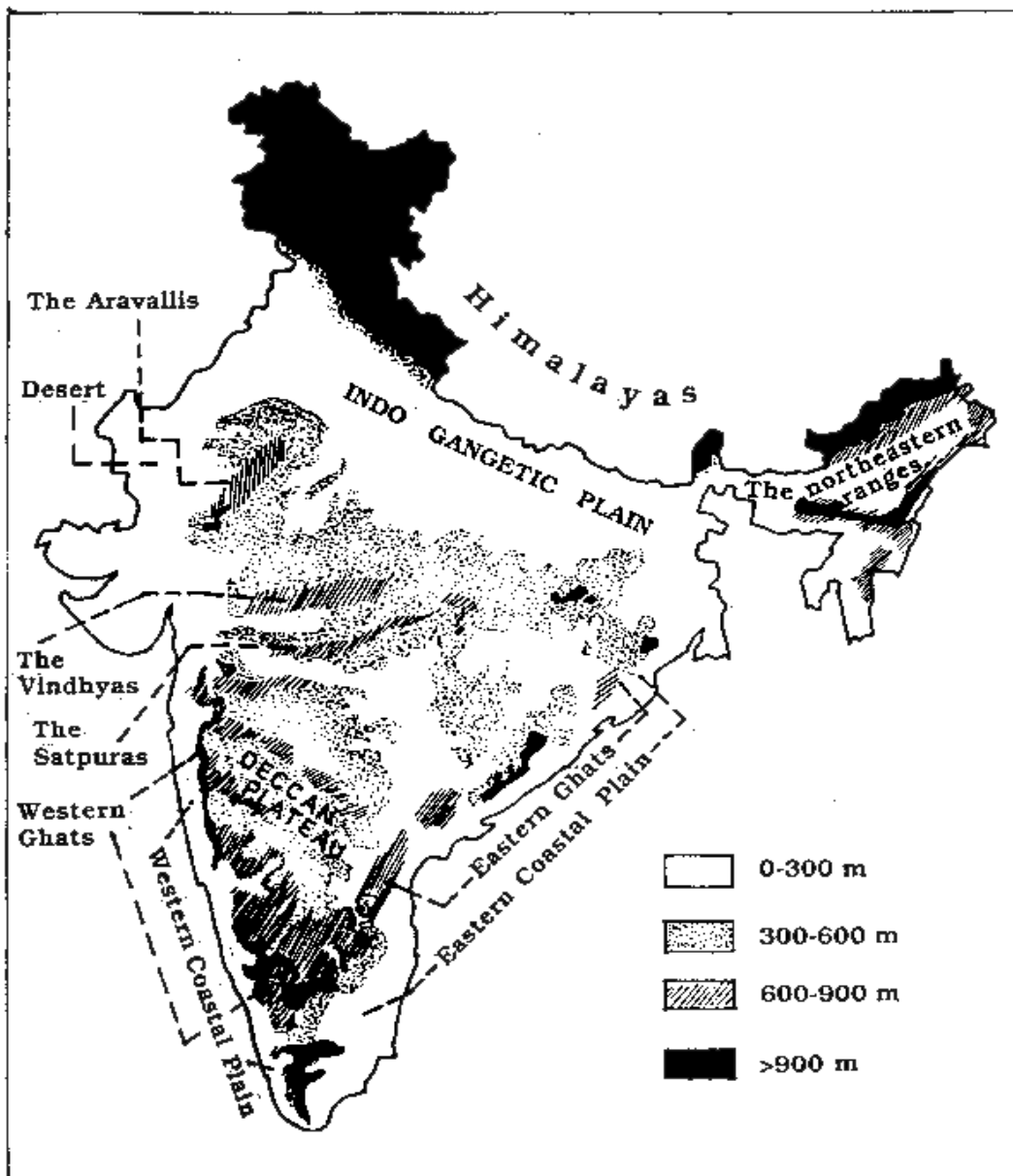


## India- Physiography

India can be divided into four physical divisions. They are:

- 1) The Northern Mountains
- 2) The North Indian Plain
- 3) The Peninsular Plateau
- 4) The Coastal regions and Islands



**1. THE NORTHERN MOUNTAINS:** The Himalayan mountains form the northern mountain region of India. They are the highest mountain ranges in the world. They have the highest peaks, deep valleys, glaciers etc. These mountain ranges start from Pamir Knot in the west and extend up to Purvanchal in the east. They extend over 2,500 km. They have been formed during different stages of continental drift of the Gondwanaland mass. There are three parallel ranges in the Himalayas. They are (a) The Greater Himalayas or Himadri, (b) The Lesser Himalayas or Himachal and (c) The Outer Himalayas or Siwaliks.

**2. NORTH INDIAN PLAIN:** The North Indian plain is also called the Gangetic plain. The total area of this plain is about 6,52,000 sq. km. This plain is situated between the Himalayan Mountains in the north and the Peninsular plateau in the south and is formed by the alluvium brought down by the rivers. The plain is very fertile and agriculture is the main occupation of the people. Many perennial rivers flow across the plain. Since the land is almost flat, it is very easy to construct irrigation canals and have inland navigation. It has excellent roads and railways, which are helpful for the establishment of many industries. 40% of the total population of India lives here and it is called "The heart of India".

**3. PENINSULAR PLATEAU:** It is the largest of India's physical divisions. It is the oldest and is formed of hard rocks. The Narmada rift valley divides the peninsular plateau into two parts. They are the Malwa plateau and the Deccan plateau. The Malwa plateau is bounded by the Aravalli hills in the north-west and the Vindhya Mountains in the south. The total area of both these plateaus is 7,05,000 sq. km. and the shape is triangular. The Malwa plateau slopes towards the Gangetic Plain. The highest peak on the Aravallis is Mt. Guru Shikhar. The Deccan plateau is surrounded by the Satpura hills, the Mahadeo hills, the Maikala range, the Amarkantak hills and the Rajmahal hills in the north and the Western Ghats in the west and the Eastern Ghats in the east. The Western Ghats are called Sahyadris in Maharashtra and Karnataka and further south they are called Nilgiris in Kerala and Annamalai range, Cardamom and Palani hills in Tamilnadu. Anaimudi in Annamalai range (2,695 mts.) is the highest peak in South India. The Western Ghats and the Eastern Ghats meet in the Nilgiri hills. The Peninsular plateau has economic importance because of its rich mineral resources and many rivers, which have waterfalls. They help in the generation of hydroelectric power. The plateau is also suitable for the cultivation of cotton and the dense forests are the home of many wild animals.

**4. COASTAL PLAINS AND ISLANDS:** Excluding the islands, the mainland of India has 6,100 kms length of coastline. It extends from Kachchh in Gujarat in the west to the Gangetic delta in the east. The coast of India is divided into western coast and eastern coastal plains. The western coastal plain lies between the Western Ghats and the Arabian Sea and from the Gulf of Kachchh in the north upto Cape Comorin (Kanyakumari) in the south, with a length of about 1,500 km. It is divided into Malabar coast, Karnataka coast(Canara), Konkan coast, Gujarat coast and Kachchh and Kathiawad peninsulas. The coast is straight and affected by the South-West Monsoon winds over a period of six months. So, there are only a few good harbours Mumbai, Marmagoa, Cochin, Mangalore, Karwar, Nhava-Sheva and Kandla are the important ports on the West Coast. The eastern coast extends from Kanyakumari to the Gangetic delta and between the Eastern Ghats and the Bay of Bengal. It consists of the deltas of rivers Mahanadi, Godavari, Krishna and Kaveri. It is a broad and flat land. There are some salt water lakes or lagoons. Chilka Lake of Orissa and Pulicat Lake of Tamilnadu are the best examples. The Eastern Coast is divided into Coromandel coast in the south and Utkal coast in the north. The coastal regions of India are noted for agriculture, trade, industrial centres, tourist centres, fishing and salt making. They provide important hinterlands for the ports. These coastal plains play a very important role in the economic development of India.

**ISLANDS OF INDIA:** There are 247 islands in India, out of which there are 204 islands in the Bay of Bengal and 43 islands in the Arabian Sea. There are a few coral islands in the Gulf of Mannar also. The Andaman and Nicobar Islands in the Bay of Bengal consist of hard volcanic rocks. The middle Andaman and Great Nicobar Islands are the largest islands of India. Lakshadweep islands in the Arabian Sea are formed by corals. The southern - most point of India is in the Greater Nicobar Island. It is called Indira Point (formerly it was called Pigmalion Point), now submerged after 2004 Tsunami.

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### **SIGNIFICANCE OF HIMALAYAS-**

- 1) Strategic significance. A natural frontier of India with other countries(China, Pakistan, Afghanistan,etc)
- 2) Climatic significance. Prevent further northward movement of summer monsoon and also prevent cold northern winds from Siberia to enter into India.
- 3) Agricultural significance. Formation of Himalayas created a trough to its south which is later filled by the sediments from the Himalayan rivers which is today known as northern plains-Indo-gangetic plains- Rich agricultural grounds.
- 4) Economic significance- Himalayan rivers have huge hydro-electric power potential. Moreover, Himalyan timber and medicinal plants have economic significance.
- 5) Tourist spot- large ecological diversity and hill stations

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### **SIGNIFICANCE OF INDIAN OCEAN FOR INDIA-**

- 1) Strategic significance- India overlooks some of the most important sea lanes viz suez canal, Malacca strait.
- 2) Economic significance- Long coastline, 2.02 million sq km EEZ ( exclusive economic zone)- Hydrocarbons, fishery potential, wave energy, tidal energy, OTEC.
- 3) Marine biodiversity and rich ecosystem with coral reefs, mangroves- Tourist attraction.
- 4) SW monsoon generates in Indian ocean.

### **DIFFERENCE BETWEEN WESTERN GHATS AND EASTERN GHATS-**

#### **WESTERN GHATS**

- More continuous
- Higher in elevation
- Sahayadris, anamalai, nilgiri and cardamom hills
- Form excellent escarpments

- Rich watersheds give birth to large peninsular rivers like Godavari and Krishna.
- Separated from coast by narrow coastal plains.

### **EASTERN GHATS**

- Discontinuous
- Lower in elevation
- Do not develop steep escarpments, lack well developed peaks.
- Do not give birth to important rivers like western ghats.
- Separated from coast by very wide coastal plains.
- Geologically older than western ghats.

### **DIFFERENCE BETWEEN BOB ISLANDS AND ARABIAN SEA ISLANDS-**

ANDAMAN & NICOBAR ISLANDS- These are volcanic islands representing submarine volcanism. These islands represent the surfaces of submerged folds. (extension of Himalayas- and precisely Arakan yoma fold mountains of Myanmar). These islands are formed of granitic rocks. Have hills and tall peaks like saddle peak. Climate is equatorial. And comprise of tropical rain-forests.

LAKSHADWEEP ISLANDS- These are a union of coral islands, entirely different from A & N islands, comprising of large number of dead corals, fringing, barrier coral reefs and atolls. Thus these islands have calcium rich soils-organic limestones. Have scattered vegetation of palm species.

### **DECCAN TRAP AND ITS CHARACTERISTICS-**

It is the deccan plateau region which includes Kathiawar plateau of Gujarat and most of Maharashtra, south west MP and NW Karnataka.

It is a volcanic plateau made up of horizontal layers of solidified lava forming trap structure which have a step like appearance. In between the layers of solidified lava, sedimentary layers are also found thus making it inter-trappean in structure. The deccan plateau slopes towards east and south and descends abruptly towards west making sahyadri ranges.

### **COASTAL ECOSYSTEM & ITS POLLUTION IN INDIA-**

The coastal domain is from 200 m above to 200m below sea level. Coastal ecosystem presents a delicate equilibrium among different components, viz. estuaries, coral reefs, salt marshes, mangrove swamps, macrophyte dominated regions, continental shelves, etc. at a given time.

Most pollution in India arises from land-based sources - industrial & domestic wastes and agricultural run-off. Shipping and associated ship-building, breaking and port activities are becoming increasingly significant. The crop of recently started coastally located industries use sea-water as a resource and the coastal domain as a sink of altered sea-water [temperature and density]. These pose newer, more direct threats to sensitive eco areas.

A compilation of the type and quantum of pollutants into the coastal ecosystem of India are given below:

Sr. No.	Input / pollutant	Quantum - Annual
1.	Sediments	1600 million tonnes
2.	Industrial effluents	$50 \times 10^6 \text{ m}^3$
3.	Sewage - largely untreated	$0.41 \times 10^9 \text{ m}^3$
4.	Garbage and other solids	$34 \times 10^6$ tonnes
5.	Fertilizer – residue	$5 \times 10^6$
6.	Synthetic detergents - residue	1,30,000 tonnes
7.	Pesticides – residue	65, 000 tonnes
8.	Petroleum hydrocarbons (Tar balls residue)	3,500 tonnes
9.	Mining rejects, dredged spoils & sand extractions	$0.2 \times 10^6$ tonnes

Indian coasts have a large variety of sensitive eco-systems. Sand dunes, coral reefs, mangroves, seagrass beds 7 wet lands are some that deserve special mention. Some of these are the spawning grounds and nurseries of a number of commercially important fishes, gastropods and crustaceans. A critical feature of these ecosystems are the variety of bioactive molecules that they host.

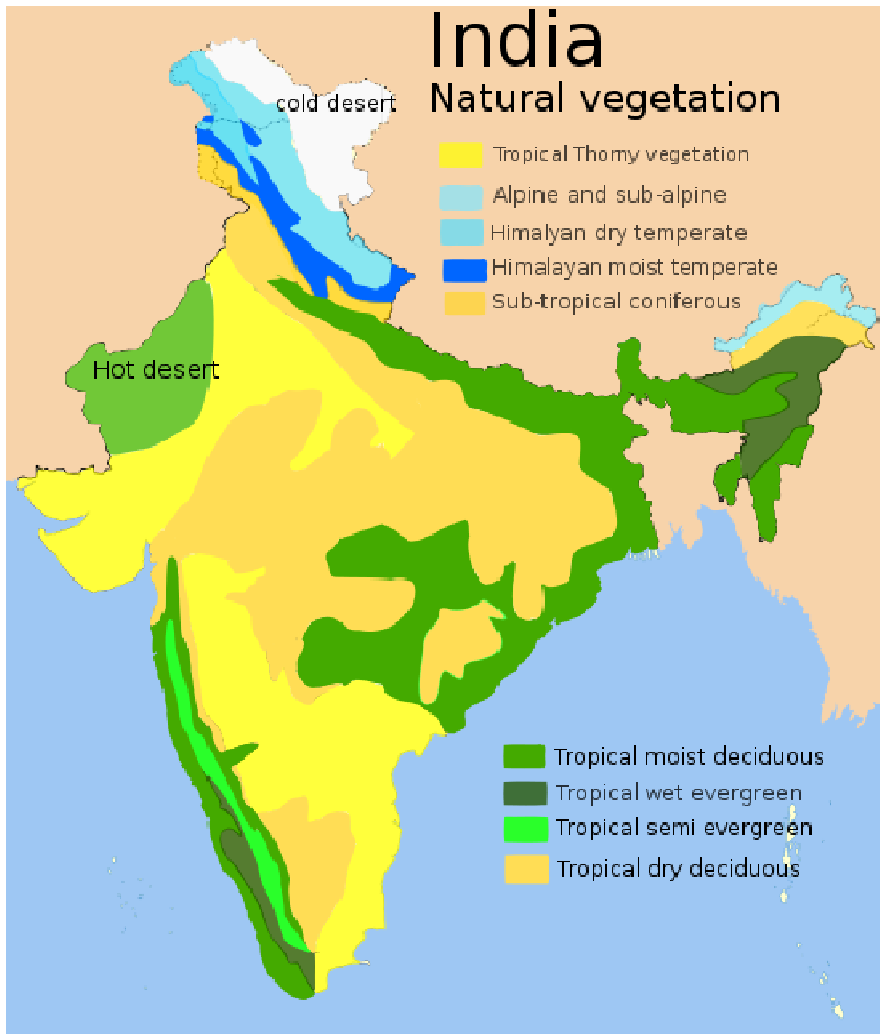
Thus, sustainable development of the coastal ecosystem is must. Sustainable development can be described as "the proper use and care of the coastal environment borrowed from future generations".

#### SHORT NOTES ON-

**Bhabhar-** a zone of porous and rocky soils made up of debris washed down from the higher ranges. The rivers usually disappear in this belt. The Bhabhar and the lower Shiwalik ranges have a subtropical climate. This belt is just above terai.

**Terai-** Above the alluvial plain lies the Terai strip, a seasonally marshy zone of sand and clay soils. The Terai has higher rainfall than the plains, and the downward-rushing rivers of the Himalaya slow down and spread out in the flatter Terai zone, depositing fertile silt during the monsoon season and receding in the dry season. The Terai has a high water table due to groundwater percolating down from the adjacent zone.

## Natural Vegetation of India



**The following are the principal types of natural vegetation in India:** (1) Tropical Evergreen Rain Forests, (2) Deciduous or Monsoon Type of Forests, (3) Dry Deciduous Forests and Scrubs, (4) Semi- Desert and Desert Vegetations, (5) Tidal or Mangrove Forests and (6) Mountain Forests.

**Tropical evergreen rain forests:** These forests grow in areas where rainfall is more than 200 cm. They are mainly found on the slopes of the Western Ghats and the Northeastern regions of Arunachal Pradesh, Meghalaya, Assam, Nagaland, the Tarai areas of the Himalayas and the Andaman groups of Islands. The trees in these belts have dense growth. Important varieties of trees are sishu, chap lash, rosewood, mahogany, bamboos, garjan and sandalwood.

**Deciduous or Monsoon type of forests:** These forests are found in areas where the rainfall is between 100 cm and 200 cm. These forests grow on the lower slope of the Himalayas, Assam, West Bengal, Bihar, Jharkhand, Orissa, Madhya Pradesh, Chhattisgarh, Maharashtra, Karnataka and the adjoining regions. The trees of these forests shed their leaves during dry winter and dry summer. The main trees are teak, sal, sandalwood, deodar, blue gum, ebony, sis am, jackfruit, mahua, pal ash, arjun, khair and bamboo.

**Dry deciduous forests and Scrubs:** These forests grow in areas where the rainfall is between 50 cm and 100 cm. These are found in areas of central Deccan plateau, South-east of Rajasthan, Punjab, Haryana and parts of Uttar

Pradesh and Madhya Pradesh. Dwarf Deciduous trees and long- grasses grow in these regions. Most of the areas are used for agriculture.

**Semi- deserts and Deserts vegetations:** These types of vegetation grow in areas where rainfall is less than 50 cm. Mostly thorny bushes, acacia, babul and sand binding grasses are found in this vegetation zone. The Indian wild date is common in these deserts. These plants grow far apart from each other. They have long roots and thick fleshy stems in which they store water to survive during the long drought. These vegetations are found in Rajasthan and parts of Gujarat's, Punjab and Karnataka.

**Tidal or Mangrove forests:** These forests grow along the coast and on the edges of the deltas e.g., the deltas of the Ganga, Mahanadi, Godavari, Krishna and Kaveri. They are called 'Tidal Forests'. In West Bengal these forests are known as 'Sundarbans'. The 'sundari' is most significant tree in these forests. The other notable trees of these forests are hogla, garan, gewa, golpata, gilepata, pasur etc. These forests supply timber and fire wood. Palm and coconut trees adorn the coastal strip.

**Mountain forests:** Mountain forests vary considerably along the slopes of mountain. On the foothills of the Himalayas upto a height of 1500 meters, evergreen trees, (Sal, teak, bamboo and cane) grow abundantly. On higher slope between 1,500 meters to 3,500 meters, temperate conifer trees, (pine, fir, oak, maple, deodar, laurel spruce, cedar) grow. At the higher altitude of the Himalayas, rhododendrons and junipers are found. Beyond these vegetation belts, alpine grasslands appear up to snowfield.

#### **MANGROVE FORESTS-**

Uses-

- Obstruct oncoming high waves and tides thus protect coastal erosion
- Absorb pollutants
- Reduce coastal erosion
- Absorb storm energy
- Rich breeding grounds for fish

#### **WASTELAND AND WASTELAND DEVELOPMENT-**

Wasteland is barren & highly degraded land not fit for agriculture.

Dept of Land resources, GOI , divides wasteland into 16 categories:

- |   |  |   |
|---|--|---|
| 1. Gullied and/or Ravinous Land                           | 2. Upland with or without Scrub              | 3. Waterlogged and Marshy Land                  |
| 4. Land Affected by Salinity/Alkalinity<br>Coastal/Inland | 5. Shifting Cultivation Area                 | 6. Under utilised/Degraded notified Forest Land |
| 7. Degraded Pastures/Grazing Land                         | 8. Degraded Land under Plantation crop       | 9. Sands-Inland/Coastal                         |
| 10. Mining/Industrial Wastelands                          | 11. Barren Rocky/Stony Waste/Sheet Rock Area | 12. Steep Sloping Area                          |
| 13. Snow Covered and/or Glacial Area                      | 14. Total Wastelands                         | 15. Total Geographical Area                     |
| 16. Percentage of total Geographical Area.                |  |   |

## **INTEGRATED WASTELAND DEVELOPMENT PROGRAMME (IWDP)-**

### **Objectives:**

The basic objective of this scheme is an integrated wastelands development based on village/micro watershed plans. These plans are prepared after taking into consideration the land capability, site condition and local needs of the people.

The scheme also aims at rural employment besides enhancing the contents of people's participation in the wastelands development programmes at all stages, which is ensured by providing modalities for equitable and sustainable sharing of benefits and usufructs arising from such projects.

