgarh, Odisha, West Bengal
known as Ruhr State (famous for minerals)
3 hills
Ranchi Plateau
Hazaribagh Plateau
Koderma Plateau
Highest peak - Parsavnath (name of 23rd Tirthankar)
River that flows in rift valley - Damodar River (eastern side)
Jadugada Mines - famous for Uranium
Central Highlands
Part lying to the North of Narmada River
Covered by Vindhya at North, Satpura at South, & Aravalis on the Northw
Main plateaus
Malwa Plateau (largest) - Western side
Chota Nagpur Plateau - Eastern side
wider in West but narrower in the East
Malwa Plateau
In Gujarat, Rajasthan, and Madhya Pradesh
Made of lava (Basaltic rock) (Black soil originates)
Rivers that flow - Chambal, Betwa, Sindh, Ken (Tributaries of Yamuna)
AraValis
Spread across 860 km
Old fold mountains
residual mountains
Spread across - Gujarat, Rajasthan, Delhi, Haryana
Highest peak - Guru Shikhar (1722 m) (situated in Mt. Abu Hills)

Parts of India

Islands

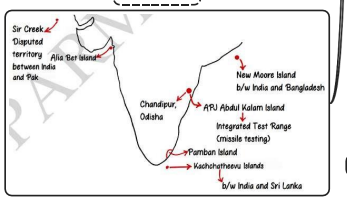
Lakshadweep
- Arabian Sea
- Total - 36 islands
- Largest - Andrott
- Tribes
  - Shompen
  - Nicobarese

Andaman & Nicobar
- Bay of Bengal
- Total - 572 islands
- Largest - Great Nicobar

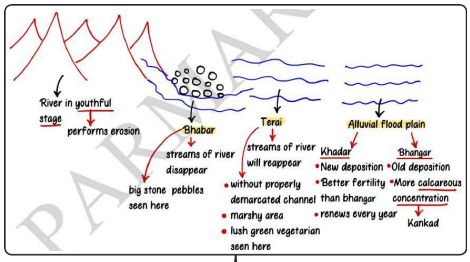


- Tribes
  - Negrito group
  - North Andamanese
  - Jarawa
  - Once
  - Senthelese

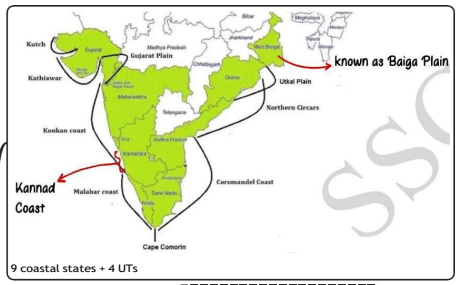
Islands renamed
- Netaji S. C. Bose Island — Ross Islands
- Shaheed Dweep — Neil Island
- Swaraj Dweep — Havelock Island



Northern Plains



Coasts



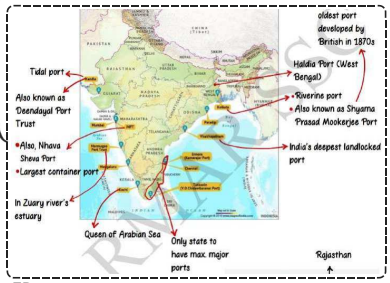
9 coastal states + 4 UTs

Western Coastal Plains
- Narrow in middle and wider in the ends
- Submerging
- Rivers do not form delta
- Formation of Kayals (Backwaters)
- Punnamada Kayal: Nehru Trophy (Boat race)
- Port development is easy

Eastern Coastal Plains
- Wider
- Emerging
- Form Delta

Ports

Major
- 13
  - 12 Govt. Owned — Ownership & management by Central Govt
  - 1 Pvt. Owned — Ennore (Kamrajkar Port)



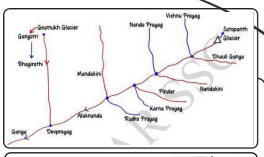
Minor
- 200 — Owned by State Govt

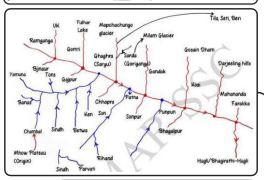
Dessert
- Seen in North Western of Aravali
- Low rainfall - more than 150 mm/year
- Also known as Marusthali
- Most rivers are ephemeral Features
  - Burchans, Seif
  - Mushroom rocks
  - Pedestrial Rocks
- Oasis is seen here
  - green part in desert

Drainage System

Brahmaputra

- 2900 km
- Length in India: 916 km
- names
  - Tibet - Yarlung Tsangpo (origin)
  - Siang & Dihang - Arunachal Pradesh
  - Assam - Brahmaputra
  - Jumuna - Bangladesh
- Takes U-turn in Namcha Barwa
- South turn in Dhubri (Assam)
- World largest Riverine Island - Majuli Island
- Origin - Chemayungdung Glacier/Angsi Glacier
- Padma + Jamuna = Meghna
- World's largest Delta - Sundarbans Delta (Sundari tree)
- Tributaries
  - Left Bank Tributaries
    Lohit, Dhansiri
  - Right Bank Tributary
    Dibang, Kameng, Manas, Testa, Subansiri





Ganga

- Ganga then flows in Bangladesh where it is flows as Padma
- Water from Ganga stored in bottle remains fresh due to presence Bacteriophage viruses
- Total length - 2525 km
- National River of India, declared in 2008
- Longest River of India
- Passes through (5 states) - Uttarakhand, Uttar Pradesh (longest), Bihar, J&K (shortest), West Bengal
- Yamuna
  - 1370 km
  - It is the longest tributary of Ganga
  - Tributaries - Chambal, Sindh, Betwa, Ken, Tons
- Son
  - Origin - Amarkantak Plateau (Radial Drainage Pattern)
  - Tributaries - Koel, Rihand
  - Punpun - joins Ganga at Fatuha near Patna
- Cities located on banks
  - West to East order
  - Prayagraj
  - Kanpur (largest)
  - Varanasi
  - Patna

