

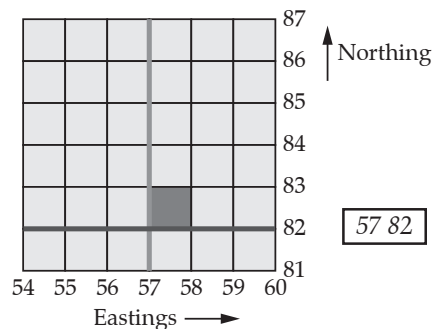
## Chapter - 1 : Interpretation of Topo-Graphical Maps

### Quick Review

- A topographic map is a detailed and accurate graphic representation of cultural and natural features that appear on the earth's surface.
- Topographic maps have multiple uses in the present day like in geographical planning or large-scale architecture, earth sciences and many other geographical disciplines, etc.
- Topographical maps are usually drawn on large-scale showing detailed features of natural and man-made.
- A Grid Reference helps in finding the exact location of a place in a map through a set of lines called the Eastings and the Northings.
- These lines are numbered. The Easting numbers are to be quoted first and then the Northing numbers.
- The points at which the vertical and the horizontal lines of grid crosses are called Coordinates.
- There are two types of grid references- Four figure grid reference and Six figure grid reference.
- The four figure grid references are applied to locate large areas like lakes, relief features, etc. while the six figure grid references are applied to locate the exact position of a particular place or feature like police station, spot heights, wells, causeways, temples, etc.

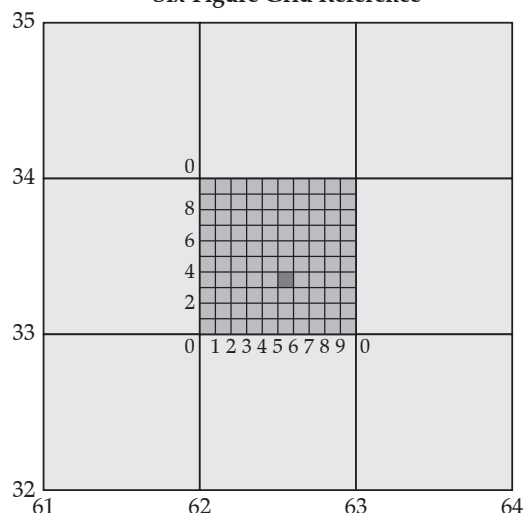
#### Four Figure Grid Reference GRID REFERENCES

first read the vertical lines (eastings),  
then the horizontal lines (northings)



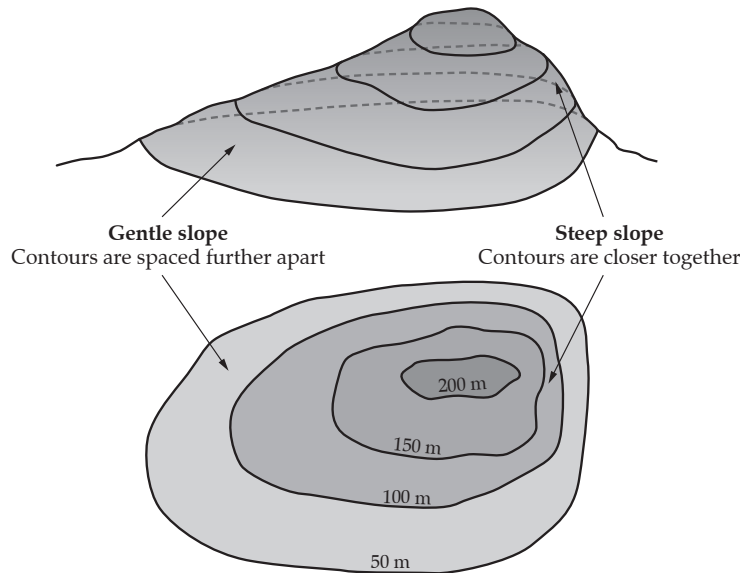
4 Fig GR- 5782

#### Six-Figure Grid Reference



6 Fig GR-625334

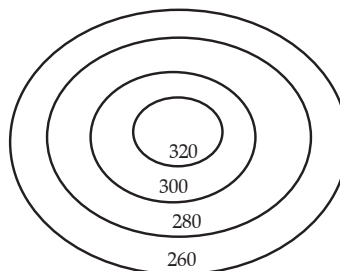
- A Contour is an imaginary line that is drawn on the map to connect a place having equal heights above mean sea level. They are also known as Isohypse ('iso' means equal and 'hypse' means height).
- Contour Interval (C.I.) is the vertical difference between two consecutive contour lines which remains constant throughout the map, e.g. 20 metres in the Survey of India Map Sheets No. 45D/7 and 45D/10.
- There are different types of slopes represented through contours. These are—Gentle Slope, Steep Slope, Concave Slope, Convex Slope and Terraced or Stepped Slope.
- Gentle Slope : When the contour lines are spaced further apart from each other.



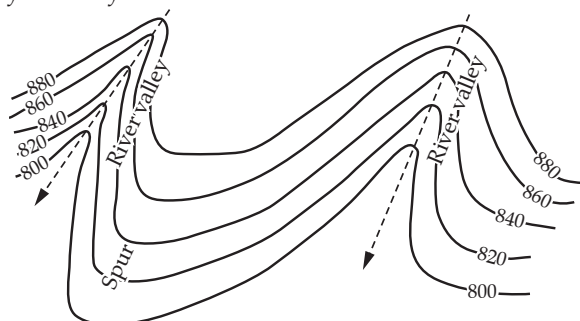
Contours and layered relief

- Steep Slope : When the contour lines are drawn closer to each other.
- Concave Slope : The slope of the land is gentle at low elevation and becomes steep at high elevation.
- Convex Slope : The slope of the level is steep at low level and gentle at high elevation.
- Terraced Slope : When two contour lines are found closer and two wider apart, this pattern of arrangement is called terraced slope.
- A Hill : It is a landform having a summit at a high elevation. It is shown by closed contours almost circular in shape. It is represented by concentric contours. The spaces between the contour lines are usually uniform and equally spaced.

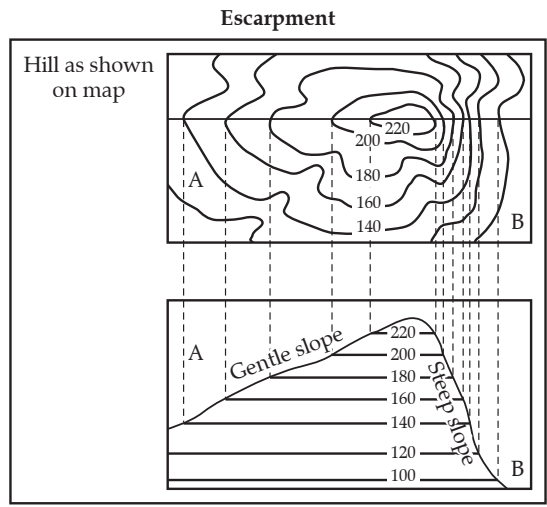
Conical Hill



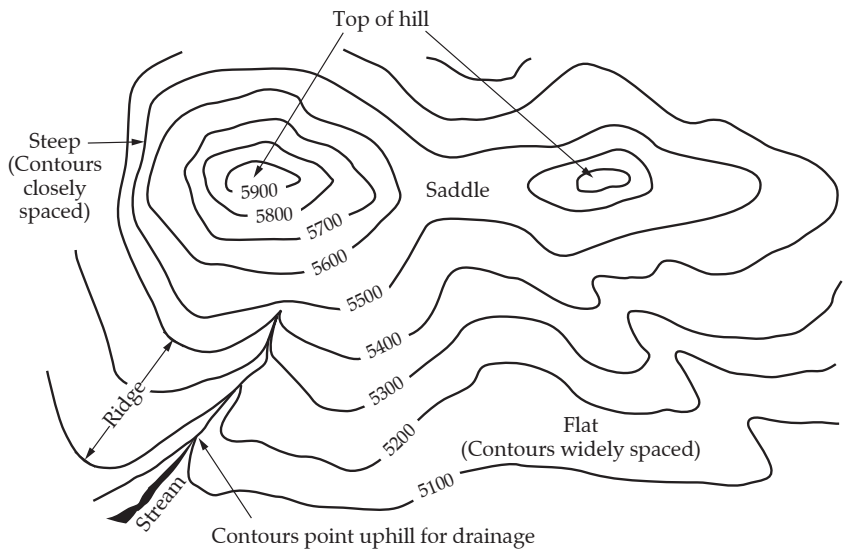
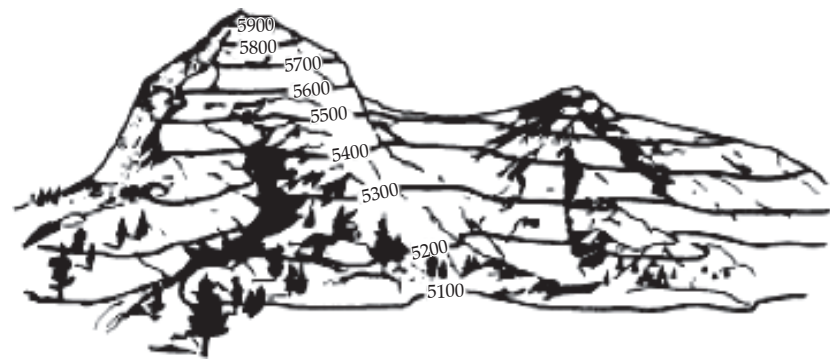
- Valleys : A river valley is represented by V-shaped contour. It is a narrow low lying area between the hills and usually points downward slope. There are four types of valleys- V-Shaped Valley, U-Shaped Valley, Hanging Valley and Gorge or Canyon Valley.



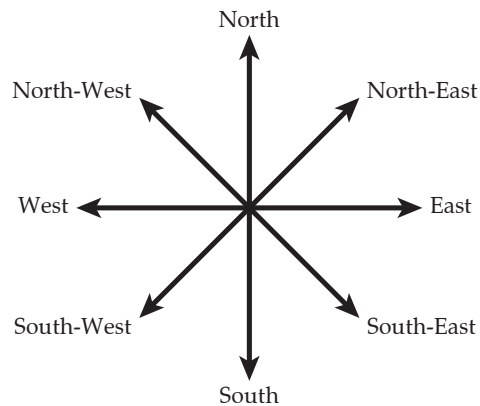
- **Watershed or Water Divide:** A ridge or highland dividing two areas that are drained by different river system. On one side of a watershed, rivers and streams flow in one direction and on the other side, they flow in another direction. It is also called water parting. E.g. Aravalli Mountains.
- **Escarpment :** It is a landform with sides sloping in opposite directions. It is a steep slope on one side and a gentle slope on the other side. The steep slope is called a scarp and the gentle slope is called a dip slope. A scarp has closely spaced contours while a dip slope has widely spaced contours.



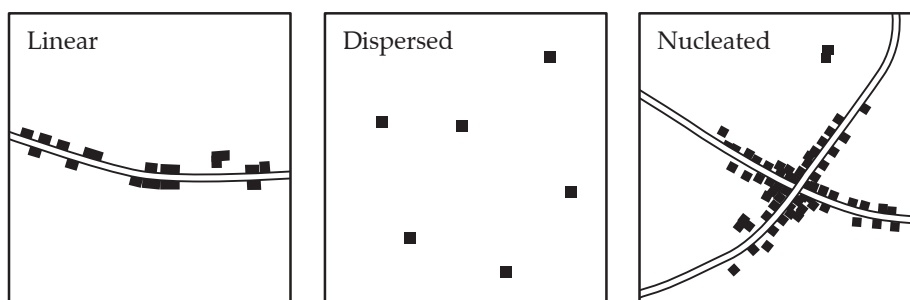
- **A Ridge :** It is a long elongated chain of hills with two or more summits.
- **A Col :** A col is a narrow, high pass through a mountain chain formed by the meeting of river or glacier valley from opposite sides of the range.
- **A Saddle :** It is a pass that slopes gently between two peaks and is shaped like a horse saddle. It is broader than a col.



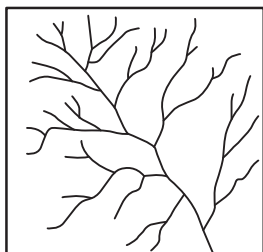
- The scale of a map is the proportion between the distance on the map and the corresponding distance on the ground. There are three ways of expressing scale-
  - (i) **The Statement of Scale :** It expresses the relationship of map to the ground in words e.g. two centimeters to 1 kilometer and is expressed as  $2\text{cm}=1\text{km}$ .
  - (ii) **The Representative Fraction (R.F.) :** It is the ratio between the distance on the map to the distance on the corresponding ground and is in fraction. The numerator denotes the length on the map and the denominator denotes the actual distance on the ground. e.g.  $1:50,000$ .
  - (iii) **The Linear or Graphical Scale :** It is divided into primary and secondary divisions. It is 10 to 20 centimeters long which is divided into 8 divisions of two centimetres each representing one kilometre each from 1 to 7 kilometres.
- There are various methods to measure distances in a map such of them are : (i) to measure distance along a straight line, (ii) to measure distance along curves and (iii) area by the grid square method.
- There are four main cardinal directions- North, South, East and West.
- These directions are further divided into four major directions-North-East, North-West, South-East and South-West.



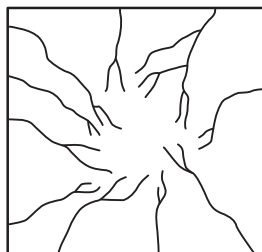
- The North to which the compass needle points is called Magnetic North.
- The Magnetic Compass is an instrument which is used in finding directions.
- Bearing is the horizontal angle between the direction of an object and the clockwise direction from North.
- A bearing with reference to magnetic north-south line is called Magnetic Bearing.
- A bearing measured with reference to geographic north-south line is called True Bearing.
- Settlement means a cluster of inhabited houses- urban and rural.
- There are different patterns of settlements like- Nucleated or clustered, dispersed or scattered, linear, radial and rectangular pattern of settlements.



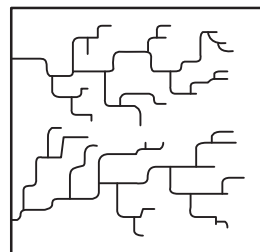
- The various patterns of drainage formed due to the development of streams and rivers known as drainage patterns.
- There are different drainage patterns. They are Dendritic, Trellis or Rectangular, Radial, Disappearing or Irregular drainage patterns.



Dendritic Drainage



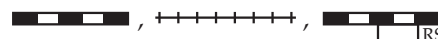
Radial Drainage



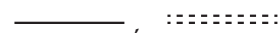
Rectangular Drainage

- The Height that is represented by a triangle ( $\Delta$ ) beside a number which indicates its height above mean sea level, like  $\Delta$  364 is called Triangulated Height. It is more accurate than Spot Height because it is calculated by trigonometry.
- Spot Height is represented on the map by a black dot in front of the number like, .275, which indicates the height of that particular point above mean sea level.
- Surveyors make a permanent cut or mark on a rock, stone, prominent building or place called the Bench Mark (B.M.). It indicates the height of that place above mean sea level.
- Relative Height/Depth is represented by a small 'r' written along with a number, like, 22r. It indicates the relative height or depth of a particular point from the surrounding surface and not from the sea level. It is marked beside the well, tank, embankment, peak, dam, sand dune, bank of a river, etc.
- The Topographical map uses signs and symbols to represent certain man made and physical features. These are called Conventional Signs and Symbols.
- Causeway : A raised road over a small stream but not a bridge/ A raised metalled road over a non-perennial stream or marshy area or which serves as a temporary bridge.

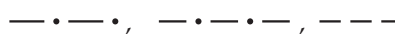
Railway Line: Broad gauge, Metre gauge, Railway station



Roads: Metalled, Unmetalled



Boundary: International, State, District



River, Well, Tank, Canal, Bridge



Temple, Church, Mosque, Chhatri



Post Office, Post and Telegraph Office, Police Station



Settlement, Graveyard



Trees, Grass

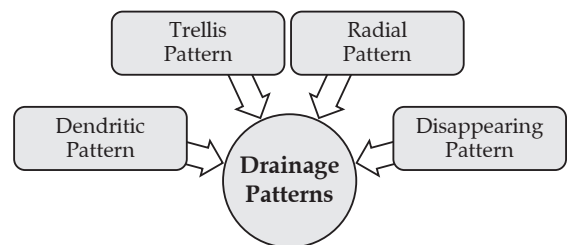
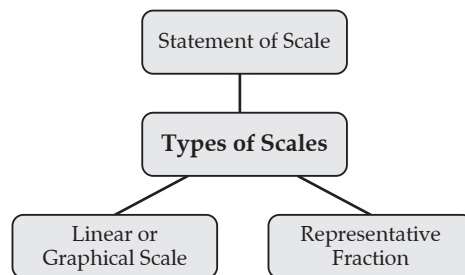
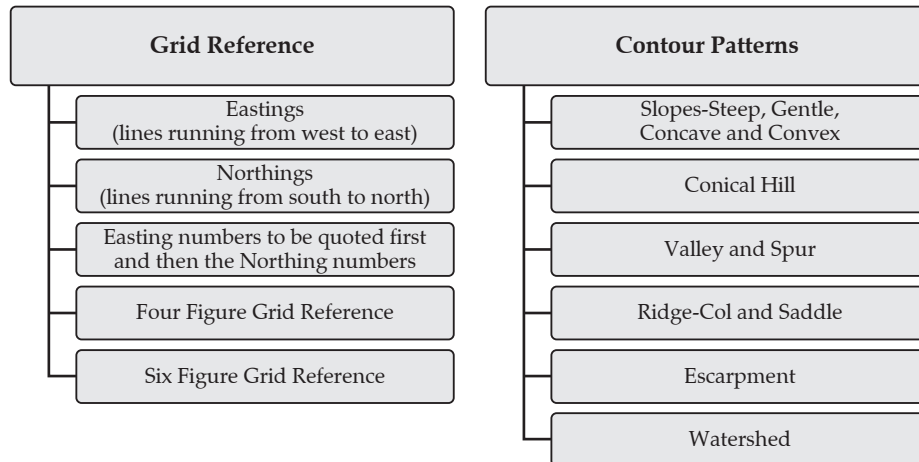


## Know the terms

- Topographic map : It is a detailed and accurate graphic representation of cultural and natural features on the ground.
- Grid Reference : It helps in finding the exact location of a place on a map through a set of lines called the Eastings and the Northings.
- Coordinates : The points at which the vertical and the horizontal lines of grid crosses.
- Conical Hill : It is a landform having a summit at a high elevation. It is shown by closed contours almost circular in shape.
- Scale : It is the proportion between the distance on the map and the corresponding distance on the ground.
- Cardinal Directions : One of the four principal directions on a compass: north, south, east, or west.
- Settlement : It means a cluster of inhabited houses- urban and rural.
- Drainage Patterns : The various patterns of drainage formed due to the development of streams and rivers.

- **Triangulated Height** : The Height that is represented by a triangle ( $\Delta$ ) beside a number which indicates its height above mean sea level, like  $\Delta$  364.
- **Bench Mark (B.M.)** : Surveyors make a permanent cut or mark on a rock, stone, prominent building or place.
- **Relative Height/Depth** : It is represented by a small 'r' written along with a number, like, 22r. It indicates the relative height or depth of a particular point from the surrounding surface and not from the sea level.

## Flowcharts



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## Part 2 : Geography of India

### Chapter - 2 : Location, Extent and Physical Features

#### Quick Review

- India is a land of unity in diversity since it has diverse language, religion, castes and creeds.
- It is the second most populous country in the world and the seventh largest in size.
- India extends from  $8^{\circ}4' N$  to  $37^{\circ}6' N$  and from  $68^{\circ}7' E$  to  $97^{\circ}25' E$ .
- India can be divided into five ethnic groups- Proto-Australoids, Negritos, Mongoloids, Mediterraneans or Dravidians and Nordic Aryans.
- Officially, 22 languages out of 200 languages spoken in India, has been recognised in the Eighth Schedule of the Constitution of India.

- The Indian Sub-continent has been divided into five physiographical divisions-
  - (i) The Northern Mountain Wall
  - (ii) The Plains of Northern India
  - (iii) The Peninsular Plateau
  - (iv) The Coastal Plains
  - (v) The Islands.
- The Northern mountain wall is also known as the Himalayan Range. It consists of three parallel ranges- the Himadri, the Himachal and the Shiwalik Range.
- The Himadri is also called the Great Himalayas or the Inner Himalayas. The Himachal is also known as the Himachal-Himalayas or the Middle or Lesser Himalayas and the Shiwalik range is also called the Outer Himalayas.
- The Great Himalayas has the world's highest peak, Mt. Everest (8,848 m) and the world's second highest peak, Mount K2 or Godwin Austen.
- It has many passes, namely, Karakoram Pass, Shipki-La Pass, Mana Pass, Niti, etc.
- The Himachal range runs parallel to the Himadri. Doons lie between the Himachal and the Shiwalik ranges e.g. Dehradun.
- Some of the most important hill stations lie in this range, e.g. Mussorie, Shimla, Nainital, Almora, Ranikhet, Chail, etc.
- The Shiwalik range is not a continuous range and its average elevation is about 1000 m above sea level.
- The Doon, Bhabhar, Terai and the Khadar and Bhangar alluvium are the other important features of the Himalayas.
- The Himalayas act as a climate-divide since they protect northern India from severe cold in winters and act as a barrier for the moisture-laden monsoon winds which bring heavy rain to the north Indian plains.
- The Himalayas are a source of many perennial rivers due to the glaciers over there. Rivers like Ganga, Yamuna, Ghagra, Gandak, Gomti, Kosi, Sharda and Brahmaputra provide water for drinking and irrigation to the entire Northern plains.
- The rivers originating in the Himalayas are a major source of hydel power.
- The Himalayas act as a physical barrier to the invaders.
- It attracts thousands of tourists from India and abroad due to the large number of hill stations like, Mussorie, Nainital, Shimla, Srinagar, Ranikhet, etc. and pilgrimage centres like the shrines of Badrinath, Kedarnath, Amarnath, Vaishno Devi, Kailash-Mansarovar, etc.
- The Himalayas also attract the adventure seekers as it provides a lot of opportunities for trekking, hiking, river rafting, skiing, etc.
- The Himalayas are rich in forest resources as they provide both hard wood and soft wood and are also a home to a wide variety of wild animals like yaks, bears, tigers, elephants, red pandas, snow leopard, etc.
- It is a store house of minerals like copper, lead, nickel, cobalt, tungsten, coal and also gold, silver and precious stones.
- The rivers flowing down from the Himalayas through the northern plains carry alluvium and deposit it in the flood plain which is very fertile.
- The plains of Northern India have three major rivers- Indus, Ganga and Brahmaputra along with their tributaries.
- The River Ganga rises in the Gangotri glacier in the Himalayas, the river Indus has its source in the Kailash range and the Brahmaputra River rises in Tibet near Lake Mansarovar.
- The Great Plains can be sub-divided into the following areas-
  - (i) The Punjab Plains
  - (ii) The Rajasthan Plains
  - (iii) The Ganga plains
  - (iv) The Brahmaputra Plains
- The Northern Plains are of great significance because of the following reasons-
  - (i) Due to the presence of a good network of rivers and favourable climate, these plains support dense population.