### **Activities:**

The major activities taken up under the scheme are:

- In situ soil and moisture conservation measures like terracing, bunding, trenching, vegetative barriers and drainage line treatment.
- Planting and sowing of multi-purpose trees, shrubs, grasses, legumes and pasture land development.
- Encouraging natural regeneration.
- Promotion of agro-forestry & horticulture.
- Wood substitution and fuel wood conservation measures.
- Awareness raising, training & extension.
- Encouraging people's participation through community organization and capacity building.
- Drainage Line treatment by vegetative and engineering structures
- Development of small water Harvesting Structures.
- Afforestation of degraded forest and non forest wasteland.
- Development and conservation of common Property Resources.

### **Approach**

Wasteland Development through holistic development of Degraded watershed.

Employment of people through Institutional arrangements

Planning from below bottom up approach.

Sustainability through people's participation.

Equitable distribution of Usufructs.



## **The problem**

The degradation of environment in the fragile Indian sub-topical eco-system is basically attributed to:-

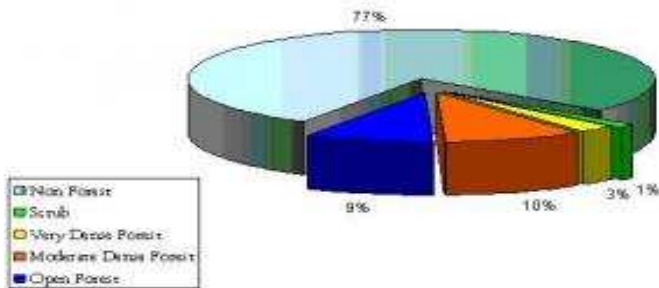
- Increasing biotic pressure
- Absence of adequate investments and appropriate management practices.
- High rate of Population growth and high incidence poverty in rural areas.
- Over-exploitation of National Resources.
- The break-down of traditional institutions for managing common property resources and failure of new institutions to fill the vacuum.
- Faulty land use practices.

## **CONSEQUENCES**

- Soil Erosion & Land Degradation
- Depletion of natural resources
- Lower productivity
- Ground Water Depletion
- Shortage of Drinking Water
- Reduction in Species Diversity
- Increase in the extent of Wastelands

## Forest Resource of India

### Forest Cover of India



India has 21 Percent of her geographical area under forest cover. According to the State Forest Report 2009, in the last 10 years, forest cover in the country has increased by 3.31 million hectares, showing an average 0.46% increase every year. The total forested area in India is about 63.73 million hectares. These forests supply a wide variety of resources. They provide structural timber and wood for making furniture and pulp, match wood, wood for charcoal, gum, resins, canes and fibres. Besides these, there are many other forest products such as leaves, fruits, tannins, dyes, medicinal herbs, bee-wax, honey, turpentine oil and lac.

### **Problems of Forestry and their Solution**

Indian Forestry faces many problems. Over grazing and forest fire often destroy forests. Reckless cutting of the trees causes forest destruction. Jhum cultivations destroy forest; it invites soil erosion. To preserve the forest, the Govt. of India has taken up a series of programmes: The forests are declared as Reserved Forests. The government has chalked out a good programme of 'Van Mahatsov'. Thousands of trees are planted every year in the months of July and August to promote new forestation. The Forest Research Institute has been set up at Dehra Dun for the promotion and preservation of the forests properly.

# Climate of India

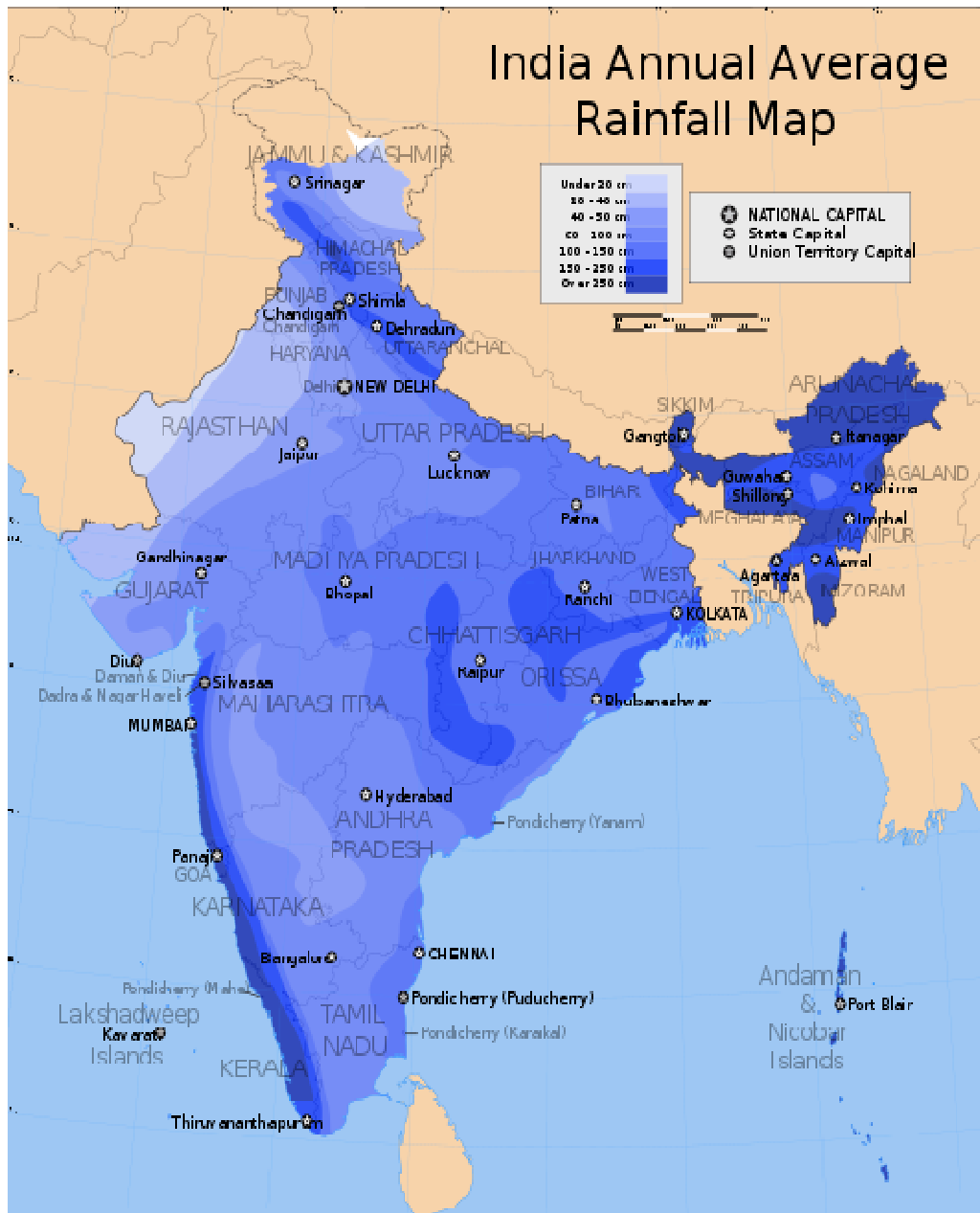
## TROPICAL MONSOON CLIMATE

India is a vast country and has different relief features. They are responsible for varied climatic conditions. India has very hot and very cold regions as well as regions with very heavy rainfall and very scanty rainfall. A large part of India has tropical monsoon climate. The climate of India has been influenced by its position, size and relief features. Monsoon winds are the main factors that determine the climate of India. They influence a large part of India. The Climate of India may be divided into four seasons-

- 1) Winter - From December to February(winter rains)
- 2) Summer - From March to May
- 3) South-West monsoons or rainy season - June to September
- 4) Retreating monsoons - October and November(tropical cyclones)

**DISTRIBUTION OF RAINFALL:** The rainfall in India is seasonal, uncertain and unevenly distributed. Most of the rain comes during the South-West Monsoon period. Rainfall may be too much or too little. There are also long dry periods in between. On the basis of the quantity of rainfall, we can divide India into five major rainfall regions.

- 1)Very low rainfall region (Less than 30 cms per year). It is found in Karakoram ranges, northern Kashmir and western parts of Kachchh and Rajasthan (Thar desert).
- 2) Low rainfall region (30 cms. to 60 cms. per year). It is found in Zaskar range, parts of Punjab and Haryana, Central Rajasthan, Western Gujarat and the rain-shadow areas of the Western Ghats.
- 3) Moderate rainfall (60 cms. to 100 cms. per year). It is found over a greater part of India, excluding the areas of low rainfall and heavy rainfall. Most of the rain is from the South-West Monsoon winds.
- 4) Heavy rainfall region (100 cms. to 200 cms. per year). It is found in four separate areas, including a narrow belt of the western coast, eastern coastal belt, the foothills of the Himalayas and a part of north-east India.
- 5) Very heavy rainfall region (over 200 cms. per year). It is found on the western side of the Western Ghats , the foothills of Himalayas, Meghalaya plateau (Shillong plateau) and Andaman and Nicobar Islands. Mawsynram in Meghalaya plateau has recorded 1141 cms. of rainfall per year and it is the place which gets the heaviest rainfall in India/world.

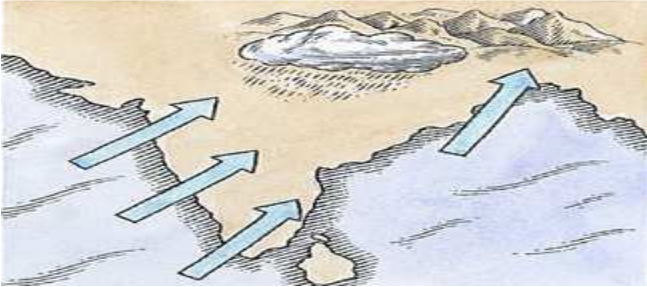


Climate plays a very important role on the economic development of a nation. The South-West Monsoons control the agriculture of India, which is the main occupation of the people. When the monsoons fail, there is drought, and the crops also fail. When the monsoons are heavy, there are floods, they also cause destruction to life and property. Hence, it is called that, “the Indian agriculture is a gamble with the Monsoons”.

## **SUMMER MONSOON OF INDIA(SW MONSOON)-**

Monsoon is seasonal changes in atmospheric circulation and precipitation associated with the asymmetric heating of land and sea. The southwest monsoon brings rains towards the end of summer as the high pressure built in the Indian Ocean pushes the wind masses towards the low pressure formed on land. It's the temperature variation between the sea and the landmass – **Temperature Gradient**.

### **ACTION OF SOUTH WEST MONSOON IN INDIA:**



The southwest monsoon arrives in two branches: the Bay of Bengal branch and the Arabian Sea branch. The latter extends toward a low-pressure area over the Thar Desert and is roughly three times stronger than the Bay of Bengal branch. The southwest monsoon typically breaks over Indian Territory by around 25 May, when it lashes the Andaman and Nicobar Islands in the Bay of Bengal. It strikes the Indian mainland around 1 June near the Malabar Coast of Kerala. By 9 June, it reaches Mumbai; it appears over Delhi by 29 June. The Bay of Bengal branch, which initially tracks the Coromandal Coast northeast from Cape Comorin to Orissa, swerves to the northwest towards the Indo-Gangetic Plain. The Arabian Sea branch moves northeast towards the Himalayas. By the first week of July, the entire country experiences monsoon rain; on average, South India receives more rainfall than North India. However, Northeast India receives the most precipitation. Monsoon clouds begin retreating from North India by the end of August; it withdraws from Mumbai by 5 October. As India further cools during September, the southwest monsoon weakens. By the end of November, it has left the country.

The southwest monsoon, a four-month period when massive convective thunderstorms dominate India's weather, is Earth's most productive wet season. A product of southeast trade winds originating from a high-pressure mass centered over the southern Indian Ocean, the monsoonal torrents supply over 80% of India's annual rainfall. Attracted by a low-pressure region centered over South Asia, the mass spawns surface winds that ferry humid air into India from the southwest. These inflows ultimately result from a northward shift of the local jet stream, which itself results from rising summer temperatures over Tibet and the Indian subcontinent. The void left by the jet stream, which switches from a route just south of the Himalayas to one tracking north of Tibet, then attracts warm, humid air. The main factor behind this shift is the high summer temperature difference between Central Asia and the Indian Ocean. This is accompanied by a seasonal excursion of the normally equatorial intertropical convergence zone, a low-pressure belt of highly unstable weather, and northward towards India.

### **KEY ASPECTS AND BARRIERS:**

- 1.Strikes at western ghats;and gives rainfall to the western most regions; while rainshadow interiors, thr Deccan plateau receives very less rainfall.
- 2.moves parallel with the eastern ghats and produce no rainfall until it strikes at NE.
- 3.Another current enters at kutch peninsula and gives medium rainfall to the Indo-Gangetic plains.

## **NORTHEAST MONSOON-**

Around September, with the sun fast retreating south, the northern land mass of the Indian subcontinent begins to cool off rapidly. With this air pressure begins to build over northern India, the Indian Ocean and its surrounding atmosphere still holds its heat. This causes the cold wind to sweep down from the Himalayas and Indo-Gangetic Plain towards the vast spans of the Indian Ocean south of the Deccan peninsula. This is known as the Northeast Monsoon or Retreating Monsoon.

While travelling towards the Indian Ocean, the dry cold wind picks up some moisture from the Bay of Bengal and pours it over peninsular India and parts of Sri Lanka. Cities like Madras, which get less rain from the Southwest Monsoon, receives rain from this Monsoon. About 50% to 60% of the rain received by the state of Tamil Nadu is from the Northeast Monsoon. In Southern Asia, the northeastern monsoons take place from December to early March when the surface high-pressure system is strongest. The jet stream in this region splits into the southern subtropical jet and the polar jet. The subtropical flow directs northeasterly winds to blow across southern Asia, creating dry air streams which produce clear skies over India. Meanwhile, a low pressure system develops over South-East Asia and Australasia and winds are directed toward Australia known as a monsoon trough.

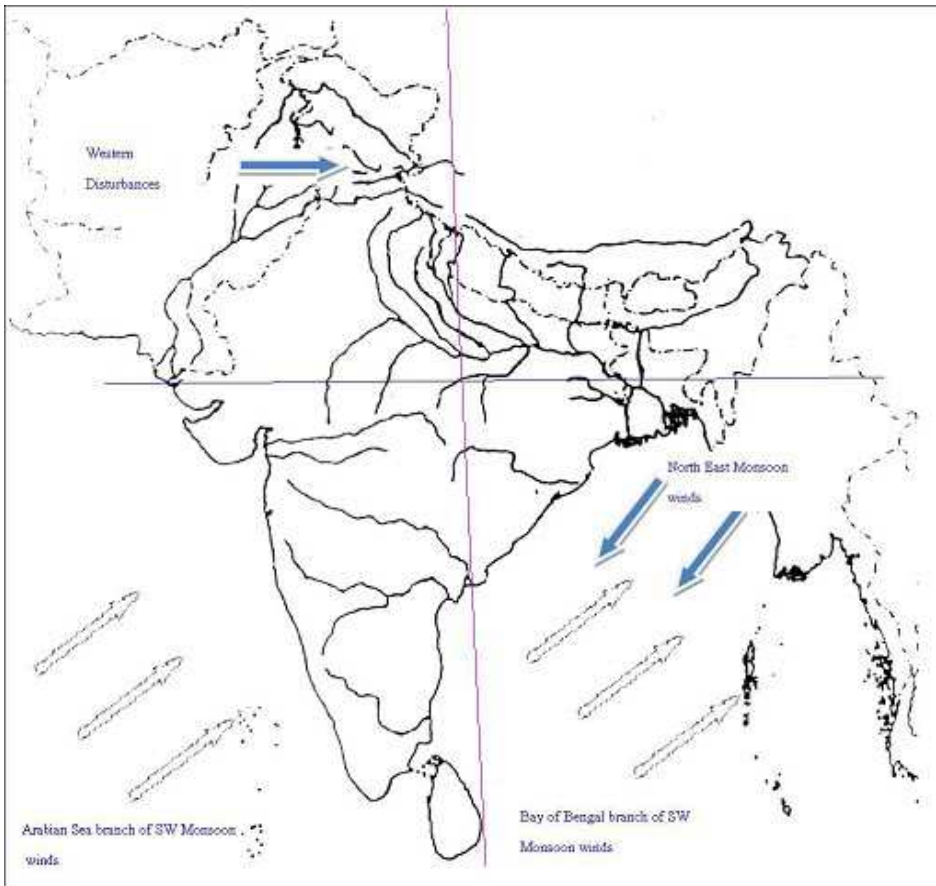
## **WESTERN DISTURBANCES-**

WD are the Temperate cyclones or extratropical storm originating in the Mediterranean, that brings sudden winter rain and snow to the northwestern parts of the Indian subcontinent. This is a non-monsoonal precipitation pattern driven by the Westerlies. The moisture in these storms usually originates over the Mediterranean Sea and the Atlantic Ocean. Extratropical storms are a global, rather than a localized, phenomena with moisture usually carried in the upper atmosphere (unlike tropical storms where it is carried in the lower atmosphere). In the case of the subcontinent, moisture is sometimes shed as rain when the storm system encounters the Himalayas.

Western Disturbances are important to the development of the Rabi crop in the northern subcontinent, which includes the locally important staple wheat.

**WINTER- RAINFALL-** occur due to-

- 1) NE Monsoons
- 2) Western disturbances
- 3) Tropical cyclones.



### FACTORS RESPONSIBLE FOR REGIONAL VARIABILITY OF RAINFALL OVER INDIA-

Geographical setting- windward regions (like western ghats) get more rainfall than interiors. Regions obstructing monsoonal branches like those perpendicular to Arabian sea branch get rainfall while the south eastern region of India which is parallel to bay of Bengal branch remains dry. Aravallis parallel to Arabian sea branch remains dry. Also regions near to the sea get more rainfall as winds bear more moisture. The regions of the confluence of the 2 major branches also receive more rainfall.

### TROPICAL CYCLONES-

A tropical cyclone is a storm system characterized by a large low-pressure center and numerous thunderstorms that produce strong winds and heavy rain.

- Winds spiral at high speed -120kmph about a calm eye.
- Inner pressure could be as low as 890mb.
- Develop over sea where surface temperature is above 27 degree celcius.
- Acquire energy from the latent heat of condensation of water vapour.
- Form between 8-20 degree north and south of equator and never between 0-8 degrees north and south of equator because of weak coriolis force.
- Quickly dissipate over land as their moisture supply is cut off.
- Cause heavy rains with thunderstorms but rain is short lived.
- Most violent and destructible type of storms. Destruction caused by storm surge, high velocity winds and heavy rainfall.

### **SOUTHERN OSCILLATIONS-**

The Southern Oscillation is the see-saw pattern of reversing surface air pressure between the eastern and western tropical Pacific; when the surface pressure is high in the eastern tropical Pacific it is low in the western tropical Pacific, and vice-versa. Thus, the El-Niño Southern Oscillation(ENSO) is the result of a cyclic warming and cooling of the surface ocean of the central and eastern Pacific. This region of the ocean is normally colder than it's equatorial location would suggest, mainly due to the influence of northeasterly trade winds, a cold ocean current flowing up the coast of Chile, and to the upwelling of cold deep water off the coast of Peru.

At times, the influence of these cold water sources wane, causing the surface of the eastern and central Pacific to warm up under the tropical sun - this is an **EL-NIÑO** event. This results in heavy rainfall in South America, but severe droughts in eastern Australia. The more intense the El-Niño, the more intense and extensive the Australian droughts.

At other times, the injection of cold water becomes more intense than usual, causing the surface of the eastern Pacific to cool - this is a **LA-NIÑA** event. This results in droughts in south America and heavy rainfall, even floods, in eastern Australia. In this way, Australia experiences it's characteristic cycle of droughts and floods - all caused by the El-Niño/La-Niña cycle described above.

### **MANGO SHOWERS-**

Mango showers are the pre-monsoon showers in the Indian states of Karnataka and Kerala that help in the ripening of mangoes. Also known as April rains or Summer showers, they are a result of thunderstorms over the Bay of Bengal. These summer rains normally come in the second half of the month of April, though the arrival is difficult to predict. The showers prevent the mangoes from dropping prematurely from trees and are crucial for the mango cultivators of South India.

### **CHERRY BLOSSOMS-**

In Karnataka and associated region the local thunderstorms are called as cherry blossoms. This is caused due to the meeting of humid sea winds and hot dry local wind. It occurs in the month of April & May. These showers help in the ripening of coffee plants.

### **NORWESTERS-**

These are the shallow cyclonic disturbances that travel to India from Mediterranean sea and Persian gulf that cause rainfall in the east India- Assam, W.Bengal, Orissa during winter season.



## Soils in India

### SOIL?

Soil is the uppermost layer of Earth's crust.

Soil is the medium in which plants grow and thus it supports the lives on earth.

### Factors that control the formation of soil-

A number of factors contribute to the soil formation and fertility.

1. Parent rocks: - the rock on which the soil is formed decomposes and disintegrates under the processes of weathering. The characteristics of rocks influence the characteristics of soils. For example on lava rocks black soils and iron oxide rich rocks red soils are formed.

2. Climate: - climate influence the rate of weathering of rocks and type of vegetation, thus these influence the characteristics of soils.

3. Slope: - the nature of relief and slope influence the accumulation of soils. Mountains have thin soil cover but the plains have thick soil cover.

4. Time: - time provides maturity to the soil.

5. Various forces of nature such as change in temperature, actions of running water, wind and glaciers, activities of decomposers etc. contribute to the formation of soil.