Patterns

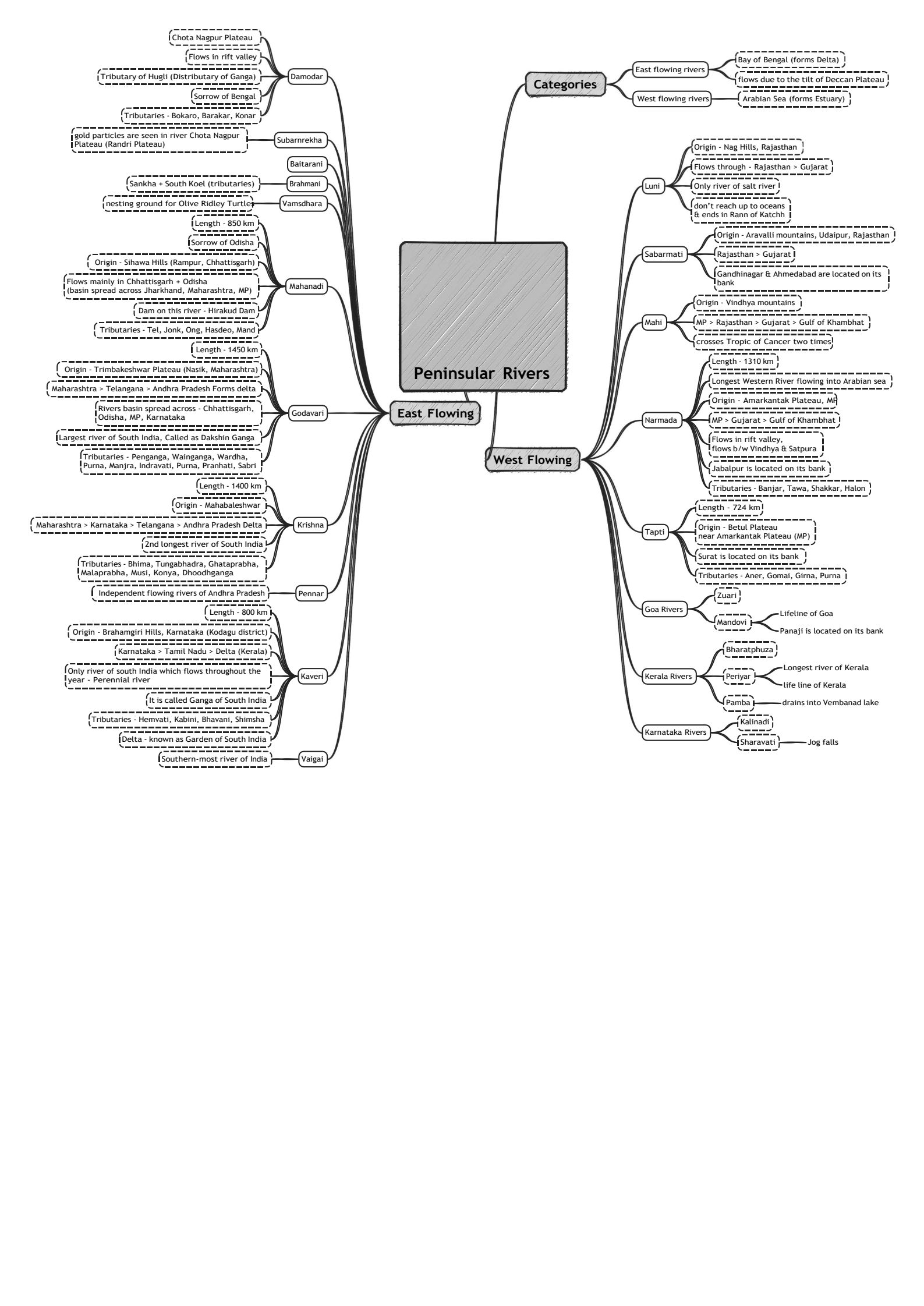
- Dendritic - resemble the branch of a tree
- Trellis - tributaries join the river at right angle
- Radial - rivers originating from a central dome/peak
- Centripetal - rivers draining their water into a central lake/depression