- (ii) The fertile soil, perennial rivers and favourable climate have made the northern plains excellent agricultural land.
- (iii) Large number of multi-purpose dams has been constructed across the rivers to provide water for irrigation and to generate electricity.
- (iv) Socially and religiously, the northern plains are of great significance. Many religious and historical cities like Allahabad, Varanasi, Haridwar, Mathura, etc. are situated along the rivers.
- (v) Due to the flat level surface of the northern plains, construction of a network of roads and railways are possible. The rivers are also navigable and allow comfortable transportation. It also facilitates easy access to good communication system.
- The Peninsular Plateau is the largest and the oldest of all the physiographical divisions.
- It has an elevation of 600 m to 900 m and is a stable terrain due to the lava tract which was formed due to the volcanic eruptions.
- The plateau can be divided into the following-
  - (i) The Central Plateau
  - (ii) The Eastern Plateau
  - (iii) The Kathiawar and Kutch
  - (iv) The Deccan Plateau
  - (v) The Northeastern Plateau
- The Western Ghats, the Eastern Ghats, the Vindhya range, the Satpura range and the Aravalli Hills are the mountains of the Peninsular India.
- The major Peninsular Rivers are divided into- The East flowing rivers and the West flowing rivers.
- The East flowing rivers are- the Mahanadi, the Godavari, the Krishna, the Cauvery or Kaveri.
- The West flowing rivers are- the Narmada, the Tapi, the Luni, the Sabarmati and the Mahi.
- The rivers of Northern India differs from the rivers of Peninsular India in the following way-

Rivers of Northern India	Rivers of Peninsular India
1. They are perennial and snow fed.	1. They are non-perennial, seasonal and are rain fed.
2. These rivers are longer and have more tributaries.	2. These rivers are shorter and have less tributaries.
3. These rivers are young and are eroding, transporting and depositing agents of the silts and sediments.	3. These rivers are at an old stage and are only the depositing agents of silts and sediments.
4. They have more silt as they erode sedimentary rocks.	4. They have less silt as they erode igneous rocks.

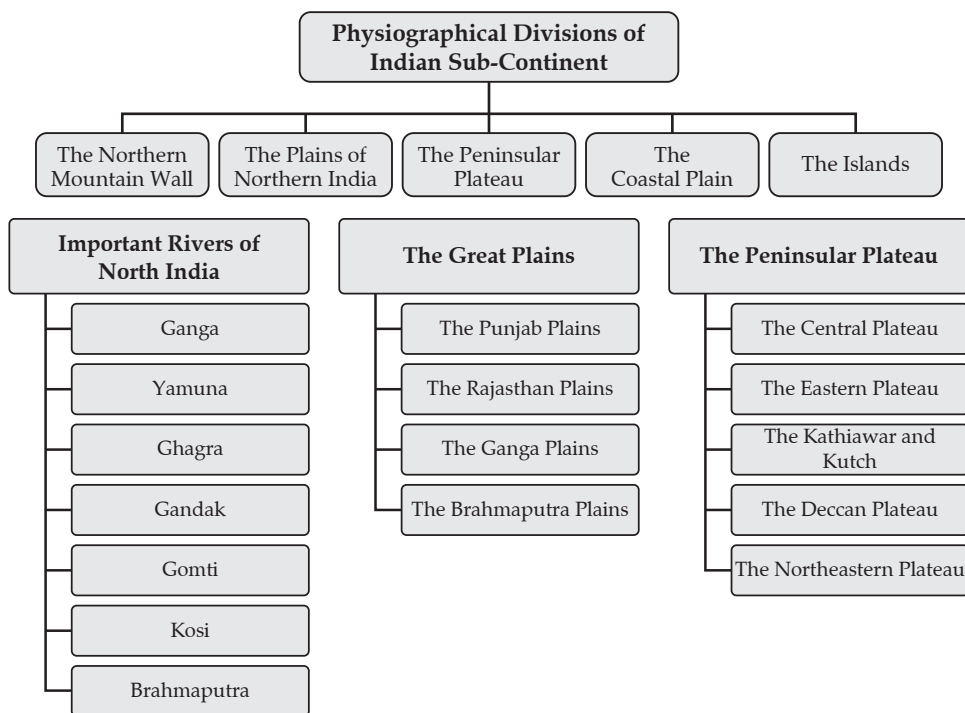
- The Deccan Plateau is flanked by two coastal plains on either side of it- The Western Coastal Plains and the Eastern Coastal Plains.
- The Western Coastal Plains consists of- the Gujarat Plains, the Kutch Peninsula, the Kathiawar Peninsula, the Konkan Coast, the Kanara Coast and the Malabar Coast.
- The Eastern Coastal Plains consists of- the Northern Circars and the Coromandel Coast and has prominent deltas of the rivers Mahanadi, Godavari, Krishna and Cauvery or Kaveri.
- These coastal plains also include several lakes like Chilka Lake in Odisha and Kolleru and Pulicat lakes in Andhra Pradesh.
- Coastal Plains are quite significant because of the following reasons-
  - (i) They are the source of precious minerals.
  - (ii) The Kerala coast has large quantities of Monazite which is used for nuclear power.
  - (iii) The sedimentary rocks of these coastal plains have large deposits of mineral oil.
  - (iv) The ports accounts for 98% of the international trade.
  - (v) Fisheries are an important activity in these coastal plains.
- India has two groups of islands- the Andaman and Nicobar Islands in the Bay of Bengal and the Lakshadweep Islands in the Arabian Sea.
- The Andaman and Nicobar Islands are a group of 300 islands.
- The two groups of islands are separated by the Ten Degree Channel.
- The chief islands are- Great Nicobar and Car Nicobar.
- The Lakshadweep islands consist of 36 islands.
- The northern portion of the island is called the Amindivis and the remaining island is called the Laccadives.

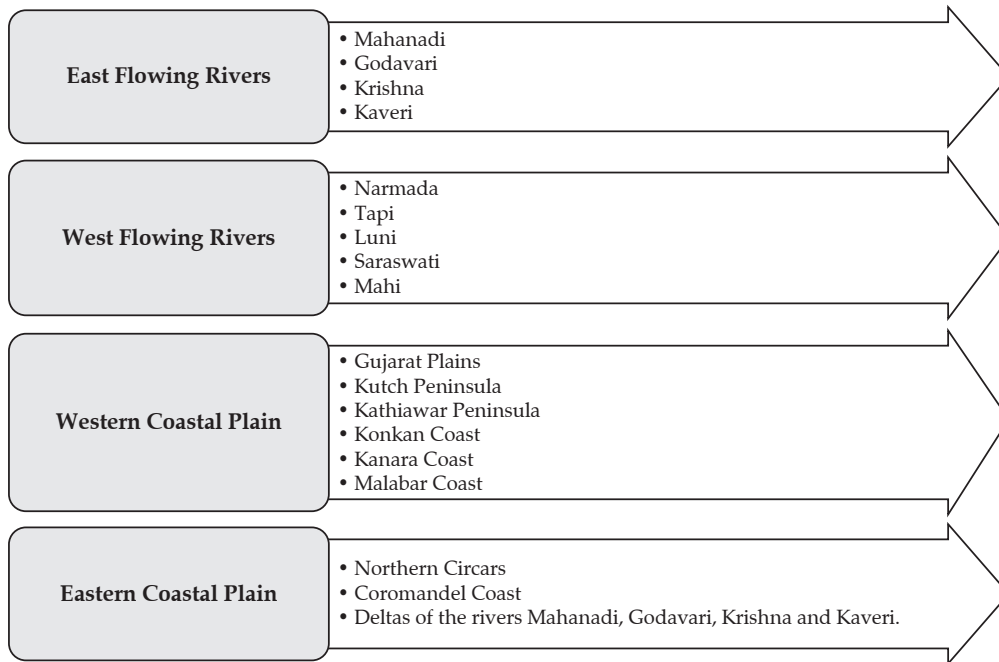


## Know the terms

- **Pass** : It is a route through a mountain range or over a ridge.
- **Doon** : Doons were originally temporary lakes but due to the upliftment of the Himalayas, rivers carved out their own courses and the lakes dried up and turned into valleys.
- **Bhabhar** : These are porous, gravel-ridden plains at the foot of the Himalayas.
- **Terai** - It is a marshy underground seepage area formed when water from the Bhabhar areas seeps down in the soil and suddenly appears.
- **Khadar and Bhangar** : The new alluvium brought down by the rivers in low lying zones is the Khadar soil and the old alluvium soil found in the riverbeds above the flood plain level is known as Bhangar.
- **Perennial river** : The rivers which flow throughout the year due to the continuous melting of snow.
- **Flood Plain** : It is a generally flat area of land next to a river or stream. It is made up of sediments such as sand, silt, and clay deposited during floods.
- **Multi-purpose Dams** : Huge dams that are built to serve many purposes like irrigation, generating electricity, fishing, recreation centres, etc.
- **Peninsular Plateau** : It is the oldest landmass made up of lava flows and is composed of the old crystalline, metamorphic and igneous rocks.
- **Erode** : To wear away of soil, rock or land with gradual destruction by natural forces such as water, wind, or ice.
- **Delta** : A river delta is a landform that forms from deposition of sediment carried by a river.
- **Ten Degree Channel** : The Ten Degree Channel is a channel that separates the Little Andaman and Car Nicobar in the Bay of Bengal.

## Flowcharts



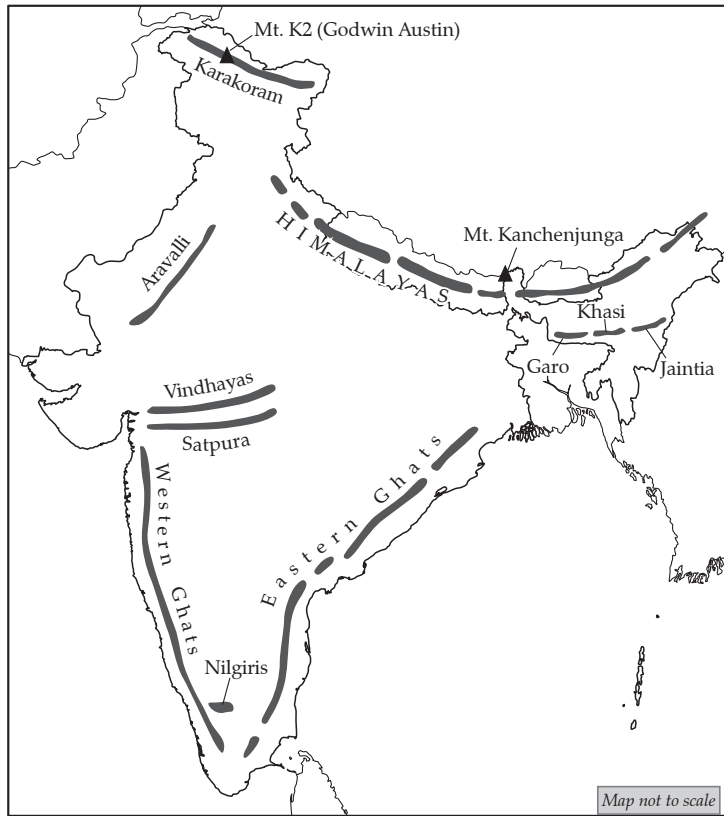


## Map of India

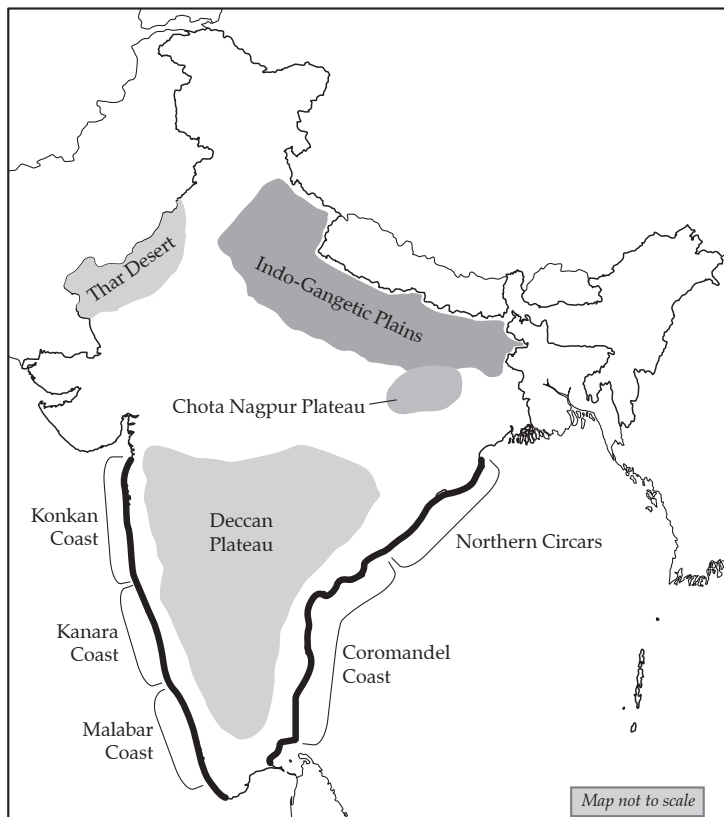
On the Outline Map of India, candidates will be required to locate, mark and name the following:

- **Mountains, Peaks and Plateaus** : Himalayas, Karakoram, Aravalli, Vindhya, Satpura, Western and Eastern Ghats, Nilgiris, Garo, Khasi, Jaintia, Mount Godwin Austin (K2), Mount Kanchenjunga. Deccan Plateau and Chotanagpur Plateau.
- **Plains** : Gangetic Plains and Coastal Plains- Konkan, Kanara, Malabar, Coromandel, Northern Circars.
- **Desert** : Thar (The Great Indian Desert).
- **Rivers** : Indus, Ravi, Beas, Chenab, Jhelum, Satluj, Ganga, Yamuna, Ghagra, Gomti, Gandak, Kosi, Chambal, Betwa Son, Damodar, Brahmaputra, Narmada, Tapi, Mahanadi, Godavari, Krishna, Cauveri and Tungabhadra.
- **Water Bodies** : Gulf of Kutch, Gulf of Khambhat, Gulf of Mannar, Palk Strait, Andaman Sea, Chilka Lake, Wular Lake.
- **Passes** : Karakoram and Nathu-La Passes.
- **Latitudes and Longitudes** : Tropic of Cancer, Standard Meridian (82°30'E).
- **Directions of Winds** : South West Monsoons (Arabian Sea and Bay of Bengal Branches), North East Monsoon and Western Disturbances.
- **Distribution of Minerals** : Oil- Mumbai High (Offshore Oil Field) and Digboi. Iron- Singhbhum, Coal- Jharia.
- **Soil Distribution** : Alluvial, Black, Laterite and Red Soil.
- **Cities** : Delhi, Mumbai, Kolkata, Chennai, Hyderabad, Bengaluru, Kochi, Chandigarh, Srinagar, Vishakhapatnam, Allahabad.
- **Population** : Distribution of Population (Dense and Sparse).

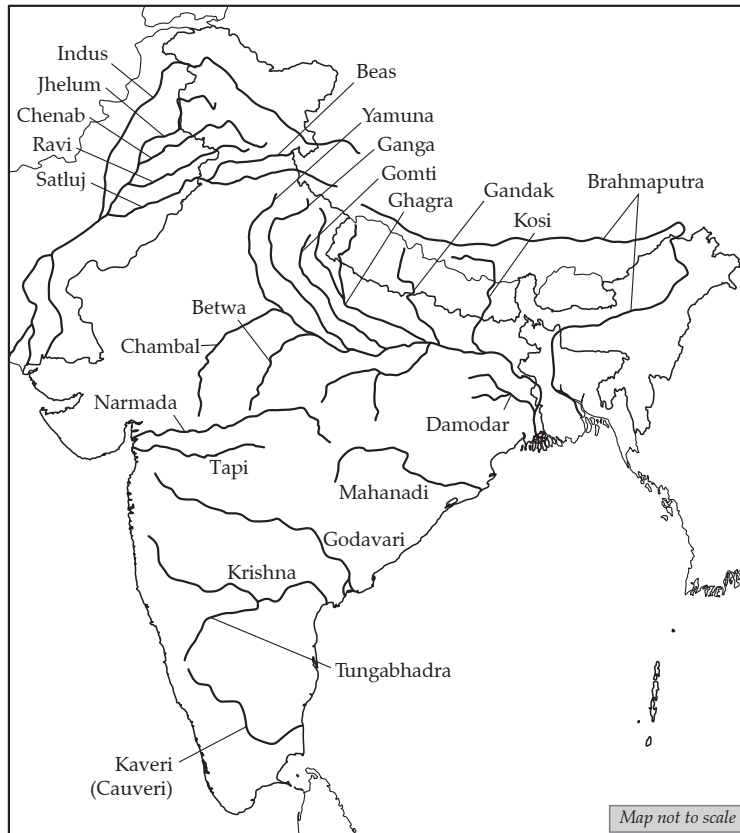
### 1. The Mountain Ranges, Mountain Peaks and Hill Ranges of India :



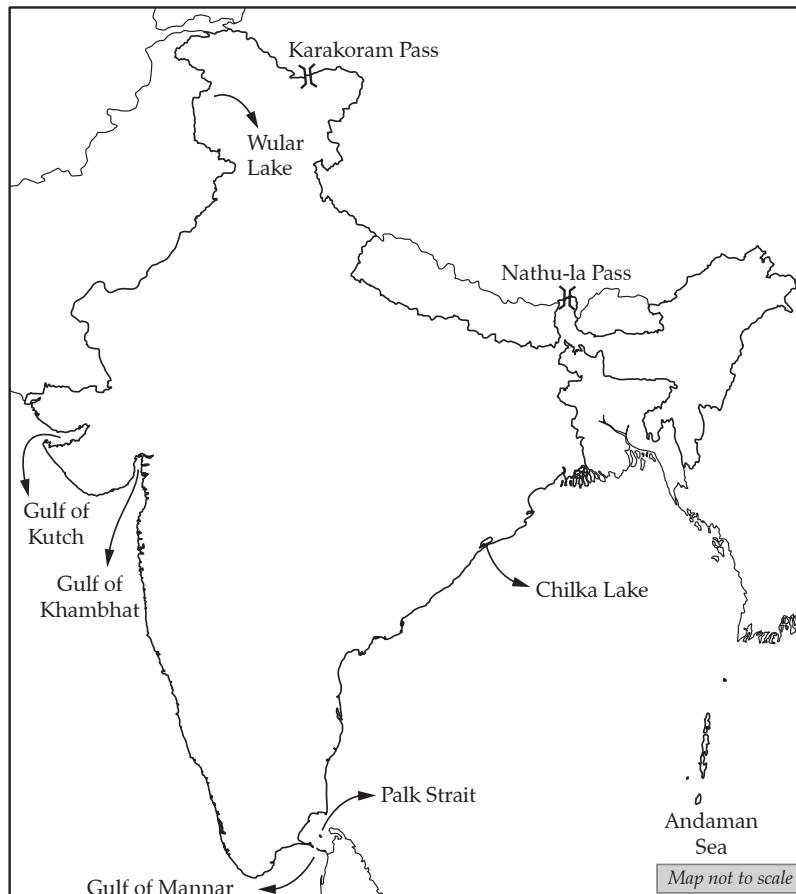
**2. The Plain (The Northern Plains and Coastal Plains) and Plateau Regions of India :**



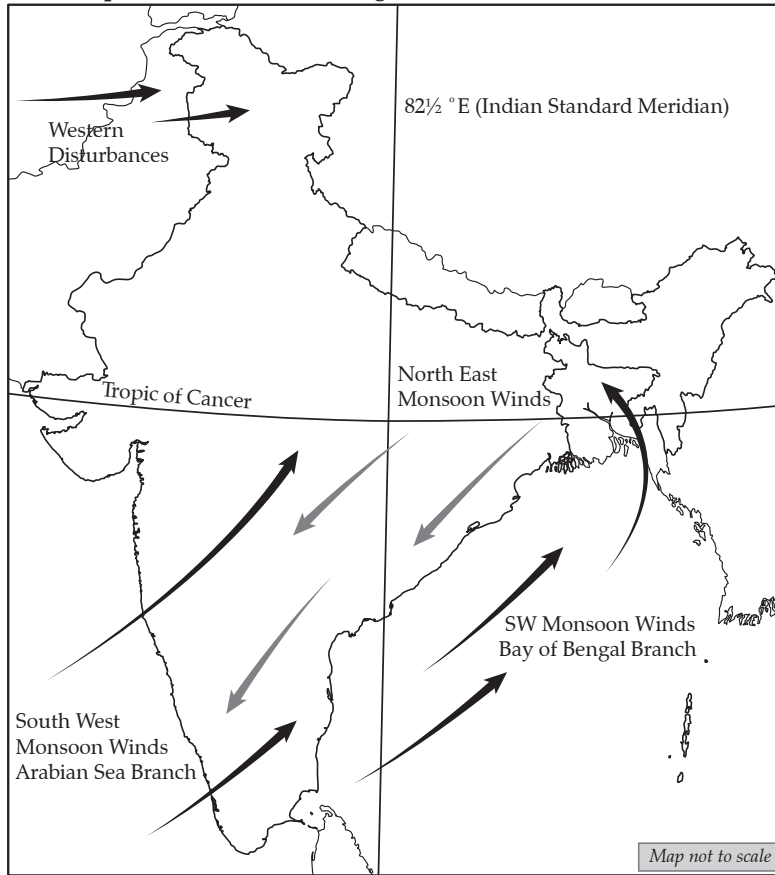
**3. The Major Rivers of India :**



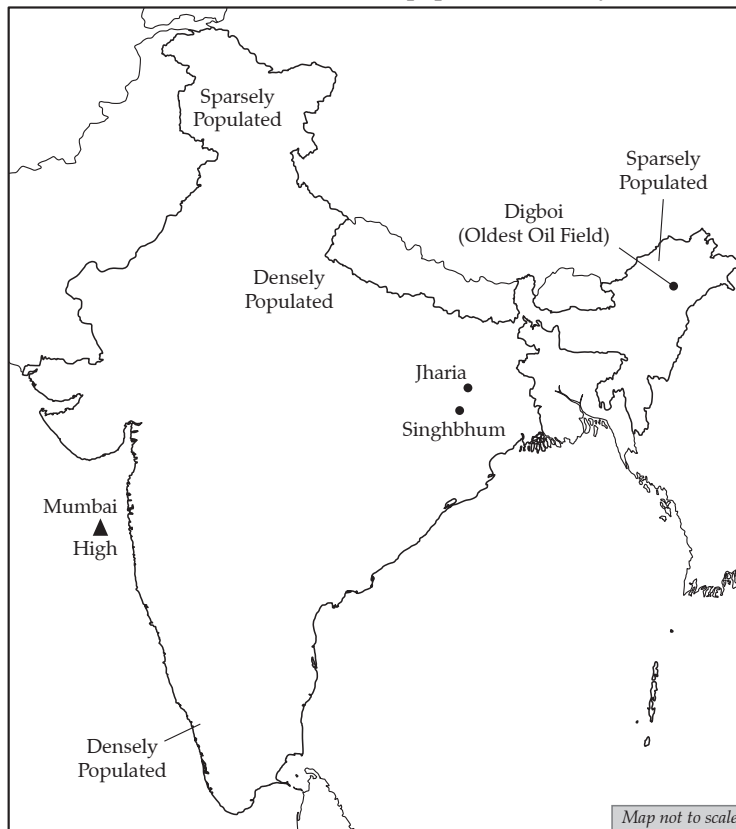
**4. Important Passes, Lakes and Gulfs of India :**