6. Chemical and organic changes which take place in the soil are equally important.

**The soils of India on the basis of their formation are divided in the following two broad categories-**

1. Residual Soil- which form at the place of their origin. Like – black soils

2. Transported Soil- which are transported from place of their formation. Like alluvial soils.

**The major soil groups are:**

### 1) BLACK SOIL

- Black soil is made from lava-solidified rocks and is also called as 'Black Cotton Soil' or 'Regur Soil'. The black colour of regur soil is due to its iron content, deriving from plutonic lava materials. Mainly found in the Deccan region which includes the major part of Maharashtra, Gujarat and part of Tamil Nadu, Andhra Pradesh and Madhya Pradesh. Cotton is most important crop grown on this soil.

### CHARACTERISTICS-

- Clayey, deep and impermeable
- They swell and become sticky when wet and shrink when dried
- During dry season, these soils develop wide cracks.
- Rich in lime and iron, magnesia and alumina
- Also contain potash

- Lack phosphorus, nitrogen and organic matter
- Very clayey and therefore highly retentive of water. Because of high clay content, these soils expand when wet and become difficult to plough.
- During dry season, black soils shrink and develop big cracks which help in air circulation.
- Dark in colour, suitable for cotton cultivation are residual soils.

Spread over an area of 5.4 sq. km., i.e. 16.6 % of the total land area of the country.

## 2) RED SOIL

- These soils are found in Chhotanagpur plateau, Telangana, Nilgiris, Tamil Nadu, Karnataka, Andhra Pradesh and periphery areas of Deccan Plateau. These soils have been formed due to decomposition of underlying igneous rocks under heavy rainfall. These are suitable for the cultivation of millets, pulses, Linseed, tobacco etc. These soils are poor in Lime, Nitrogen and humus.

### CHARACTERISTICS:

Red soils are reddish in colour due to the presence of iron. Formed due to weathering of ancient crystalline and metamorphic rocks.

- Parent rocks are acid granites and gneisses.
- Occupy an area of about 3.5 lakh sq km – 10.6% of the total land area of the country .
- These are transported type soils.
- Are mostly light to dark colour depending on new or old alluvium.
- Rich in potash and become fertile with the proper use of fertilizers and irrigation.
- Deficient in nitrogen, lime, magnesia, humus and phosphate
- Red due to its very high iron content.
- Are porous, friable in nature .
- Loose and aerated.

Contains soluble salts in small quantities.

## 3) LATERITE SOIL

- laterite = brick (Latin word)

These soils are formed under conditions of high temperature and heavy rainfall with alternate wet and dry periods. Thus its formation takes place strictly under monsoon conditions.

Residual soils formed by leaching in areas of heavy rain.

Leaching is a process in which the nutrients get percolated down below the soil due to heavy rainfall; thus leaving the top soil infertile. Also called DESILICATION.

Laterite soils are found in elevated areas which receive very high rainfall

As a result, top soil gets washed away. This process is called leaching. The soil, therefore, loses its fertility to a great extent.

It covers an area of about 2.4 lakh sq km. These soils are found in the north-eastern state of Meghalaya in India. Laterite soils are found on the highland areas of the plateau. These are found in Karnataka, Kerala, Tamil Nadu and hilly regions of Assam, Rajmahal hills and Chhotanagpur plateau. These are shallow, acidic and less fertile soils. These soils are poor in lime but rich in iron. So these are suitable for plantation of crops like tea, rubber, coffee etc.

- Is of coarse texture, soft and friable.
- Is red due to the presence of iron oxide which is formed by leaching. The soluble plant foods like potash are removed from the top soil leaving alumina and iron oxide.
- Is a porous soil, silica is removed from it by chemical action. Is poor in lime and magnesium, and deficient in nitrogen.

#### 4) ALLUVIAL SOIL

- (Riverine soil)

It covers about 40 percent of land area of the country. They are depositional soils, transported and deposited by rivers and streams. These soils are formed by the deposition of fine sediments and silt by the rivers along their banks. In India, alluvial soils are mostly found in the Great Northern Plains, the coastal plains and river deltas.

They can be divided into two types:

1. Young Khadar soils: these are newer alluvium of sandy, pale brown composition, found in lower areas of valley bottom which are flooded almost every year. It is non porous, clayey and loamy.
2. Old Bhangar soils: these consist of older alluvium of clayey composition and are dark in colour.

They are coarse in nature, contain kankar (lime nodules), pebbles, gravels. They are found 30 m above flood level of the rivers.

They represent the 'riverine alluvium' brought down by Sutlej, Yamuna, Ghagra and other rivers of Indo-Gangetic Plains.

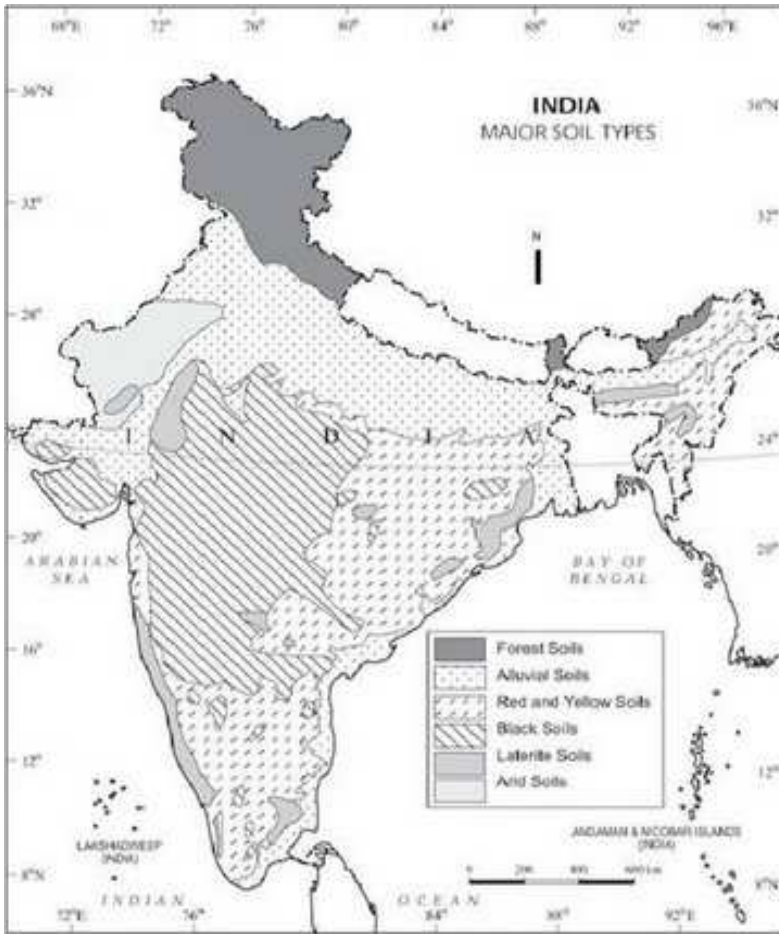
These soils are the most widespread soils covering an area of 8 lakh sq. km from Punjab to Assam. These are found in the river basin, flood plains and coastal areas. These soils are covering 22.16 per cent of total area of India.

Alluvial soils though differ greatly in texture, are very fertile on whole. They:

- Respond well to irrigation and manuring.
- Good for both rabi and kharif crops.
- Suitable for wheat, sugarcane, rice, cotton and oilseeds.
- In delta region, they are ideal for jute cultivation.

Useful for agriculture since it is fertile.

Soil is rich in potash and lime but poor in nitrogen and humus.



NOTE\*- THE AFOREMENTIONED FOUR SOILS – BLACK, RED, LATERITE AND ALLUVIAL ARE GENERALLY ASKED IN MAINS.

Other Soils: The other soils in the category of the Indian soils are as follows:

**MOUNTAIN SOILS:**

Mountain soils are found in, as the name suggests, in mountainous regions. They are quite prone to soil erosion as a result of the top soil getting washed away due to the steep slopes of the mountains after a period of heavy rainfall.

These soils are mostly thin and infertile. These include peat, meadow and forest hill soils. The major characteristics of this soil are:

- They are rich in humus
- Are coarse and infertile. They are deficient in potash, phosphorous and lime.
- Tea, coffee, spices and tropical fruits

The states of Jammu and Kashmir, Himachal Pradesh and Uttaranchal, Assam, Sikkim as well as higher reaches of Arunachal Pradesh have mountain soil.

## ARID AND DESERT SOILS

Large part of arid and semi-arid region of Rajasthan and adjoining areas of Punjab and Haryana Desert soils are found in arid regions which receive very little rainfall.

- Low rainfall and high temperature are reasons for the formation of this soil .
- Having less than 50 cm rainfall . The high temperature adds to the loss of any remaining moisture in the soil. The soil is therefore sandy in nature. Thar Desert in Rajasthan has sandy soil.
- Covers an area of about 1.4 lakh sq km
- Originated from the mechanical disintegration of the ground rock of by deposition by wind
- Desert soil contain 90% of sand and 5% of clay. It contains rich percentage of soluble salts, but lack in organic matter.
- Are porous and coarse .
- They respond well to irrigation and manuring , especially phosphate and nitrate- it can improve the soil fertility as it is seen in the case of Indira Gandhi Canal in Rajasthan.
- Only suitable for drought resistance crops like millets, barley, cotton, maize and pulses.

## SALINE AND ALKALINE SOILS

Soils with high proportion of salts and alkalis are called saline and alkaline soils . They are formed due to accumulation of tidal water in adjoining coasts where drainage is poor. They are found in drier parts of Bihar, Rajasthan, U.P., Punjab, Haryana, Maharashtra. These soils contain many salts like sodium, magnesium and calcium which make them infertile and render unfit for agriculture.

## MARSHY SOIL

Found in continuously water-logged areas, or marshy areas especially in the coastal regions near the sea or near the deltas.

- It covers about 56,000 sq km.
- They are formed as a result of water-logging
- It contain iron and varying amount of decayed organic matter.
- Found in southern parts of Siwaliks, Jammu and Kashmir, U.P.

## SOIL EROSION

### Soil- erode-

when topmost fertile layer of the soil become loose and gets eroded/washed away with the action of wind or water.

### Common Causes-

- Deforestation
- Over-grazing
- Action of wind, water, glacier, etc.
- Faulty methods of agriculture, over-irrigation, shifting agriculture, wrong ploughing, etc.
- Other anthropogenic factors(mining activities,industrial activities,etc).

## CAUSES OF SOIL EROSION IN INDIA-

- 1) Heavy population pressure on land: - forest cover as low as 20.55% of total area – population continues to rise at a rapid rate – more forests are destroyed – heavy pressure on land.
- 2) Nature of Rainfall:- receives 80 to 90 per cent of rainfall in the monsoon season. – heavy downpour during during monsoon months causes floods. - remaining months – droughts – these affect soils.
- 3) Overgrazing – number of domestic animals, esp cattle highest in world – cattle freely graze in open lands making them bare of vegetation-winds carry away dry soil particles – Rajasthan
- 4). Bad farming techniques – plough fields in traditional ways – small size of holdings, absence of terracing, contour cultivation, crop rotation, improper use of manure have caused erosion
- 5) Topography – North –Eastern parts of India, Shiwaliks and the hilly regions in south India are affected by soil erosion because of steep slopes and heavy rainfall. During heavy rainfall, soils are washed away by running water down the slope.
- 6) Deforestation: destruction of forests for cultivation – cutting of trees exposes the soil to water and wind which leads to soil erosion

## REGIONS OF SOIL EROSION

\*Rajasthan, Madhya Pradesh, Maharashtra, UP, Gujarat, Andhra Pradesh, Karnataka. Worst affected areas include:

- \* The badlands of Chambal and Yamuna rivers
- \* The piedmont zone of the western Himalayas
- \* The Chotanagpur plateau region
- \* The Tapi-Sabarmati valley region in Gujarat
- \* The regur soil area of Maharashtra
- \* The dry areas of Rajasthan, Gujarat and Haryana

## EFFECTS OF SOIL EROSION:

- \* Loss of fertile top soil
- \* Lowering of the underground water table and decreasing soil moisture
- \* Drying of vegetation and extension of arid lands, increase in the frequency of droughts and floods
- \* Silting of river and canal beds, Recurrence of landslides, adverse effect on economic prosperity and cultural development
- \* Wind erosion reduces the productive capacity of soil, as most of the nutrients required by the plants are carried by the wind.

## PREVENTION OF SOIL EROSION-

1. *Terrace Farming*:- On hilly slopes, terraces act as bunds and prevent the soil from being washed away.
2. *Contour ploughing*- Ploughing along contourson a slope prevents soil being washed away by rainwater or by surface run off. Contours act like bunds. Terraces are levelled into step like small fields with even slope.
- 3) *Afforestation*: planting of trees along the edges of the fields, the waste land and on steepy slopes to prevent soil erosion as wellas to enahnce the capacity of the soil to retain water.  
\* increase area under forests and indiscriminate felling of trees must stop.
- 4) *Shelter Belts*: Farmers plant trees in several rows to check wind erosion. Known as wind breaks.
- 5) *Strip cropping*: Crops are grown in alternate strips of land to check the impact of the winds.
- 6) *Construction of dams*: Rivers cause soil erosion. Dams are built in the upper course of rivers to control erosion of soil. This would check the speed of water and thereby save soil from erosion.
- 7) *Ploughing Gullies*:The gullies made in the soil are plugged with deposition of silt during heavy rains.
- 8) Shifting or Jhuming or slash and burn type of agriculture should be banned.

## SOIL CONSERVATION SCHEMES

1.The centrally sponsored scheme of Integrated Watershed Management in the catchments of flood-prone rivers was launched during sixth Plan in eight flood-prone rivers of the Gangetic Basin covering seven States and one Union Territory. It aims at enhancing the ability of the catchment by absorbing larger quantity of rainwater, reducing erosion and consequent silt load in the stream and river beds and thus helping to mitigate the fury of floods in the productive plains.

2.A scheme for reclamation and development of ravine areas was launched in 1987-88 in MP, UP and Rajasthan. – included prepheral bunding to halt further ingress of ravines, afforestation of ravines, aforestaton of ravines for fuel, fodder and reclamation of shallow ravines.

3. Control of shifting cultivation is implemented since 1994-95 in the States of Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Tripura

The integrated programme envisages settling of families practising shifting cultivation.

it helps them to practise terraced cultivation, raising of horticultural palantations and afforestation to support animal husbandry and to meet fuel and fodder requirements.

4) In urban areas, rain water harvesting is means of checking soil erosion, besides recharging ground water.





**Indian Rivers are classified into four categories on the basis of their origin. They are**

1. Himalayan Rivers
2. Deccan Rivers
3. Coastal Rivers and
4. Rivers of the inland Drainage basin

#### **DIFFERENCE BETWEEN HIMALAYAN AND PENINSULAR RIVERS-**

##### **HIMALAYAN DRAINAGE-**

- Antecedent drainage i.e. Himalayan rivers are older than lesser Himalayas and shivaliks (older than the structures they cut across).
- Nature of flow is perennial- fed by rain and melting glaciers.
- Geologically young
- Long courses
- Flow through loose alluvial soils of northern plains
- Form deep valley and gorges due to intensive erosion.
- Generate large quantities of sediment.
- Cause annual flooding.
- Nature of river course is quiet changing, meandering, forming ox-bow lakes, high waterfalls, deeper basins and large catchment areas and form deltas.

##### **PENINSULAR DRAINAGE-**

- Super-imposed drainage i.e. regional structures are older than the river valleys that cut through them.
- Nature of flow is seasonal- during sw monsoons.
- Geologically older.
- Shorter courses.
- Flow through hard granitic soils of peninsular India.
- Shallow graded valleys with little erosion.
- Shallow valleys, small waterfalls, deltas and estuaries.

#### **DIFFERENCE BETWEEN WEST FLOWING RIVERS AND EAST FLOWING RIVERS OF PENINSULAR INDIA-**

WEST FLOWING- Narmada, Tapi, etc

- Flow into Arabian sea
- Through rift valley in straight linear course
- Donot have extensive network of tributaries
- Geologically young
- Generally form estuaries and not deltas
- Their valley floors much above the sea level
- Flow swiftly into the sea.

EAST FLOWING- Mahanadi, Godavari, Krishna, cauvery,etc

- Flow into bay of Bengal
- Have extensive network of tributaries
- Geologically old
- Have large catchment areas and form deltas
- Their valley floors at sea level
- Flow sluggishly into the sea.

### STREAM PATTERNS-

Drainage basin (drainage basin is equivalent term to watershed, catchment) is the area drained by tributary streams that coalesce into a main channel. The line, which divides the surface runoff between two adjacent river basins, is called the topographic water divide, or the watershed divide. The divide follows the ridgeline around the basin crossing the stream only at the outlet point. It marks the highest points between the basins, but isolated peaks within a basin may reach higher elevations than any point on the divide. The combined effects of climate and geology on the catchment topography yield an erosion pattern, which is characterized by a network of streams. Some of the frequently observed stream patterns are,

i. Dentric: When a region is homogenous offering no variation in the resistance to the flow of water, the resulting streams run in all directions without definite preference to any one particular region.

ii. Trellis: The trellis drainage pattern is develops when the underlying rock is strongly folded or sharply dipping. The longer streams will have preference to one particular orientation and the other tributaries will have an orientation and the tributaries will have an orientation at right angles to this.

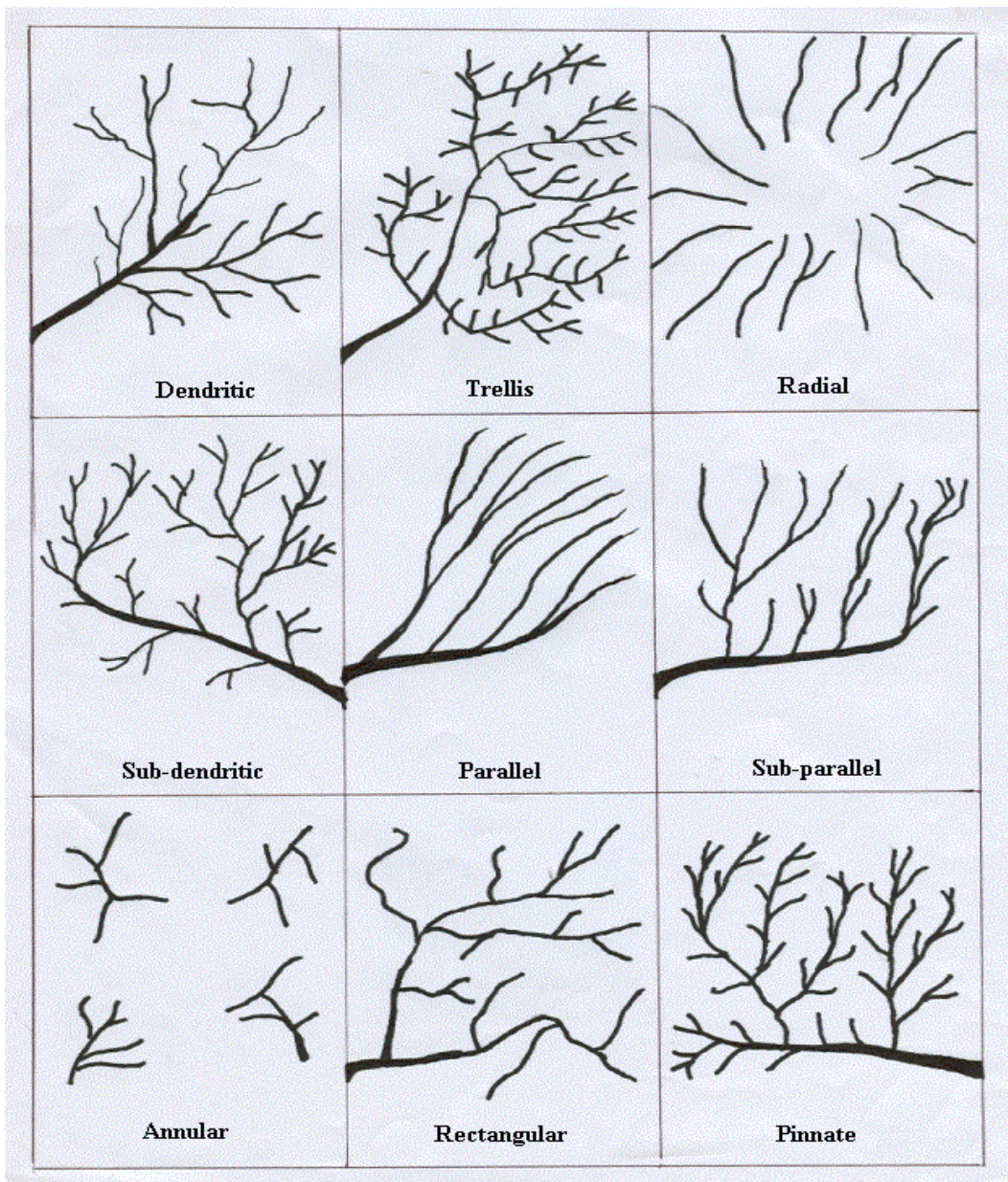
iii. Radial: The drainage pattern from dome Mountains and volcanoes is of radial type where the streams emanate from a central focus and flow radially outward.

iv. Parallel and Sub parallel: The internal geological structure of the land, sometimes the parallel and sub parallel patterns are formed. The most of the streams run in the same direction is the main characteristic feature.

v. Annular: The streams, which form in the weaker strata of the dome mountain, indicate approximately circular or annular pattern. The annular pattern may be treated as a special form of trellis pattern.

vi. Rectangular: A region consisting of many rectangular joints and faults may produce a rectangular drainage pattern with streams meeting at the right angle.

vii. Pinnate: In pinnate stream pattern, all the main streams run in one direction with the tributaries joining them at an oblique angle



## NATIONAL WATERWAYS-

**Inland Waterways Authority of India (IWAI)** was created by Indian Government on 27 October 1986 for development and regulation of Inland Waterways for shipping and navigation.