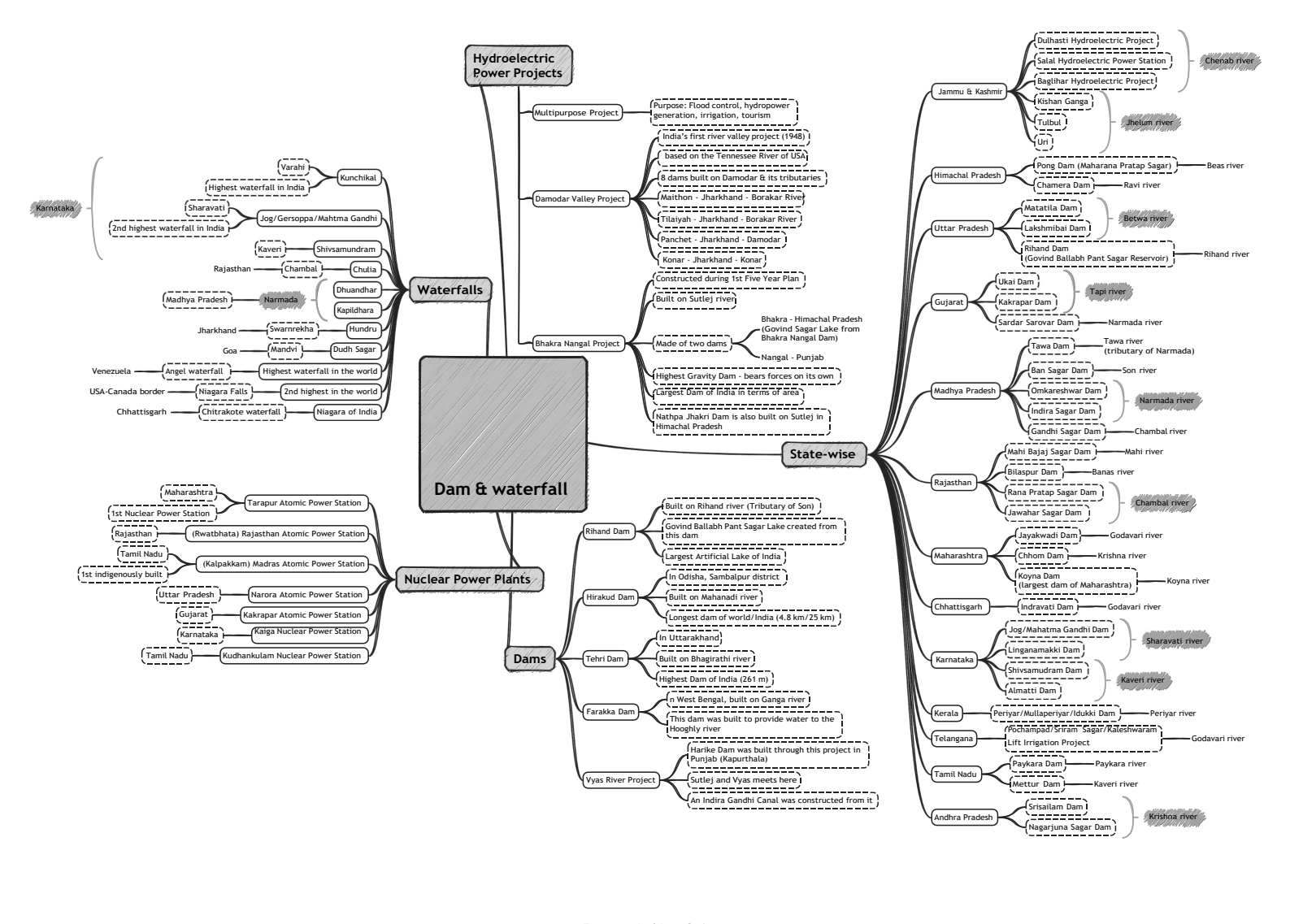
Indian RiVer System

- Himalayan Rivers
  - They are Perennial
  - Water throughout the year
    Origin/Source - Glaciers
  - They have long courses from their source to the sea
  - 3 major rivers - Indus, Brahmaputra & Ganga originating from north of the mountain ranges
  - Some Himalayan rivers are antecedent (following their original course)
    eg: Satluj, Kosi, Indus
- Peninsular River
  - They are ephemeral
  - During dry season, large rivers have reduced flow of water in their channels
  - They have shorter and shallower course
  - Most of the rivers here originate in the Western Ghats and flow towards Bay of Bengal
  - Ex: Narmada, Tapi, Godavari

Indus

- origin - Bokhar Chu Glacier near Lake Mansarovar
- Length - 2880 km/1114 km in India
- Flows in - China, India & Pakistan
- Drains - into Arabian Sea
- National river of Pakistan
- Indus in Tibet is known as Singi Khamban (Lion's mouth)
- Doab
  - Indus + Jhelum - Sindh Sagar Doab
  - Jhelum + Chenab - Jech Doab
  - Chenab + Ravi - Rechna Doab
  - Ravi + Beas - Bari Doab
  - Beas + Sutlej - Bist Doab
- Indus Water Treaty, 1960
  - signed in Karachi
    B/w J L Nehru & Ayub Khan
  - Mediator - World Bank
  - Indus, Jhelum & Chenab
    80% water used by Pakistan
    20% water used by India
  - Ravi, Beas & Sutlej
    80% water used by India
    20% water used by Pakistan
- Tributaries - (Panchnad)
  - Jhelum
    - meanders in its youthful stage
    - Ancient name - Vitasta
    - Origin - Verinag (J & K)
    - Flows in the border of India & Pakistan
    - Wular Lake gets its water from Jhelum
  - Chenab
    - Ancient name - Askini
    - Origin - Baralacha La pass
    - Largest tributary of Indus
  - Ravi
    - Ancient name - Purushni
    - Origin - Rohtang pass
  - Beas
    - Ancient name - Bipasha
    - Origin - Rohtang pass
    - Only tributary of Indus that does not pass or enter Pakistan
  - Sutlej
    - Ancient name - Shutudri
    - Origin - Rakas lake (Lake Mansarovar)
    - It enters India through Shipkila pass
  - Right Bank Tributaries - Shyok, Gilgit, Hunza