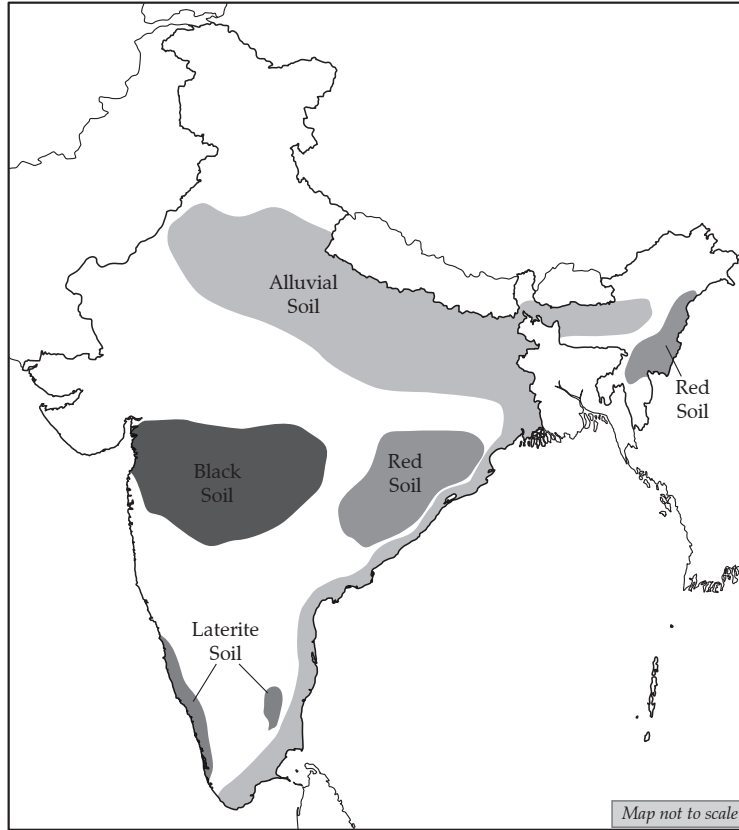
**5. Monsoon Winds and Important Latitude and Longitude of India :**



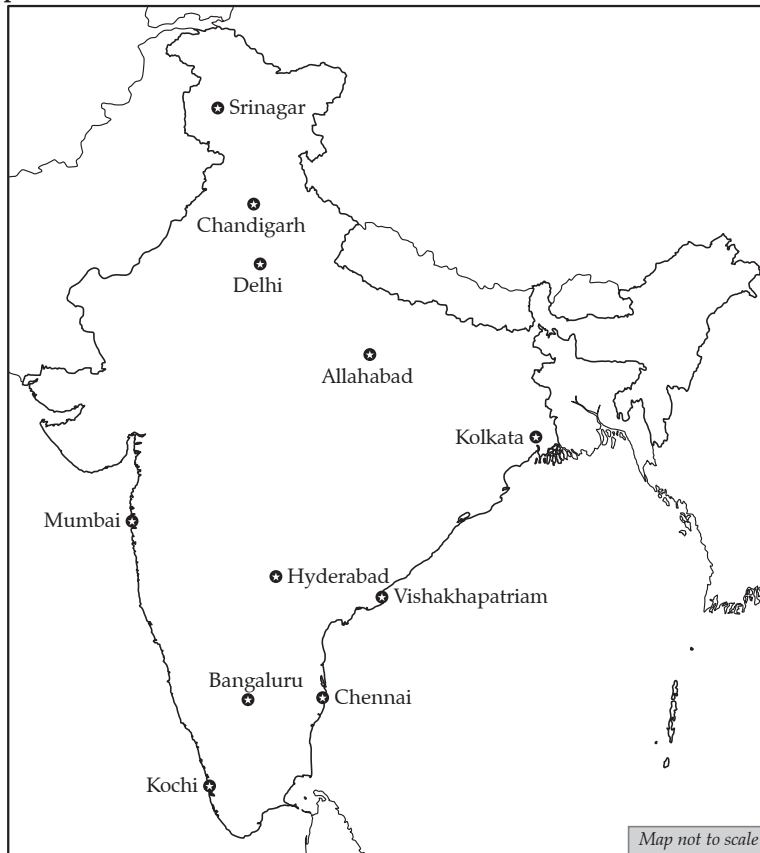
**6. Iron-ore Mines, Oilfields, Coalfields and different population density zones in India :**



7. Major Soils in India :



8. Major software parks in India :



## Chapter -3 : Climate



### TOPIC-1

## Distribution of Temperature, Rainfall and Winds

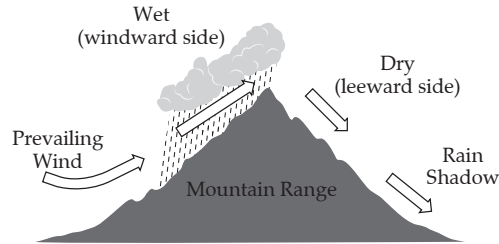
### Quick Review

- India has a tropical monsoon type of climate.
- The temperature varies from region to region due to the vastness of the country and topographical differences.
- The difference between the highest and the lowest temperature in a year is the Annual Range of temperature.
- The northern part of India which lies beyond the Tropic of Cancer ( $23\frac{1}{2}^{\circ}\text{N}$ ) experiences continental type of climate i.e. too hot in summer and too cold in winter.
- The extremity of this climate is due to its distance from the sea. The northern part of the country is situated far away from the influence of the sea.
- The southern part of India lying in the tropical region between  $8^{\circ}\text{N}$  and  $23\frac{1}{2}^{\circ}\text{N}$  experiences moderate temperature. The regions lying close to the coasts experiences equable climate.
- Due to the proximity of the sea, the southern coastal regions experiences equable or maritime or oceanic type of climate.
- The rainfall is mainly Relief or Orographic. It is due to the presence of mountain ranges.
- The moisture laden winds in summer blow from sea to land and strike the Windward side of the mountain causing heavy rainfall while the other side of the mountain called the Leeward side receives scanty rainfall.
- Rainfall is erratic, uncertain and unpredictable due to its variation from time to time. Thus, sometimes it causes floods or droughts.
- In India, rainfall occurs mainly in summer.
- During summer, the moisture laden winds blow from the Arabian Sea branch and bring heavy rainfall to the western, central and northern regions due to the presence of the Western Ghats and the lofty Himalayas.
- The Eastern coastal region receives scanty rainfall in summer but receives heavy rainfall in winters due to the Retreating N.E. winds.
- Besides the summer monsoon, the North Western region also receives rain in winter due to the cyclonic winds that originate over the Mediterranean Sea and blow towards India.
- The rainfall is also unevenly distributed. Some regions like Rajasthan receives less than 50 cms of rainfall, the central part and the Deccan plateau receives low rainfall of about 80 cms while place like Mawsynram near Cherrapunji receives 2500 cms of rainfall.
- The distribution of rainfall depends on the relief of the land, direction of the winds from the sea and the path of the cyclonic winds.
- Due to increasing temperature in summer, the winds become hot and dry and affect local areas strongly. Loo is a local wind that blows in the northern part of the country in the month of May and June and causes heat strokes. It is a gusty, hot and dry wind.
- Similarly, Kalbaisakhi is a local wind that blows in West Bengal and Assam in the month of April, which is accompanied with thunderstorms and heavy rainfall.
- This rain is beneficial for the growth of tea in Assam and rice and jute in West Bengal.
- Mango Showers or Cherry Blossoms are also the local winds which blow in Kerala during summers in June. This wind helps in the growth of mango, coffee and tea.
- In winter, the winds blow from land to sea from the north east direction. These winds are dry and slow in process.
- The North Western region also receives the cyclonic winds blowing from the Mediterranean Sea and influences the Northern plains.

### Know the terms

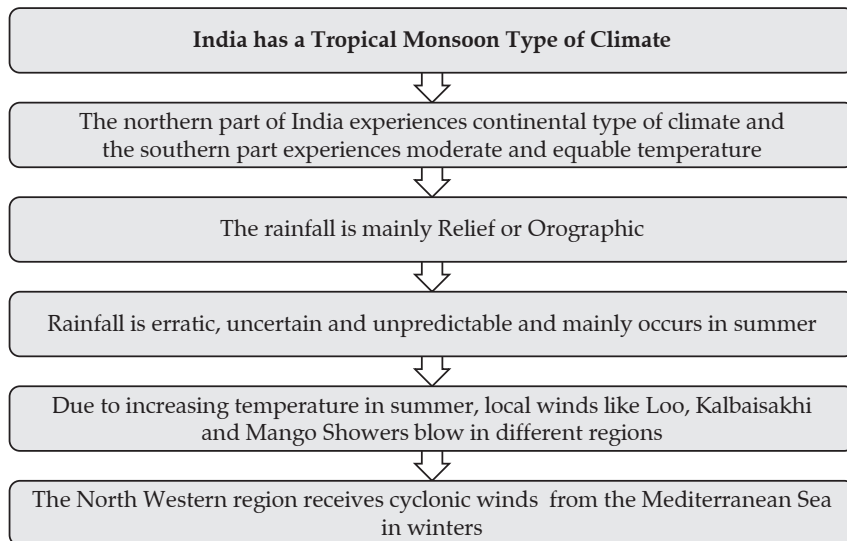
- **Climate** : The atmospheric condition which prevails over an area for a longer period of time usually over a span of 30 years.
- **Continental Climate** : It is experienced in the interior part of the country away from the influence of the sea with very hot summers and cold winters. It is also called extreme climate.

- **Equable Climate** : It is experienced near and along the coasts due to the influence of the sea with summers and winters not very hot or cold respectively. There is not much difference in the temperature throughout the year.
- **Relief Rainfall** : Due to the presence of mountains (relief feature), the moisture laden winds blowing from the sea strikes the mountain and cause heavy rainfall.
- **Windward Side**- The side of the mountain facing the moisture laden winds which causes heavy rainfall after striking the mountain. E.g. western side of the Western Ghats.



- **Leeward Side or Rain Shadow Area** : The other side of the mountain which receives scanty or less rainfall. It is also the Rain shadow area. E.g. Deccan Plateau.
- **Loo** : It is a local wind that blows in the northern part of the country and causes heat strokes. It is a gusty, hot and dry wind.
- **Kalbaisakhi** : It is a local wind that blows in West Bengal and Assam in the month of April, which is accompanied with thunderstorms and heavy rainfall. This rain is beneficial for the growth of tea in Assam and rice and jute in West Bengal.
- **Mango Showers or Cherry Blossoms** : These are the local winds which blow in Kerala during summers. This wind helps in the growth of mango, coffee and tea.

## Flowchart



## TOPIC-2

### Factors Affecting Climate and Seasons

## Quick Review

- Climate refers to the atmospheric condition that prevails on a large area over a long period of time.
- There are a number of factors responsible which influences the climate of India- the Himalayas, the monsoon winds, latitude, altitude, distance from sea, western disturbances, etc.
- The **Himalaya** acts as a climate divide. It prevents the South-West moisture laden winds from crossing over it which results in heavy rainfall in the entire Indian Sub-Continent. It also protects from the cold Siberian winds from entering the Indian region.



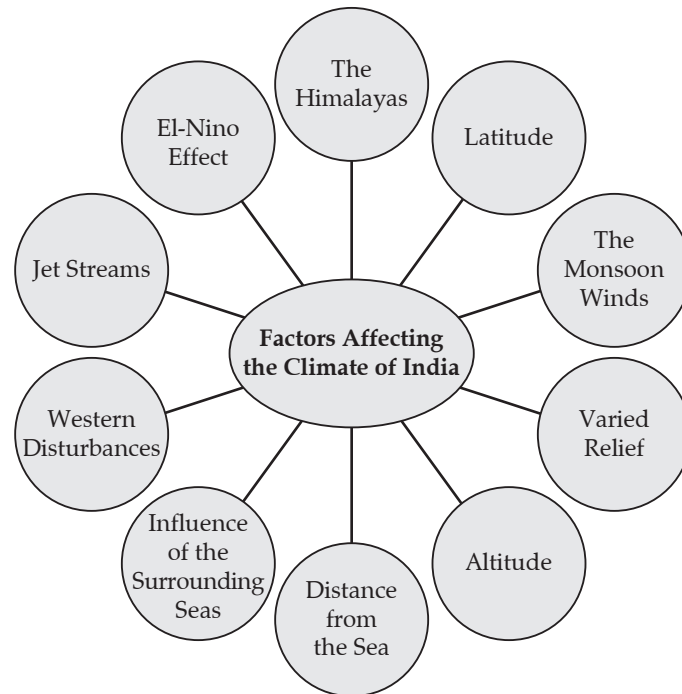
- The **Monsoon Winds** bring summer rainfall over the whole of South Asia. The South West monsoon winds moves from the Arabian Sea branch and the Bay of Bengal branch to the low pressure areas of north and north-west India.
- These winds bring heavy rainfall during summers from June to September. In October when it withdraws and retreats, it picks up moisture from the Bay of Bengal and shed good amount of rainfall on the eastern coastal plain of India. The winds blowing over the land are cold and dry.
- The important line of **Latitude**, the **Tropic of Cancer** passes through the middle of India dividing it into two zones- Temperate Zone (Northern part) and the Tropical Zone (Southern part). The southern tropical zone remains warm throughout the year and practically has no winter season.
- The places beyond the Tropic of Cancer never experiences overhead sun while all the places in the southern zone experiences overhead sun twice a day.
- **Relief** is also an important factor in affecting the climate of India. The Western Ghats stands as a barrier on the way of the South-West monsoon winds which comes from the Arabian Sea and results in heavy rain on the western coastal plains.
- The Himalayas in the extreme north prevents the moisture laden winds from crossing it and thus causes heavy rainfall in the major portion of the India Sub-Continent. The Aravalli Range in the west runs parallel to the South West monsoon winds and thus doesn't shed any rainfall in that region.
- Higher the **Altitude**, lower the temperature. It is due to normal Lapse Rate, i.e. for every rise of 166 metres there is a decrease of 1°C of temperature. Thus, the mountains are cooler than the plains.
- The three major **surrounding seas- Indian Ocean, Arabian Sea and Bay of Bengal** have a great influence and impact on the climate. They are the major source of rain in India and also due to its proximity; the coastal places have moderate climatic conditions.
- During the winter season, due to the **Western Disturbances** over the Mediterranean Sea, the westerly cyclonic winds blow towards India and bring the north- west part of India under its influence. These cyclonic winds bring rain to the North West part of India.
- Air currents which determine the arrival and departure of the monsoons are known as **Jet Streams**. The westerly jet streams prevail over the northern plains while the easterly jet streams steers the tropical depression over India.
- Due to the **distance from the sea**, the areas far away from the influence of the sea experiences continental type of climate, i.e. too hot in summers and too cold in winters. The coastal places, on the other hand, experiences equable or maritime climate due to the nearness of sea. The land breeze and sea breeze are caused due to the differential heating and cooling of land and sea.
- **El-Nino** is a warm ocean current which increases the surface temperature of the sea and affects the monsoon winds in the Indian Ocean. It causes weak drought-like situation in the Indian Sub-Continent.
- Monsoons are periodic seasonal winds and are caused due to differential heating and cooling of land and sea.
- Monsoons are divided into two wind systems- the Summer Monsoon and the Winter Monsoon.
- In India, on the basis of monsoon variations, the year may be categorized into four main seasons. They are-
  - (i) The Hot Summer Season (March to May)
  - (ii) The Hot and Wet or Rainy Season (June to September)
  - (iii) The Retreating South West Monsoon (October-November)
  - (iv) The Cold and Dry Winter Season (December-February)
- The Hot Summer Season begins in March when the sun starts moving northwards and shines vertically over the Tropic of Cancer. During this period, the temperature rises up and goes upto 48°C.
- Due to the moderating influence of the sea, the heat is not so intense in the southern part of India. Plateaus and hills are also cool due to its elevation.
- The Rainy season begins in June and continues till September. The differential heating and cooling of land and sea develops intense low pressure over the large landmass and intense high pressure over the seas.
- The moisture laden monsoon winds enter the Indian mainland from the south west direction and brings heavy rainfall accompanied by thundering and lightning.
- The sudden violent onset of rainfall in the first week of June is termed as the **Burst of the Monsoon**.
- **Kerala** is the first state to receive the monsoon showers and the last to see it retreat.
- **The South West monsoon is divided into two branches-**
  - (i) The Arabian Sea Branch
  - (ii) The Bay of Bengal Branch
- After the monsoon, in the month of October, the South-West Monsoon begins to retreat from the northern part of India and is thus called Retreating Monsoon.

- During this period, due to the apparent movement of the sun, the low pressure trough is gradually replaced by high pressure.
- The retreating winds are dry and slow in their process. The combination of high temperature and humidity gives rise to an oppressive weather, termed as October Heat.
- Due to local variations of heat and moisture, tropical depressions originate in the Bay of Bengal which leads to tropical cyclones.
- By the end of November the winter season begins and continues till March. The temperature decreases from South to North. January is the coldest month.
- The north east winds prevail over the country during the winter season and blow from land to sea. When part of these winds blow over the Bay of Bengal, they pick up moisture from there and strike the Eastern Ghats, thereby, shedding heavy rainfall along the coastal plains.
- A characteristic feature of the winter season is the inflow of cyclonic winds coming from the west. These cyclonic winds, caused due to low pressure systems, originate over the Mediterranean Sea and are called Western Disturbances.
- These winds bring heavy rainfall over the plains of the north-west part of India in the winter season.
- **The distribution of rainfall is determined by the following situations:**
  - (i) The pressure conditions
  - (ii) The direction of relief features
  - (iii) The direction of the wind bearing moisture
  - (iv) Cyclonic depression.
- **Main features of rainfall in India are as follows:**
  - (i) Rainfall occurs only for three months during the rainy season.
  - (ii) The rains are mainly of relief type i.e. the windward side of the mountain receives more rainfall than the leeward side of the mountain.
  - (iii) Less rainfall is received from the other sources like the conventional rainfall and the cyclonic rainfall.
  - (iv) Rainfall is mainly erratic in nature.
  - (v) India being an agrarian country is dependent on rainfall which affects its economy.

## Know the terms

- **Climate** : It refers to the atmospheric condition that prevails on a large area over a long period of time.
- **Temperate zone** : The region beyond the Tropic of Cancer ( $23\frac{1}{2}^{\circ}\text{N}$ ) where the sun is never overhead.
- **Tropical zone** : The region between the Equator and the Tropic of Cancer where the overhead sun is experienced twice a year.
- **Western Disturbances** : The cyclonic depressions that originate over the Mediterranean Sea and bring good amount of rainfall in the North West part of India in the winter season.
- **Jet Streams** : Air currents which determine the arrival and departure of the monsoons.
- **El-Nino** : It is a warm ocean current which increases the surface temperature of the sea and affects the monsoon winds in the Indian Ocean.
- **Monsoon** : It is derived from the Arabic word Mausim which means season. These are periodic seasonal winds and are caused due to differential heating and cooling of land and sea.
- **Burst of the Monsoon** : The sudden violent onset of rainfall in the first week of June accompanied by thundering and lightning.
- **Retreating Monsoon** : The withdrawal of monsoon in the month of October from the mainland of Indian Sub-Continent.

## Flowchart



## Chapter -4 : Soil Resources



### TOPIC-1

### Types of Soil, Composition and Its Characteristics

## Quick Review

- Soil is the main layer of loose mixture of small rock particles and decaying organic matter that covers the land surface.
- Different sources of nature like changing temperature, running water and wind affect the formation of soil.
- Soil is derived from parent rock material through a process of breakup or wear and tear.
- Humus (decomposed vegetal and animal remains) is the main constituent of soil. Silica, clay and sand are also other constituents of soil.
- Soil fertility refers to the nutrients present in the soil to support plant life.
- The important features of soil fertility is that it contains adequate amount of moisture, is rich in nutrients like nitrogen, phosphorous and potassium (NPK), contains organic matter and has sufficient depth to enable the plants to grow roots.
- Depending on the location, soil can be categorized into- Residual or Sedimentary Soil and Transported Soil.
- Residual soil are formed 'in-situ' that is formed in their original position by the breaking up of parent rocks, e.g. Black Soil, Red soil, Laterite Soil, Desert Soil etc.
- Soils that are transported through various agents of soil erosion like wind and running water, e.g. Alluvial Soil.
- Soils are classified into the following types- Alluvial Soils, Black Soils, Red Soils and Laterite Soils.