We have 6 national waterways in or country-

- 1) National waterway 1  
Allahabad — Haldia stretch of the Ganga-Bhagirathi-Hooghly river system.  
Estd = October 1986.  
Length = 1620 km
- 2) National waterway 2  
Sadiya — Dhubri stretch of Brahmaputra river.  
Estd = September 1982.  
Length = 891 km



- 3) National waterway 3  
Kottapuram-Kollam stretch of the West Coast Canal, Champakara Canal and Udyogmandal Canal.  
Estd = February 1993  
Length = 205 km
- 4) National waterway 4  
Kakinada - Puducherry stretch of Canals and the Kaluvelly Tank, Bhadrachalam – Rajahmundry stretch of River Godavari and Wazirabad – Vijayawada stretch of River Krishna.  
Estd = November 2008  
Length = 1095 km
- 5) National waterway 5  
Talcher - Dhamra stretch of the Brahmani River, the Geonkhali - Charbatia stretch of the East Coast Canal, the Charbatia - Dhamra stretch of Matai river and the Mangalgadi - Paradip stretch of the Mahanadi River Delta.  
Established = November 2008  
Length = 623 km
- 6) National waterway 6  
Lakhipur to Bhanga of river Barak.  
Proposed  
Length = 121 km

#### **INTER-LINKING OF RIVERS-**

Massive project to interlink major Indian rivers by constructing canals to reduce the risk of flood and to transport water from surplus to deficient areas.

Plans for parts of the Indian Rivers Inter-link were mooted in the British period. In 1972 the then Minister for Irrigation K. L. Rao proposed a 2640 kilometer long link between the Ganges and Cauvery rivers. In 1974 plans were proposed for the Garland canal. In 1982 the National Water Development Agency was set up to carry out surveys of the links and prepare feasibility studies.

#### **Project?**

The Inter-link would consist of two parts, a northern Himalayan River Development component and a southern Peninsular River Development component.

#### **Present Proposals-**

In India 30 links have been identified as technically feasible and economically viable on the basis of pre-feasibility studies. These are: Mahanadi (Manibhadra – Godavari (Dowlaiswaram) link, Godavari (Inchampalli Low Dam) – Krishna link, Godavari (Inchampalli) – Krishna (Nagarjunasagar) link, Godavari (Polavaram) – Krishna (Vijayawada) link, Krishna (Almatti) – Pennar link, Krishna (Srisaillam)- Pennar link, Krishna (Nagarjunasagar) – Pennar (Somasila) link, Pennar (Somasila) –Cauvery (Grand Anicut) link, Cauvery (Kattalsi)- Vaigai-Gundar link, Ken-Belwa link, Parbati-Kalisindh-Chambal link, Par-Tapti-Narmada link, Damanganga-Pinjal link, Bedti-Varda link, Netravati-Hemavati link and Pamba-Achankovil-Vaippar link.

Similarly, based on various water balance studies carried out for the Himalayan component, the link proposals identified for preparation of feasibility reports include the Manas-Sankosh-Tista-Ganga link, Kosi-Ghagra link,

Ghagra-Yamuna link, Sardar-Yamuna link, Yamuna-Rajasthan link, Rajasthan-Sabarmati link, Chunar-Sone Barrage link, Sone Dam – Southern Tributaries of Ganga link, Ganga-Damodar-Subernarekha link, Subernarekha-Mahanadi link, Kosi-Mechi link, Farakka-Sunderbans link, and Jogigopa-Tista-Farakka link

#### **BENEFITS-**

- 1) Greatly reduce the regional imbalance in the availability of water in different river basins. Surplus water which flows waste to the sea would be fruitfully utilized. It is assessed that the inter-linking of rivers will provide additional irrigation benefits to 35 million hectares (Mha) -25 Mha from surface water and an additional 10 Mha from increased ground water recharge- which will be over and above the ultimate irrigation potential of 140 Mha envisaged from the conventional irrigation projects.
- 2) Construction of storage dams as proposed will considerably reduce the severity of floods and the resultant damages. The flood peaks are estimated to reduce by about 20 to 30 per cent in the Ganga and Brahmaputra basins.
- 3) The benefits of drought mitigation from inter-basin water transfers will accrue to an area of about 25 lakh hectares in West Bengal, Bihar, Jharkhand, Uttar Pradesh, Haryana, Rajasthan, Madhya Pradesh, Gujarat, Andhra Pradesh, Karnataka and Tamil Nadu.
- 4) Hydro power could also be generated on a massive scale by the storage dams proposed under the interlinking of rivers. Hydro power development has not kept pace with the potential and requirement in our country. Against a potential of 84,000 MW, only about 22,000 MW capacity for hydro power generation has been developed so far. The storage dams proposed under interlinking of rivers will greatly improve this situation. The total hydro power potential of the interlinking systems is estimated to be 34,000 MW.
- 5) Most of the mega cities and urban centres in our country are already suffering from water shortages. A major part of the future requirements of big cities will have to be met from long-distance inter-basin transfer of water. In the link proposals under study, water supply to Mumbai and Delhi and many other villages and habitations enroute the link canals are proposed to be raised.

#### **ISSUES-**

- 1) Very expensive
- 2) Possibility of extensive environmental and ecological damage
- 3) Problem of land-acquisition
- 4) Inter-state disputes
- 5) Maintenance problems & cost
- 6) Siltation of canals

#### **RIVER WATER POLLUTION-**

Most of the Indian rivers and their tributaries viz., Ganges, Yamuna, Godavari, Krishna, Sone, Cauvery Damodar and Brahmaputra are reported to be grossly polluted due to discharge of untreated sewage disposal and industrial effluents directly into the rivers. These wastes usually contain a wide variety of organic and inorganic pollutants including solvents, oils, grease, plastics, plasticizers, phenols, heavy metals, pesticides and suspended solids. The indiscriminate dumping and release of wastes containing the above mentioned hazardous substances

into rivers might lead to environmental disturbance which could be considered as a potential source of stress to biotic community.

As for example, River Ganges alone receives sewage of 29 class I cities situated on its banks and the industrial effluents of about 300 small, medium, and big industrial units throughout its whole course of approximately 2525 kms. Identically Yamuna is another major river, has also been threatened with pollution in Delhi and Ghaziabad area. Approximately 5,15,000 kilolitres of sewage waste water is reported to be discharged in the river Yamuna daily. In addition, there are about 1,500 medium and small industrial units which also contribute huge amounts of untreated or partially treated effluent to the river Yamuna every day.

Similarly many other rivers were surveyed during past two decades with respect to their pollutional status. In addition to domestic and industrial discharge into the rivers, there were continued surface run off of agricultural areas, mines and even from cremation on the river banks. According to a report, over 32 thousand dead bodies were cremated at the major burning Ghats per year in Varanasi alone in the year 1984.

### IMPACT OF RIVER WATER POLLUTION-

The pollutants include oils, greases, plastics, plasticizers, metallic wastes, suspended solids, phenols, toxins, acids, salts, dyes, cyanides, pesticides etc. Many of these pollutants are not easily susceptible to degradation and thus cause serious pollution problems. Contamination of ground water and fish-kill episodes are the major effects of the toxic discharges from industries. Discharge of untreated sewage and industrial effluents leads to number of conspicuous effects on the river environment. The impact involves gross changes in water quality viz. reduction in dissolved oxygen and reduction in light penetration that's tends loss in self-purification capability of river water.

Environmental implications of the discharge of sewage and industrial effluents				
S.N.	Factor	Principal environmental effect	Potential ecological consequences	Remedial action
1.	High biochemical oxygen demand (BOD) caused by bacterial breakdown of organic matter	Reduction in dissolved oxygen (DO) concentration	Elimination of sensitive species, increase in some tolerant species; change in the community structure	Pretreatment of effluent, ensure adequate dilution
2.	Partial biodegradation of proteins and other nitrogenous material	Elevated ammonia concentration; increased nitrite and nitrate levels	Elimination of intolerant species, reduction in sensitive species	Improved treatment to ensure complete nitrification; nutrient stripping possible but expensive
3.	Release of suspended solid	Increased turbidity and reduction of light	Reduced photosynthesis of submerge plants; abrasion of gills or interference with	Provide improved settlement, insure adequate

	matter	penetration	normal feeding behaviour	dilution
4.	Deposition of organic sludge in slower water	Release of methane and hydrogen as sulphide matter decomposes anoxically, Modification of substratum by blanket of sludge	Elimination of normal benthic community loss of interstitial species; increase in the species able to exploit increased food source	Discharge where velocity adequate to prevent deposition
Other poisons				
1.	Presence of poisonous substances	Change in water quality	Water directly and acutely toxic to some organisms, causing change in community composition; consequential effect on pray- predator relation; sub-lethal effects on some species	Increase dilution
Inert solids				
1.	Particles in suspension	Increased turbidity. Possibly increased abrasion	Reduced photosynthesis of submerged plant. Impairing feeding ability through reduced vision or interference with collecting mechanism of filter feeders (e.g. reduction in nutritive value of collected material).Possible abrasion	Improve settlement
2.	Deposition of material	Blanketing of substratum, filling of interstices and/or substrate instability	Change in benthic community, reduction in diversity ( increased number of a few species)	Discharge where velocity adequate to ensure dispersion

## **RIVER CLEANSING-**

Water pollution has increased to such an extent that, rivers are being declared “Dead”. The part of Yamuna River which flows through Delhi is declared as dead as no living organism can sustain in that environment. It is not the case with only river Yamuna but many rivers in India needs quick attention.

India desperately needs strategies to manage its human waste. Out of 22,900MLD of waste-water generated in the country, only about 5,900 MLD (about 26%) is treated before disposal. According to a survey by BORDA, a NGO, out of the 3,119 big and small cities in India, only 217 (about 7%) have centralized sewage treatment plants(STP). A closer analysis reveals that 73% of the STPs operate below their design capacity with 7% of them being defunct. This clearly shows the failure of the centralized treatment plants.

## **METHODS-**

Waste water should be treated before discharging it into the river

Capacity & quality of sewage treatment plants should be upgraded

Litter traps should be inserted at the mouth of waste water entering into the river so as to stop solid litter/waste entering into the river

NRCA(National river conservation authority) had already started river specific programmes like Ganga actiona plan,etc for the conservation of national rivers.

VISION IAS



## AGRICULTURE

### TERMINOLOGIES-

**Agriculture:-** The art and science of cultivating soil, raising crops and rearing livestock including fishing and forests.

**Commercial Agriculture:-** Farming in which farmer grows the crop with the aim of selling it in the market.

**Cash Crops:-** Cash crops are those which are grown by the farmers to sell in the market, eg., Tobacco and Cotton.

**Dry Farming:-** Dry farming is adopted in scanty rainfall areas. Such types of crops are grown which requires less irrigation facilities.

**Wet Land farming:-** It is a type of farming which is practiced in high rainfall and irrigated areas. Eg., cultivation of jowar and bajra.

**Extensive Agriculture:-** Agriculture in which the agriculturalist tries to get the greatest output by bringing more and more new land areas under cultivation.

**Fallow Land:-** leaving the field free without growing a crop for recouplement of soil fertility. A breakthrough in seen technology which has led to a considerable increase in agricultural production, especially in wheat as a result of better inputs.

**Horticulture:-** Intensive cultivation of vegetables, fruits and flowers. It is an agricultural cropping season from early June to October. Rice, millets, maize, jute, etc are some of the crops of the season.

**Multiple Cropping:-** When two or more than two crops are grown simultaneously on the same field.

**Plantation Agriculture:-** A large-scale farming of one crop resembling the factory production, based on capital investment and application of modern science and technology in cultivating, processing and marketing the final products.

**Rabi Season:-** It is an agricultural cropping season from November to May. Wheat, gram, and oilseeds are some of the crops of the season.

**Shifting Agriculture:-** It is that type of agriculture in which farmers clear the forestland and use it for growing crops. The crops are grown for 2 to 3 years. When the fertility of the soil decreases, the farmer shifts to a new land.

**Subsistence Agriculture:-** Farming in which the main production is consumed by the farmer's household.

**Zaid Crops:-** These are crops which are sown between the rabi and the kharif crops. Watermelon, muskmelon, cucumber and vegetable are some examples of zaid crops.

**Sericulture:-** Rearing of silkworms for the production of silk fibre is known as sericulture.

## **Agriculture – backbone of our economy**

- India is an agricultural economy where 58% of the people depend on agriculture.
- Net sown area still accounts for about 47% of the total cultivable area of India.
- It accounts for about 35% of our national income.
- It provides food for the people and fodder for the animals.
- Agriculture is the main source of raw materials to the agro-based industries.- sugar, textile, edible oil, etc
- Agriculture provides market for many of the finished products.
- Foreign exchange is earned through exports of agriculture-based produce.
- Agriculture, being less capital-intensive, is of great importance as there is less capital for investment in India.
- It helps in better distribution of income and wealth.

## **SALIENT FEATURES OF INDIAN AGRICULTURE**

### 1. Dependence on monsoons:

- always dependent on monsoons
- monsoons are unreliable- uncertain and irregular
- large scale irrigation serves only one third of crop area
- remaining has to suffer the vagaries of monsoon.

### 2. Variety of crops

- India's vast relief, varying climate and soil conditions produce a variety of crops.
- Both tropical, subtropical and temperate crops like wheat, barley are grown.

### 3. Preponderance of Food crops

- Has to feed large population
- So preponderance of food crops over other crops in most important feature
- More than 2/3rd of total cropped area is food crops

### 4. Seasonal Pattern

- India – 3 main crop seasons which are most influenced by the changing season.

#### a.KHARIF

#### b.RABI

#### c.ZAID

A.KHARIF SEASON: ground is prepared in April – May and the seeds are sown in June on arrival of rain.

Harvest – beginning of November

major crops of this season – rice, maize, jowar, bajra, cotton, sesame, groundnut, pulses, jute

B. RABI SEASON: ground is prepared by end of October or beginning of November

harvesting – in March

Major crops – wheat, barley, jowar, gram, oil seeds, tobacco

C. ZAID SEASON: it is summer cropping season – crops sown at the beginning of the hot season in February and March and are harvested in the months of April and May

crops – rice, maize, watermelons, groundnut, vegetables and fruits

## Causes for backwardness of Indian Agriculture

- Our farmers still follow old methods of cultivation.
- Illiteracy and conservatism have come in the way of adopting scientific methods of cultivation.
- In many parts of the country farmers are still tenants and have no security of tenancy.
- Uneconomical holdings are a result of our laws of inheritance, but they adversely affect agriculture.
- Rural indebtedness and non-availability of capital also act as hindrances.
- Defective marketing and low prices have affected farming.
- Over-dependence on monsoons
- Overdependence of monsoon rainfall- erratic rainfall
- Floods and droughts
- Soil erosion
- Small and fragmented land holding: common feature  
intensive farming, increasing population, practice of dividing and subdividing land for inheritance – irrigation, wastage of labour, wastage of raised boundaries
- Poor quality of seeds – poor productivity
- Lack of proper use of manure and Fertilizer
- Reluctant to use modern scientific methods of cultivation
- Most farmers do not own the land- belongs to absentee landlords who are indifferent to land improvements
- Pests and diseases – no protection – farmers should be educated
- Traditional upbringing – most farmers do not believe in change – stick to old method of farming – very little improvement
- Excessive pressure on land
- Low yield – average yield of crops is lower than other countries
- Unsound credit system and poverty of the farmers.

## SOLUTION TO THE PROBLEMS-

- 1) Irrigation- Drip, sprinkler.
- 2) Consolidation of Land Holdings
- 3) Soil Conservation
- 4) Modernisation of Agriculture- mechanization, hybrid seeds, fertilizer, pesticides.
- 5) Scientific farming (use of S&T in agriculture).
- 6) GREEN REVOLUTION – during Fourth Five Year Plan period
  - Means to quick up trend change in agricultural production.
  - Able to export some of the food grains to other countries.
  - Under the INTENSIVE AGRICULTURE DEVELOPMENT PROGRAMME (IADP), several measures were adopted
  - AIMED at transforming the agriculture sector and increase the food crop production to meet the increasing demand
  - Effort began in 1960
  - Introduced in 1967-68
  - Sponsored by INDIAN COUNCIL OF AGRICULTURAL RESEARCH (ICAR) and an eminent agricultural agronomist, NORMAN BORLAUG

**•MEASURES ADOPTED:**

1. Use of high yielding varieties (HYV) of seeds
  2. Irrigation
  3. Use of insecticides, pesticides
  4. Consolidation of holdings
  5. Land reforms
  6. Rural electrification
  7. Improved rural infrastructure
  8. Supply of agricultural credit
  9. Use of (chemicals) fertilizers
  10. Opening of agricultural universities
- Led to remarkable increase in productivity
  - Made India self-sufficient in food production
  - By 94-95 food production of food grains increased 4 times
  - Most remarkable in Punjab, Haryana, U.P.

**How do the monsoons affect cultivation in India?**

A major part of the cultivated lands in India is still dependent on monsoon rains which are uncertain, irregular, and unevenly distributed. Sometimes crops get destroyed due to scanty rainfall and sometimes floods caused due to heavy rainfall bring destruction to the crops.

**What solutions are offered against irregular monsoons as far as farming is concerned?**

Different solutions are offered against irregular monsoons which are as follows:

- \* Irrigation facilities are provided in many areas by constructing canals.
- \* Several dams have been constructed to check floods.
- \* Recently, the Government of India is planning to interconnect the rivers of India in order to divert the water of flooded river to the water starved river.

**Mention problems faced by the farmers on account of small land holdings. Or What is farm fragmentation? How does it affect agriculture?**

Owing to small land holdings the farmers face following problems:

- i. Farmers are not interested in improving the land, to make it more fertile.
- ii. They are not willing to use new method of new technology in such a small land.
- iii. Being small and marginal farmers, they are not in position to use expensive high yielding seeds and agricultural machines on their small holdings.

**What is slash and burn agriculture? Mention its local names by mentioning the state or region.**

Ans. Under the slash and burn agriculture farmers clear a patch of land, grow crops for some years on a patch of land and then move to a new patch. Local names of the slash and burn agriculture are :-

1. Jhumming - Assam, Meghalaya, Mizoram and Nagaland
- 2 Pamlou - Manipur
- 3 Dipa - Chhattisgarh and Andaman and Nicobar Island.

### **Some new trends in the Indian agriculture.**

- i). There has been a gradual shift from cultivation of food crops to cultivation of fruits, vegetables, oil seeds, and crops which act as industrial raw materials. This has led to the reduction in the net sown area under cereals, millets and pulses.
- ii). The success of the green revolution has mechanized the Indian agriculture.
- iii). The farmers are also giving due attention to animal husbandry, and this has led to white revolution.
- iv). To supplement their income farmers are also adopting pisciculture and horticulture.

### **Steps taken by the Indian government to modernize the Indian agriculture.**

- i). The government has established the Indian Council of Agricultural Research (ICAR), agricultural universities, animal breeding centres to carry research and development activities in agriculture
- ii). The government is also investing in rural infrastructure to link the rural market with the international market.
- iii). Kissan Credit Card, Personal and Crop Insurance schemes, etc, have been launched.
- iv). A comprehensive land development programme has been launched.

### **DRYLAND AGRICULTURE-**

The areas which receive 370- 1130 mm of rainfall are known as dryland areas.

These regions are semi arid and arid regions. Dryland agriculture is entirely based on rainfall and includes minimal use of chemicals, fertilizers etc. It contributes 40% of the food production and provide support to nearly 45% of the population. The crops like coarse cereals and pulses are generally grown in these areas which are resistant to water stress.

Dryland agriculture face many problems like high risk in cropping, soil erosion, small holdings thus mechanisation not possible, small holdings, 75% of farmers are poor thus cant afford costly inputs, socio-economic disparities.

The solution to these problems lies in improving soil health of this region by minimising soil erosion, watershed development, introducing draught resistant hyv seeds, consolidation of land holdings & farm mechanisation, organic farming, afforestation, Jatropha cultivation on utterly barren lands that cant be rejuvenated.

### **SOCIAL FORESTRY-**

People oriented afforestation programme which aims at benefitting local community especially poorer and tribal sections, for improvement of environment at large through community based tree plantation. Trees are grown on public & community lands like along roadside, railways, canals, river banks, panchayat lands, barren and wastelands,etc.

### **OBJECTIVES**

- To relieve increase pressure on the traditional forests and expand the area under tree cover by massive people oriented afforestation.
- To meet basic needs of local people, esp poor and landless, in respect of fuel, fodder, minor forest produce.
- Help in checking water and wind erosion by acting as shelter belts.
- Employment generation.
- Additional income generation.

## **AGRO FORESTRY-**

It is the practice where land is used for agriculture, forestry and animal husbandry at the same time.

It is agro- silvi- pastoral system.

Deforestation is recognised as an environmental problem, therefore, there is need for afforestation but land is limited to grow forests, thus trees are grown within agricultural lands.

Benefits-

- Trees bind soil and acts as shelter belts thus check soil erosion.
- Deep roots of trees trap new nutrients and bring them close to the surface.
- Leguminous trees fix atmospheric nitrogen, thus improves fertility of the soil.
- Soil nutrient increases due to addition and deposition of leaf litter.
- Improvement of micro climate.
- Trees provide timber, food, fodder, fruits, shade, etc.