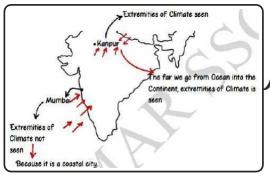

Peninsular Rivers
East Flowing
Damodar
Chota Nagpur Plateau
Flows in rift valley
Tributary of Hugli (Distributary of Ganga)
Sorrow of Bengal
Tributaries - Bokaro, Barakar, Konar
Subarnrekha
gold particles are seen in river Chota Nagpur Plateau (Randri Plateau)
Baitarani
Brahmani
Sankha + South Koel (tributaries)
Vamsdhara
nesting ground for Olive Ridley Turtles
Mahanadi
Length - 850 km
Sorrow of Odisha
Origin - Sihawa Hills (Rampur, Chhattisgarh)
Flows mainly in Chhattisgarh + Odisha (basin spread across Jharkhand, Maharashtra, MP)
Dam on this river - Hirakud Dam
Tributaries - Tel, Jonk, Ong, Hasdeo, Mand
Godavari
Length - 1450 km
Origin - Trimbakeshwar Plateau (Nasik, Maharashtra)
Maharashtra > Telangana > Andhra Pradesh Forms delta
Rivers basin spread across - Chhattisgarh, Odisha, MP, Karnataka
Largest river of South India, Called as Dakshin Ganga
Tributaries - Penganga, Wainganga, Wardha, Purna, Manjra, Indravati, Purna, Pranhati, Sabri
Krishna
Length - 1400 km
Origin - Mahabaleshwar
Maharashtra > Karnataka > Telangana > Andhra Pradesh Delta
2nd longest river of South India
Tributaries - Bhima, Tungabhadra, Ghataprabha, Malaprabha, Musi, Konya, Dhoodhganga
Pennar
Independent flowing rivers of Andhra Pradesh
Kaveri
Length - 800 km
Origin - Brahamgiri Hills, Karnataka (Kodagu district)
Karnataka > Tamil Nadu > Delta (Kerala)
Only river of south India which flows throughout the year - Perennial river
It is called Ganga of South India
Tributaries - Hemvati, Kabini, Bhavani, Shimsha
Delta - known as Garden of South India
Vaigai
Southern-most river of India
West Flowing
Categories
East flowing rivers
Bay of Bengal (forms Delta)
flows due to the tilt of Deccan Plateau
West flowing rivers
Arabian Sea (forms Estuary)
Luni
Origin - Nag Hills, Rajasthan
Flows through - Rajasthan > Gujarat
Only river of salt river
don't reach up to oceans & ends in Rann of Katchh
Sabarmati
Origin - Aravalli mountains, Udaipur, Rajasthan
Rajasthan > Gujarat
Gandhinagar & Ahmedabad are located on its bank
Mahi
Origin - Vindhya mountains
MP > Rajasthan > Gujarat > Gulf of Khambhat
crosses Tropic of Cancer two times
Narmada
Length - 1310 km
Longest Western River flowing into Arabian sea
Origin - Amarkantak Plateau, MP
MP > Gujarat > Gulf of Khambhat
Flows in rift valley, flows b/w Vindhya & Satpura
Jabalpur is located on its bank
Tributaries - Banjar, Tawa, Shakkar, Halon
Tapti
Length - 724 km
Origin - Betul Plateau near Amarkantak Plateau (MP)
Surat is located on its bank
Tributaries - Aner, Gomai, Girna, Purna
Goa Rivers
Zuari
Mandovi
Lifeline of Goa
Panaji is located on its bank
Kerala Rivers
Bharatphuza
Periyar
Longest river of Kerala
life line of Kerala
Pamba
drains into Vembanad lake
Karnataka Rivers
Kalinadi
Sharavati
Jog falls

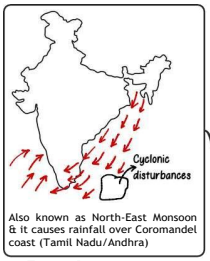

Dam & waterfall
Hydroelectric Power Projects
Multipurpose Project
Purpose: Flood control, hydropower generation, irrigation, tourism
Damodar Valley Project
India's first river valley project (1948)
based on the Tennessee River of USA
8 dams built on Damodar & its tributaries
Maithon - Jharkhand - Borakar River
Tilaiyah - Jharkhand - Borakar River
Panchet - Jharkhand - Damodar
Konar - Jharkhand - Konar
Bhakra Nangal Project
Constructed during 1st Five Year Plan
Built on Sutlej river
Made of two dams
Bhakra - Himachal Pradesh (Govind Sagar Lake from Bhakra Nangal Dam)
Nangal - Punjab
Highest Gravity Dam - bears forces on its own
Largest Dam of India in terms of area
Nathpa Jhakri Dam is also built on Sutlej in Himachal Pradesh
Waterfalls
Karnataka
Kunchikal
Varahi
Highest waterfall in India
Jog/Gersoppa/Mahtma Gandhi
Sharavati
2nd highest waterfall in India
Shivsamundram
Kaveri
Rajasthan
Chulia
Chambal
Madhya Pradesh
Narmada
Dhuandhar
Kapildhara
Jharkhand
Hundru
Swarnrekha
Goa
Dudh Sagar
Mandvi
Venezuela
Angel waterfall
Highest waterfall in the world
USA-Canada border
Niagara Falls
2nd highest in the world
Chhattisgarh
Chitrakote waterfall
Niagara of India
Nuclear Power Plants
Maharashtra
1st Nuclear Power Station
Tarapur Atomic Power Station
Rajasthan
(Rwatbhata) Rajasthan Atomic Power Station
Tamil Nadu
1st indigenously built
(Kalpakkam) Madras Atomic Power Station
Uttar Pradesh
Narora Atomic Power Station
Gujarat
Kakrapar Atomic Power Station
Karnataka
Kaiga Nuclear Power Station
Tamil Nadu
Kudhankulam Nuclear Power Station
Dams
Rihand Dam
Built on Rihand river (Tributary of Son)
Govind Ballabh Pant Sagar Lake created from this dam
Largest Artificial Lake of India
Hirakud Dam
In Odisha, Sambalpur district
Built on Mahanadi river
Longest dam of world/India (4.8 km/25 km)
Tehri Dam
In Uttarakhand
Built on Bhagirathi river
Highest Dam of India (261 m)
Farakka Dam
n West Bengal, built on Ganga river
This dam was built to provide water to the Hooghly river
Vyas River Project
Harike Dam was built through this project in Punjab (Kapurthala)
Sutlej and Vyas meets here
An Indira Gandhi Canal was constructed from it
State-wise
Jammu & Kashmir
Dulhasti Hydroelectric Project
Salal Hydroelectric Power Station
Baglihar Hydroelectric Project
Chenab river
Kishan Ganga
Tulbul
Uri
Jhelum river
Himachal Pradesh
Pong Dam (Maharana Pratap Sagar)
Beas river
Chamera Dam
Ravi river
Uttar Pradesh
Matatila Dam
Lakshmibai Dam
Betwa river
Rihand Dam (Govind Ballabh Pant Sagar Reservoir)
Rihand river
Gujarat
Ukai Dam
Kakrapar Dam
Tapi river
Sardar Sarovar Dam
Narmada river
Madhya Pradesh
Tawa Dam
Tawa river (tributary of Narmada)
Ban Sagar Dam
Son river
Omkareshwar Dam
Indira Sagar Dam
Narmada river
Gandhi Sagar Dam
Chambal river
Rajasthan
Mahi Bajaj Sagar Dam
Mahi river
Bilaspur Dam
Banas river
Rana Pratap Sagar Dam
Jawahar Sagar Dam
Chambal river
Maharashtra
Jayakwadi Dam
Godavari river
Chhom Dam
Krishna river
Koyna Dam (largest dam of Maharashtra)
Koyna river
Chhattisgarh
Indravati Dam
Godavari river
Karnataka
Jog/Mahatma Gandhi Dam
Linganamakki Dam
Sharavati river
Shivsamudram Dam
Almatti Dam
Kaveri river
Kerala
Periyar/Mullaperiyar/Idukki Dam
Periyar river
Telangana
Pochampad/Sriram Sagar/Kaleshwaram Lift Irrigation Project
Godavari river
Tamil Nadu
Paykara Dam
Paykara river
Mettur Dam
Kaveri river
Andhra Pradesh
Srisailam Dam
Nagarjuna Sagar Dam
Krishna river