Name of the Soil	Formation	Crops grown	Characteristics	Areas
1. Alluvial Soil (also called Riverine Soil)	By the deposition of silts and sediments brought down by the rivers.	-Wheat -Rice -Sugarcane -Cotton -Oil Seeds	(i) It is of two types- Bhangar (Old Alluvium) and Khadar (New Alluvium). (ii) It is porous and is coarse in the upper region and fine in the lower region. (iii) Rich in Potash and Lime but deficient in Nitrogen, phosphoric acid and humus (except the alluvium in the Ganga deltaic region which is rich in humus).	-Uttar Pradesh -Uttarakhand -Punjab -Haryana -Jharkhand -Bihar -West Bengal
2. Black Soil (also called Regur Soil or Black Cotton Soil)	By the weathering of lava flow rocks or igneous rocks	-Cotton -Sugarcane -Jowar -Wheat -Oil seeds	(i) It is fine textured. (ii) Clayey in nature. (iii) Its moisture retentive and becomes sticky when wet and forms crack when dry. (iv) Rich in lime, magnesium and iron. (v) Poor in phosphorous, nitrogen and organic matter.	-Maharashtra -Gujarat - A n d h r a Pradesh -Karnataka -Rajasthan -Uttar Pradesh -Parts of Tamil Nadu
3. Red Soil	By the weathering of old hard crystalline and metamorphic rocks	-Wheat -Rice -Cotton -Pulses Can be grown by using fertilizers	(i) It is porous, friable and coarse. (ii) It does not retain moisture. (iii) Rich in iron and potash. (iv) Deficient in lime, nitrogen, phosphorous and humus. (v) Responds to manures or fertilizers. (vi) Does not get water logged. (vii) It is red in colour due to the presence of iron oxides.	-Tamil Nadu, Goa, Karnataka, Odisha and Meghalaya
4. Laterite Soil	Formed <i>in-situ</i> as a result of leaching under typical monsoonal conditions with high temperature and heavy rainfall with alternating wet and dry spells.	Tea, coffee, rubber, cashew, tapioca and millets	(i) Highly acidic in nature. (ii) It is porous and coarse. (iii) Rich in iron. (iv) Poor in silica, lime, nitrogen and humus.	-Summits of Eastern Ghats and Western Ghats - A n d h r a Pradesh -Tamil Nadu -West Bengal -Odisha -Assam

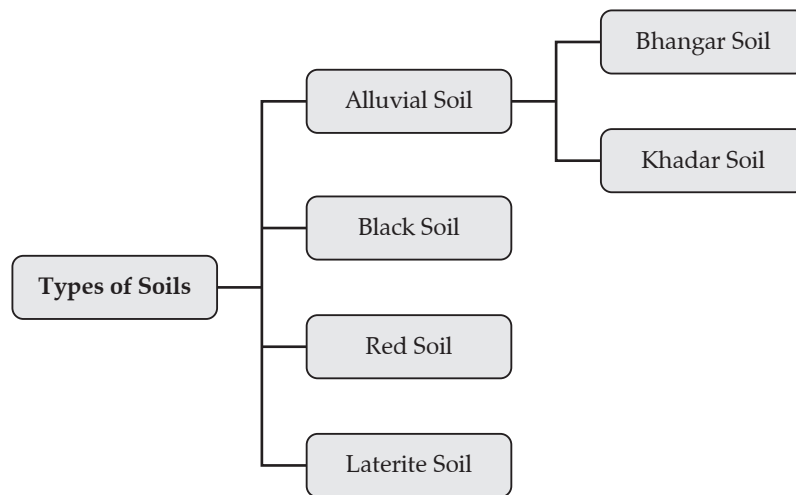
Bhangar Soil	Khadar Soil
1. Older Alluvium soil.	1. Newer Alluvium soil.
2. It is found above the flood levels of rivers and is of a terrace like structure.	2. It lies below the flood levels.
3. It is composed of lime nodules or <i>kankar</i> and has a clayey composition.	3. It is light in colour and is composed of newer deposits.
4. It is not very fertile.	4. It is fertile and is formed of fine silt and clay.

## Know the terms

- **Soil** : It is the main layer of loose mixture of small rock particles and decaying organic matter that covers the land surface.

- **Parent Rock** : It refers to the original rock from which something else was formed. It is mainly used in the context of soil formation.
- **Humus** : It is the organic matter present in the soil formed by the decomposition of plants and animals.
- **NPK** : It is the abbreviation of Nitrogen (N), Phosphorous (P) and Potassium (K) which is good for the fertility of the soil.
- **Bhangar Soil** : It is older alluvium soil and is found above the flood levels of rivers.
- **Khadar Soil** : It is newer alluvium soil and is found below the flood levels.
- **Residual Soil** : These soils are formed 'in-situ', which is formed in their original position by the breaking up of parent rocks.
- **Transported Soil** : Soils that are transported through various agents of soil erosion like water and wind.

## Flowchart



## TOPIC-2

### Soil Erosion- Causes, Prevention and Conservation

## Quick Review

- Soil erosion is the removal of the top fertile soil by wind, water and human activities.
- Soil erosion caused by running water are-
  - (i) **Gully Erosion**- It occurs due to heavy rainfall; deep gullies are formed on the soil and remove the soil nutrients.
  - (ii) **Sheet Erosion**- It occurs on gentle slopes where the thin layer of top soil is removed due to rain water.
  - (iii) **Rill Erosion**- Due to prolonged sheet erosion, finger shaped rills or grooves are formed over a large area.
  - (iv) **Leaching**- When the soil is left bare after harvesting, the nutrients of the soil are percolated below or leached due to rainfall.
  - (v) **Shore Erosion**- The powerful waves of the tidal waters of the sea damage and destroy the coastal areas.
  - (vi) **Stream Bank Erosion**- The streams and rivers change their course by cutting one another's bank, thereby, depositing the silt loads.
- Wind Erosion takes place where there is less or no vegetation due to high velocity a strong movement of winds and deposition of soil particles.
- When wind moves soil particles 0.1-0.5 mm in size in bouncing or hopping way, it is known as Saltation while those which are greater than 0.5 mm and moves by rolling are called Soil Creep.
- Large scale deforestation by man has been witnessed in the Outer Himalayas, the Western and Eastern Ghats for various land use like constructing railway lines, roads, buildings etc.

- The uncontrolled grazing of domestic animals is an important factor for causing Sheet, Gully and Rill Erosion.
- In India, soil erosion is responsible due to the following causes-
  - (i) Increasing population
  - (ii) Erratic nature of rainfall
  - (iii) Overgrazing by domestic animals
  - (iv) Bad Farming Technique
  - (v) Topography of the region
  - (vii) Deforestation.
- The Indian states which are highly prone to soil erosion are Rajasthan, Madhya Pradesh, Maharashtra, Uttar Pradesh, Gujarat, Andhra Pradesh and Karnataka.
- Soil erosion can be prevented by taking up the following measures-
  - (i) Terrace Farming
  - (ii) Contour Ploughing
  - (iii) Strip Cropping
  - (iv) Shelter Belts
  - (v) Plugging Gullies
  - (vi) Construction of Dams
  - (vii) Planting Trees.
- Soil is needed to be conserved as well. Soil Conservation is the preventing of soil loss from erosion or reduced fertility caused by over usage.
- In India, the government has taken special conservation measures-
  - (i) Scheme of Integrated Watershed Management
  - (ii) Scheme for Reclamation and development of ravine areas
  - (iii) Scheme for Control of Shifting cultivation
  - (iv) National Project on Development and use of Bio-Fertilizers and National Project on Quality Control implemented
  - (v) Rainwater Harvesting.



## Chapter -5: Natural Vegetation



### TOPIC-1

### Importance of Forests

## Quick Review

- Natural Vegetation refers to the plant cover that has not been disturbed over a long time and has grown naturally depending upon the climate and soil conditions of that area.
- Grasses, shrubs and trees constitute the natural vegetation of an area.
- Flora refers to plants of a particular region or period, listed a species, e.g. 4000 species of plants in the Eastern Himalayas.
- Vegetation refers to the plants and other flora that make up the plant life in the region.
- It is an assemblage of plant species living in association with each other in a given environmental set-up.
- Forest is defined as an ecosystem or assemblage of ecosystems dominated by trees and other woody vegetation.
- It also refers to a large tract of land covered with trees and accompanying undergrowth of shrubs, herbs and sustaining thousands of life forms.
- In our day to day life, forests play an important role. They are as follows:
  - (i) Forests are **highly productive** since they provide us fruits, leaves, roots, tuber of plants, woods for furniture, wood pulp for manufacturing paper.
  - (ii) The **forest animals provide food** in the form of meat to the tribals living in the forest.
  - (iii) Forests also **provide essential products** like oils seeds, edible plants, fibres, etc.
  - (iv) Bamboos in the forests also **provide as a means of livelihood** to the tribal people as they make mats, ropes,

baskets, etc. from these bamboos.

- (v) The forests **protect from flooding** by controlling the flow of water and prevent evaporation of water due to thick layer of humus.
  - (vi) The roots of trees in the **forest bind the soil firmly** which prevents soil erosion.
  - (vii) The trees **absorb the carbon dioxide and releases oxygen** which is used by human beings and animals.
  - (viii) The trees also **help in regulating the water cycle**.
  - (ix) The forests **provide an abode for the wild animals**.
  - (x) It also **provides recreation** to humans through various Wildlife Sanctuaries, National Parks, etc.
- India can be divided into five major vegetation regions. They are-
- (i) Tropical Evergreen
  - (ii) Tropical Deciduous
  - (iii) Tropical Desert
  - (iv) Littoral
  - (v) Montane
- Tropical Evergreen or Rain Forests :
- (i) Temperature between 25°C and 27°C.
  - (ii) Amount of rainfall is more than 200 cm.
  - (iii) Found in the western slopes of the Western Ghats, hills of north-eastern region and in the island groups of Lakshadweep, the Andaman and Nicobar and Tamil Nadu coasts.
  - (iv) **The characteristic features are :**
    1. They are dense and have a variety of trees and shrubs.
    2. Trees reach at a height of 60 m or above.
    3. Due to thick canopy of trees, herbs and grasses cannot grow.
    4. These forests do not have any fixed period of time for shedding of leave.
  - (v) The main varieties of trees are Ebony, Rosewood, Mahogany, Toon, Chaplas, Gurjan, Sissoo, Telsur, etc.
  - (vi) Economically, these forests were of high value as the timbers produced were hard, durable and fine-grained.
- Tropical Deciduous Forests or Monsoon Forests :
- On the basis of the availability of the water, these forests were categorized into two types :
- (i) The Moist Deciduous Forests
  - (ii) The Dry Deciduous Forests
- The Moist Deciduous Forests :**
- (i) Rainfall between 100 cm to 200 cm.
  - (ii) Temperature between 24°C and 27°C.
  - (iii) Found in the areas of the north-eastern part of the Peninsula, along the foothills of Himalayas, Jharkhand, West Odisha, Chhattisgarh and the eastern slopes of the Western Ghats.
  - (iv) **The main characteristic features are :**
    1. The trees shed their leaves from six to eight weeks during spring and early summer.
    2. These forests are the most commercially exploited forests in India.
    3. These forests have trees found in pure stands.
    4. They provide valuable timber and other forest products.
  - (v) The main varieties of tress found here are Sal, Teak, Arjun, Mahua, Shisham, Palas, Mulberry, Semul and Sandalwood.
  - (vi) These forests are commercially the most exploited one as they provide valuable timber, other forest products like Sandalwood.
- The Dry Deciduous Forests :
- (i) Rainfall between 70 cm to 100 cm.
  - (ii) Annual Temperature is between 23°C and 27°C.
  - (iii) Found in the areas from the foothills of the Himalayas to Kanyakumari except Rajasthan, West Bengal and Western Ghats.
  - (iv) **The main characteristic features are :**
    1. These forests survive in accordance with the climatic condition of that particular region.
    2. The forests on the wetter regions are moist deciduous while on the drier areas, they are thorny bushes.
    3. Teak and other trees are spread out in the northern part of India and in the region of higher rainfall in the Peninsular Plateau along with patches of grass.
    4. The trees of these forests completely shed their leaves and look like a vast tract of grasslands.

- (v) The main trees found there are- Teak, Sal, Tendu, Amaltas, Rosewood, Bel, Khair, etc.
- (vi) These forests provide timber, fruits and other valuable products. Parts of these forests are also cleared to carry agricultural activities.
- Tropical Desert Forests :
  - (i) Rainfall is less than 50 cm.
  - (ii) Temperature between 25°C and 27°C.
  - (iii) Forests are found in Haryana, South-western Punjab, Uttar Pradesh, Central and Eastern Rajasthan, Chhattisgarh, Gujarat, Madhya Pradesh, parts of Maharashtra, Karnataka and Andhra Pradesh.
  - (iv) **The main characteristic features are :**
    1. Due to scanty rainfall, the forests have xerophytic vegetation.
    2. The trees of the forests are stunted and have large patches of coarse grasses.
    3. The trees of these forests remain leafless.
    4. The forest looks like scrub vegetation.
  - (v) The important trees of these forests are Date Palm, Khair, Ber, Babool, Neem, Kanju, Kejri, Cactil, etc.
  - (vi) The trees are economically valuable. The Ber fruit is useful for making pickle or beverage and is also eaten raw, timber is hard and durable, Date Palm is eaten raw and is used as an astringent, as a decoction, etc. Neem leaves and its bark are used for making many health related and beauty products.
- Littoral or Mangrove Tidal Forests :
  - (i) These forests are grown along the sea coasts, in wet marshy areas, in river deltas, in tidal or other swampy areas.
  - (ii) Found in the areas around the deltas of the large rivers along the eastern coasts, in the saline swamps of Sunderbans in West Bengal, along the coasts of Odisha and Andhra Pradesh.
  - (iii) **The main characteristic features are :**
    1. These forests are dense, evergreen and of varying heights.
    2. The trees have long roots submerged under water and have pores which help them to breathe during high tide.
    3. The tidal tree yields hardwood which is strong and durable and is used for making boats and boxes.
    4. The most important tree is the Sundari tree in the Ganga Delta from which the word Sunderbans is coined.
    5. The Indian tidal or mangrove forests are considered as the largest mangrove forest in the world.
    6. These mangrove forests are one of the most productive and bio-diverse wetlands on earth.
    7. These forests have nicely adapted to the muddy, shifting, saline conditions and grow in the brackish marshy areas, mud flats and estuaries along the coast.
  - (iv) The important trees are the Sundari, Gorjan, Hintal, Keora, Rhizophora, Amur, Bhara, Canes, etc.
  - (v) The Littoral forests are economically important too. The Mangrove trees are utilised for fuel while the Sundari trees provide hard, durable timber and is used for making boats and boxes.
- Montane Forests :
  - (i) Rainfall between 100 and 300 cms.
  - (ii) Temperature between 12°C and 13°C and the humidity is between 56%-65%.
  - (iii) These forests are found in the mountain regions having an altitude between 1000 m to 4000 m.
  - (iv) **The main characteristic features are :**
    1. These forests are mainly found in the higher hills of Tamil Nadu and Kerala, in the Eastern Himalayan region including the hills of West Bengal, Assam, Arunachal Pradesh, Sikkim and Nagaland.
    2. These forests are evergreen forests in which the trees are mostly branchy, leaves are broad, dense and rounded.
    3. The branches are covered with mosses, lichens, ferns and creepers.
    4. It provides fine wood which is of much use for construction, timber and railway sleepers.
    5. These forests occur in the temperate zone of the Himalayas at an altitude between 1500 and 3300 metres where the annual rainfall varies from 150 cm to 250 cm.
    6. The Himalayan moist temperate forests cover the entire mountain range in Kashmir, Himachal Pradesh, Uttarakhand, Darjeeling and Sikkim.
    7. In the Peninsular region, these forests are found at an altitude of 1500 m.
  - (v) The important trees of the Montane forests are Indian Chestnut, Birch, Plum, Cinchona, Litsea, Mangolia, Pine, Oak, Hemlock, etc.
- Important Trees and their Uses
  - (i) **Ebony** : It is used for ornamental carving, making musical instruments, sports goods, piano keys etc.

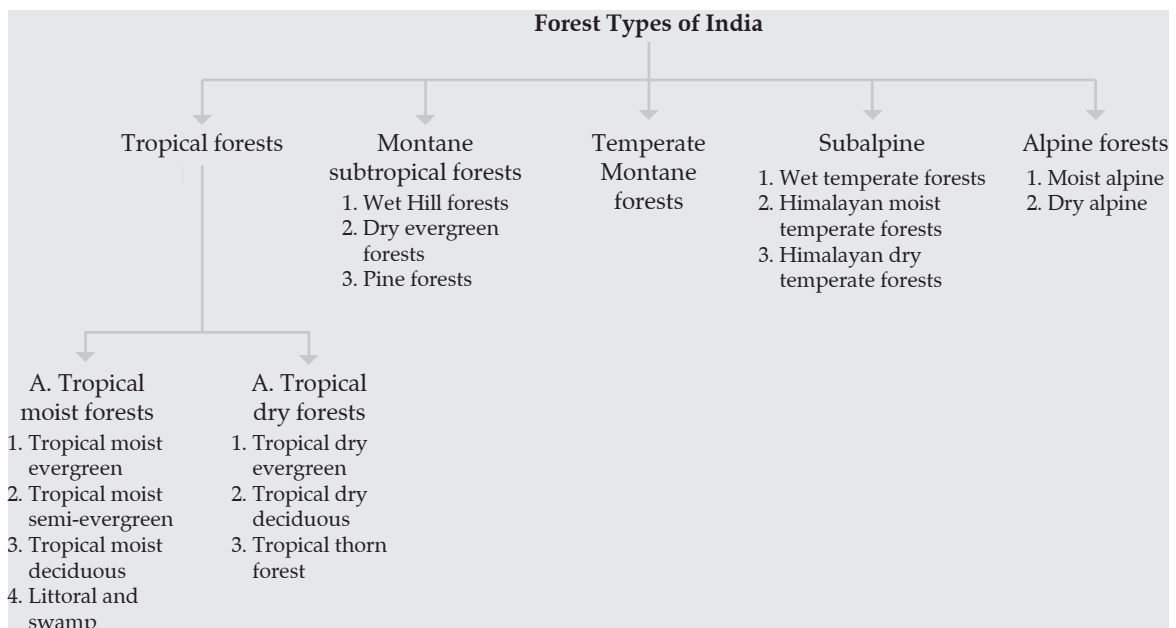


- (ii) **Rosewood** : It is used for making furniture, doors windows, musical instruments, carvings etc. Because of durability it is often used in the martial art weaponry. It is also good for medicinal purposes like it is useful against acne.
- (iii) **Teak** : It has high oil content making it very weather resistant. It has great value as timber and is very heavy, tough and durable. It is broadly used for making furniture, houses and also ships. The bark of the teak tree is considered to be astringent and is used to treat bronchitis.
- (iv) **Mahogany** : It is very durable and is mainly used for crafting cabinets and furniture, musical instruments. It resists wood rot and is used for the construction of boat.
- (v) **Sal** : It is hard, tough and heavy wood. It is mainly used for making doors, windows, railings of bridges, beams, railway sleepers.
- (vi) **Sandalwood** : It is widely used in the cosmetic industry. It is used as perfume and its oil is used in making aromatic substances. It is also used for making ornamental objects like statues.
- (vii) **Ber** : It is hard, tough and durable wood. It is a fruit which is eaten raw as it is rich in Vitamin C and is also used to make pickle or beverage. It is used for making agricultural implements, boat ribs, charcoal, etc.
- (viii) **Babool** : It has high medicinal value. It is a source of gum and used as an emulsifier. The twigs and barks are chewed to prevent Vitamin C deficiency. Its wood is used as fire wood and charcoal and for boat building.
- (ix) **Palas** : It's leaves are used for rearing shellac worms.
- (x) **Neem** : The leaves, bark and roots of this tree has medicinal properties. It helps to cure skin infection, ulcers, allergies, etc. Its oil is used for manufacturing beauty and health products.
- (xi) **Cinchona** : Cinchona is used for increasing appetite. It is also used for blood vessel disorders including hemorrhoids, varicose veins, and leg cramps. It contains quinine, which is a chemical used to treat malaria. Cinchona bark stimulates saliva and stomach (gastric) juice secretion.
- (xi) **Deodar** : Its wood is strong, durable and tough. It is mainly used for construction and for making railway sleepers.
- (xii) **Sundari** : It is a hard, durable and strong tree. It is mainly used for making boats and for house construction.

## Know the terms

- **Flora** : It refers to plants of a particular region or period.
- **Forest** : It is defined as an ecosystem or assemblage of ecosystems dominated by trees and other woody vegetation.
- **Canopy** : The uppermost leafy layer of a forest, formed by the crowns of the trees and climbers.
- **Decoction** : It is a method of extraction by boiling herbal or plant material to dissolve the chemicals of the material, which may include stems, roots, bark and rhizomes.
- **Mangrove** : A mangrove is a shrub or small tree that grows in coastal saline or brackish water.
- **Montane** : It means of or inhabiting mountainous regions.