In region of shifting cultivation, agro forestry is the best way to restore land and ensure soil fertility.

## **ORGANIC FARMING-**

Organic farming is the form of agriculture that relies on techniques such as crop rotation, green manure, compost and biological pest control to maintain soil productivity and control pests on a farm. Organic farming excludes or strictly limits the use of manufactured fertilizers, pesticides (which include herbicides, insecticides and fungicides), plant growth regulators such as hormones, livestock antibiotics, food additives, and genetically modified organisms.

"Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.."

—International Federation of Organic Agriculture Movements

## **AGRO- ECOLOGICAL/CLIMATIC ZONES-**

Crop yield is the function of many factors like weather, soil type and its nutrient status, management practices and other inputs available. Of these, weather plays an important role, probably more so in India where aberrant weather such as drought, flood, etc., is a rule rather than an exception. Efficient crop planning, therefore, requires proper understanding of agro-climatic conditions. This calls for collection, collation, analysis and interpretation of long-term weather parameters available for each region to identify the length of the possible cropping period taking into consideration the availability of water.

The agro-climatic zone planning aims at scientific management of regional resources to meet the food, fiber, fodder and fuel wood without adversely affecting the status of natural resources and environment. While assessing the resource base required is the holistic perspective, development will have to be achieved through an appropriate mix of crop production and allied activities including horticulture, forestry, animal husbandry and

agro-processing etc. improved farming systems technologies will replace traditional crop production approach to minimize regional variations in rural incomes.

With the 329 million hectares of the geographical area the country presents a large number of complex agro-climatic situations. However, for the purpose of this exercise, Planning Commission has delineated 15 agro-climatic regions which were proposed to form basis for agricultural planning for the Eighth Plan.

### **GENETICALLY MODIFIED FOOD -**

The term GM foods or GMOs (genetically-modified organisms) is most commonly used to refer to crop plants created for human or animal consumption using the latest molecular biology techniques. These plants have been modified in the laboratory to enhance desired traits such as increased resistance to herbicides or improved nutritional content. The enhancement of desired traits has traditionally been undertaken through breeding, but conventional plant breeding methods can be very time consuming and are often not very accurate. Genetic engineering, on the other hand, can create plants with the exact desired trait very rapidly and with great accuracy.

#### **Advantages of GM Foods-**

- Pest resistance
- Herbicide resistance
- Disease resistance
- Cold tolerance
- Drought tolerance
- Salinity tolerance
- Increased nutrition
- Better flavour and colour
- Early maturing
- All year availability
- Easy to store

#### **Disadvantages-**

- Reduced effectiveness to pesticides
- Gene transfer to non-target species.
- Unknown effects on human health
- Economic concerns
- Playing with nature and its mechanisms.

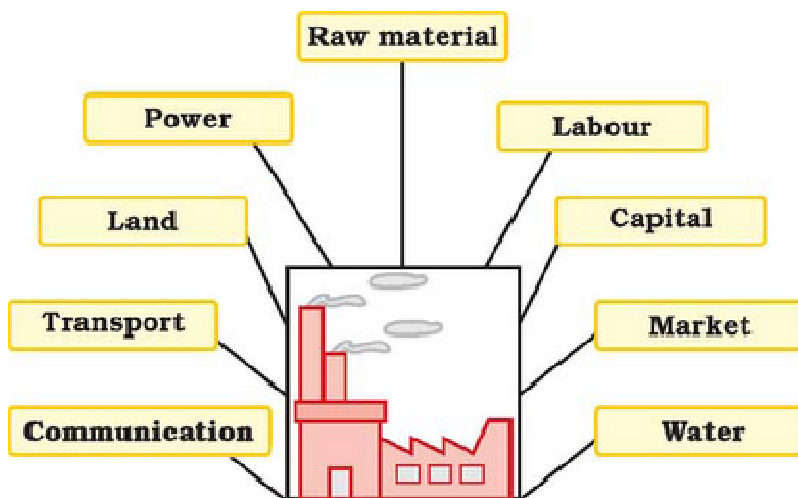
Genetically-modified foods have the potential to solve many of the world's hunger and malnutrition problems, and to help protect and preserve the environment by increasing yield and reducing reliance upon chemical pesticides and herbicides. Yet there are many challenges ahead for governments, especially in the areas of safety testing, regulation, international policy and food labeling. Many people feel that genetic engineering is the inevitable wave of the future and that we cannot afford to ignore a technology that has such enormous potential benefits. However, we must proceed with caution to avoid causing unintended harm to human health and the environment as a result of our enthusiasm for this powerful technology.

# INDUSTRIES

Industry refers to an economic activity that is concerned with production of goods, extraction of minerals or the provision of services.

## **The factors responsible for the location of industries-**

1. Availability of Raw Material
2. Power Resources
3. Availability of water
4. Labour
5. Transport Network
6. Availability of Market
7. Capital
8. Govt policies



## **THE NEED FOR INDUSTRIALISATION IN INDIA:**

- \* To reduce dependence on the other countries and become self-sufficient.
- \* to maintain the balance of trade.
- \* to solve the problem of unemployment .
- \* to accelerate the economic growth.

## **Industries pollute the environment-**

Rapid industrialisation for rapid economic development has raised various serious problems. It has actually degraded the environment in a number of ways:

- \* Emitting Harmful Effluents and Smoke into the Air:

For every industry one of the basic requirements is power and for that the factories use coal, mineral oil and gas day in and day out. And thus they emit many harmful effluents and smoke into the air which leads to the pollution of the air and degradation of the environment.

- \* Discharging Large Quantities of Chemical Waste and Garbage:

Almost all industries pollute the water as well by discharging large quantities of chemical wastes and garbage in it or through it. This water sometimes gets poisonous and plays havoc wherever it goes.



\* Leading to the Degradation of the Land:

Harmful effluents of factories and their chemical wastes do not spare the land as well. When polluted water finds no outlet and begins to stagnate at a particular place, it renders such a land quite degraded and useless.

\* Contaminating Underground Water:

When such contaminated water of factories is allowed to stagnate at a particular place for a longer period, it slowly and slowly seeps through the earth and freely mixes with the underground water.

\* ILL- effects of Industrial Slums on Environment:

Slums near the industrial areas also lead to environmental degradation. Generally, the workers build jhuggis near and around the factories and within no time slum after slum comes into existence. The jhuggi dwellers defecate in the open and pollute the whole environment.

\* Rapid growth in Population ultimately leading to Degradation of Environment: Rapid industrialisation is directly leading to rapid increase in population as with increase in living standard of the population and due to this rapid increase in population pressure on resources is taking place which ultimately leads to the exploitation of the resources and environment.

#### **Steps to be taken to minimise environmental degradation by industry-**

1. Use of Hydro-Electricity or Hydel Power: One of the major steps in this regard is that instead of using thermal power which is prepared by the burning coal, mineral oil or gas, Hydel power should be used. Hydroelectricity is both pollution free as well as an inexhaustible source of power. India has a large potential for Hydel power.
2. Use of Higher Quality Coal for Thermal Plants: It is suggested that if in any case, in certain areas, coal is to be used in Thermal Plants to produce electricity, then only the higher quality coal should be used which emits less smoke but gives more heat and produces more electricity.
3. Shifting of Factories out of Municipal Limits: All those factories which emit harmful effluents and smoke in the air or those who discharge dirty water into nearby streams and rivers should be shifted out of the municipal limits so that they do not pollute the air in the city areas.
4. Discharging dirty water after treating it: The dirty water of the factories must be first treated and then discharged in the nearby streams and rivers.
5. Recycling of Water: It would be better if the factories make an arrangement for using their waste-water over and over again after scientifically treating it.
6. Enacting Stringent Laws for checking Pollution and Degradation of the Environment: Those industrialists who do not see reason must be fined heavily so that they do not cause any concern either for the government or for the innocent public.
7. Planting of Trees and Creating Mini-Forest Areas: Factory owners can be encouraged and even rewarded for planting of trees in and around their factories. Such a measure would minimise both pollution and degradation of the environment.

### **Advantages of decentralization of industries in India-**

- Employment opportunities are created in every region of the country.
- Equitable distribution of national income is made possible.
- it removes regional disparities in the industrialization of the country.
- There is a check upon the concentration of population in certain parts of the country.

### **Cottage industries play an important role in the Indian economy-**

- Cottage industries provide jobs to millions of people. Thus, these industries create not only creates jobs for people, but also check their migration to urban areas.
- These industries can be started with low investment. Thus, these units help in earning additional income.
- Use of local raw material in these industries helps in the optimum utilization of national resources.
- Their products earn a lot of foreign exchange for the country.
- These industries generate seasonal as well as perennial employment for labour.

Thus cottage industries play significant role in our national economy

### **Why is sugar industry located in Uttar Pradesh?**

Uttar Pradesh leads in the production of sugar. The reasons are:

- RAW MATERIAL – Uttar Pradesh is the home of sugarcane because it has a fertile soil, with tropical climate, more than 100 cm rainfall , bright sunshine and irrigation facilities i.e. all the facilities essential for the growth of sugarcane.
- SUITABLE CLIMATE – Sugarcane is a tropical crop and grows well in this part of India.
- POWER: Electric power for running the mills is available in abundance.
- LABOUR – Cheap labour is locally available in Uttar Pradesh.
- EXTENSIVE AREA – Extensive area is put under the cultivation of sugarcane crop.

### **The sugar industry is now shifting from North to South-**

The sugar industry is now shifting from North to South because of the following reasons-

The sugar contents in the cane are higher. i.e. 10.5% in Maharashtra and other southern states.

South has better export facilities as compared to North.

Climate is also suitable for the cultivation of sugarcane.

### **Challenges faced by cotton industry-**

- Fluctuations in the production of raw material: Production of cotton is uncertain. It fluctuates depending on the climatic conditions. It makes the supply of raw material irregular.
- Poor Quality of Cotton: Fine quality of cotton is not produced in India. For manufacturing fine and costly cloth, we have to import fine quality cotton from other countries.
- The textile industry in our country had suffered badly for want of adequate and unfailing supply of Power. The inadequacy of coal supplies had also affected the progress of the industry.
- Competition in global market: The Indian cotton textile industry has been facing increasing competition in world markets, especially from countries like Japan, Korea, the USA and Taiwan, both in cost and quality. This is largely due to low productivity and high cost and consequently high prices of Indian cotton textile.
- Old and outdated machinery and need for modernization : Cotton textile industry is one of the oldest industries of India. So it has a major problem of old and outdated machinery which are inefficient and, hence, uneconomic.
- Rivalry: Strikes, lock-outs and market rivalry have also made the industry sick.
- The invention of synthetic as a substitute for cotton has resulted in the decline of cotton industry.

### **Why cotton textile industry is largely concentrated in Maharashtra/Mumbai**

Cotton textile industry is largely concentrated in Maharashtra for the following reasons-

- AVAILABILITY OF RAW MATERIALS- Cotton is the basic input of cotton textile industry and Maharashtra is the leading producer of cotton.
- TRANSPORT AND EXPORT FACILITY- Mumbai has excellent transportation network. It is also a port city and so export facilities are available. Therefore through it, good quality cotton, machines and the raw material are easily imported and finished products can be easily exported.
- LABOUR AND MARKET – Maharashtra has high density of population . So skilled and unskilled labour is easily available. Due to high density of population, demand for the products is also high.
- FAVOURABLE CLIMATE – this region has equitable climate which ensures the production of cotton.
- SOURCE OF POWER: The Western Ghats provide suitable conditions for the generation of cheap hydro-electricity required for this industry.
- FINANCE: There is no dearth of financial and banking institutions to make available finances for the growth of this industry.

### **Main problems faced by the Jute Industry in India-**

\*PROBLEMS OF RAW MATERIAL – After independence most of the jute-producing areas went to Bangladesh (erstwhile East Pakistan) resulting in acute shortage of raw jute. Although successful efforts have been made to increase the supply of raw jute since independence, it still falls short of our current requirements.

\* INTERNATIONAL COMPETITION – Our jute industry has to face a very tough competition from synthetic packing materials of the advanced countries of Europe and North America. As such the market for jute goods has shrunk. Indian Jute industry is facing very stiff competition from Bangladesh, Philippines, Japan and Brazil.

\* LESS DEMAND – Due to synthetic substitutes in domestic as well as international markets the overall demand for jute products is gradually decreasing in the international market.

LABOUR UNREST: Labour unrest and strikes have further added problems for this industry

VISION IAS

## TOURISM INDUSTRY

**INDIA'S TOURISM POTENTIAL-** India is a multi-destination country with a variety of tourist attractions and facilities. It is the second largest net foreign exchange earner by way of invisible exports. Tourism creates more jobs than any other sector for every rupee invested. It has a major role in promoting large-scale employment opportunities. Keeping this in view, it has been granted the status of an industry.

### **Tourist Attractions-**

India is a country known for its lavish treatment to all visitors, no matter where they come from. Its visitor-friendly traditions, varied life styles and cultural heritage and colourful fairs and festivals held abiding attractions for the tourists. The other attractions include beautiful beaches, forests and wild life and landscapes for eco-tourism, snow, river and mountain peaks for adventure tourism, technological parks and science museums for science tourism; centres of pilgrimage for spiritual tourism; heritage trains and hotels for heritage tourism. Yoga, ayurveda and natural health resorts also attract tourists.

The Indian handicrafts particularly, jewellery, carpets, leather goods, ivory and brass work are the main shopping items of foreign tourists. The estimates available through surveys indicate that nearly forty per cent of the tourist expenditure on shopping is spent on such items.

- Sight seeing- physiography- Himalayas, desert, rainforests, plateaus, grasslands, etc.
- Taj-mahal- One of 7 wonders of the world
- Pilgrimage tourism
- Festival tourism
- Medical tourism
- Educational tourism
- Pro-poor tourism
- Rural tourism
- Cultural tourism
- Slum tourism
- Wild-life tourism

### **Thrust Areas**

In order to speed up the development of tourism in the country several thrust areas have been identified for accomplishment during the Ninth Five Year Plan (1997-2002). The important ones are development of infrastructure, products, trekking, winter sports, wildlife and beach resorts and streamlining of facilitation procedures at airports, human resource development and facilitating private sector participation in the growth of infrastructure.

## Organisation

The organisations involved in the development of tourism in India are the Ministry of Tourism with its 21 field offices within the country and 18 abroad, Indian Institute of Tourism and Travel Management, National Council for Hotel Management and Catering Technology, India Tourism Development Corporation, Indian Institute of Skiing and Mountaineering and the National Institute of Water Sports.

## Boosting Tourism

Some of the recent initiatives taken by the Government to boost tourism include grant of export house status to the tourism sector and incentives for promoting private investment in the form of Income Tax exemptions, interest subsidy and reduced import duty. The hotel and tourism-related industry has been declared a high priority industry for foreign investment which entails automatic approval of direct investment up to 51 per cent of foreign equity and allowing 100 per cent non-resident Indian investment and simplifying rules regarding the grant of approval to travel agents, tour operators and tourist transport operators.

## Constraints

The major constraint in the expansion of international tourist traffic to India is non-availability of adequate infrastructure including adequate air seat capacity, accessibility to tourist destinations, accommodation and trained manpower in sufficient number.

Poor visitor experience, particularly, due to inadequate infrastructural facilities, poor hygienic conditions and incidents of touting and harassment of tourists in some places are factors that contribute to poor visitor experience.

To sum up, Indian tourism has vast potential for generating employment and earning large sums of foreign exchange besides giving a fillip to the country's overall economic and social development. Much has been achieved by way of increasing air seat capacity, increasing trains and railway connectivity to important tourist destinations, four-laning of roads connecting important tourist centres and increasing availability of accommodation by adding heritage hotels to the hotel industry and encouraging paying guest accommodation. But much more remains to be done. Since tourism is a multi-dimensional activity, and basically a service industry, it would be necessary that all wings of the Central and State governments, private sector and voluntary organisations become active partners in the endeavour to attain sustainable growth in tourism if India is to become a world player in the tourist industry.

# Energy Resources

## IMPORTANCE OF ENERGY RESOURCES:

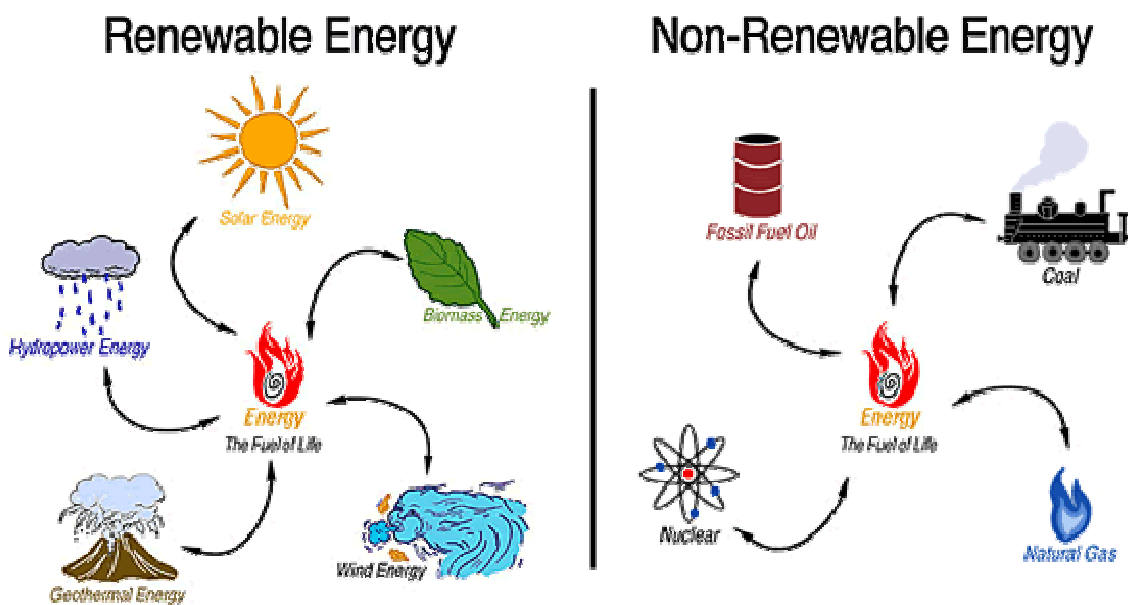
- Power is the main input for agriculture and industry.
- Energy sources are the backbone of economic development .
- The resources which are widely used and constitute the major source of energy are called conventional resources of energy.

## ENERGY

Conventional- Like coal, oil, natural gas,etc

Non- conventional- Solar, wind, tidal, geothermal, OTEC,etc.

## RESOURCES-



## Disadvantages of conventional sources of energy:-

- They are non-renewable.
- They are very costly.
- They cause pollution.
- Exhaustible.

## NEED FOR CONSERVING CONVENTIONAL ENERGY RESOURCES-

- Conventional sources of energy like coal, petroleum, gas, and wood are limited in supply and cannot be renewed easily. Therefore they need to be conserved.
- Due to population explosion, modernization and industrialization the demand for energy resources is increasing day by day but the reserves of conventional resources are limited. This is leading to 'energy crisis'. So to avoid or to control energy crisis there is need to conserve conventional energy resources.
- The present efficiency rate especially of thermal power station is very low. On the other hand demand is rising.



### Advantages of non- conventional sources of energy-

- Renewable
- Cheap
- Pollution free
- Inexhaustible.

Source	Approx. Potential (MW)
Biomass energy	19,500
Solar energy	20,000
Wind energy	47,000
Small hydropower	15,000
Ocean energy	50,000

### National Grid ( NAT-GRID)-

Under national grid all the regional grids will be connected into a single grid to supply uninterrupted power to all the regions during adverse conditions. Its objective is to ensure the optimum utilization of generating resources, conservation of an eco-sensitive right of way and the flexibility to accommodate the uncertainty of generation plans.

### ENERGY CRISIS-

It is a situation in which the production of resources is less as compared to demand. In the past few decades due to high demand, there is shortage of energy resources, which has created energy crisis.

### CAUSES-

- Rapid Industrialisation
- Over Population
- Transfer losses
- Rise in oil prices
- Problems in Middle east.
- Wastage of energy resources.

### MEASURES TO CONSERVE ENERGY-

- Crisis management- The energy should be used in a planned way so that these can be used in judicious way.
- Wastage of energy should be minimized.
- Modern technology should be used for the exploitation of energy.
- Alternative sources of energy should be explored.

## **NUCLEAR ENERGY-**

Nuclear energy is the energy obtained from atomic minerals like uranium, thorium, zircon, beryllium and limonite. These minerals provide colossal energy through a small quantity of substance.

§ Nuclear energy is very economical.

§ Nuclear energy does not produce green-house gases that pollute atmosphere.

§ It requires small proportion of minerals which can produce energy for a long period of time.

### **Nuclear power plants in India-**

Kaiga- Karnataka

Kakrapara- Gujarat

Kalpakkam & Koodankulam- Tamil Nadu

Narora- UP

Rawatbhata & Banswara- Rajasthan

Tarapur- Maharashtra

### **Important nuclear raw materials & their availability in India-**

Most important nuclear raw material for nuclear power are minerals like thorium, uranium, and beryllium.

i. THORIUM – Thorium mainly occurs in the form of thorianite, allanite and monazite. In India large reserves of monazite are found. Deposits of monazite are found in the beach sands of Kerala, Tamil Nadu, Andhra Pradesh, and Orissa.

ii. URANIUM – It occurs mainly in Bihar, Jharkhand, Rajasthan, Uttarkhand, Chattisgarh and in the ilmenite beach sands in Kerala.

iii. BERYLLIUM- It is obtained from beryl, which is found in association with Felspar and Mica. Beryllium is found in Bihar, Rajasthan, Andhra Pradesh, Madhya Pradesh, Jammu and Kashmir and Sikkim.

iv. ZIRCONIUM- Its chief ore is zircon which is mainly associated with igneous rocks. It is found in Bihar and Tamil Nadu.