Monsoon

Variation in Temperature/Rainfall

- Diurnal Range of Temperature
- Annual Range of Temperature
- Annual Range of Rainfall





Also known as North-East Monsoon & it causes rainfall over Coromandel coast (Tamil Nadu/Andhra)

Seasons & Months

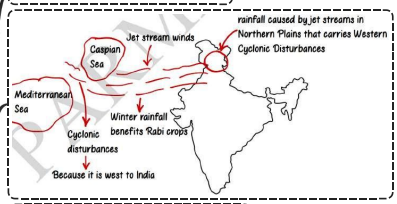
Seasons	Months (According to the Indian Calendar)	Months (According to the Indian Calendar)
Vasanta	Chaitra-Vaisakha	March-April
Grishma	Jyaistha-Asadha	May-June
Varsha	Sravana-Bhadra	July-August
Sharada	Asvina-Kartika	September-October
Hemanta	Margashirsa-Pausa	November-December
Shishira	Magha-Phalguna	January-February

Winter Season

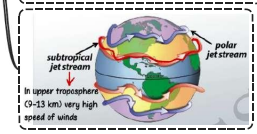
Chilling winds from Artic/Central Asia effect winter season

Winter Rainfall

known as Upper atmospheric Circulation



Inward of Western Disturbances through jet streams is marked by increase in prevailing night temperature



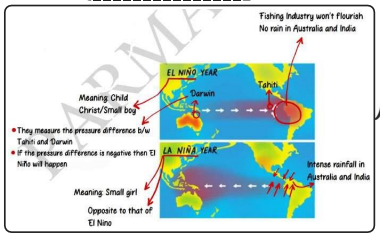
Factors affecting climate of India

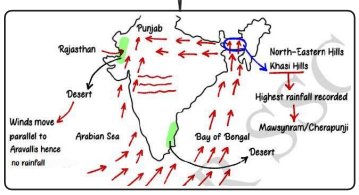
- Latitude
- Altitude
- Pressure & wind system
- Relief feature
- Ocean Current
- Distance form sea

Retreating monsoon

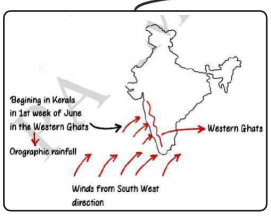
- Clear skies
- In North India
- October heat - oppressing heat