## Flowchart



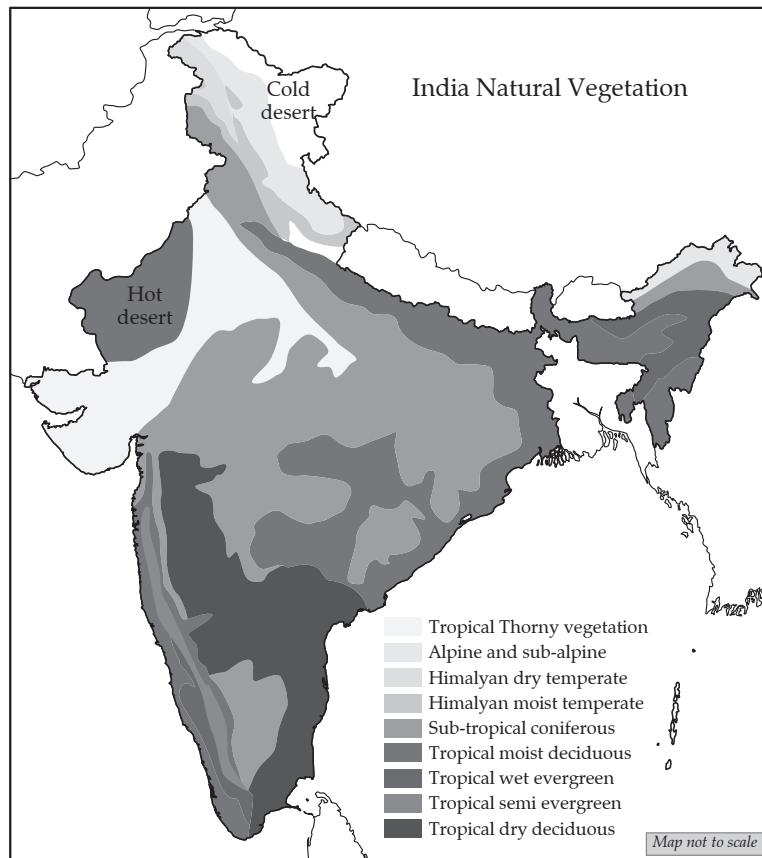


## TOPIC-2

# Distribution and Correlation with their Environment

## Quick Review

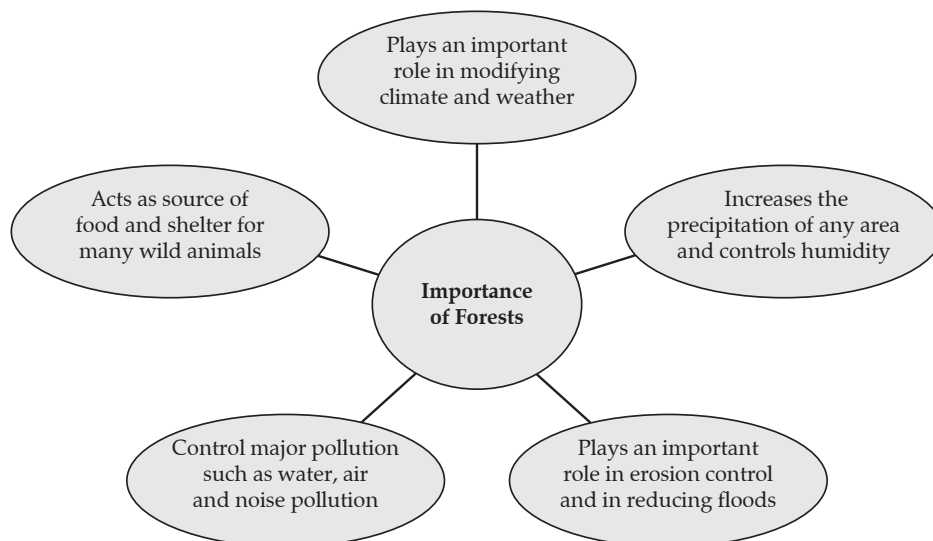
- India is a vast, diverse country and is one of the seventeen mega bio-diverse regions of the world.
- From world's highest rainfall region to dry desert like Thar, from productive Eastern and Western coast line to alpine regions and from river deltas to tropical islands, are found in this land.
- India has a large variety of forest vegetation and has 600 species of hardwoods like sal, teak, etc.
- Indian forests types include Tropical Evergreens, Tropical Deciduous, Littoral, Mangroves, Sub-Tropical, Montane, Tropical Desert, Sub-Alpine and Alpine forests.
- These forests support a variety of ecosystems with diverse flora and fauna.
- In 1970, India declared three major objectives for forestry development: (i) to reduce soil erosion and flooding, (ii) to supply the growing needs of the domestic wood products industries, and (iii) to supply the needs of the rural population for fuel wood, fodder, small timber, and miscellaneous forest produce.
- In 1976, the National Commission on Agriculture recommended advocated the concept of social forestry and in 1980 forestry was encouraged by state community forestry agencies.
- In 2002, India set up a National Forest Commission to review and assess India's policy and law and its effects on India's forests.
- Forests have an interrelationship with environment.
- Forest plays an important role in modifying climate and weather. It reduces mean annual temperature.
- It helps in lowering maximum temperature and raises the minimum temperature.
- Forest increases the precipitation of any area and controls humidity.
- By reducing surface runoff, the forest vegetation helps to increase the amount of water that percolates into a soil.
- Forests help in the firmness and stability of the soil by checking the velocity of wind and by reducing surface runoff.
- Forest plays an important role in erosion control.
- Forests help in reducing floods in the hilly region as well as in the plains by reducing the volume of surface run-off.
- Forests have the potential to bring change in the climatic condition of a region through their influence on the global carbon cycle.
- Trees and other green plants produce oxygen and consume carbon dioxide.
- Forests also control major pollution such as water, air and noise pollution.
- It also influences the life of many terrestrial animals.
- It acts as source of food and shelter for many wild animals.
- Forests improve the nutrition of soil through the addition of organic matter, decomposition of leaves and penetration of plant root.



## Know the terms

- **Bio-Diverse Regions** : It refers to areas containing a wide variety of plant and animal species.
- **Ecosystem** : It means a community of living organisms together with the non-living components of their environment like air, water and mineral soil, interacting as a system.
- **National Forest Commission** : This Commission was set up to review and asses India’s policy and law, its effect on India’s forests and their impact from the ecological, scientific, economic, social and cultural points of view.
- **Global Carbon Cycle** : It describes the exchanges of carbon between the earth’s atmosphere, oceans, land and fossil fuels.

## Flowchart





## TOPIC-3

### Forest Conservation

## Quick Review

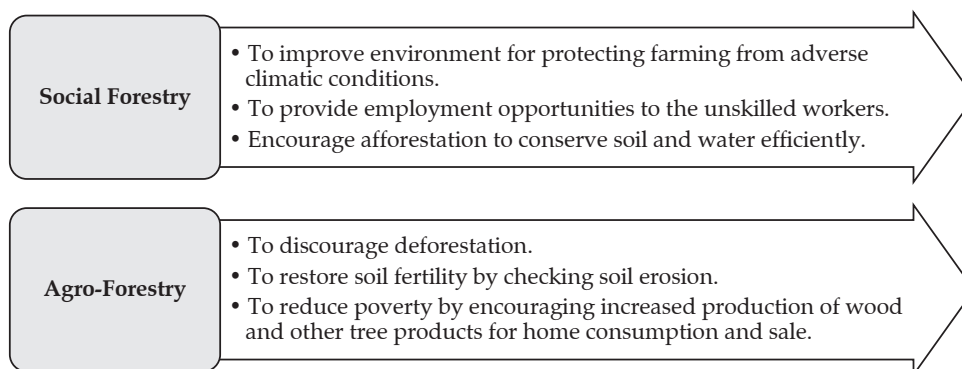
- Man, in order to satisfy his own need, indiscriminately deforested the forested areas which led to a decline in the forest cover area.
- **Some reasons that led to the decline in the forest are :**
  - (i) Increasing population
  - (ii) Converting forests into pasture lands
  - (iii) Overgrazing of animals
  - (iv) Increasing demand for timber
  - (v) Construction of multi-purpose river valley projects
- All these reasons has an adverse effect, like decline in forest productivity, causes soil erosion and floods, reduces rainfall causing droughts and increasing the Green House effect in the atmosphere.
- In order to conserve forests, many practices have to be undertaken by the people. Some of these practices are :
  - (i) To plant trees.
  - (ii) To discourage cutting of trees and ensure to plant ten saplings in lieu of felling one tree.
  - (iii) Banning the practice of shifting cultivation prevalent amongst the tribals.
  - (iv) To grow trees around the Iron and Steel industries and other industrial units.
  - (v) To use non-conventional or renewable sources of energy like solar energy, tidal energy, etc.
  - (vi) To establish corridors between the forests for the migration of wild animals.
  - (vii) To make strict conservation measures and laws to check deforestation.
  - (viii) Participation of people in planning, decision making and implementation of forest programmes.
- In 1988, the Forest Conservation Act of 1980 was amended to facilitate stricter conservation measures.
- India launched its **National Forest Policy** in 1988 and led to a programme named Joint Forest Management.
- This policy proposed that specific villages in association with the forest department will manage specific forest blocks.
- **The other objectives of this policy are :**
  - (i) Restoration of ecological balance.
  - (ii) Maintenance of environmental stability.
  - (iii) Preserving natural forests through wide variety of flora and fauna.
  - (iv) Checking soil erosion and the extension of sand-dunes in the desert areas.
  - (v) To increase forest cover area through extensive afforestation and social forestry programmes.
  - (vi) To meet the basic requirements of the rural and tribal people by providing fuel wood, minor forest product, fodder, etc.
  - (vii) Encouraging the use of forest produce.
  - (viii) Organising people's movement in order to achieve these objectives. Even women are involved, in particular, to be a part of these movements.
- **Social Forestry** means the management and protection of forests and afforestation of barren and deforested lands with the purpose of helping in the environmental, social and rural development.
- It also aims at raising plantations by the common man so as to meet the growing demand for timber, fuel wood, fodder, etc., thereby reducing pressure on traditional forest areas.
- Since India has dominantly a rural population and largely depends on fuel wood and other biomass for their cooking and heating, the need for a social forestry scheme was felt.
- Another scheme taken up under the social forestry programme is the raising of trees on community land and not on private land.
- Social forestry scheme can be categorized into groups; farm forestry, community forestry, extension forestry and agro forestry.
- The government through these schemes aims at providing an entire community and not an individual and takes the responsibility of providing seedlings and fertilizers provided the community takes the responsibility of saving and protecting the trees.
- **The objectives of social forestry are :**
  - (i) To improve environment for protecting farming from adverse climatic conditions.
  - (ii) To increase the supply of fuel wood, fodder for livestock, small timber for rural housing, minor forest products for local industries.
  - (iii) To enhance the natural scenic beauty of the area.

- (iv) To provide employment opportunities to the unskilled workers.
  - (v) To utilize rehabilitated land or restored land for better production.
  - (vi) To create forests as recreational centres for the people.
  - (vii) To develop local cottage industries by providing raw materials.
  - (viii) Encourage afforestation to conserve soil and water efficiently.
  - (ix) Its mission is to convert urban and industrial areas into Green Belts.
  - (x) To enhance the quality of life and raise the standard of living of both the urban and the rural population.
- **Agro forestry** may be defined as a sustainable land use system that maintains or increases the total yield by combining food crop together with forest tree and livestock ranching on the same unit of land, using management practices that take care of the social and culture characteristic of the local people and the economic and ecological condition of the local area.
  - It is a part of social forestry.
  - In agro forestry growing of forest tree along with agriculture crop on the same piece of land is carried out.
  - It is an intermediate stage between forestry and agriculture.
  - It aims to provide soil conservation to improve the growth of forest products and agricultural crops together.
  - **Objectives of Agro Forestry :**
    - (i) To discourage deforestation and reduce pressure on forests for obtaining fuel woods and other forest produce.
    - (ii) To restore soil fertility by checking soil erosion.
    - (iii) By proper utilization of farm resources the ecological balance to be maintained.
    - (iv) To reduce poverty by encouraging increased production of wood and other tree products for home consumption and sale.

## Know the terms

- **Multi-Purpose River Valley Projects** : It refers to major river valley projects with an aim to meet the basic requirements of irrigation for agriculture, electricity for industries and flood control.
- **Green House Effect** : It is a warming of Earth's surface and the air above it. It is caused by gases in the air that trap energy from the sun. These heat-trapping gases are called greenhouse gases. The most common greenhouse gases are water vapour, carbon-dioxide and methane.
- **Joint Forest Management** : It is the official and popular term in India for partnerships in forest movement involving both the state forest departments and local communities.
- **Afforestation** : Planting of new trees.
- **Social Forestry** : It means the management and protection of forests and afforestation of barren and deforested lands with the purpose of helping in the environmental, social and rural development.
- **Green Belts** : It is a policy and land use designation used in land use planning to retain areas of largely undeveloped, wild or agricultural land surrounding or neighbouring urban areas.
- **Agro Forestry** : A sustainable land use system that maintains or increases the total yield by combining food crop together with forest tree and livestock ranching on the same unit of land, using management practices that take care of the social and culture characteristic of the local people and the economic and ecological condition of the local area.

## Flowchart



## Chapter -6: Water Resources



### TOPIC-1

## Sources of Water and Need for Conservation

### Quick Review

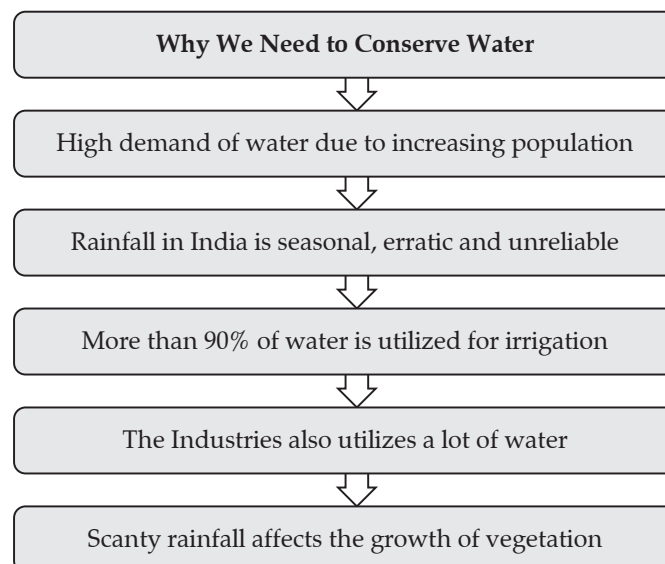
- Our Earth is surrounded by water from all sides but unfortunately only 0.03% of water is available to us as freshwater in rivers, lakes and streams.
- 97% water supply is from the oceans and seas and due to high salt content water is unfit for drinking and for agricultural purposes.
- **There are two sources of water :**
  - (i) Surface Water
  - (ii) Ground Water
- **Surface Water :** Water that collects on the surface of the earth such as oceans, seas, lakes, rivers, streams, etc.
- **Ground Water :** Water from rainfall that collects or flows beneath the Earth's surface, sinks into the soil, filling the porous cracks and spaces in soil, sediment and rocks.
- Groundwater constitutes 0.66% of usable water on the earth.
- Water is the most essential element on earth. Life is impossible without it.
- The increasing population, industrialization, urbanisation and agricultural irrigation, have reduced the per capita availability of water.
- **We need to conserve water due to the following reasons :**
  - (i) High demand of water due to increasing population is leading to the lowering of the ground water levels.
  - (ii) Rainfall in India is seasonal, erratic and unreliable and thus, the farmers cannot wholly depend on rain.
  - (iii) More than 90% of water is utilized for irrigation.
  - (iv) The Industries also utilizes a lot of water and pollutes it too.
  - (v) A large amount of underground water like lakes, rivers, streams, etc. are polluted which cannot be used without its proper treatment.
  - (vi) Scanty rainfall affects the growth of vegetation which results in drought and lowering of ground water levels.
  - (vii) Water is essential for generating hydro-electric power.
- In order to overcome the shortage of water due to its increasing demands, we need to manage our water resources.
- A number of practices have been initiated and measures have been adopted to conserve water effectively.
- Some of these effective measures are- rainwater harvesting, watershed management, water saving technologies, recycling of water and prevention of water pollution.
- Rainwater harvesting is a technique through which rainwater is collected from surfaces on which rain falls, filtering it and then storing it for future use.
- In other words, it is a technique of increasing the recharge of ground water by capturing and storing rain water.
- **It includes activities that are aimed at :**
  - (i) harvesting surface and groundwater,
  - (ii) prevention of losses through evaporation and seepage,
  - (iii) other techniques aimed at conservation and efficient utilization of limited water endowment.
- Rain water harvesting has become a necessity and we need to understand its value by making optimum use of rainwater where it falls.
- The main objective of rainwater harvesting is to make water available for future use and to avoid flooding of roads.
- Water harvesting has many advantages like no land is wasted for storage purpose, no population displacement is required, ground water is not directly exposed to evaporation and pollution, increases the productivity of aquifer, reduces soil erosion, recharge groundwater resource, etc.
- There is different water harvesting mechanisms carried out in different regions of the country. They are-
  - (i) Surface runoff harvesting
  - (ii) Roof Top Water harvesting.

- In different parts of the country rainwater storing mechanisms were known by different names. They were called Khul in Western Himalayas, Zing in Ladakh, Baolis in the Gangetic Plains, Johads in Central India and Rajasthan, Surangam in Western Ghats, Korambu in the Eastern Ghats and Bhandaras in Deccan Plateau.
- Watershed Management refers to the efficient management and conservation of both the surface and groundwater resources.
- It includes prevention of runoff as well as storage and recharge of groundwater by various methods like percolation pits, recharge wells, borewells, dugwells, etc.
- **The elements of water harvesting mechanisms are as follows :**
  - (i) **Catchments :** The catchment of a water harvesting system is the surface which directly receives the rainfall.
  - (ii) **Conduits :** These are the pipelines or drains that carry rainwater from the catchment or rooftop area to the harvesting system.
  - (iii) **Storage Facility :** Rainwater can be stored in any available storage container like, masonry or plastic tanks, RCC (Reinforced cement concrete), etc.
  - (iv) **Recharge Facility :** Rainwater can be used to recharge groundwater aquifers through any suitable structures like dugwells, borewells, recharge trenches and recharge pits.

## Know the terms

- **Surface Water :** Water that collects on the surface of the earth such as oceans, seas, lakes, rivers, streams, etc.
- **Ground Water :** Water from rainfall that collects or flows beneath the Earth's surface, sinks into the soil, filling the porous cracks and spaces in soil, sediment and rocks.
- **Industrialisation :** It is the period of social and economic change that transforms a human group from an agrarian society into industrial one or from agriculture to manufacturing of goods.
- **Urbanisation :** It refers to shifting of population from rural to urban areas.
- **Rainwater harvesting :** It is a technique through which rainwater is collected from surfaces on which rainfall, filtering it and then storing it for future use.
- **Watershed Management :** It refers to the efficient management and conservation of both the surface and groundwater resources.
- **Aquifer :** An underground layer of permeable rock, sediment or soil that yields water.
- **Percolation Pits :** It is used to dispose of produced water by percolation and evaporation through the bottom or sides of the pits into surrounding soils.
- **Surface runoff harvesting :** The water from rain, snow melt or other sources that flows over the land surface is caught and collected to a tank below the surface of the ground.
- **Roof Top Rainwater harvesting :** It is the technique through which rain water is captured from the roof catchments and stored in reservoirs.

## Flowchart





## TOPIC-2

# Importance and Methods of Irrigation

## Quick Review

- Irrigation refers to the process by which a controlled amount of water is artificially supplied to the plants at regular intervals to help in the production of crops.
- In other words, Irrigation is the supply of water to the plants through artificial means from wells, tanks, tubewells, canals, etc.
- Agriculture is the backbone of Indian economy and about 70% people are engaged in it.
- 92% of water is utilized for irrigating the agricultural fields.
- Though rainfall is still an important source of water for the farmers yet these artificial means of irrigation support the farmer to a large extent.
- Irrigation is the most essential requirement for the development of agriculture in India due to the following reasons :
  - (i) Uncertainty of rainfall
  - (ii) Uneven distribution of rainfall
  - (iii) Requirement of different quantities of water for various crops for their growth
  - (iv) Dependent of crops on the nature of soil
  - (v) Utilization of river water effectively
  - (vi) To increase or maximise production.
- There are various means of irrigation- Traditional and Modern means.
- Traditional means of irrigation includes wells, tanks and inundation canals and modern means include tubewells, perennial canals, drip irrigation, spray irrigation, furrow irrigation and sprinkler irrigation.
- Well irrigation is the oldest method of irrigation. It is normally carried out in the places where the soil is soft and easy to dig.
- Well irrigation is practised in the states of Uttar Pradesh, Punjab, Haryana, Bihar, Goa, Gujarat, Rajasthan, Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka and Tamil Nadu.
- There are different methods of lifting water from the wells for irrigation in India. They are :
  - (i) Persian Wheel Method
  - (ii) Lever Method
  - (iii) Inclined method
- There are many advantages and disadvantages of well irrigation.
- **Advantages of Well Irrigation :**
  - (i) Less expensive.
  - (ii) Can be dug anywhere where the soil is soft.
  - (iii) Oxen kept for ploughing of field can be utilized for drawing water from the wheel at no extra cost.
  - (iv) By using pumps and tubewells, water can be lifted from great depths.
- **Disadvantages of Well Irrigation-**
  - (i) It is difficult to dig wells or bore tubewells in the hilly regions and in the rocky areas of Southern Peninsula.
  - (ii) Due to uneven distribution of underground water resources in different areas, wells do not function effectively.
  - (iii) Owing to excessive withdrawal of underground water and lowering of water table, the conventional wells dry up.
  - (iv) It is expensive for a farmer to use electricity or diesel to operate tubewells which also causes many problems.
- Tubewells are deeper wells from where the water is lifted from a great depth of 20-30 m by the use of power pumps.
- **The tubewells can be drilled in places which has the following conditions :**
  - (i) Availability of plenty of water.
  - (ii) Soft soil, level land and fertile area.
  - (iii) Availability of cheap electricity at a regular basis to run tubewells.
- **Advantages of Tubewell Irrigation :**
  - (i) It is able to irrigate a larger agricultural land.
  - (ii) Large amount of underground water is easily available.