### **Chief limitations of nuclear power-**

SAFETY – All types of nuclear installations have an element of risk of leaking radioactive wastes which are harmful to all living beings.

WASTE MANAGEMENT – Nuclear installations take precautions for the disposal of the waste material or for its utilization. However, the discharge of radioactivity in the atmosphere remains the greatest danger. Even in advanced countries radioactive wastes are dumped in geological formations. These wastes through are immobilized, contaminate underground water oceans and even the air.

THERMAL POLLUTION: This happens through discharge of coolants like heavy water.

NUCLEAR DISASTER : Construction of nuclear power plant can cause a nuclear disaster if it is not administered properly.

## **GEO THERMAL ENERGY**

Geothermal energy refers to the heat and electricity produced by using the heat from the interior of the Earth. Geothermal energy exists because, the Earth grows progressively hotter with increasing depth. Where the geothermal gradient is high, high temperatures are found at shallow depths. Groundwater in such areas absorbs heat from the rocks and becomes hot. It is so hot that when it rises to the earth's surface, it turns into steam. This steam is used to drive turbines and generate electricity. There are several hundred hot springs in India, which could be used to generate electricity. Two experimental projects have been set up in India to harness geothermal energy. One is located in the Parvati valley near Manikarn in Himachal Pradesh and the other is located in the Puga Valley, Ladakh.

## **BIOGAS**

It is energy gas which is produced from organic waste such as farm waste, shrubs, animal and human waste which is converted into energy by direct combustion or by conversion of such wastages into alcohol, methane, or other storage fuels.

- Biogas plant provides pollution-free energy.
- It is cheaper than most of the common fuels.
- The residue can be used as manure.
- It has higher thermal efficiency in comparison to kerosene, cow dung, coal and charcoal.

## **SOLAR ENERGY**

India is a tropical country. It has enormous possibilities of tapping solar energy. Photovoltaic technology converts sunlight directly into electricity. Solar energy is fast becoming popular in rural and remote areas. India has already made progress in the use of solar energy for daily requirements. It is a equi-stable energy and can rightly be called the energy of the future, because it is an inexhaustible source of energy. The largest solar plant of India is located at Madhavpur, near Bhuj, where solar energy is used to sterilise milk cans. It is expected that use of solar energy will be able to minimise the dependence of rural households on firewood and dung cakes, which in turn will contribute to environmental conservation and adequate supply of manure in agriculture. Solar station at Baramer in Rajasthan was set up to produce large quantities of solar energy.

Solar energy is used as a source of electricity in villages. It is also used in railway signals, lift irrigation and for communication media. Solar cookers and solar heaters are very popular. It is also used in desalination of water and drying of grains.

## **WIND ENERGY-**

India now ranks as a "wind super power" in the world. The largest wind farm cluster is located in Tamil Nadu from Nagarcoil to Madurai. Apart from these, Andhra Pradesh, Karnataka, Gujarat, Kerala, Maharashtra and Lakshadweep have important wind farms. Nagercoil and Jaisalmer are well known for effective use of wind energy in the country.

## **TIDAL ENERGY-**

Oceanic tides can be used to generate electricity. Floodgate dams are built across inlets. During high tide water flows into the inlet and gets trapped when the gate is closed. After the tide falls outside the flood gate, the water retained by the floodgate flows back to the sea via a pipe that carries it through a power-generating turbine. In India, the Gulf of Kutchh, provides ideal conditions for utilising tidal energy. A 900mw tidal energy power plant is set up here by the National Hydropower Corporation.

## **OTEC-**

Ocean thermal energy conversion (OTEC) uses the difference between cooler deep and warmer shallow or surface ocean waters to run a heat engine and produce useful work, usually in the form of electricity. It is planned to construct a pilot floating OTEC plant with a rating of 1MW gross off the coast of India

## **BIOFUELS-**

Biofuels(bio-ethanol & bio-diesel) are a wide range of fuels which are in some way derived from biomass. The term covers solid biomass, liquid fuels and various biogases. Biofuels are gaining increased public and scientific attention, driven by factors such as oil price spikes, the need for increased energy security, concern over greenhouse gas emissions from fossil fuels, and government subsidies. Biofuel development in India centers mainly around the cultivation and processing of Jatropha plant seeds which are very rich in oil (40%).

Jatropha incentives in India is a part of India's goal to achieve energy independence by the year 2012. Jatropha oil is produced from the seeds of the Jatropha curcas, a plant that can grow in wastelands across India, and the oil is considered to be an excellent source of bio-diesel. India is keen on reducing its dependence on coal and petroleum to meet its increasing energy demand and encouraging Jatropha cultivation is a crucial component of its energy policy.

Large plots of waste land have been selected for Jatropha cultivation and will provide much needed employment to the rural poor of India. Businesses are also seeing the planting of Jatropha as a good business opportunity. The Government of India has identified 400,000 square kilometres (98 million acres) of land where Jatropha can be grown, hoping it will replace 20% of India's diesel consumption by 2011.

## POPULATION- Statistics, Problems & Solutions-

India is currently home to about 1.21 billion people, representing a full 17% of the earth's population. India's 2011 census showed that the country's population had grown by 181 million people in the prior decade.

### **PATTERNS OF POPULATION DISTRIBUTION IN INDIA-**

Uneven distribution of population in India suggests a close relationship between population and physical, socioeconomic and historical factors.

a. **Physical factors** such as Climate, Terrain and Availability of water influenced and determined the pattern of the population distribution.

Example 1: the North Indian Plains, deltas and Coastal Plains have higher proportion of population because they have climate suitable for agriculture and fertile plains.

ii. Example 2: Mountainous and forested regions of southern and central Indian States, Himalayan states, and some of the north-eastern states are less populated.

iii. Example 3: Development of irrigation (Rajasthan), availability of mineral and energy resources (Jharkhand) and development of transport network (Peninsular States) have resulted in moderate to high proportion of population.

b. **Socio-economic and historical factors** also influence and determine the distribution of population of India.

i. Example 1: Traditional settled agriculture and early human settlement has resulted in large population in the river plains and coastal areas of India.

ii. Example 2: Development of transport and better agricultural development has resulted in large population in North Plains.

c. **The industrialization and urbanization** also influenced the distribution of population.

i. Example 1: The urban regions of Delhi, Mumbai, Kolkata, Bangalore, etc. have high concentration of population due to industrial development and urbanization. A large numbers of rural-urban migrants come to these towns.

### **FOUR DISTINCT PHASES OF GROWTH OF INDIAN POPULATION-**

#### **Phase I:**

a. The period from 1901-1921 is referred to as a period of stagnant or stationary phase of growth of India's population

b. In this period growth rate was very low, even recording a negative growth rate during 1911-1921.

c. Both the birth rate and death rate were high keeping the rate of increase low.

d. Poor health and medical services, illiteracy of people at large and inefficient distribution system of food and other basic necessities were largely responsible for a high birth and death rates in this period.

### **Phase II:**

- a. The decades 1921-1951 are referred to as the period of steady population growth.
- b. An overall improvement in health and sanitation throughout the country brought down the mortality rate.
- c. At the same time better transport and communication system improved distribution system.
- d. The crude birth rate remained high in this period leading to higher growth rate than the previous phase.

### **Phase III:**

- a. The decades 1951-1981 are referred to as the period of population explosion in India,
- b. It was caused by a rapid fall in the death rate but a high birth rate.
- c. The average annual growth rate was as high as 2.2 per cent.
- d. High birth rate was due to developmental activities and growing economy which improved living condition of people.
- e. Beside it, due to increased international immigration from Tibet, Bangladesh, Nepal and Pakistan growth rate was high.

### **Phase IV:**

- a. After 1981 till present, the growth rate has started slowing down gradually.
- b. It is due to decline in crude birth rate.
- c. It is also due to an increase in the mean age at marriage, improved quality of life particularly education of females in the country.

### **FOUR LANGUAGE FAMILIES OF INDIA-**

- a. Austric (Nishada)
- b. Dravidian (Dravida)
- c. Sino-Tibetan (Kirata)
- d. Indo –European (Aryan)

Among the four families Indo-European (Aryan) are spoken largest in India.

Four states in which this language is spoken are

- a) Jammu & Kashmir, b) Punjab, c) Himachal Pradesh, d) U.P., e) Rajasthan,
- f) Haryana.

### **Religious composition of the population of India-**

#### **a. Hindus**

- i. Hindus are dominant in many states such as Haryana, HP, UP.

ii. They are less in the states along Sikkim, Punjab, Jammu & Kashmir, and Mizoram.

**b. Muslims**

i. Muslims are the largest religious minority in India.

ii. They are in majority in Jammu & Kashmir, some districts of West Bengal and Kerala, Uttar Pradesh, in and around Delhi and in Lakshadweep.

**c. Christian**

i. They are distributed mostly in rural areas of the country.

ii. The main concentration is in the Western coast around Goa,

Kerala and also in the hill states of Meghalaya, Mizoram, Nagaland, and Hills of Manipur.

**d. Sikhs**

i. They are mostly concentrated in relatively small area of the country, particularly in the states of Punjab, Haryana and Delhi.

**e. Jains and Buddhists**

i. Jains are the smallest religious groups in India.

ii. They are concentrated only in the urban areas of Rajasthan, Gujarat and Maharashtra.

iii. Buddhists are concentrated mostly in Maharashtra. The other areas of Buddhist majority are Sikkim, Arunachal Pradesh, and Ladakh.

f. The other religions of India include Zoroastrians, tribal and other indigenous faiths and beliefs. These groups are concentrated in small pockets scattered throughout the country.

**POPULATION PROBLEMS IN INDIA-**

Population in itself is NOT the problem. Lack of basic education and poor economic conditions are!

- Unemployment, Poverty, Migration, Urbanization problems, regional disparities, etc

**Following are the adverse effects of population growth on the Indian Economy: -**

1. Adverse effects on savings
2. Unproductive investment
3. Slow growth of Per Capita Income
4. Underutilization of labour
5. Growing pressure on land
6. Adverse effect on quality of population and
7. Adverse social impact



## **DISTRESSED MIGRATION AND URBAN CRISIS IN INDIA-**

### **1. Poverty-Induced Migration and Crucial Urban Crisis-**

Massive distressed migration of people from villages to metropolises and problems of unbalanced urbanization and extreme urban decay in India. First, masses of the poor, landless, illiterate and unskilled agricultural laborers and petty farmers from backward states of such countries make quantum jumps towards big metropolises like Calcutta, Bombay, Delhi, Madras, and so forth, bypassing local small towns and small cities -- which fail to give them even minimum employment. Such massive rural to metropolitan migration of distressed people is a typical characteristic of migration in India, which is leading to acute urban involution, congestion and decay. Proliferation of filthy urban slums and pavement dwelling, extreme squalor and very poor level of living characterize such metros. Because such metropolises have failed to provide to migrants and residents with minimum shelter and minimum subsistence employment. Overflow of urban poverty, unemployment, extreme housing shortages, and frequent breakdowns of essential urban services (like water, electricity, sewerage, transport) are visible everywhere in such metropolises.

Secondly, such phenomena are occurring because the metropolises of many such countries have very limited employment-generating capacity under capital-intensive industrialization, and consequently, the incoming illiterate and unskilled migrants are absorbed only in very poorly paid urban informal sectors; that are characterized by low productivity, cut-throat competition, insecurity and exploitation. It leads to a colossal waste of human resources and of national potential. So the migrants are in fact moving from rural poverty to urban poverty.

Thirdly, as a result, such metropolises also became very much involuted, not evolved; i.e., they grew merely in population, not in prosperity.

Fourthly, such metropolises are very fast becoming the scenes of extreme social and economic inequalities wherein abundant affluence among a handful few stand hanging and over-looking abject poverty among the masses down below. These kinds of situations may create a dangerously eruptive situation -- which is conducive to unleash in the near future extreme social disorder, severe class conflict, crimes, widespread violence and urban civil war.

### **2. Acute Urban Environmental Degradation-**

Shortage of housing, water, electricity, etc- Problem of squatter settlements and slums, worsening water quality, excessive air pollution, noise pollution, heat, problem of disposal of solid waste, hazardous waste, etc.

### **3. Nature of Low Quality Migration in Indian Mega Cities-**

Educational status and occupational status of large number of migrants is below average.

## **TRIBES OF INDIA-**

They comprise a substantial indigenous minority of the population of India and claim to be the aboriginal population of India.

Adivasi societies are particularly present in the Indian states of Kerala, Orissa, Madhya Pradesh, Chattisgarh, Rajasthan, Gujarat, Maharashtra, Andhra Pradesh, Bihar, Jharkhand, West Bengal, Mizoram and other northeastern states, and the Andaman and Nicobar Islands. Many smaller tribal groups are quite sensitive to ecological degradation caused by modernization. Both commercial forestry and intensive agriculture have proved destructive to the forests that had endured swidden agriculture for many centuries. Officially recognized

by the Indian government as "Scheduled Tribes" in the Fifth Schedule of the Constitution of India, they are often grouped together with scheduled castes in the category "Scheduled Castes and Tribes", which is eligible for certain affirmative action measures.

The Constitution of India, Article 366 (25) defines Scheduled Tribes as "such tribes or tribal communities or part of or groups within such tribes or tribal communities as are deemed under Article 342 to be the scheduled Tribes (STs) for the purposes of this Constitution". In Article 342, the procedure to be followed for specification of a scheduled tribe is prescribed. However, it does not contain the criterion for the specification of any community as scheduled tribe. An often used criterion is based on attributes such as:

- Geographical isolation - they live in cloistered, exclusive, remote and inhospitable areas such as hills and forests.
- Backwardness - their livelihood is based on primitive agriculture, a low-value closed economy with a low level of technology that leads to their poverty. They have low levels of literacy and health.
- Distinctive culture, language and religion - communities have developed their own distinctive culture, language and religion.
- Shyness of contact – they have a marginal degree of contact with other cultures and people

#### **Geographical overview-**

Tribal peoples constitute 8.2% of the nation's total population, over 84 million people according to the 2001 census. One concentration lives in a belt along the Himalayas stretching through Jammu and Kashmir, Himachal Pradesh, and Uttarakhand in the west, to Assam, Meghalaya, Tripura, Arunachal Pradesh, Mizoram, Manipur, and Nagaland in the northeast. In the northeastern states of Arunachal Pradesh, Meghalaya, Mizoram, and Nagaland, more than 90% of the population is tribal. However, in the remaining northeast states of Assam, Manipur, Sikkim, and Tripura, tribal peoples form between 20 and 30% of the population.

Another concentration lives in the hilly areas of central India (Chhattisgarh, Madhya Pradesh, Orissa and, to a lesser extent, Andhra Pradesh); in this belt, which is bounded by the Narmada River to the north and the Godavari River to the southeast, tribal peoples occupy the slopes of the region's mountains. Other tribals, including the Santals, live in Jharkhand and West Bengal. Central Indian states have the country's largest tribes, and, taken as a whole, roughly 75% of the total tribal population live there, although the tribal population there accounts for only around 10% of the region's total population.

There are smaller numbers of tribal people in Karnataka, Tamil Nadu, and Kerala in south India; in western India in Gujarat and Rajasthan, and in the union territories of Lakshadweep and the Andaman Islands and Nicobar Islands. About one percent of the populations of Kerala and Tamil Nadu are tribal, whereas about six percent in Andhra Pradesh and Karnataka are members of tribes.

#### **Problems of Tribal people-**

- Poverty
- Illiteracy
- Dependence on forests
- Unemployment
- Malnutrition & other health related problems

- Excessive discrimination & Misery
- Problem of land Alienation
- Indebtedness
- Bonded labour

And now a days, The large development projects undertaken by the government also encroaches upon their land. Large scale displacements and unsatisfactory compensation and rehabilitation are common place, leading to further backwardness and seclusion. Because of their diversity they lack a common voice to bargain collectively.

#### **Impact assessment-**

1. Landlessness: Expropriation of land removes the main foundation upon which people's productive systems, commercial activities, and livelihoods are constructed.
2. Joblessness: The risk of losing wage employment is very high both in urban and rural displacements for those employed in enterprises, services or agriculture. Yet creating new jobs is difficult and requires substantial investment.
3. Homelessness. Loss of shelter tends to be only temporary for many people being resettled; but, for some, homelessness or a worsening in their housing standards remains a lingering condition. In a broader cultural sense, loss of a family's individual home and the loss of a group's cultural space tend to result in alienation and status deprivation.
4. Marginalisation. Marginalisation occurs when families lose economic power and spiral on a "downward mobility" path. Many individuals cannot use their earlier-acquired skills at the new location; human capital is lost or rendered inactive or obsolete. Economic marginalisation is often accompanied by social and psychological marginalisation.
5. Food Insecurity. Forced uprooting increases the risk that people will fall into temporary or chronic undernourishment, defined as Calorie-protein intake levels below the minimum necessary for normal growth and work.
6. Increased Morbidity and Mortality. Displacement-induced social stress and psychological trauma, the use of unsafe water supply and improvised sewage systems, increase vulnerability to epidemics and chronic diarrhoea, dysentery, or particularly parasitic and vector-borne diseases such as malaria and schistosomiasis.
7. Loss of Access to Common Property. For poor people, loss of access to the common property assets that belonged to relocated communities (pastures, forest lands, water bodies, burial grounds, quarries and so on) result in significant deterioration in income and livelihood levels.
8. Social Disintegration. Displacement causes a profound unravelling of existing patterns of social organisation. This unravelling occurs at many levels. When people are forcibly moved, production systems, life-sustaining informal networks, trade linkages, etc are dismantled.

#### **Solutions-**

Development induced proper resettlement & rehabilitation.

(and reverse all steps in given in problems)

## Census,2011- Basic statistics

Census 2011- 15th Indian national census... In 2011 first time biometric info is collected.

Provisional data released on 31st march, 2011.. complete data will be available by 2012

<b>Population</b>	Total	1,210,193,422
	Males	623,724,248
	Females	586,469,174
<b>Literacy</b>	Total	74.04%
	Males	82.14%
	Females	65.46%
<b>Density of population</b>	per sq. km	382
<b>Sex ratio</b>	per 1000 males	940 females

Population increased by 181 million since 2001.

India with 2.4% of the world's surface area accounts for 17.5 % of its population. UP is the most populous state with roughly 200 million people.

population - 1.2102 bn(17.5% of world population), 623.7 million males and 586.5 million females, making it more populous than Indonesia, the United States, Brazil, Pakistan and Bangladesh combined.

**Growth of Population-** Highest- Meghalaya(27.8), Lowest – Nagaland(-0.5)- 2011- negative growth

**Most populous-** UP..(UT- Delhi), Least populous- Sikkim( UT- Lakshdweep)

**Child population**(0-6 years).. In 2001- 163.8 million, In 2011- 158.8 million... this reduction is an indicative of fall in fertility, which is a positive sign

**Sex ratio-** 940/1000 (2011).. highest since 1971.. in 2001- 933/1000.

China- 926, pak- 943, b'desh- 978, sri lanka- 1034, Nepal- 1014

Highest- 2001- kerela(1058).....2011- kerela(1084).....UT- puducherry(1038)

Lowest- 2001- Haryana(861).....2011- Haryana(877).....UT- Dadra and nagar(775)

**Child sex ratio-** 914(2011).....927(2001)

2001- Lowest- Punjab(798)..... Highest- Meghalaya(973)

2011- Highest- Mizoram(971)..... Lowest – Haryana(830).. Haryana in 2001 had 819.. Punjab now have 848.

**Literacy**- 74% (2011) as compared to 65%(2001)

Male- 82.14, female- 65.46

Highest literacy- kerela(93.91%) > Lakshadweep(92.28%) > Mizoram(91.58%)

Lowest- Bihar (63.82%)

Female literacy- highest- kerela, lowest- rajasthan

Male literacy- highest- Lakshadweep, lowest- Bihar

**Density of population**

Gone up- 382(2011) from 325(2001)

Highest- Delhi... Bihar(1102) > w.bengal> Kerela > UP( 4th with density- 828{2011}.. from 690{2001}

Lowest- A & N..... arunachal Pradesh(17)

VISION IAS



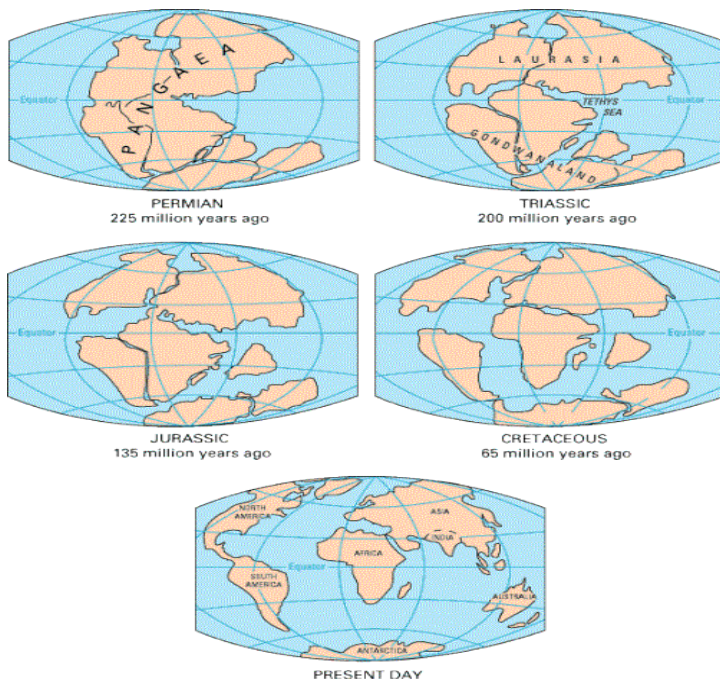
## General geographical terminologies & other Issues

### **GEOSYNCLINES-**

Linear trough of subsidence of the Earth's crust, in which vast amounts of sediment accumulate. The filling of a geosyncline with thousands or tens of thousands of feet of sediment is accompanied by folding, crumpling, and faulting of the deposits. Intrusion of crystalline igneous rock and regional uplift complete the transformation into a belt of folded mountains. The concept was introduced by James Hall in 1859 and is basic to the theory of mountain building. Eg- Tethys sea was a geosyncline.