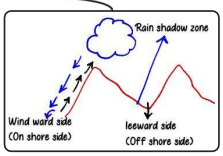
Rain Bearing System



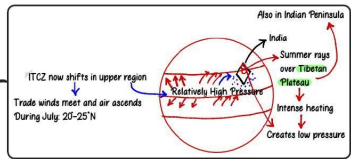


On Set of Monsoon



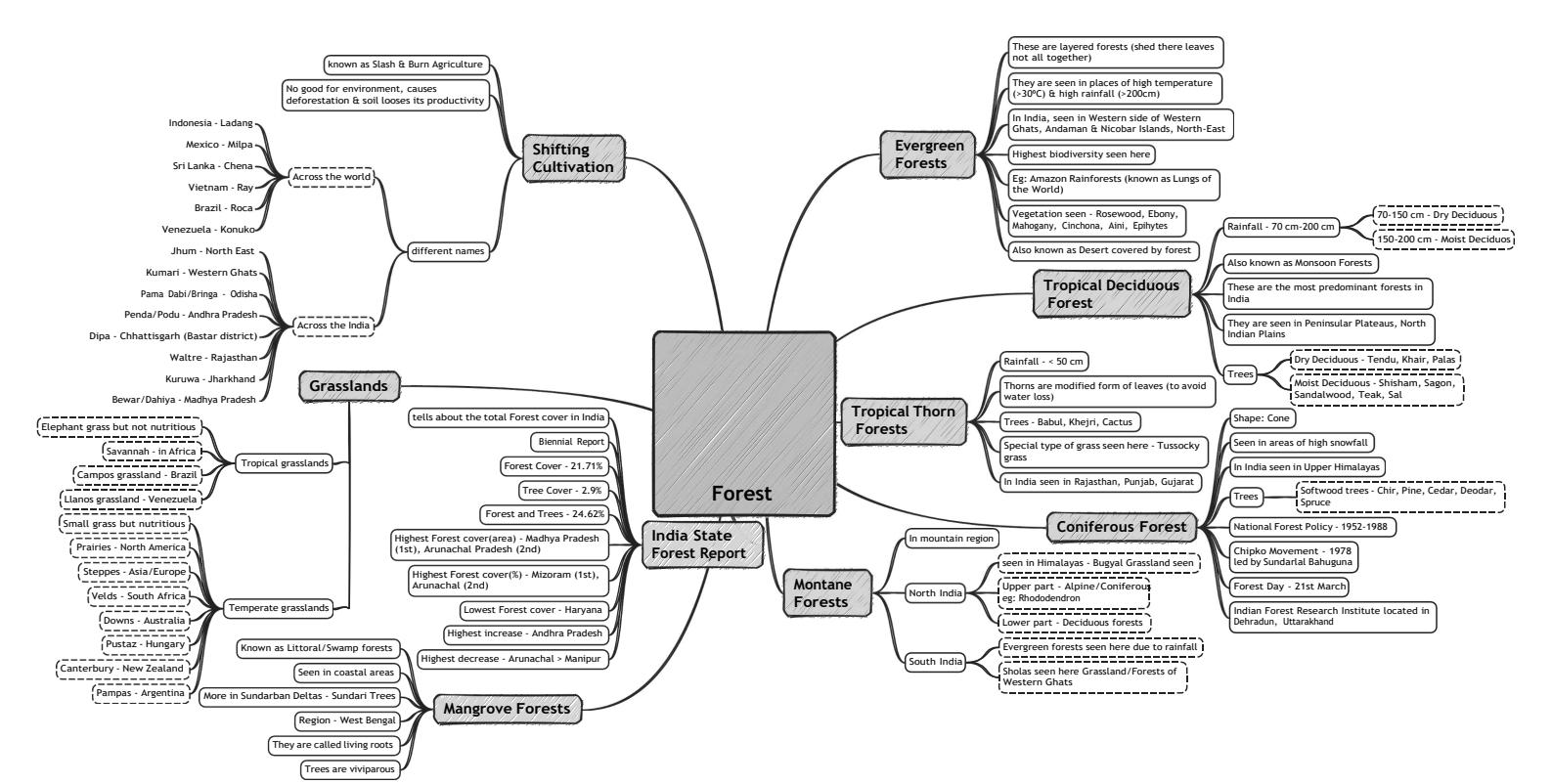


Summer Season



Pre-Monsoon Showers

- Nor-Westers
  - Kal Baisakhi
    - Calamity in the month of Baisakh
    - in West Bengal
    - helpful for growth of jute, tea
  - Bardoli Chheerha — In Assam
- Blossom Showers
  - Seen in Kerala/ Karnataka
  - Helps in growth/cultivation of coffee
- Mango Showers
  - Seen in Kerala
  - Helps in early ripening of mangoes


Forest
Shifting Cultivation
known as Slash & Burn Agriculture
No good for environment, causes deforestation & soil looses its productivity
different names
Across the world
Indonesia - Ladang
Mexico - Milpa
Sri Lanka - Chena
Vietnam - Ray
Brazil - Roca
Venezuela - Konuko
Across the India
Jhum - North East
Kumari - Western Ghats
Pama Dabi/Bringa - Odisha
Penda/Podu - Andhra Pradesh
Dipa - Chhattisgarh (Bastar district)
Waltre - Rajasthan
Kuruwa - Jharkhand
Bewar/Dahiya - Madhya Pradesh
Grasslands
Tropical grasslands
Elephant grass but not nutritious
Savannah - In Africa
Campos grassland - Brazil
Llanos grassland - Venezuela
Temperate grasslands
Small grass but nutritious
Prairies - North America
Steppes - Asia/Europe
Velds - South Africa
Downs - Australia
Pustaz - Hungary
Canterbury - New Zealand
Pampas - Argentina
Mangrove Forests
Known as Littoral/Swamp forests
Seen in coastal areas
More in Sundarban Deltas - Sundari Trees
Region - West Bengal
They are called living roots
Trees are viviparous
India State Forest Report
tells about the total Forest cover in India
Biennial Report
Forest Cover - 21.71%
Tree Cover - 2.9%
Forest and Trees - 24.62%
Highest Forest cover(area) - Madhya Pradesh (1st), Arunachal Pradesh (2nd)
Highest Forest cover(%) - Mizoram (1st), Arunachal (2nd)
Lowest Forest cover - Haryana
Highest increase - Andhra Pradesh
Highest decrease - Arunachal > Manipur
Montane Forests
In mountain region
North India
seen in Himalayas - Bugyal Grassland seen
Upper part - Alpine/Coniferous eg: Rhododendron
Lower part - Deciduous forests
South India
Evergreen forests seen here due to rainfall
Sholas seen here Grassland/Forests of Western Ghats
Tropical Thorn Forests
Rainfall - < 50 cm
Thorns are modified form of leaves (to avoid water loss)
Trees - Babul, Khejri, Cactus
Special type of grass seen here - Tussocky grass
In India seen in Rajasthan, Punjab, Gujarat
Evergreen Forests
These are layered forests (shed there leaves not all together)
They are seen in places of high temperature (>30°C) & high rainfall (>200cm)
In India, seen in Western side of Western Ghats, Andaman & Nicobar Islands, North-East
Highest biodiversity seen here
Eg: Amazon Rainforests (known as Lungs of the World)
Vegetation seen - Rosewood, Ebony, Mahogany, Cinchona, Aini, Epihytes
Also known as Desert covered by forest
Tropical Deciduous Forest
Rainfall - 70 cm-200 cm
70-150 cm - Dry Deciduous
150-200 cm - Moist Deciduos
Also known as Monsoon Forests
These are the most predominant forests in India
They are seen in Peninsular Plateaus, North Indian Plains
Trees
Dry Deciduous - Tendu, Khair, Palas
Moist Deciduous - Shisham, Sagon, Sandalwood, Teak, Sal
Coniferous Forest
Shape: Cone
Seen in areas of high snowfall
In India seen in Upper Himalayas
Trees
Softwood trees - Chir, Pine, Cedar, Deodar, Spruce
National Forest Policy - 1952-1988
Chipko Movement - 1978 led by Sundarlal Bahuguna
Forest Day - 21st March
Indian Forest Research Institute located in Dehradun, Uttarakhand