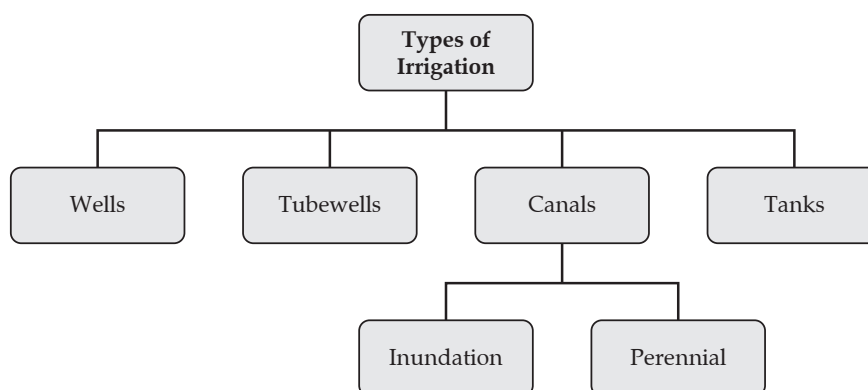
- (iii) It is reliable during dry season when the surface water dries up since the tubewell is drilled upto the permanent water table.
- (iv) A good amount of water can be pulled out in a short period of time.
- **Disadvantages of Tubewell Irrigation :**
  - (i) Irrigation is not possible if the groundwater is brackish.
  - (ii) It is costly as it requires regular supply of electricity.
  - (iii) Irrigation is not possible if the underground water level is low.
  - (iv) Excessive use of tubewell leads to lowering of groundwater level.
- Tubewell irrigation is mainly prevalent in the states of Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal, Rajasthan, Madhya Pradesh and Gujarat.
- Canal is an important and effective means of irrigation in India.
- Canal irrigation is mainly concentrated in Uttar Pradesh, Punjab and Haryana.
- Since digging is difficult in the rocky and uneven surfaces of land, canals are practically absent in the Southern Peninsular region.
- **There are two types of canals in India :**
  - (i) Inundation Canal
  - (ii) Perennial Canal
- **Inundation Canals** are those canals which are taken out directly from the rivers without any regulating systems like barrage or dam.
- This type of canal provides water for irrigation only during the rainy season and at times of flood.
- Since the level of water drops after the rainy season is over, the canal dries up and thus it has limited use.
- **Perennial Canals** are those canals which taken off from perennial rivers by constructing a dam or a barrage across the river.
- These canals help to irrigate large areas and can draw water throughout the year.
- Today in India most of the canals are perennial.
- Canal irrigation is practiced in Uttar Pradesh, Punjab, Haryana, Bihar, Madhya Pradesh, Rajasthan, Andhra Pradesh, Jammu and Kashmir, Assam and Tripura.
- Uttar Pradesh has constructed a large number of canals to irrigate around 3,091 thousand hectares of land which is 30.91% of the total canal irrigated area of the country.
- The important canals of Uttar Pradesh are Upper Ganga Canal, Lower Ganga Canal, Sharda Canal, Eastern Yamuna Canal, Agra Canal and Betwa Canal.
- The important canals in Punjab are Upper Bari Doab Canal, Srihind Canal, Bhakra Canal, Bist Doab Canal.
- In Haryana, the Western Yamuna Canal, Bhakra Canal, Jui Canal and Gurgaon Canal are the main canals.
- The important canals of Rajasthan are Indira Gandhi Canal, Gang or Bikaner Canal and Chambal Canal Projects.
- **Advantages of Canal Irrigation :**
  - (i) The perennial canals provide constant supply of water and save the crops from drought situations.
  - (ii) Canal irrigation has proved to be a boon to the sandy areas of Rajasthan which are yielding good agricultural crops.
  - (iii) Canal irrigation has converted Punjab and Haryana into a Granary of the country.
  - (iv) Canals carry a lot of sediment brought down by the rivers which gets deposited in the agricultural fields and add to the fertility of the soil.
  - (v) Although the initial investment for constructing a canal is high but it is quite cheap in the long run.
- **Disadvantages of Canal Irrigation :**
  - (i) During rainy season, many canals overflow and flood the already cultivated areas.
  - (ii) In areas where the water is excessively flowing in fields, it raises the ground water level and results in bringing the alkaline salts to the surface, thereby making the field unfit for agriculture or unproductive.
  - (iii) Due to waterlogging, the capacity of soil to absorb water reduces and thus ruins the standing crops, stored grains etc.
  - (iv) Canal irrigation is suitable mainly in plain areas.
- Tank comprises an important source of irrigation mainly in the southern part of the country.
- Tank irrigation is one of the oldest irrigation systems in India.
- It is mainly carried out in the rocky plateau region of South India where the rainfall is highly seasonal and uneven.
- Tank Irrigation is practiced in Andhra Pradesh, Telangana, Tamil Nadu, Maharashtra, Gujarat, Madhya Pradesh, etc.
- Tank irrigation is mainly prevalent in South India due to the following reasons :

- (i) The Southern rivers are not snow-fed and are dependent on rainfall.
- (ii) The streams are mainly seasonal and dry up once the rainfall is over.
- (iii) Due to hard rocks, non-porous and rocky surface the water doesn't penetrate through the layers of the soil, so digging wells is not possible.
- (iv) The Deccan terrain is uneven with many natural depressions which facilitate the construction of tanks.
- **Advantages of Tank Irrigation-**
  - (i) It is inexpensive as they are mostly natural.
  - (ii) It is highly beneficial in the uneven rocky plateau of Deccan since rainfall is seasonal.
  - (iii) It is highly significant because it stores the abundant rainwater and reduces the waste of the excessive flowing water.
  - (iv) Since wells and tubewells cannot be dug in the rocky surface of the Deccan Plateau, tanks are easily constructed.
- **Disadvantages of Tank Irrigation-**
  - (i) In the absence of rainwater during dry season, the tanks become dry and fail to provide water for irrigation.
  - (ii) Due to deposition of sediments, the tanks get silted up soon and desilting is necessary for making irrigation suitable which is expensive.
  - (iii) Tanks occupy large fertile areas which otherwise could be used for agricultural purposes.
  - (iv) Since tanks are very extensive and shallow, huge quantities of stored water go waste as it gets evaporated or sinks underground.
- The conventional system of irrigation or the traditional method of irrigation has a number of disadvantages. They are :
  - (i) In this method large quantity of water cannot be used.
  - (ii) Waterlogging is caused in the low lying agricultural fields due to the flowing of excess water which damage the crops and gives poor yield.
  - (iii) Due to accumulation of salts in arid and semi-arid regions of India, large tract of lands are left barren and cannot be utilized for cultivation.
- Modern methods of irrigation are efficient and supply water to the fields more uniformly as compared to the traditional methods of irrigation.
- **The important modern methods of irrigation are :**
  - (i) **Drip Irrigation :** This method is considered to be the most efficient and advanced system of irrigation. It supplies the water to the roots of the plants slowly through pipes, valves, tubing etc. and thus saves water and fertilizer. This helps in the reduction of evaporation.
  - (ii) **Sprinkler Irrigation :** It is a method by which water is supplied to the plants uniformly through a nozzle fitted in a pipe. It is widely used in the arid areas as it checks and controls the wastage of water through evaporation and seepage.  
One advantage of this type of irrigation is that there is no loss of water through evaporation and seepage and one disadvantage is that it is expensive and can water only a small area.
  - (iii) **Furrow Irrigation :** It is a type of surface irrigation in which furrows are dug between the rows of the crops and water is evenly distributed to the entire field. It is one of the oldest methods of irrigation and is cheap.
  - (iv) **Spray Irrigation :** In this type of irrigation, water is shot from high pressure sprayers onto the crops through a long hose pipe. It is expensive but utilizes water more efficiently. Since it is sprayed so a good amount of water gets evaporated.

## Know the terms

- **Irrigation :** It is the supply of water to the plants through artificial means from wells, tanks, tubewells, canals, etc.
- **Well :** A pit or a hole created in the ground by digging, boring or drilling to access groundwater. It is drawn by a pump or by a pulley.
- **Persian Wheel Method :** It is a mechanical water lifting device operated by draught animals like bullocks, buffaloes or camels.
- **Tubewell :** Tubewells are deeper wells from where the water is lifted from a great depth of 20-30 m by the use of power pumps.
- **Inundation Canals :** These are those canals which are taken out directly from the rivers without any regulating systems like barrage or dam.
- **Perennial Canals :** These are those canals which taken off from perennial rivers by constructing a dam or a barrage across the river.
- **Drip Irrigation :** It supplies the water to the roots of the plants slowly through pipes, valves, tubing etc. and thus saves water and fertilizer.
- **Sprinkler Irrigation :** It is a method by which water is supplied to the plants uniformly through a nozzle fitted in a pipe.

## Flowchart



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## Chapter -7: Mineral Resources

### Quick Review

- **Minerals** are defined as solid, inorganic, naturally occurring substances with a definite chemical and physical properties and general structure.
- Minerals are very important because they are the source of raw materials and form the basis for industries.
- They are the source of energy/power e.g. coal and petroleum.
- Minerals also help to earn foreign exchange.
- Minerals are classified into two categories- Metallic and Non-metallic.
- **Metallic minerals** are those minerals which can be melted to obtain new products like iron, copper, bauxite, tin, gold, manganese, etc.
- These minerals are usually hard, ductile and malleable and are associated with igneous rocks.
- Metallic minerals have lustre or shine of their own.
- They are further categorised into ferrous and non-ferrous minerals.
- **Ferrous minerals** are those which have iron content like iron ore whereas **non-ferrous** minerals do not have iron content like bauxite, copper, gold, etc.
- **Non-Metallic minerals** are either organic or inorganic in origin.
- They are generally associated with sedimentary rocks.
- They do not have metallic luster and break easily.
- Non-metallic minerals are not malleable.
- Organic non-metallic minerals include fossil fuels and inorganic non-metallic minerals include mica, graphite, limestone, etc.
- **Some unique characteristics of minerals are-**
  - (i) They are not evenly distributed.
  - (ii) They are exhaustible.
  - (iii) They have inverse relationship in quality and quantity.
- India is rich in mineral deposits. A wide variety of minerals like iron, bauxite, mica, copper, gold, chromite, manganese, limestone, etc.
- **Iron Ore-** India is rich in Iron deposits and is the largest producer of it in Asia.
- In India four varieties of iron ore are found- Haematite, Magnetite, Limonite and Siderite.
- The primary use of iron ore is in the production of iron.
- Iron ore is usually smelted to produce pig iron (metallic iron) used to make steel.
- It is alloyed with other elements to make it strong and hard and then utilize for construction, automobile manufacturing, etc.

➤ **Uses of Iron ore :**

- (i) Used in airplanes, beams used in the construction purposes.
- (ii) Manufacturing automobiles, trains, trucks, etc.
- (iii) Manufacturing metallurgy products, magnets, etc.
- (iv) Used in appliances and surgical instruments in the form of steel.
- (v) Radioactive iron is used in medicine as tracer element.
- (vi) Iron blue is used in blueprints, inks, paints, enamels, crayons, linoleum, etc.

➤ Iron Ore is found in the deposit areas of Chhattisgarh, Jharkhand, Karnataka, Goa, Odisha, Andhra Pradesh, Tamil Nadu, Maharashtra and Rajasthan.

➤ Singhbhum, Keonjhar, Myurbhanj and Sundargarh districts have large deposits of Iron ore.

➤ Iron ore is exported Italy, Iran, China, Japan, etc. The main exporting ports are Mormugao and Vishakhapatnam.

➤ **Manganese** is an important ferro-allied ore mined in India.

➤ It is hard, black and iron like metal, an important raw material for smelting of iron ore and is used in the manufacture of steel.

➤ **Uses of Manganese-**

- (i) It makes steel tough and hard and is rust resistant.
- (ii) It is used in manufacture of chemical and electrical equipments.
- (iii) It is used to manufacture coloured glass.
- (iv) It is used in chemical industries for manufacturing bleaching powder.
- (v) It is used in dry cell batteries.
- (vi) Manganese is also used to manufacture vital enzymes for the metabolism of fats and proteins.
- (vii) Manganese is also used to regulate blood sugar levels, supports immune system, involved in bone development and reproduction.
- (viii) It is useful in plant growth too as it reduces nitrates in green plants and algae.
- (ix) It is an essential trace element in higher animals.

➤ The important Manganese producing areas in India are- Odisha, Karnataka, Madhya Pradesh, Maharashtra, Andhra Pradesh, Goa, Telangana, Jharkhand and Rajasthan.

➤ The main buyers of Manganese from India are USA, Japan, France, The Netherlands, UK, West Germany and Belgium.

➤ **Copper** is an important non-ferrous metal.

➤ It is a good conductor of electricity and is ductile.

➤ Copper is found in old as well as young rock formations and occurs as veins and as bedded deposits.

➤ Copper contains a very small percentage of metal and thus copper mining is an expensive and tiring affair.

➤ **Uses of Copper-**

- (i) Since copper is a good conductor of electricity, it is used for making electric wires.
- (ii) It is also used in automobiles and in defence industries.
- (iii) It is alloyed with nickel and iron to make stainless steel.
- (iv) It is alloyed with aluminium to make duralumin.
- (v) When it is alloyed with zinc, it is called brass and when alloyed with tin, it is called bronze.
- (vi) Copper is also used in building construction, plumbing and in ship building.

➤ India has low grade copper ore and thus imports from USA, Canada, Japan, Mexico and Zimbabwe.

➤ The major copper mines are in Khetri in Rajasthan, Singhbhum in Bihar and Malanjkhand in Madhya Pradesh. Besides these, Guntoor in Andhra Pradesh and Nagpur in Maharashtra.

➤ **Bauxite** is an important ore of aluminium.

➤ It is mixed with sand and iron oxide.

➤ It is sticky like clay and is found in the tertiary deposits of Peninsular Plateau.

➤ Bauxite has 60-70% of aluminium oxide and by melting aluminium is obtained.

➤ India has a huge deposit of Bauxite and ranks 5<sup>th</sup> in the world production.

➤ The largest integrated aluminium plant in India is at Renukoot in Uttar Pradesh.

➤ It gets its supply from Amarkanth Plateau and Ranchi.

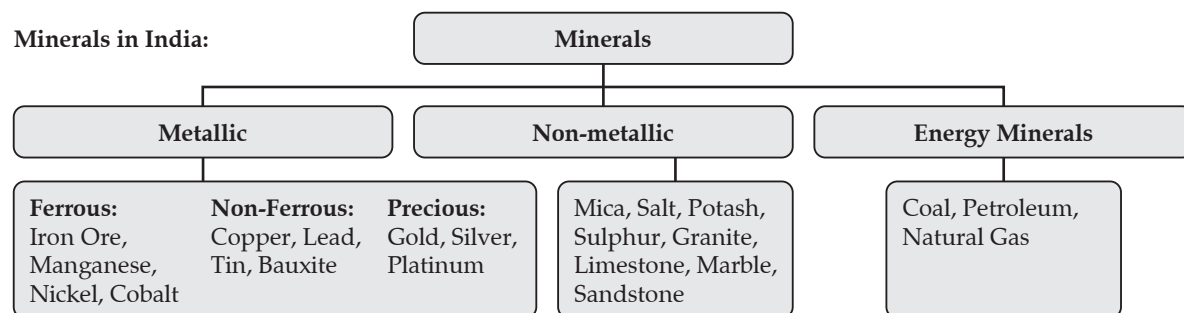
➤ **Uses of Bauxite :**

- (i) Bauxite is rust resistant, strong and lightweight metal.
  - (ii) It is mainly used in aircrafts, automobiles, shipping industry, household appliances, rail wagons, coaches, etc.
  - (iii) Bauxite is a good conductor of electricity and is used in electrical equipment industries.
  - (iv) It is also used in making mirrors, headlight reflectors and in telescopes.
- The main deposits are in Odisha, Goa, Gujarat, Maharashtra, Madhya Pradesh, Chhattisgarh, Jharkhand, Karnataka and Tamil Nadu.

## Know the terms

- **Minerals :** They are defined as solid, inorganic, naturally occurring substances with a definite chemical and physical properties and general structure.
- **Metallic Minerals :** These are those minerals which can be melted to obtain new products like iron, copper, bauxite, tin, gold, manganese, etc.
- **Non-Metallic Minerals :** They are either organic or inorganic in origin, associated with sedimentary rocks and are not malleable.
- **Haematite :** It is a good quality of iron ore with 60%-70% of pure iron. It is reddish in colour and is also called Red Ore.
- **Magnetite :** It is the finest quality of iron ore with more than 70% of iron and possesses magnetic property. It is brown to blackish in colour and also called Black Ore.
- **Limonite :** It contains 35% to 50% of iron. It is a low quality iron ore. It is yellowish to yellowish brown in colour.
- **Siderite :** It contains 20%-30% iron content and a residual ore. It is a carbonate of iron and is found near coal fields.
- **Metallurgy :** It is a science that deals with the nature, uses, production and purification of metal.

## Flowchart



□□

## Chapter -8: Energy Resources

### Quick Review

- **Conventional sources of energy** are those sources of energy which are non-renewable, i.e. cannot be replenished once they are consumed e.g. coal, petroleum, electricity or hydel power and natural gas.
- Conventional sources of energy are hazardous to environment as they cause pollution.
- This source of energy is expensive.
- **Coal** is an organic sedimentary rock and is formed due to the accumulation and preservation of plant materials in a swamp environment, deltaic regions, coastal plains, etc.
- Coal is a combustible rock and an important fossil fuel but its reserves have depleted in the recent times due to its constant demand.
- Coal is widely used and the most important use is for the generation of electricity.
- India ranks third in the world in the production of coal.
- Raniganj in West Bengal is the oldest coalfield in India while Jharia in Jharkhand is the largest coalfield in India.
- In India, coal belongs to two geological ages- Gondwana Coalfields and Tertiary Coalfields.

- Gondwana coalfields mainly of bituminous type, makes upto 98% of the total reserves in India and is extensively available unlike Anthracite coal.
- **The main advantages of Coal are :**
  - (i) It is a source of direct heat and energy for domestic purposes.
  - (ii) It is one of the cheapest forms of energy making.
  - (iii) It provides numerous raw materials to chemical industries like benzole, ammonia, coal tar, coal gas, etc.
  - (iv) Coal is also a source of many by-products like coke, tar, ammonium sulphate, phenol, naphthalene, benzene, etc.
- **The main disadvantages of Coal are :**
  - (i) Coal releases carbon dioxide which affects the environment leading to Greenhouse gas emissions and global warming effect.
  - (ii) The coal reserves in India are scattered in small quantities.
  - (iii) The transportation and production of coal is significantly high.
  - (iv) Coal reserves are limited in India.
- **Uses of Coal :**
  - (i) It is used primarily as an energy source either for heat or electricity.
  - (ii) It is used to run railway locomotives, machines, dynamos and ship engines.
  - (iii) It is used to produce electricity. Out of the various uses of coal, thermal power generation is the most important.
  - (iv) Coal is essentially a requirement for the iron and steel industries.
  - (v) It is also used for building materials like burning of bricks, potteries, in iron and brass foundries, etc.
- On the basis of the amount of carbon content, coal may be classified into four varieties or types- Anthracite, Bituminous, Lignite and Peat.
- **Anthracite Coal :**
  - (i) It is a hard and compressed variety of coal with highest carbon content of 90%.
  - (ii) It is associated with strongly deformed sedimentary rocks which were subjected to higher pressure and temperature.
  - (iii) It ignites with difficulty but burns for a long time with a smokeless flame.
  - (iv) It is lustrous, shiny and jet black in colour.
  - (v) It has a heating value and leaves behind little ash after burning.
  - (vi) It has high caloric value and is good for domestic use since it is smokeless.
  - (vii) Anthracite coal is found only in Jammu and Kashmir.
- **Bituminous Coal :**
  - (i) It is a black, hard, brittle and compact coal with 50% to 80% of carbon content in it.
  - (ii) Due to high carbon content its calorific value is very high and it has low moisture content.
  - (iii) It is used as steam coal, household coal, coking coal, gas coal, etc.
  - (iv) Steam coal is the best bituminous coal since it contains 80% carbon in it.
  - (v) Bituminous coal is black and lustrous and is a household coal as it is widely used for domestic purposes.
  - (vi) It is relatively a soft coal and contains tar like substance called bitumen.
  - (vii) The highest grade bituminous coal is the coking coal and is an important ingredient in iron and steel smelting in blast furnaces.
  - (viii) Bituminous coal is found in Odisha, Jharkhand, Chhattisgarh, West Bengal and Madhya Pradesh.
- **Lignite Coal :**
  - (i) Lignite is also referred to as brown coal.
  - (ii) It is a soft brown combustible sedimentary rock.
  - (iii) It is a low grade coal due to its relative low heat content.
  - (iv) It has a carbon content of only 40%.
  - (v) It has high moisture content and is less combustible.
  - (vi) It is found in Tamil Nadu, Rajasthan, Kerala, West Bengal and Puducherry.
- **Peat Coal :**
  - (i) Peat is an accumulation of partially decayed vegetative or organic matter which has undergone varying degree of decomposition and carbonisation.
  - (ii) It contains high moisture and small percentage of volatile matter.
  - (iii) It has less carbon content and is of inferior grade.
  - (iv) The formation of Peat is the first step in the geological formation of other fossil fuels.
  - (v) It is found in the regions of Nilgiri Mountain, in the Kashmir Valley and in the swampy areas of coastal plains.

**➤ Petroleum :**

- (i) Petroleum is derived from the Greek words 'Petra' meaning rock and 'oleum' which means oil.
- (ii) It is a naturally occurring liquid found beneath the Earth's surface.
- (iii) It is a combination or mixture of hydrocarbons of organic compounds.
- (iv) Petroleum is a fossil fuel which is formed when huge quantities of dead organisms are buried beneath the sedimentary rock like shale, limestone, sandstone.
- (v) It is called Liquid Gold because not a single drop of crude petroleum goes waste or remains unused.
- (vi) Petroleum includes all liquid, gaseous and solid hydrocarbons.
- (vii) It is crude oil as a liquid, petroleum gas is called the natural gas and the solid forms of petroleum are called tar, bitumen, asphalt, etc.
- (viii) Some of the products of petroleum are petrol, diesel, lubricants, paraffin wax, slack wax, tar, kerosene, Liquefied Petroleum Gas (LPG), etc.
- (ix) By-products of petroleum are- Fertilizer, petroleum jelly, insecticide, soap, linoleum, perfume, etc.

**➤ Advantages of Petroleum :**

- (i) Petroleum has high density as it can generate 10,000 kcal of energy from 1 kg of burnt oil.
- (ii) Extraction of oil is easy and inexpensive due to new technologies used.
- (iii) Petroleum in the liquid form can be transported to long distances through pipes or vehicles.
- (iv) It has been the primary energy resource of all power plants and has broad areas for applications and thus has high demands for energy.
- (v) It is widely used as fuel for transportation on land, on sea and in the air.
- (vi) Petroleum is used for power generation.
- (vii) Its fuel derivatives include ethane, diesel, gasoline, kerosene and LPG.
- (viii) Petrochemicals are chemical products that are derived from petroleum after refining.
- (ix) Some examples of petrochemical products are- fertilizers, gasoline, synthetic rubber, synthetic fibre, explosives, dyes, crayons, paraffin wax, pesticides, perfume, paints, varnishes, phenol, PVC, lubricating oil, printing ink, film photography, carbon black, polystyrene, safety glass, herbicides, detergents, cosmetics, etc.

**➤ Disadvantages of Petroleum :**

- (i) Petroleum is an expensive product and is in high demand due to its limited supply.
- (ii) It is a natural fossil fuel and non-renewable.
- (iii) It is non-environment friendly as its burning and extracting generates Greenhouse Gasses that lead to pollution and Global Warming.
- (iv) It is highly inflammable and can cause fire.
- (v) It is harmful to the marine animals as during the extraction and transportation of oil if the oil spills in water, the marine animals die.

**➤ Oil Refineries :**

- (i) Oil refineries are industrial units where crude oil is refined and processed to produce useful products like gasoline, petroleum naphtha, LPG and diesel oil, asphalt base, etc.
- (ii) There are 21 oil refineries in India- 17 in the Public Sector and 2 in the Private Sector and 2 in the Joint Sector.
- (iii) In India, the maximum oil production is from the Assam- Arakan belt, the Gujarat-Cambay belt and the Mumbai High offshore zone.
- (iv) The main oil deposits in India, in accordance to their importance are :
  1. Mumbai High
  2. Oilfields of Eastern Region
  3. Oilfields of Western Region
- (v) Mumbai High produces superior quality of crude oil as compared to Middle East countries.
- (vi) The oil in Mumbai High is drilled with the drillship Sagar Samrat which has a maximum drill depth of 20,000 feet.
- (vii) Oil refineries are located close to oil fields or near ports due to the following reasons-
  1. To minimise the cost of transport
  2. To avoid transportation of mineral oil to the interior places of the country as it is highly inflammable.
- (viii) Some of the oil refineries of India are- Mathura Refinery, Mumbai Refinery, Haldia Refinery, Barauni Refinery, Panipat Refinery, Digboi Refinery, Vishakhapatnam Refinery, Kochi Refineries, Jamnagar Refinery, etc.
- (ix) The oldest oilfield in India is Digboi oilfield situated in the Eastern Region of India. The other oilfields in this region are- Moran, Bappapung, Hausanpung and Hugirijang.