### **CONTINENTAL DRIFT-**

In 1915, the German geologist and meteorologist Alfred Wegener first proposed the theory of continental drift, which states that parts of the Earth's crust slowly drift atop a liquid core (precisely asthenosphere). The fossil record supports and gives credence to the theories of continental drift and plate tectonics. Wegener hypothesized that there was a gigantic supercontinent 200 million years ago, which he named Pangaea, meaning "All-earth". Pangaea started to break up into two smaller supercontinents, called Laurasia and Gondwanaland, during the Jurassic period. By the end of the Cretaceous period, the continents were separating into land masses that look like our modern-day continents.



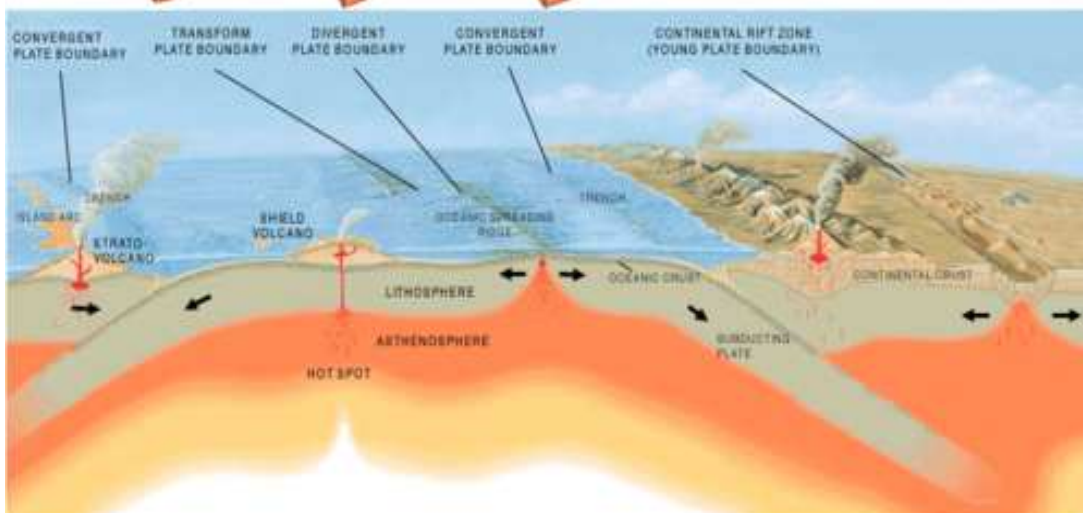
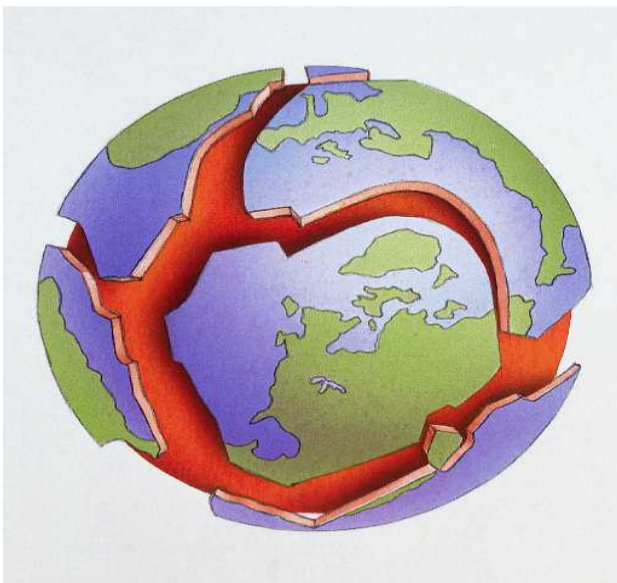
### **ISOSTASY-**

Isostasy is a geophysical phenomenon describing the force of gravity acting on crustal materials of various densities (mass per unit volume) that affects the relative floatation of crustal plates. Isostasy specifically describes the naturally occurring balance of mass in Earth's crust. It is not a process or a force. It is simply a natural adjustment or balance maintained by blocks of crust of different mass or density. Isostasy describes vertical movement of land to maintain a balanced crust. It does not explain or include horizontal movements like the compression or folding of rock into mountain ranges.



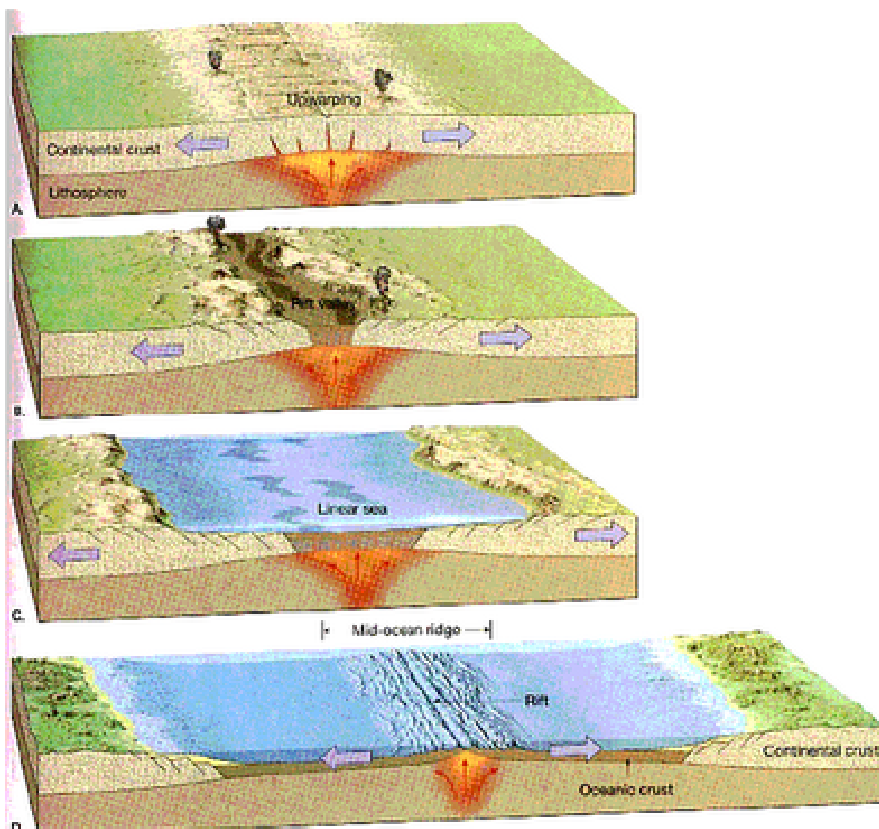
## PLATE TECTONICS-

Earth's lithosphere (the crust and upper mantle) is divided into a number of large, platelike sections that move as distinct masses. The movement of the plates is believed to result from the presence of large convection cells in the Earth's mantle which allow the rigid plates to move over the relatively plastic asthenosphere. The lithosphere essentially "floats" on the asthenosphere and is broken-up into seven major plates: African, Antarctic, Australian, Eurasian, North American, South American, and the Pacific. These plates (and the more numerous minor plates) move in relation to one another at one of three types of plate boundaries; Convergent (two plates push against one another), Divergent (two plates move away from each other), and transform (two plates slide past one another). Earthquakes, volcanic activity, mountain-building, and oceanic trench formation occur along plate boundaries (most notably around the so-called "Pacific Ring of Fire").



## SEA FLOOR SPREADING-

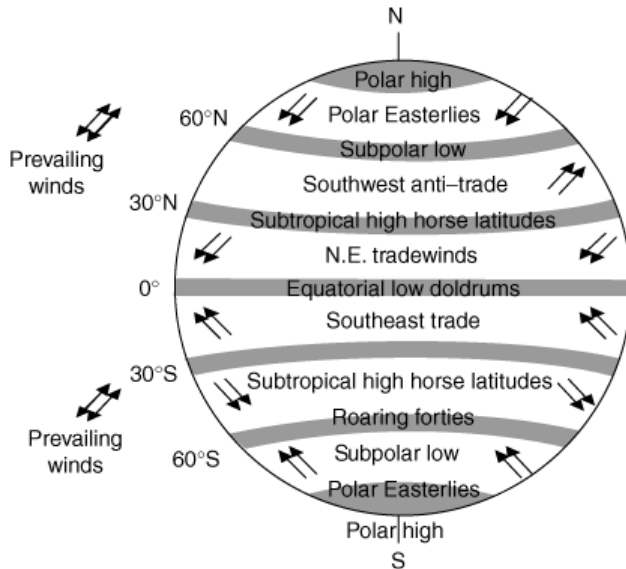
Sea-floor spreading is the process in which the ocean floor is extended when two plates move apart. As the plates move apart, the rocks break and form a crack between the plates. Earthquakes occur along the plate boundary. Magma rises through the cracks and seeps out onto the ocean floor like a long, thin, undersea volcano. As magma meets the water, it cools and solidifies, adding to the edges of the sideways-moving plates. As magma piles up along the crack, a long chain of mountains forms gradually on the ocean floor. This chain is called an oceanic ridge. The boundaries where the plates move apart are 'constructive' because new crust is being formed and added to the ocean floor. The ocean floor gradually extends and thus the size of these plates increases. As these plates get bigger, others become smaller as they melt back into the Earth in the process called subduction.



## WINDS-

On the earth's surface, certain winds blow constantly in a particular direction throughout the year. These are known as the 'Prevailing Winds'. They are also called the Permanent or the Planetary Winds. Certain winds blow in one direction in one season and in the opposite direction in another. They are known as Periodic Winds. Then, there are Local Winds in different parts of the world.

### Planetary Or Permanent Winds



The planetary wind system of the world accompanies the presence of the High and Low-Pressure Belts. We know that winds tend to blow from the high-pressure centres to the low-pressure centres. The effect of the earth's rotation (Coriolis Force) tends to deflect the direction of these winds. The deflection in the direction of these winds take place according to Ferrel's Law. Two sets of surface winds, the Trades and the Westerlies are the main planetary winds of the world.

### Trade Winds

North and South of the Equatorial Belt of Calms, are the Trade Winds covering roughly the zone lying between 5° and 30° North and South. In other words they cover almost the entire area between 30°N and 30°S latitudes on both sides of the equator. The Trade Winds are a result of a pressure gradient from the Sub-Tropical Belt of High Pressure to the Equatorial Belt of Low Pressure. In the Northern Hemisphere, the wind moving equatorward, is deflected by the earth's rotation to flow south-westward. Thus, the prevailing wind there is from the North-East, and it has been named as the 'North-East Trades'. In the Southern Hemisphere, deflection of the wind is towards the left, this causes the 'South-East Trades'. Trade Winds are noted for their steadiness and persistent direction. But the system of Doldrums and trades shifts seasonally north and south, through several degrees of latitudes, as do the pressure belts that causes them. The trades are best developed over the Pacific and the Atlantic Oceans, but are upset in the Indian Ocean because of nearness of the great Asian landmass. They are named after the Latin word 'trado' which means blowing steadily in a constant direction; hence, the name Trade Winds. As these Trade Winds blow from the warmer, sub-tropical latitudes to the hot tropics, they have a great capacity for holding water-vapour or moisture. When they cross the open oceans, they pick up a lot of moisture. They bring heavy rainfall to the eastern coasts of continents lying within the tropics because they blow on-shore. On the western coasts of continents, these Trade Winds do not bring any rainfall. It is because here there are 'off-shore' winds or winds blowing just parallel to the shores, as they blow off-shore. As such, the western areas

within the tropics suffer from aridity. The great deserts of the Sahara, Kalahari, Atacama and the Great Australian Deserts all lie on the western margins of the continents, lying within the tropical latitudes.

### **Westerlies**

The Westerlies or the Prevailing Westerly Winds blow between 35° and 60° North and South latitudes from the Sub-Tropical High-Pressure Belts towards the Sub-Polar Low-Pressure Belts. We know that the high-pressure belt is a zone of divergence for these outgoing winds. In the Northern Hemisphere, the Westerlies generally blow from the south-west to the north-east, and in the Southern Hemisphere from the north-west to the south-east. These are on-shore winds on the west coasts and off-shore winds on their east coasts. The on-shore winds bring rainfall while the off-shore winds are lacking in it. These winds are not as constant in strength and direction as the Trade Winds. They are rather stormy and variable though the main direction remains from west to east. But as their general direction is from the west, they are called the "Westerlies". They are also known as "Anti-Trade Winds", because their movement is in the opposite direction from that of the Trade Winds. In the Northern Hemisphere, land-masses cause considerable disruption in the westerly winds. But in the Southern Hemisphere, between 40°S and 60°S, the westerlies gain great strength and persistence because of the vast expanse of oceans in their belt. This made the mariners of old call them the "Roaring Forties", the "Furious Fifties" and the "Screaming Sixties". In olden days, sailing vessels had to face great danger while sailing in the opposite direction in the face of the prevailing westerly winds. It is to be noted that the westerlies bring warmth and rainfall throughout the year to all the western coasts of the Temperate Zone. But the areas, which lie in the Mediterranean type of region, get rainfall only in winter. At that time, in December, the Mediterranean parts of Europe and California (U.S.A.) come under the influence of the westerlies and receive rainfall. In the Southern Hemisphere, in this month, the Mediterranean regions (Central Chile, Southern Africa, S.W. Australian coast) do not receive any rainfall, as they shift away from the influence of the westerlies. In June, the Mediterranean parts of the southern continents come under the influence of the westerlies and receive rainfall. At that time, the Mediterranean areas of the Northern Hemisphere do not receive any rainfall from the westerlies, because they shift away from their influence.

### **Polar Winds**

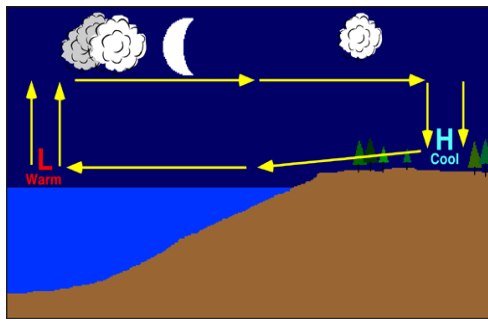
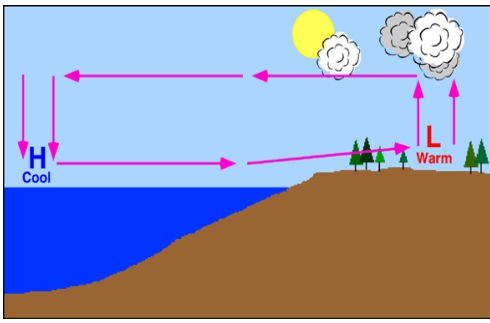
The winds blowing in the Arctic and the Antarctic latitudes are known as the Polar Winds. They have been termed the 'Polar Easterlies', as they blow from the Polar High Pressure Centres towards the Sub-Polar Low-Pressure Belts. In the Northern Hemisphere, they blow in general from the north-east, and are called the North-East Polar Winds; and in the Southern Hemisphere, they blow from the south-east and are called the South-East Polar Winds. As these winds blow from the ice-capped landmass, they are extremely cold. They are more regular in the Southern Hemisphere than in the Northern Hemisphere.

### **Periodic Winds/Local winds-**

Land and sea breezes, Mountain and valley breezes and monsoon winds are winds of a periodic type.

### **Sea Breeze**

During the day, the greater heating of the land causes the air to ascend, causing a low pressure over land and the cool heavy air from the sea moves in to take its place. The strength of the sea breeze depends on the topography of the coast and the regions.

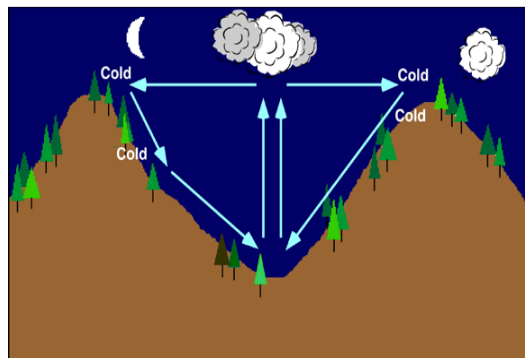
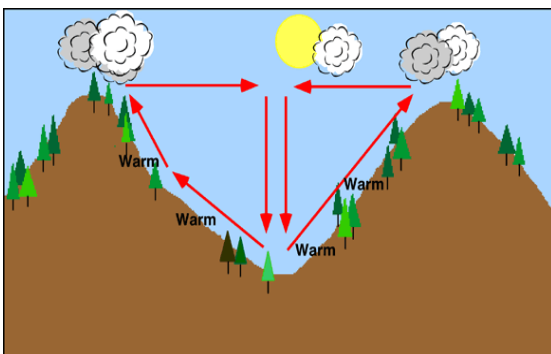


### Land Breeze

During the night the land cools quickly so that it is colder than the sea. A low pressure area is caused over the sea and the cooler heavier air from the land begins to flow towards the sea. The general effect of the contrast in heating of land and sea is to produce cooler winters and warmer summers in the centres of continents than along coasts.

### Mountain and Valley Breezes

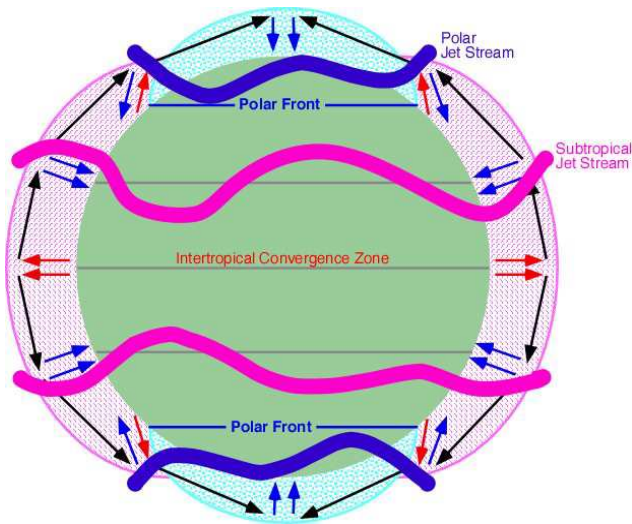
Mountain and valley breezes are common in regions with great topographic relief. A valley breeze develops during the day as the Sun heats the land surface and air at the valley bottom and sides. As the air heats it becomes less dense and buoyant and begins to flow gently up the valley sides. Vertical ascent of the air rising along the sides of the mountain is usually limited by the presence of a temperature inversion layer. When the ascending air currents encounter the inversion they are forced to move horizontally and then back down to the valley floor. This creates a self-contained circulation system. If conditions are right, the rising air can condense and form into cumuliform clouds.



## JET STREAMS-

A jet stream is a band of fast-moving air high in the Earth's atmosphere that affects weather patterns, temperatures and air travel. Jet streams are used to forecast the weather because they act as a steering mechanism for storms and other weather fronts.

Jet streams move around the Earth in a narrow band. They are created by the difference in temperatures between two air masses, usually cold polar air and warm tropical air. The temperature variance creates gradients in air pressure, which in turn affects the strength of the winds in the jet stream. The greater the variance, the greater the wind speed. Jet stream winds normally are 100 to 200 mph but can reach speeds as high as 300 mph.



## FRONTOGENESIS & FRONTOLYSIS-

Frontogenesis- evolution of a front

Frontolysis- Decay of a front

Frontogenesis is the formation of a weather front as a result of contact between two different air masses, usually with resultant clouds and precipitation.

Frontolysis is the process that tends to destroy a weather front, as by mixture of the frontal air.

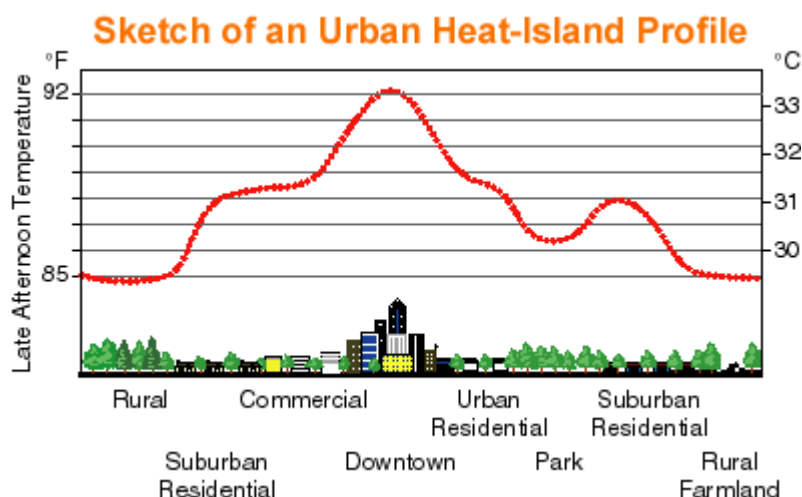
## URBAN CLIMATE-

Urbanization has a significant impact on all elements of the atmosphere. Replacing natural vegetation with artificial surfaces alters the heat balance and hydrology of the local environment. Urban canyons affect wind speed and increased particulate content enhances precipitation down wind of a city.