Soil

Marshy/Peaty soil
- Seen in coastal areas
- Has organic matter/humus
- It is seen in regions of high humidity & high rainfall

Montane soil
- High humus is seen

Desert soil
- Seen in extremely low rainfall areas (<50 cm) - Western Rajasthan, Gujarat, Haryana

Laterite soil
- Covers 4.3% area of India
- It is formed by leaching process (where important minerals such as Silica washes away with the soil)
- Found in regions of high temperature & high rainfall
- It is known as Brick Soil
- Good for Cashew growth & cultivation
- Found in Tamil Nadu, Andhra Pradesh, Kerala

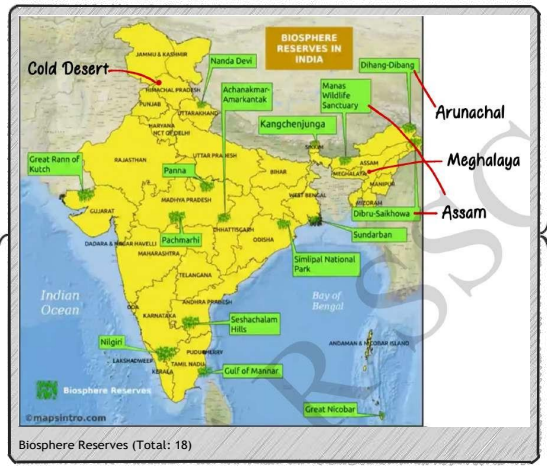
Black soil
- Covers 15% area of India
- It is formed due to eruption of lava
- Found in North Western part of Peninsular Plateau - Maharashtra, Gujarat
- Also known as Regur
- Clayey in nature
- It is impermeable soil (high water holding capacity)
- Self-ploughing characteristics (develops cracks when dry & sticky when moist)
- Most suitable soil for cotton cultivation (requires 210 frost free days)
- rich in Iron, lime, Alumina
- Loamy Soil - sand content is more

Factors for formation of soil
- Parent Rock
- Climate
- Time

AlluVial soil
- Covers 40% area of India (In India, most fertile type of soil)
- Found in Northern Plains + Deltas of Peninsular rivers
- eg - Uttar Pradesh, Bihar, West Bengal, Assam
- Rich in Potash & poor in Phosphorus
- Formed due to sediments deposited by rivers
- Type
  - Khadar - New Alluvium, more fertile
  - Bhangar - Old Alluvium, less fertile