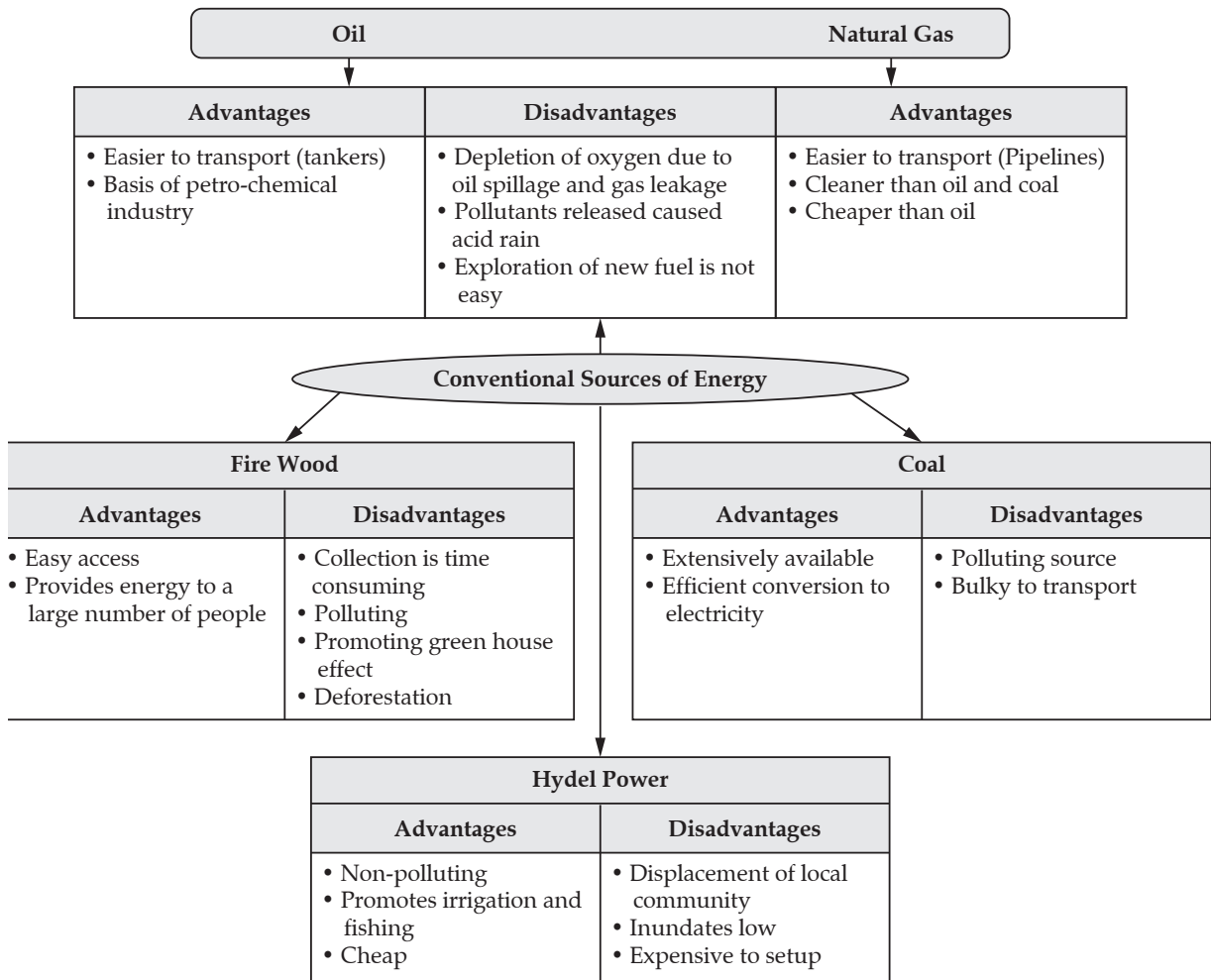
- (x) Cambay Basin in Gujarat is the main oilfield in the Western Region of India.
- (xi) The other important oilfields in Gujarat are Kalol, Koyali, Kosamba, Sanad, Kathana, Ankleshwar and Navgaon.
- **Natural Gas :**
  - (i) Natural Gas is a mixture of gases which are rich in hydrocarbons. These gases are- methane, nitrogen, carbon dioxide, etc. found in the atmosphere.
  - (ii) Natural Gas reserves are beneath the earth's surface near the crude oil deposits.
  - (iii) It is never used in its pure form. It is processed and then converted into cleaner fuel for consumption.
  - (iv) It is mainly used as a fuel for generating electricity and heat.
  - (v) Natural gas in compressed form is used as fuel for vehicles which is known as CNG (Compressed Natural Gas).
  - (vi) Liquefied Petroleum Gas (LPG) is the gas which is supplied to household for cooking purposes.
  - (vii) It is a by-product acquired after refining the crudeoil.
  - (viii) The main constituents of LPG are butane and propane and are flammable mixtures of hydrocarbon gases.
  - (ix) LPG is used as fuel for domestic purposes like for cooking and in vehicles.
  - (x) The gas cylinder contains ethyl mercaptan, which gives out the foul smell, is added to LPG on purpose so that if there is any leakage it can be easily detected.
  - (xi) LPG is also being replaced in some places with PNG (Piped Natural Gas) which is supplied through pipeline instead of storing in the cylinder.
  - (xii) Compressed Natural Gas (CNG) is a fuel which is used in place of petrol, diesel and LPG.
  - (xiii) In CNG, methane is stored at high pressure.
  - (xiv) 3/4th of natural gas in India comes from Mumbai High and the remaining from Assam, Rajasthan, Tamil Nadu and Tripura.
- **Advantages of Natural Gas :**
  - (i) Natural Gas is considered to be environment friendly as it emits less carbon, i.e. about 60%-90% less smog producing pollutants.
  - (ii) It can be stored safely and can be transported efficiently through pipelines, cylinders, etc a **valuable or useful chemical substance that is formed naturally** in the ground.
  - (iii) It is reliable and is conveniently used for cooking and for running many appliances.
  - (iv) It is cheaper and cleaner than petrol or diesel.
  - (v) Natural Gas is colourless, odourless and lighter than air.
  - (vi) Hydrogen and ammonia is produced from Natural Gas which is used for fertilizers, paints and plastics.
  - (vii) It has abundance supply and has a good reserve for centuries to come.
- **Disadvantages of Natural Gas :**
  - (i) Though found in plenty yet it is non-renewable due to its increasing demand.
  - (ii) Possibility of leakage of gas is of high risk since it is colourless, odourless and tasteless.
  - (iii) It is highly volatile and need to be handled carefully while transporting.
  - (iv) The infrastructure for production and distribution is quite expensive which includes plumbing systems and specialized tanks.
  - (v) In order to use it as fuel all constituents other than methane have to be extracted and this processing result in various by-products: hydrocarbons, sulfur, water vapour, carbon dioxide and helium and nitrogen.
  - (vi) The mileage of natural gas used as fuels in cars is lower than petrol/diesel.

## Know the terms

- **Conventional sources of energy :** These are those sources of energy which are non-renewable.
- **Coal-** It is an organic sedimentary rock and is formed due to the accumulation and preservation of plant materials in a swamp environment, deltaic regions, coastal plains, etc.
- **Bituminous Coal :** It is a soft coal containing a tar like substance called bitumen.
- **Volatile Matter :** In coal, it is those substances, other than moisture, that are given off as gas and vapour during combustion.
- **Petroleum :** It is derived from the Greek words 'Petra' meaning rock and 'oleum' which means oil.
- **Hydrocarbons :** It is a compound of hydrogen and carbon such as any of those which are the chief components of petroleum and natural gas.
- **Greenhouse Gas :** A gas that contributes to the greenhouse effect by absorbing infrared radiation, e.g. Carbon dioxide and chlorofluorocarbons.
- **Global Warming :** It is the increase of earth's average surface temperature due to effect of greenhouse gases.
- **Natural Gas :** It is a mixture of gases which are rich in hydrocarbons, e.g. methane, nitrogen, carbon dioxide.



# Flowchart



## TOPIC-2 Hydel Power

### Quick Review

- Hydropower is the most widely used renewable sources of energy to generate electricity.
- Hydroelectricity is produced from the energy that is released in the fast flowing water or when water falls from a height with a great force.
- Energy can be produced from tides by creating a reservoir or basin behind a barrage and then passing tidal water through turbines in the barrage to generate electricity.
- It is one of the best, cleanest and cheapest sources of energy.
- It plays an important role in reducing Greenhouse Gas emissions.
- There is very less possibility of causing pollution.
- Most of the hydroelectric power plants have a dam and a reservoir and its power generation depends on the head of water and the volume of water flowing towards the water turbine.
- **Advantages of Hydel Power**
  - (i) There is less pollution due to absence of burning fuel.
  - (ii) It is one of the best, cleanest and cheapest sources of energy.

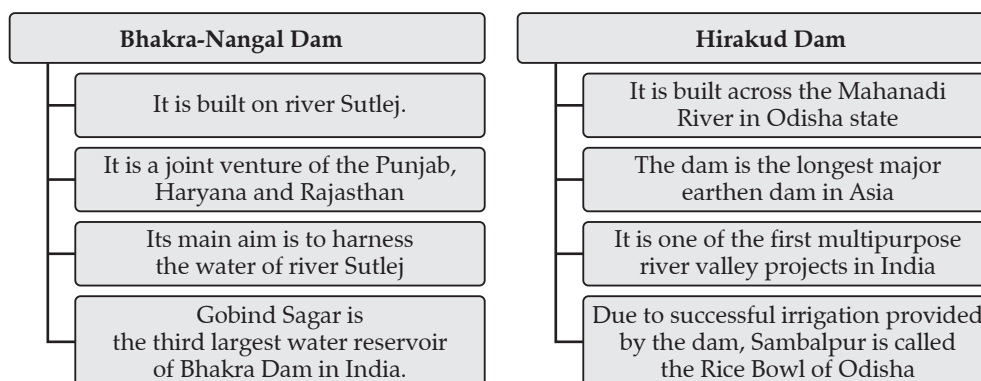
- (iii) Less maintenance costs.
- (iv) It plays a big role in reducing Greenhouse Gas emissions.
- (v) It is reliable, renewable and sustainable.
- (vi) The reservoirs and dams built to produce hydroelectricity helps in saving and restoring water.
- **Disadvantages of Hydel Power**
  - (i) It is expensive due to its high investment costs to build dams.
  - (ii) Construction of dams can cause water access problems as it can change the water-table level.
  - (iii) The building of large dams can cause serious geological damage like it can cause earthquakes.
  - (iv) Displacement of people living in the villages and towns in the regions to be flooded loses their farms and business and is physically and psychologically disturbed.
- **Bhakra Nangal Dam**
  - (i) It is the largest and most significant multipurpose project built in India on river Sutlej.
  - (ii) It is a joint venture of the Punjab, Haryana and Rajasthan.
  - (iii) Its main aim is to harness the water of river Sutlej for the benefit of the states mentioned.
  - (iv) **The Bhakra Nangal project comprises of :**
    1. Two dams at Bhakra and Nangal
    2. Nangal Hydel Channel
    3. Power Houses
    4. Bhakra Canal System
    5. Electric Transmission lines
  - (v) **The Bhakra Dam :**
    1. It is one of the highest dams in the world.
    2. Gobind Sagar is the name of the reservoir of Bhakra Dam.
    3. It is the third largest water reservoir in India.
  - (vi) **The Nangal Dam :**
    1. It has been constructed on river Sutlej about 13 kms downstream of the Bhakra Dam.
    2. It is an auxiliary dam which serves as a balancing reservoir.
    3. It is one of the longest cemented canals of the world.
    4. Its main function is to turn the turbines of power houses located below the Nangal Dam.
  - (vii) **The Power House :**
    1. It has been built to generate hydroelectricity from the water of river Sutlej.
    2. There are four power houses at Ganguwal, Kotla, Right Bank power house and Left Bank power house.
    3. All these power houses have an installed capacity of 1204 MW.
  - (viii) **Bhakra Canal System :**
    1. The main Bhakra Canal is 174 km long.
    2. It provides irrigation to 27.41 lakh hectares in the states of Haryana, Punjab and Rajasthan.
- **Hirakud Dam :**
  - (i) Hirakud Dam is built across the Mahanadi River in Odisha state.
  - (ii) It is one of the first multipurpose river valley projects in India.
  - (iii) The dam was completed in 1953 but was formally inaugurated in 1957.
  - (iv) The dam is the longest major earthen dam in Asia.
  - (v) This project also provides irrigation for kharif and rabi crop in the districts of Sambalpur, Bargarh, Bolangir and Subarnapur.
  - (vi) Due to successful irrigation provided by the dam, Sambalpur is called the Rice Bowl of Odisha.
  - (vi) The dam can generate up to 307.5 MW of electrical power through its two power plants at Burla and Chiplima.
  - (vii) **The objectives of this dam are-**
    1. It helps to control floods in the Mahanadi delta.
    2. It irrigates 75,000 square kilometers of land.
    3. It generates electricity through many hydroelectric plants.
- **The main objective of these multi-purpose projects are :**
  - (i) Provision of irrigation especially to areas of less rainfall areas.
  - (ii) Generation of hydroelectricity to enhance industrial development besides other basic facilities.
  - (iii) To control flooding in the Sutlej and Beas rivers.

- (iv) To develop river navigation to reduce pressure on the railways.
- (v) To provide pisciculture or fish culture.
- (vi) Soil Conservation through afforestation and increase the productivity of timber.
- (vii) Control of diseases by preventing water logging.
- (viii) To develop recreation centres and health resorts.

## Know the terms

- **Hydropower** : It is a power derived from the energy of falling water or fast running water.
- **Hydroelectric Power Plant** : It is a hydropower system that uses a dam to store river water in a reservoir. Water released from the reservoir flows through a turbine, spinning it, which in turn activates a generator to produce electricity.
- **Multipurpose Project** : It is a large scale hydro project designed to serve many purposes like irrigation, flood control, pisciculture, etc.
- **Auxiliary Dam** : It is constructed to confine the reservoir created by a primary dam either to permit a higher water elevation and storage or to limit the extent of a reservoir for increased efficiency.
- **Pisciculture** : It is the controlled breeding and rearing of fish.
- **Afforestation** : The planting of new saplings in an area where there was no trees before.

## Flowchart



### TOPIC-3

## Non-Conventional Sources of Energy

## Quick Review

- Non-conventional sources of energy are that energy which is generated by solar energy, wind, tides, geothermal heat, nuclear energy, biomass including farm and animal waste and human excreta.
- They are renewable and inexhaustible and do not cause any environmental pollution.
- It is inexpensive and easy to maintain.
- The non- conventional sources of energy are gaining importance because of the increasing demand for energy and the fast depleting conventional sources like coal, petroleum, natural gas, etc.
- **Solar Energy** is the primary source of energy which is inexhaustible.
- To harness solar energy in India many techniques have been developed-
  - (i) **Solar Cells or Photovoltaic Cells** :
    1. Solar energy can be converted into electrical energy by using solar cells or photovoltaic cells.
    2. The solar cell is a device that converts light energy into electrical energy.
    3. These cells are made using a silicon wafer.
    4. The light shining on the solar cell produces both a current and a voltage to generate electric power.
    5. Solar cells are regarded as one of the key technologies towards a sustainable energy supply.
    6. Solar cells are used in calculators, wrist watches, traffic signals street lighting, water pumps, etc.

**(ii) Solar Cooker :**

1. Solar cooking is done by the use of sun's UV rays.
2. The UV rays enter the solar and convert into infrared light rays.
3. The food in the solar cooker is not cooked by the sun's heat. It is the sun's rays that are converted to heat energy that cook the food.
4. The heat energy is retained by the utensil and the food with a lid.
5. A new design of solar cooker has been invented which uses a spherical reflector instead of a plane mirror as the reflector has more heating effect and efficiency.

**(iii) Solar Water Heater :**

1. Solar energy is best used for the heating of water.
2. A sun facing collector heats a working fluid that passes into a storage system for later use.
3. The plate is a simple glass-topped insulated box with a flat solar absorber made of sheet metal, attached to copper heat exchanger pipes.

**➤ Advantages of Solar Energy :**

- (i) It is a renewable and an inexhaustible source of energy.
- (ii) It is environment friendly.
- (iii) It can be used for varied purposes like electricity, heating, drying, etc.
- (iv) After the initial cost of installation its maintenance and repairing is less and inexpensive.
- (v) Solar energy save fossil fuels like coal and petroleum to generate electricity and also helps in reducing electricity bills.
- (vi) A solar energy system can be installed anywhere and solar panels can be easily placed in houses.

**➤ Wind Energy** or wind power is the process by which the wind is used to generate electricity.

- Through the windmills wind energy is produced.
- The wind turns the blades of the windmill, which spins the shaft and the turbine moves; turbines are connected to a generator and produces electricity.
- A wind farm is a group of wind turbines or windmills in the same location used for the production of electricity.
- The windmills are installed in open areas, in coastal regions or in hilly areas.
- There are both onshore and offshore wind farms.
- Onshore wind farm is an inexpensive source of electric power while offshore wind farms are steadier and stronger but its construction and maintenance costs are higher.
- They generate a large amount of electricity.
- The largest wind farm network in India is located from Nagarcoil to Madurai in Tamil Nadu.
- Muppandal wind farm, situated in the Kanyakumari district of Tamil Nadu, is the second largest onshore wind farm in the world.

**➤ Advantages of Wind Energy :**

- (i) Wind energy is plentiful and is renewable.
- (ii) It is widely distributed.
- (iii) It is the cleanest of all and do not produce any greenhouse gas emissions during operation.
- (iv) It uses small areas of land and consumes no water.
- (v) It is an alternative to burning fossil fuels.
- (vi) The electricity produced by wind energy is used for domestic purposes and is economical.

**➤ Tidal Energy** is a form of hydropower that generates electricity through high tidal movements.**➤ Tidal energy** can be harnessed from the tides in two ways-

- (i) By using the change in height of the tides (potential energy).
- (ii) By using the flow of water (kinetic energy).

- In-Stream Device or Tidal Stream Generator, Tidal Barrage, Dynamic Tidal Power and Tidal Lagoon are the four main categories of tidal power technology.
- Tidal stream generator makes use of the kinetic energy of moving water to power turbines.
- Tidal barrages make use of the potential energy in the difference in height between high and low tides.
- Tidal barrages are the oldest methods of tidal power generation.
- A barrage is built across a bay or a river that is subject to tidal flow.
- During high tides, the sea water flows into the reservoir of the barrage and turns the turbine which in turn produces electricity by rotating the generators.

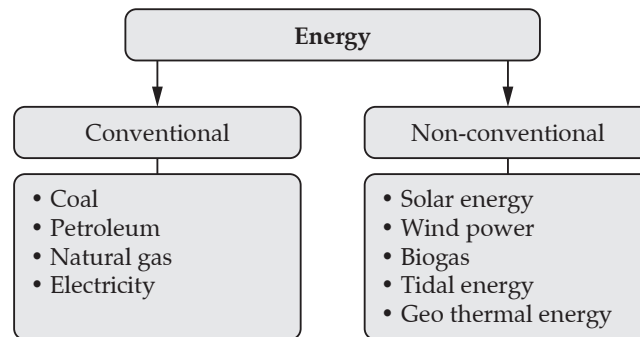
- When the tides are low, the sea water stored in the barrage reservoir flows out in the sea and the flow of water turns the turbines in its process.
- Dynamic tidal power is a promising technology and proposes to build very long dams from coasts straight out into the sea or ocean, without enclosing an area.
- Tidal lagoons are independent enclosing barrages built on high level tidal estuary land that trap the high water and release it to generate power.
- **Advantages of Tidal Energy :**
  - (i) Tidal energy is an inexhaustible source of energy.
  - (ii) It is non-polluting and does not lead to any carbon emissions like fossil fuels.
  - (iii) It is predictable since tides rise with great uniformity and energy can also be produced if the speed of water is slow.
  - (iv) Once a tidal energy power plant is installed, its maintenance costs are extremely low.
  - (v) The energy density of tidal energy is much higher than that of other forms of renewable energy like wind power.
- **Geothermal Energy :** Geothermal is derived from a Greek words 'Geo' which means earth and 'Thermos' meaning heat. It is the thermal energy generated and stored in the Earth.
- Due to very high temperature below the earth's crust, hot magmas from deep down below rises up and the temperature of water and rocks get increasingly hotter. This heated substance contains enormous energy and power and is tapped for creating geothermal energy.
- To obtain geothermal energy, a geothermal power plant has to be set up. A well has to be dug in a place where there is a good source of superheated fluid or magma.
- Pipes have to be fitted that would go down into the source and then the fluids would be forced upto the surface in order to produce the required steam. This steam would be used to rotate a turbine engine, thus generating electricity or geothermal power.
- **Advantages of Geothermal Energy :**
  - (i) Geothermal energy is considered to be sustainable and renewable source of energy.
  - (ii) It is inexpensive, reliable and easily accessible.
  - (iii) It is environment friendly and emits less Greenhouse gases.
  - (iv) Geothermal energy power plant requires low maintenance costs and the electricity bills are reduced.
- In India, Geothermal plants have the potential to harness about 12,000 MW.
- Geothermal Plants are located in Manikaran in Himachal Pradesh and Puga Valley in Ladakh.
- **Nuclear Power :** It is the energy that is created by nuclear reactions.
- Inside the nuclear reactor, energy is generated by means of a chain reaction involving uranium atoms.
- When the uranium atom is split into pieces, it releases heat and energy which is converted into electricity.
- **Advantages of Nuclear Power :**
  - (i) Since single uranium can generate a lot of energy when it split, so it is found in abundance.
  - (ii) It is clean and do not produce substantial Greenhouse Gases.
  - (iii) It is reliable unlike solar energy which is dependent on weather.
  - (iv) It is a viable alternative as fossil fuels are non-renewable.
  - (v) Though there is an initial cost factor during installation but once it starts functioning it provides a cheap source of energy.
  - (vi) The waste produced by nuclear power plants can be re-used and the waste can be turned to make useful materials like aircraft production.
- **Biogas :** It is a mixture of different gases like methane, carbon dioxide and hydrogen sulphide.
- It is produced by processing residual waste from livestock, food production and effluents from industrial and municipal wastes.
- Biogas is produced by the breakdown of organic matter in the absence of oxygen which is referred to as anaerobic digestion.
- A biogas plant can convert animal manure, vegetative matter, waste from agro industry and slaughter houses into combustible gas.
- The plants which use cattle dung are called Gobar Gas Plant.
- The biogas can be used for power generation, cooking, lighting, etc.
- **Advantages of Biogas :**
  - (i) Biogas is a cheap and clean source of energy.
  - (ii) It is non-polluting and reduces greenhouse gases.
  - (iii) It is renewable source of energy.