The concentration of human activities in urban areas creates an "island" of heat surrounded by a "sea" of cooler rural areas called the urban heat island. Heat is added to the urban atmosphere by industry, transportation, exhaust heat, and air conditioning among other things. Artificial surfaces with low albedo absorb much insolation, heating the surface more than if it were a natural surface like grass. The additional heat can create differences in air temperature between the city and countryside of 10°C (18°F) or more. Consequently, snow disappears earlier and vegetation bloom earlier in the city. Sunlight is trapped within the "urban canyon" by reflective surfaces. Building materials like brick and asphalt have high heat conductivity. Heat loss in the evening can compensate for that which has been gained during the day. The warm city surface induces convection that



draws urban air upwards, which is then replaced by cool air from the countryside. This rural-urban circulation is more likely to occur when synoptic-scale winds are light. The rising air transports dust and other particulates upward, gathering as a dust dome. If synoptic-scale winds are strong enough, the pollutants spill over the city boundary and stretch downwind over the countryside as a pollution plume. Particulates concentrated in the urban atmosphere serve as nuclei for the condensation of water. Several studies have shown how precipitation is enhanced downwind of an urban area due to increased particulate content from urban sources.



### ECO-TOURISM-

Ecotourism is: "Responsible travel to natural areas that conserves the environment and improves the well-being of local people."

### Principles of Ecotourism:-

Ecotourism is about uniting conservation, communities, and sustainable travel. This means that those who implement and participate in ecotourism activities should follow the following ecotourism principles:

Minimize impact.

Build environmental and cultural awareness and respect.

Provide positive experiences for both visitors and hosts.

Provide direct financial benefits for conservation.

Provide financial benefits and empowerment for local people.

Raise sensitivity to host countries' political, environmental, and social climate.

### ENVIRONMENT IMPACT ASSESSMENT-

An environmental impact assessment is an assessment of the possible positive or negative impact that a proposed project may have on the environment, together consisting of the natural, social and economic aspects. The Ministry of Environment and Forests of India have been in a great effort in Environmental Impact Assessment in India .

### FOOD SECURITY-

Food security can be defined as the condition in which a population has the physical, social, and economic access to safe and nutritious food over a given time period to meet dietary needs and preferences for an active life. FAO, IFAD, and UNDP focus on food access and availability, while USAID includes food utilization as part of its definition of food security. Other non-governmental organizations (NGOs) add the concept of biological utilization. CCF International follows the USAID description of food security, which is defined as:

When all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

THE GLOBAL food security is in question today, with ever increasing food prices resulting from adverse climatic effects on agricultural production, rise in oil prices, increasing use of grains for biofuels, and almost a 50 per cent reduction in public spending on agricultural sector over the last three decades. The environmental sustainability has also become more elusive due to rapid industrial and population growth, urbanization and with the lack of public realization about the sheer effects of environmental pollution. Asiatic countries and their economy largely depend upon agriculture. With the technological breakthrough, significant level of food grain production has been achieved and large stocks of food grains have been piled up to meet exigencies. Importantly, this large stock of food grains is being infested with insects' and pests that have increased the cost of storage, besides deterioration in the quality of food grains. Secondly, the use of food grains for manufacturing of bio fuel to meet the energy need of industrial and transportation sector has resulted in diversion of main crop like corn, maize and beans.

#### **SOLUTION-**

- Upgrading the biological potential of wasted lands.
- Achieve agricultural intensification and diversification, so that the income and employment potential of small-farm agriculture is enhanced through economically and ecologically sustainable farm and off-farm enterprises.
- Ensure access to food at affordable prices by both maintaining food security reserves and operating an efficient public distribution system.
- Introduction of ecologically sound practices in agriculture and in capture and culture fisheries
- Promotion of group cooperation among families with smallholdings to empower them with the economic and ecological advantages of scale in farm operations.
- A new trade ethic that leads the industrial nations to buy agricultural commodities from the developing world at fair prices and on a long-term basis.

#### **LANDSLIDE**

Land + Slide

Landslide is the geological phenomenon which includes movement of weathered material down a slope, like avalanche, debris flow, soil flow, slump, sheet flow, rock fall, etc.

#### **CAUSES-**

- Gravity ( any landslide which occur under the impact of gravity is known as mass movement).
- Slope angle
- Weathering of rocks



- Groundwater pressure
- Deforestation & Soil erosion
- Earthquake, volcanic eruption
- Anthropogenic factors, like- construction, etc.

MEASURES to slow landslide-

- Afforestation.
- Construction of traps, benches across the slope
- Proper drainage system should be constructed for the affected area.

## **EARTHQUAKE-**

Sudden release of the energy in earth's crust caused by earth's internal modifications that cause the ground surface to shake.

In its most general sense, the word *earthquake* is used to describe any seismic event — whether natural or caused by humans — that generates seismic waves. Earthquakes are caused mostly by rupture of geological faults, but also by other events such as volcanic activity, landslides, mine blasts, and nuclear tests. An earthquake's point of initial rupture is called its focus or hypocenter. The epicenter is the point at ground level directly above the hypocenter.

## **CAUSES-**

This can be explained by Plate tectonics, Major earthquakes occur at the plate boundaries especially where plates collide (eg- Pacific ring of fire).

Reservoir induced seismicity can also be seen in large man – made dams ( due to heavy pressure of water ) eg- Koyana EQ(1967)

## **EQ ZONES-**

India is divided into 5 seismic zones.

Zone 1 being least EQ prone and Zone 5 being most seismic prone(whole Himalayan belt is in zone 4 and 5)

## **EFFECTS-**

- Shaking and ground rupture
- Landslide and avalanches
- Tsunami (if EQ occurs in sea floor or near sea shore)
- Floods

## **PREPARATION-**

No major human/economic activity in Zone 5.

Construction of EQ resistant structure (buildings,etc).

EQ prediction in time.

## **TSUNAMI-**

Also known as harbour wave. It is a series of water waves caused by the displacement of a large volume of a body of water, usually an ocean. Owing to the immense volumes of water and the high energy involved, tsunamis can devastate coastal regions.

## **GENERATION MECHANISMS-**

The principal generation mechanism (or cause) of a tsunami is the displacement of a substantial volume of water or perturbation of the sea. This displacement of water is usually attributed to either earthquakes, landslides, volcanic eruptions, glacier calvings or more rarely by meteorites and nuclear tests. The waves formed in this way are then sustained by gravity. Tides do not play any part in the generation of tsunamis.

Tsunamis have a small amplitude (wave height) offshore, and a very long wavelength (often hundreds of kilometres long, whereas normal ocean waves have a wavelength of only 30 or 40 metres), which is why they generally pass unnoticed at sea, forming only a slight swell usually about 300 millimetres (12 in) above the normal sea surface. They grow in height when they reach shallower water.

## **CONSEQUENCES-**

- Loss of life and property
- Loss of coastal vegetation
- Physiogeographical changes ( in 2004 tsunami, Indira point is submerged).
- Marine flora and fauna is affected.
- Sea water reaches deep within land area causing groundwater to be contaminated with saline water thereby decreasing agricultural productivity and declining quality of drinking water.

## **PRECAUTION-**

- No human/economic activity in Tsunami prone areas ( eg east coast of Japan).
- Thick vegetation cover on the coasts ( helps in decreasing the speed of waves).
- Construction of breaker walls along the coast.
- Installing Tsunami warning systems in deep sea waters.

## WATER HARVESTING:

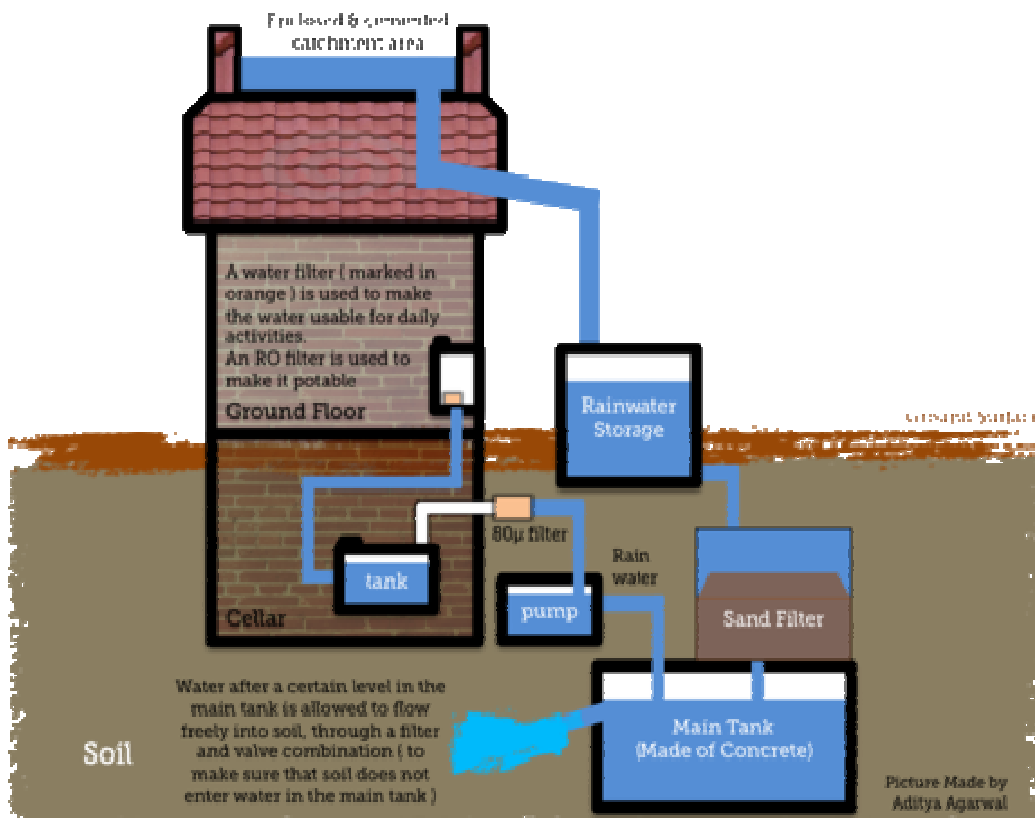
It means capturing rain where it falls or capturing the run off in your own village or town. And taking measures to keep that water clean by not allowing polluting activities to take place in the catchment.

Therefore, water harvesting can be undertaken through a variety of ways

- Capturing runoff from rooftops
- Capturing runoff from local catchments
- Capturing seasonal floodwaters from local streams
- Conserving water through watershed management

These techniques can serve the following the following purposes:

- Provide drinking water
- Provide irrigation water
- Increase groundwater recharge
- Reduce stormwater discharges, urban floods and overloading of sewage treatment plants
- Reduce seawater ingress in coastal areas.



**Other rain water harvesting techniques:**

**CATCH WATER PITS AND SEMI-CIRCULAR BUNDS-**



**MINI-WATER SHEDS**



## DEEP PONDS



## Check Dams/Boulder dams



## **NATIONAL INSTITUTES**

- 1) **IMD-** The India Meteorological Department was established in 1875. It is the National Meteorological Service of the country and the principal government agency in all matters relating to meteorology, seismology and allied subjects.

### **IMD's Mandate-**

- To take meteorological observations and to provide current and forecast meteorological information for optimum operation of weather-sensitive activities like agriculture, irrigation, shipping, aviation, offshore oil explorations, etc.
- To warn against severe weather phenomena like tropical cyclones, norwesters, duststorms, heavy rains and snow, cold and heat waves, etc., which cause destruction of life and property.
- To provide meteorological statistics required for agriculture, water resource management, industries, oil exploration and other nation-building activities.
- To conduct and promote research in meteorology and allied disciplines.
- To detect and locate earthquakes and to evaluate seismicity in different parts of the country for development projects.

- 2) **ICAR-** The Indian Council of Agricultural Research (ICAR) is an autonomous organisation under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture, Government of India. Formerly known as Imperial Council of Agricultural Research, it was established on 16 July 1929 as a registered society under the Societies Registration Act, 1860 in pursuance of the report of the Royal Commission on Agriculture. The ICAR has its headquarters at New Delhi.

The Council is the apex body for co-ordinating, guiding and managing research and education in agriculture including horticulture, fisheries and animal sciences in the entire country. With 97 ICAR institutes and 47 agricultural universities spread across the country this is one of the largest national agricultural systems in the world.

The ICAR has played a pioneering role in ushering Green Revolution and subsequent developments in agriculture in India through its research and technology development that has enabled the country to increase the production of foodgrains by 4 times, horticultural crops by 6 times, fish by 9 times (marine 5 times and inland 17 times), milk 6 times and eggs 27 times since 1950-51, thus making a visible impact on the national food and nutritional security. It has played a major role in promoting excellence in higher education in agriculture. It is engaged in cutting edge areas of science and technology development and its scientists are internationally acknowledged in their fields.

### **Its Mandate-**

- To plan, undertake, aid, promote and co-ordinate education, research and its application in agriculture, agroforestry, animal husbandry, fisheries, home science and allied sciences



- To act as a clearing house of research and general information relating to agriculture, animal husbandry, home science and allied sciences, and fisheries through its publications and information system; and instituting and promoting transfer of technology programmes
- To provide, undertake and promote consultancy services in the fields of education, research, training and dissemination of information in agriculture, agroforestry, animal husbandry, fisheries, home science and allied sciences
- To look into the problems relating to broader areas of rural development concerning agriculture, including postharvest technology by developing co-operative programmes with other organizations such as the Indian Council of Social Science Research, Council of Scientific and Industrial Research, Bhabha Atomic Research Centre and the universities
- To do other things considered necessary to attain the objectives of the Society

### 3) CAZRI- Central Arid Zone Research Institute

The arid zone of India covers about 12% of the country's geographical area and occupies over 31.7 m ha of hot desert and about 7 m ha is under cold desert. The production and life support systems in the hot regions are constrained by low and erratic precipitation (100-420 mm/year), high evapotranspiration (1500-2000 mm/year), and poor soil physical and fertility conditions. The local inhabitants have evolved suitable land use and management systems of farming, pastoralism and animal husbandry; of late, these local survival systems have become inadequate to fulfill the ever increasing needs. This has resulted in over-exploitation of the resources causing rapid and widespread land degradation and decline in productivity. To arrest this degradation process and for scientific and sustainable management of the resources, Desert Afforestation Station was established in 1952 at Jodhpur. This was later expanded into Desert Afforestation and Soil Conservation Station in 1957, and finally upgraded to Central Arid Zone Research Institute (CAZRI) in 1959 under Indian Council of Agricultural Research, New Delhi. The CAZRI operates through 7 Divisions, located at the headquarters in Jodhpur. There are four Regional Research Stations located in different agro-climatic zones to work on location-specific problems.

#### Its mandate-

- To undertake basic and applied research that will contribute to the development of sustainable farming systems in the arid ecosystem.
- To act as repository of information on the state of natural resources and desertification process and its control, in the form of digital database.
- To develop livestock-based farming systems and range management practices for the chronically drought-affected areas depending on livestock species; also aquaculture in water.
- To utilize high and precision technologies in production systems.
- To provide scientific leadership and to develop collaboration with State Agricultural Universities, State line departments and other national and international agencies for generating location-specific technologies and transfer of the technologies.
- To act as a center of learning for arid land management technologies.
- To provide consultancy and other services for utilizing the available expertise, and to generate financial resources.

### 4) CRIDA- Central Research Institute for Dryland.

The Institute is a constituent organisation of Indian Council of Agricultural Research (ICAR), Ministry of Agriculture, Government of India and was established in 1985 with focus on rainfed agriculture.

Out of the 142 million (m) ha cultivated area in the country, only 51 m ha is irrigated. Even after complete exploitation of the full irrigation potential of the country, it is estimated that nearly 70 m ha of net sown area will continue to depend upon monsoons. Rainfed areas produce approximately 20-25 m t rice, 2-3 m t wheat, 30-35 m t coarse cereals, and 10-12 m t pulses, thus contributing nearly 65-75 m t food grains and 12-14 m t oilseeds besides significant quantities of cotton, vegetables, and fruits.

#### **Its Mandate-**

CRIDA conducts problem oriented multi-disciplinary research. The mandate of the Institute includes

- To undertake basic and applied researches that will contribute to the development of strategies for sustainable farming systems in the rainfed areas.
- To act as a repository of information on rainfed agriculture in the country.
- To provide leadership and co-ordinate network research with SAUs for generating location-specific technologies for rainfed areas.
- To act as a centre for training in research methodologies in the fields basic to management of rainfed-farming systems.
- To collaborate with relevant national and international agencies in achieving the above objectives.
- To provide consultancy.

A Socio economic and Policy Research Cell (SEPR) has been constituted at CRIDA. It is effective from 07.07.2007.

The SEPR Cell is constituted with the following mandate :

- \* Prepare status papers on rainfed agriculture encompassing major rainfed agriculture components
- \* Provide inputs to rainfed agriculture policy making process
- \* Assess impact of rainfed agricultural technologies from rural livelihoods perspective

#### **5) National Institute of Oceanography(NIO)-**

With its headquarters at Dona Paula, Goa, and regional centers at Kochi, Mumbai and Visakhapatnam, is one of the 38 constituent laboratories of the Council of Scientific & Industrial Research (CSIR), New Delhi. NIO was established on 1 January 1966 following the International Indian Ocean Expedition (IIOE) in early 1960s. The institute has grown today into a large oceanographic laboratory of international repute. The focus of research has been on observing and understanding the special oceanographic features that the North Indian basin offers.

#### **Its mandate-**

- To develop knowledge on physical, chemical, biological, geological, geophysical, engineering and pollution aspects of the waters around India
- To provide support to various industries, government and non-government organisations through consultancy and contract research
- To disseminate knowledge on the waters around India



## NATURAL HERITAGE

India is a megadiverse country, rich in biodiversity. With just 2.4% of the world's land area, India holds about 7-8% of the global biodiversity. The wide diversity in physical features and climatic situations have resulted in a variety of ecosystems such as forests, grasslands, wetlands, coastal and marine and desert. Forests ecosystems in particular exhibit tremendous variability ranging from temperate alpine to tropical wet evergreen forests. There are 16 major forest types in India. India is also one of the eight primary centres of the origin of cultivated plants and is rich agricultural biodiversity

### **BIODIVERSITY HOTSPOTS-**

A biodiversity hotspot is a biogeographic region with a significant reservoir of biodiversity that is under threat from humans.

The concept of biodiversity hotspots was originated by Norman Myers in two articles in "The Environmentalist" (1988 & 1990), revised after thorough analysis by Myers and others in "Hotspots: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions".

To qualify as a biodiversity hotspot on Myers 2000 edition of the hotspot-map, a region must meet two strict criteria: it must contain at least 0.5% or 1,500 species of vascular plants as endemics, and it has to have lost at least 70% of its primary vegetation. Around the world, at least 25 areas qualify under this definition, with nine others possible candidates. These sites support nearly 60% of the world's plant, bird, mammal, reptile, and amphibian species, with a very high share of endemic species.

Example of Biodiversity hotspots in India- Western Ghats, A&N Islands, Eastern Himalayas.

### **Threats to biodiversity-**

- Habitat destruction
- Introduction of invasive species
- Genetic pollution
- Over-exploitation
- Food- security
- Climate change
- Over population
- Economic reasons

### **Conservation-**

- Habitat conservation
- Gene banks
- Legislations to protect flora and fauna.
- Protected areas-
  - a) National parks- A national park is a reserve of natural or semi-natural land, declared or owned by a government, that is restricted from most development and is set aside for human recreation and environmental protection
  - b) Wild life sanctuaries- A wildlife sanctuary is a space which is set aside exclusively for the use of wild animals, who are protected when they roam or live in that area. Wildlife sanctuaries are also referred to as wildlife refuges in some areas. Typically, a wildlife sanctuary is created through a government

mandate which sets the space aside for the use of animal protection, and rangers or other government employees may patrol the area to ensure that no one hunts or otherwise harasses the animals

- c) Biosphere reserves- an environmentally sensitive area with protected status managed primarily to preserve natural ecological conditions ( it is generally open to tourists).

Wildlife sanctuaries are the most generic of the terms listed in the question. Wildlife sanctuaries may be public or private, and managed by any level of government or private entity.

National Parks are managed by federal governments. They often preserve natural settings, but also cultural and historically significant sites.

Biosphere Reserve is a designation extended by the United Nations Environmental, Scientific, and Cultural Organization (UNESCO) to recognize the significance of an intact ecosystem. This status helps protect places in poor countries that cannot afford to take care of such places, and offers leverage in protecting national parks from international threats (such as pollution).

## MAPS

Below are few maps of India, the locations marked in these maps can be asked for 2-3 marks in the mains exam.



**For example-**

1) Chilka Lake

- Brackish water coastal lake in Odisha.
- Formed due to silting action of R.Mahanadi
- Designated as wetland of international importance under Ramsar convention.
- Important habitat and breeding ground for both resident and migratory and aquatic birds.

2) Kolleru Lake

- Large fresh water lake located b/w Krishna and Godavari deltas in Andhra Pradesh.
- Serves as important habitat for resident and migratory birds.
- The lake was declared a wetland of international importance under Ramsar convention.

3) Pulicat Lake

- Brackish water lake on coromandel coast at the border of A.P & T.N
- The barrier island of Sriharikota separates the lake from bay of Bengal.
- The second largest brackish water lake in India after chilka.
- Important nesting spot for sea turtles.
- Known for diversity of birds and is an important stop over on migration routes.

VISION IAS