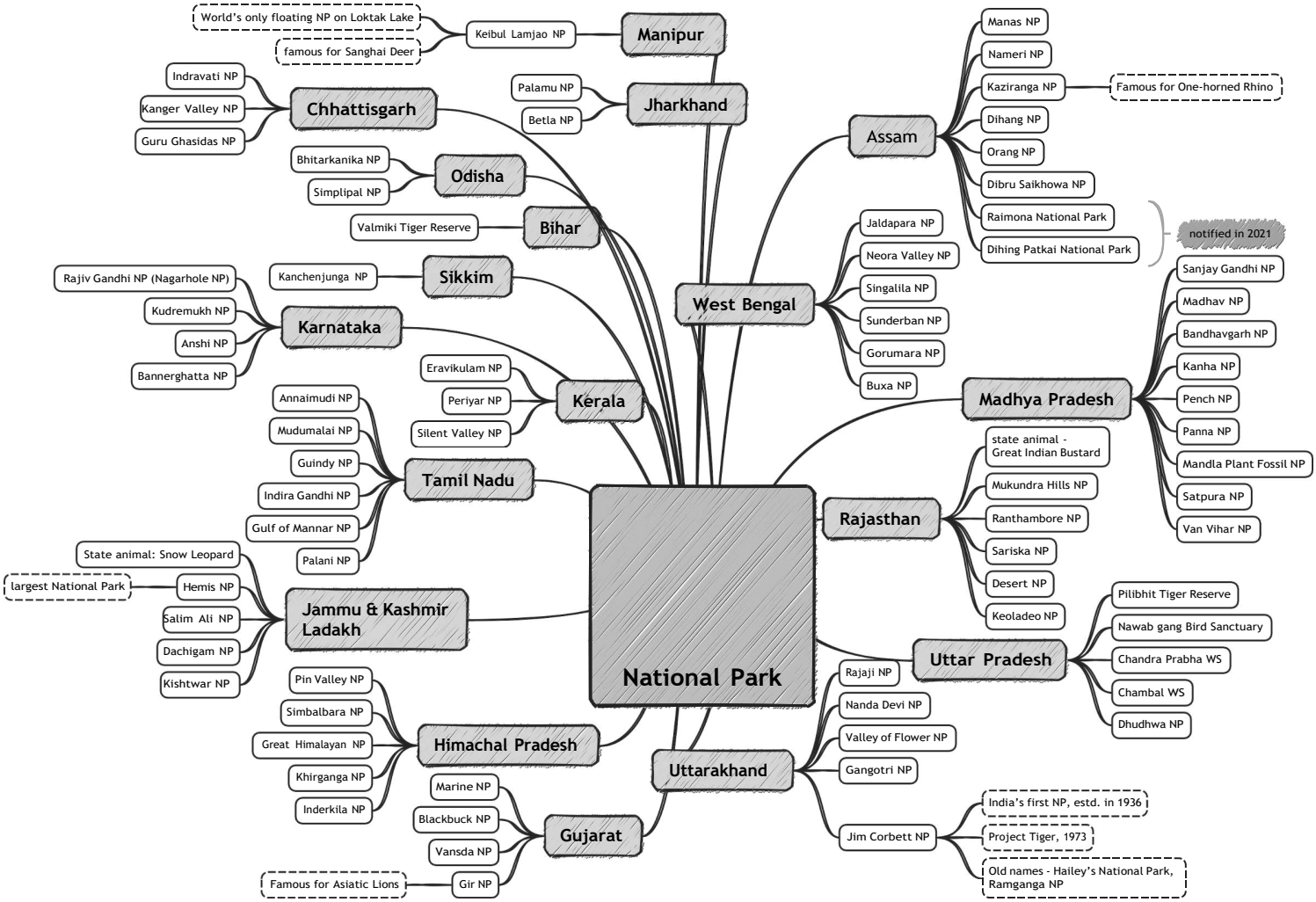
Red soil
- Covers 18% area of India
- Formed by the weathering of the metamorphic rock
- It is red due to presence of Iron Oxide
- Changes colour to yellow on hydration
- It is found in water deficit region - Karnataka, Tamil Nadu, Maharashtra, Piedmont Zone of Western Ghats
- In low rainfall areas

12 UNESCO Biosphere Reserves: Man and Biosphere programme (MAB), 1971
- Nilgiri — Extended to 3 states Kerala, Tamil Nadu, Karnataka
- Great Rann of Kutch
- Sundarban
- Nanda Devi
- Nokrek
- Panchmarhi
- Simplipal
- Achanakmar-Amarkantak — Chattisgarh-Madhya Pradesh border
- Great Nicobar
- Agasthyamalai
- Kangchenjunga — Highest mixed & first World Heritage Site
- 1Panna — latest added



Biosphere Reserves (Total: 18)

- Nilgiri Biosphere Reserves - 1st Biosphere Reserve in Kerala, Tamil Nadu, Karnataka
- Largest - Great Rann of Kutch


National Park
Manipur
Keibul Lamjao NP
World's only floating NP on Loktak Lake
famous for Sanghai Deer
Jharkhand
Palamu NP
Betla NP
Chhattisgarh
Indravati NP
Kanger Valley NP
Guru Ghasidas NP
Odisha
Bhitarkanika NP
Simplipal NP
Bihar
Valmiki Tiger Reserve
Sikkim
Kanchenjunga NP
Karnataka
Rajiv Gandhi NP (Nagarhole NP)
Kudremukh NP
Anshi NP
Bannerghatta NP
Kerala
Eravikulam NP
Periyar NP
Silent Valley NP
Tamil Nadu
Annaimudi NP
Mudumalai NP
Guindy NP
Indira Gandhi NP
Gulf of Mannar NP
Palani NP
Jammu & Kashmir Ladakh
State animal: Snow Leopard
largest National Park
Hemis NP
Salim Ali NP
Dachigam NP
Kishtwar NP
Himachal Pradesh
Pin Valley NP
Simbalbara NP
Great Himalayan NP
Khirganga NP
Inderkila NP
Gujarat
Marine NP
Blackbuck NP
Vansda NP
Gir NP
Famous for Asiatic Lions
Uttarakhand
Rajaji NP
Nanda Devi NP
Valley of Flower NP
Gangotri NP
Jim Corbett NP
India's first NP, estd. in 1936
Project Tiger, 1973
Old names - Hailey's National Park, Ramganga NP
Uttar Pradesh
Pilibhit Tiger Reserve
Nawab gang Bird Sanctuary
Chandra Prabha WS
Chambal WS
Dhudhwa NP
Rajasthan
state animal - Great Indian Bustard
Mukundra Hills NP
Ranthambore NP
Sariska NP
Desert NP
Keoladeo NP
Madhya Pradesh
Sanjay Gandhi NP
Madhav NP
Bandhavgarh NP
Kanha NP
Pench NP
Panna NP
Mandla Plant Fossil NP
Satpura NP
Van Vihar NP
West Bengal
Jaldapara NP
Neora Valley NP
Singalila NP
Sunderban NP
Gorumara NP
Buxa NP
Assam
Manas NP
Nameri NP
Kaziranga NP
Famous for One-horned Rhino
Dihang NP
Orang NP
Dibru Saikhowa NP
Raimona National Park
Dihing Patkai National Park
notified in 2021