- (iv) There is no storage problem since there is direct supply of gas from the plant.
- (v) The sludge left behind is a good fertilizer for pastures and meadows and is better from an ecological point of view.
- (vi) Leads to employment generation in rural areas.
- (vii) It produces enriched organic manure which can supplement or even replace chemical fertilizers.

## Know the terms

- **Non-conventional sources of energy** : These are that energy which is generated by solar energy, wind, tides, geothermal heat, nuclear energy, biomass, etc.
- **Photovoltaic Cells** : It is a method for generating electric power by using solar cells to convert energy from the sun.
- **Wind Energy** : It is the process by which the wind is used to generate electricity.
- **Wind Farm** : It is a group of wind turbines or windmills in the same location used for the production of electricity.
- **Potential Energy** : It is an energy an object has because of its position relative to some other object.
- **Kinetic Energy** : It is an energy possessed by an object in motion.
- **Geothermal** : It is derived from a Greek word 'Geo' which means earth and 'Thermos' meaning heat.

## Flowchart



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## Chapter -9: Agriculture I and II



### TOPIC-1

## Indian Agriculture-Importance, Problems And Reforms

## Quick Review

- Agriculture is the most important occupation in India.
- The word **agriculture** is derived from two Latin words- 'ager' meaning land and 'culture' meaning cultivation.
- Agriculture means the cultivation of the soil in order to grow crops and rear livestock.
- Agriculture plays an important role in the Indian economy.
- Over 60% of India's land is arable and 70% of the rural families are engaged in this occupation for their livelihood.
- Agriculture contributes about 14% of total GDP and 12% share of the country's export.
- India has a vast expanse of agricultural land due to rich fertile soil and a good network of perennial rivers.
- In support, India has suitable climatic conditions, good amount of sunshine throughout the year, long growing seasons, etc.
- Agriculture is the single largest private sector occupation and provides employment to 58.4% of country's workforce.
- Agriculture is the backbone of Indian economy. It occupies a significant position in the overall economy of the country.

- **It plays an important role in the Indian economy due to the following reasons :**
  - (i) Agriculture is essential because it feeds millions of people and its ever increasing population.
  - (ii) It also helps in raising livestock with suitable environmental conditions and provides fodder to them.
  - (iii) Agriculture helps in creating job opportunities to millions of people.
  - (iv) It supports many important industries with the supply of raw materials like cotton and jute textile industries, sugar industries, vanaspati, food processing, etc.
  - (v) India's foreign trade and exports are deeply associated with agriculture. It accounts for about 14.7 % of the total export earnings.
  - (vi) Various small scale and cottage industries like handlooms, spinning oil milling, rice thrashing, etc. are dependent on agriculture for their raw material.
  - (vii) Agriculture also provides a good market for the farm inputs like implements, fertilizers, pesticides, machinery, etc.
- India is witnessing a slow agricultural growth despite its efforts to achieve high agricultural yield.
- It is due to unreliable rainfall, poor irrigation system, farmer's inaccessibility to the market, lack of proper market infrastructure, poor farming techniques, etc.
- Many factors attributes to its low development as compared to other developed countries. These factors are categorized into four groups:
  - (i) Environmental Factors
  - (ii) Economic Factors
  - (iii) Institutional Factors
  - (iv) Technological Factors.
- **Environmental Factors :**
  - (i) Erratic and unreliable rainfall.
  - (ii) Lack of adequate irrigation facilities and dependence on monsoon.
  - (iii) Soil degradation from erosion and salinization destroys productivity.
  - (iv) The repetition of growing same crops like rice and wheat lead to soil infertility.
  - (v) Inadequate use of manures and fertilizers, negligence of crop rotation, use of poor quality seeds, inadequate water supply, etc. leads to low productivity.
  - (vi) Use of simple and old agricultural tools, use of no or less machines for ploughing, sowing, irrigating, pruning, harvesting and threshing results in low yield.
  - (vii) In recent years, the net sown area has reduced due to the shifting of cultivating food crops to cultivation of fruits, vegetables, oil seeds, etc.
- **Institutional Factors :**
  - (i) The average size of land holdings is very small and is subject to fragmentation due to land ceiling acts and family disputes.
  - (ii) The land holdings are uneconomic due to their small size and as such the yields are low.
  - (iii) The small land holdings do not generate good income which results in selling of a small portion of land by the small farmers to repay their debt.
  - (iv) The land tenure system in India is a problem for the farmers which is making their life miserable.
  - (v) Though the tenancy problem has been solved to certain extent but the Indian farmers are suffering from insecurity of tenancy.
  - (vi) The absentee landowners make their land cultivated through tenants and sharecroppers which results in less production due to their little interest.
- **Economic Factors :**
  - (i) The Indian farmer's chiefly practice subsistence farming where large manual labour is employed to work on farms but grow only to suffice their family's needs and not much is left for sale in the market.
  - (ii) Farmers are using primitive methods and obtain poor yields as they lack in scientific and technological knowledge.
  - (iii) The location of the market is an important factor. Markets located at a far off distance costs high transportation.
  - (iv) Lack of transportation facilities.
  - (v) Availability of cheap and efficient labour for the cultivation of crops is important, e.g. intensive agriculture requires large supply of cheap labour.
  - (vi) Agriculture is becoming mechanised and requires huge capital investments to purchase machineries, fertilizers, pesticides and high yielding variety seeds. The Indian farmers are poor to buy all these materials.
  - (vii) Globalisation has posed a great threat to the Indian farmers. The international market is a big challenge to the farmers because new agricultural products are being imported easily to India.
  - (viii) The price of the farm products in the international market is declining while in India the price is increasing.
  - (ix) Reduction in import duties on agricultural products proved detrimental to Indian agriculture.

- **Technological Factors :**
  - (i) A majority of Indian farmers are still dependent on the primitive and poor techniques of producing crops.
  - (ii) They use inadequate and obsolete implements and fail to apply modern science and technology to agriculture in India due to their poverty.
- **Reforms :**
  - (i) Agriculture is the backbone of Indian economy. Due to too many factors agriculture in the past was declining and was a serious concern.
  - (ii) The Government of India took various measures to overcome the declining Gross Domestic Product (GDP).
  - (iii) It established the Indian Council of Agriculture Research (ICAR), agricultural universities, veterinary services, horticulture development, research and development in the field of meteorology and weather forecast and Kisan Call Centres.
  - (iv) The Green Revolution and the National Agricultural Policy (NAP) introduced by the Indian government is the turning point in the development of Indian agricultural sector.
- **The Green Revolution :**
  - (i) The Green Revolution is one of the major break-through in the agricultural sector in India.
  - (ii) It is considered as the greatest revolution that brought a transform from food scarcity to food self-sufficiency.
  - (iii) Green Revolution was a technology package comprising material components of improved high yielding varieties of two staple cereals, rice and wheat, irrigation, fertilizers and pesticides and associated management skills.
  - (iv) During 1960's, India adopted the New Agricultural Strategy. It was to replace the traditional agricultural practices by modern technological agricultural methods and practices.
  - (v) **The main elements of the New Agricultural Strategy are :**
    1. Use of large capital and technological inputs.
    2. Adoption of modern scientific methods of farming.
    3. Use of HYV (High Yielding Varieties) seeds.
    4. Extension of irrigation facilities, particularly ground water resources.
    5. Proper use of chemical fertilizers.
    6. Improvement in marketing and storage facilities.
    7. Use of insecticides and pesticides.
    8. Consolidation of landholdings.
    9. Supply of agricultural credit.
    10. Rural electrification.
  - (vi) The Green Revolution had a great impact on Indian agriculture. They are as follows :
    1. It enhanced agricultural production and transformed Indian agriculture from subsistence farming to commercial farming or market oriented farming.
    2. There was a spectacular increase in the production of wheat. Besides wheat, rice, sugarcane and oilseeds also showed significant changes in their productions.
    3. A remarkable improvement was also seen with an increase in yield per hectare.
    4. The strategy also benefitted the associated industries like transportation, marketing, food processing, etc. which have helped to generate additional job opportunities both in agricultural and non-agricultural sectors.
    5. It has paved its way to latest and modern technology to raise the productivity per unit of land.
    6. The revolution and the new strategy also made a significant change in cropping pattern.
    7. It improved the economy of the farmers and increased rural prosperity.
    8. The import of food grains has considerably declined.
    9. With the adoption of HYV seeds, chemical fertilizers, irrigational methods, the production has enhanced to a quiet high level.
- Besides the Green Revolution, many steps were taken to improve the agricultural production in India. They are-
  - (i) Passing of legislations to prevent sub-division and fragmentation of lands beyond a certain limit.
  - (ii) Introduction of various land reforms.
  - (iii) Rational utilization of country's water resources for optimum use of irrigation potential.
  - (iv) The Government declares prices for the protection of farmers, minimises fluctuations in commodity prices and monitors international prices.
  - (v) Setting up of Kisan Call Centres also known as Farm Tele-Advisors (FTAs).
  - (vi) The Government of India provides subsidy on fertilizers.



- (vii) In order to reduce the burden on chemical fertilizers and to increase the yield of organic food, the Government of India launched a National Project on Organic Farming.
- (viii) To avoid the excessive use of chemical fertilizers, soil testing laboratories have been set up to check the health and the fertility of soil.

➤ **National Agricultural Policy (NAP)**

The National Policy on Agriculture seeks to untap the growth potential of Indian agriculture, strengthen rural infrastructure, generate the growth of agro business, create employment in rural areas and face the challenges arising out of economic liberalisation and globalisation.

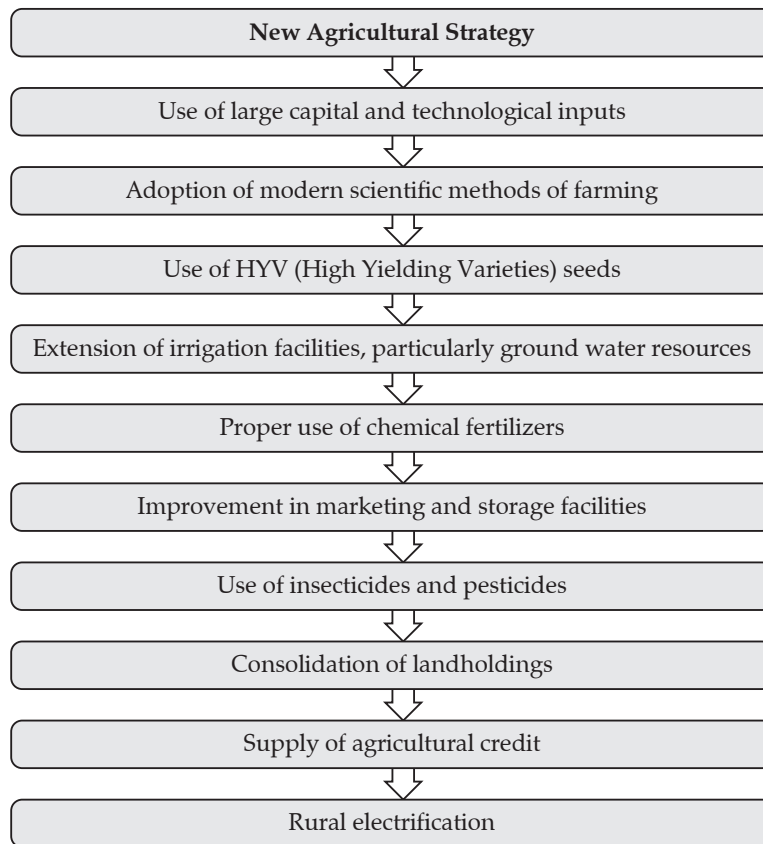
**The salient features of the National Agricultural Policy are-**

- (i) Over 4% annual growth rate aimed over next two decades.
- (ii) Greater private sector participation through contract farming.
- (iii) To minimise fluctuation of prices to protect the farmers from risks.
- (iv) National agricultural insurance scheme to be launched.
- (v) Remove restrictions on the movement of agricultural commodities throughout the country.
- (vi) Exemption from payment of capital gains tax on compulsory acquisition of agricultural land.
- (vii) Progressive institutionalisation of rural and farm credit.
- (viii) High priority to rural electrification.
- (ix) Plant varieties to be protected through legislations.
- (x) Monitoring of international prices.
- (xi) Adequate and timely supply of quality inputs to farmers.
- (xii) Setting up of agro-processing units and creation of off-farm employment in rural areas.
- (xiii) High priority to be given for the development of animal husbandry, poultry, dairy and aquaculture.

## Know the terms

- **GDP** : It is Gross Domestic Product which means the monetary value of all the finished goods and services produced within a country's borders in a specific time period.
- **Salinization** : It is the process by which water-soluble salts accumulate in the soil.
- **Crop Rotation** : It is the practice of growing different types of crops in succession on the same land to preserve the fertility of the soil.
- **Pruning** : The process of cutting off unwanted branches.
- **Land Ceiling** : It means fixing maximum size of land holding that an individual can own.
- **Absentee Landowners** : A person who rents or leases real estate for profit earning to another individual or group of individuals but does not reside within the property's premises.
- **Green Revolution** : It is considered as the greatest revolution that brought a transform from food scarcity to food self-sufficiency.
- **Kisan Call Centres** : It is a scheme of the Department of Agriculture launched across the country to deliver extension services to the farming community.
- **Organic Farming** : It is a farming method that involves growing and nurturing crops without the use of synthetic based fertilizers and pesticides.
- **Animal Husbandry** : It is the branch of agriculture concerned with animals that are raised for meat, fibre, milk, eggs or other products.

## Flowchart



## TOPIC-2

### Types of Farming in India

## Quick Review

- The farming system is based on the nature of land, climatic conditions, technological knowledge and irrigational facilities.
- In India different types of farming is practiced in different parts of the country.
- **The different types of farming practiced in India are-**
  - (i) Subsistence Farming
  - (ii) Shifting Agriculture
  - (iii) Plantation Farming
  - (iv) Commercial Farming
  - (v) Intensive Farming
  - (vi) Extensive Farming
  - (vii) Mixed Farming.
- **Subsistence Farming-**
  - (i) Subsistence farming is a self-sufficient farming in which the farmers grow enough food to feed himself and his family.
  - (ii) The farmers have small land and do not use fertilizers and thus the yield is low.
  - (iii) The output is mostly for local requirements with little or no surplus trade.
  - (iv) The land holdings are small and scattered.
  - (v) The farmer uses simple and primitive tools with traditional method of agriculture.

- (vi) Farming is very intensive and double or treble-cropping is practiced.
- (vii) A good amount of hand labour is required.
- (viii) This type of farming is highly dependent on monsoon since there is no irrigational facilities and also depends on the natural fertility of the soil.

➤ **Shifting Agriculture :**

- (i) Shifting agriculture is known as “slash and burn method”.
- (ii) It is a primitive method of farming in which a patch of forest is cleared by felling trees or by burning the trees.
- (iii) The patch of land is cultivated with primitive tools like sticks and hoes with no use of machines.
- (iv) The cultivation on this land is done for 2-3 years or until the soil fertility is lost.
- (v) Then the farmer shifts to another piece of land and again cultivates that piece of land.
- (vi) This type of agriculture is a great menace to environment.
- (vii) It encourages soil erosion and causes floods.
- (viii) The crops grown in this type of farming are- maize, millets, barley, buckwheat, root crops, rain fed rice and vegetables.
- (ix) The yield per hectare is quite low since no fertilizers are used.
- (x) It is called by different names in different regions in India. It is called Jhum in Assam, Poonam in Kerala, Koman or Bring in Odisha, Khil in the Himalayan region, Podu in Andhra Pradesh, Kuruwa in Jharkhand and Bewar, Masha, Penda and Hera in different parts of Madhya Pradesh.
- (xi) Shifting agriculture is discouraged by the government because frequent shifting from one land to another land has affected the ecology of the regions.

➤ **Plantation Farming :**

- (i) Plantation farming is an extensive system of agriculture in which single cash crop is cultivated on a large scale in an estate.
- (ii) Crops like tea, coffee, rubber, spices, etc. are grown under plantation farming mainly for profit.
- (iii) This type of farming is practiced in vast lands extending from a few hectares to thousands of hectares.
- (iv) Only one type of crop is cultivated like rubber, bananas, tea, coffee, cocoa, tobacco, etc.
- (v) Modern methods, techniques and machineries are used for growing crops.
- (vi) Huge capital is invested in buying machineries, fertilizers, pesticides and building factories for processing of crops.
- (vii) Due to the large size of the plantation, large numbers of labourers are required to tend to the crops and work in the nearby processing factories.
- (viii) The plantation crops earn a good amount of foreign exchange as they are exported in huge quantities.

➤ **Commercial Farming :**

- (i) Commercial farming is a farming where crops are grown and animals are reared for sale in the market for commercial purposes.
- (ii) The crops like tobacco, sugarcane, oilseeds, jute and cotton that are sold in the market are also called cash crops.
- (iii) It largely depends on machines, uses HYV seeds, chemical fertilizers, pesticides and insecticides to obtain higher yield.
- (iv) This type of farming is practiced in large farms spreading over hundreds of hectares of land.
- (v) The degree of commercialisation of agriculture varies in different parts of the country, e.g. rice is grown as a commercial crop in Punjab and Haryana but it is a subsistence crop in Odisha.
- (vi) Since most of the states have small landholdings as such commercial farming is not popular throughout the country.

➤ **Intensive Farming :**

- (i) Intensive farming is a system of farming that involves higher input of labour, increased use of fertilizers, pesticides, high quality seeds, etc.
- (ii) It is practised in the regions where the density of population is high.
- (iii) It requires good amount of irrigation as it is characterised by a high incidence of multiple cropping.
- (iv) This type of farming is also called labour intensive farming.
- (v) Rice and wheat are the main crops that are grown in intensive farming.

➤ **Extensive Farming :**

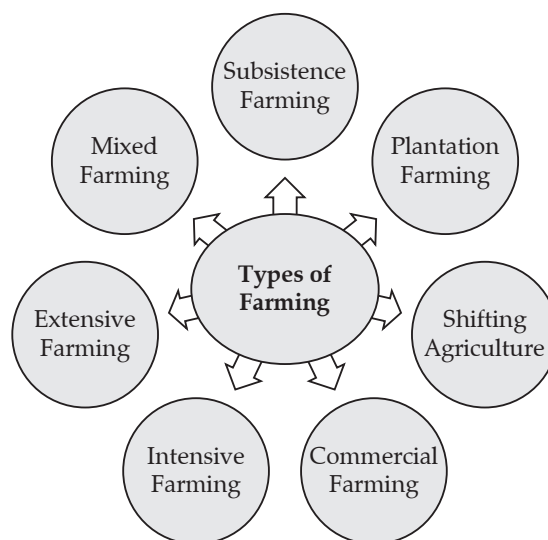
- (i) Extensive farming unlike intensive farming requires less labour to farm large areas of land.
- (ii) It uses machinery and scientific methods to produce large quantity of crops.
- (iii) Mechanisation is effectively used over large and flat areas.
- (iv) It is highly capital intensive.
- (v) Crop specialisation is one of the major characteristics of this type of farming.

- (vi) The main crops grown are rice, wheat, sugarcane, etc.
- (vii) One of the advantages of extensive farming is that local environment and soil are not damaged by overuse of chemicals.
- (viii) This type of farming is practised in the Terai region of Sub-Himalayas and in parts of North-Western India.
- **Mixed Farming :**
  - (i) Mixed farming is a type of farming in which a farmer conducts different agricultural practices on a single farm to increase income through different sources.
  - (ii) It is a combination of growing crops and rearing of cattle simultaneously.
  - (iii) In it along with farming other occupations carried out are- poultry farming, dairy farming, bee keeping, sericulture, piggery, goat and sheep rearing, agro forestry, etc.
  - (iv) The main benefit of this type of farming is that it ensures a steady income for the farmers because if any one business or farming fails, the other means can support.
  - (v) It maintains soil fertility, soil biodiversity, minimize soil erosion and help to conserve water.
  - (vi) Farmers can grow sorghum, pusa giant napier, berseem, etc. as fodder crops for their cattle along with food crops.

## Know the terms

- **Subsistence farming :** It is a self-sufficient farming in which the farmers grow enough food to feed themselves and their family.
- **Double Cropping :** To raise two consecutive crops on the same land within a single growing season.
- **Shifting Agriculture :** It is a primitive method of agriculture in which a patch of forest is cleared by felling trees or by fire.
- **Plantation farming :** It is an extensive system of agriculture in which single cash crop is cultivated on a large scale in an estate.
- **Commercial farming :** It is a farming where crops are grown and animals are reared for sale in the market for commercial purposes.
- **Intensive farming :** It is a system of farming that involves higher input of labour, increased use of fertilizers, pesticides, high quality seeds, etc.
- **Extensive Farming :** It is a farming that requires less labour to farm large areas of land and uses machinery and scientific methods to produce large quantity of crops.
- **Mixed Farming :** It is a combination of growing crops and rearing of cattle simultaneously.

## Flowchart





## TOPIC-3

# Agricultural Seasons and Food Crops

## Quick Review

- In India, different crops are grown in different seasons.
- There are two major agricultural seasons in India- Kharif Season and Rabi Season.
- In Kharif season, the crops are grown in the months of June and July and harvested in September and October.
- Rice, jowar, sugarcane, bajra, ragi, maize, cotton and jute are some of the important kharif crops.
- In Rabi season, the crops are sown in October and November and harvested in March and April.
- Crops like wheat, barley, rapeseed, linseed, gram, peas, mustard, potatoes, etc. are grown as Rabi crops.
- There are some crops which are grown throughout the year and are known as Zaid.
- Zaid and Kharif crops are sown in August and September and harvested in December and January, e.g. mustard oilseed.
- Zaid and Rabi crops are sown in February and March and harvested in April and May, e.g. jowar, maize, watermelons, cucumbers, etc.
- In India agriculture occupies 65% of the total cropped area.
- With the advent of Green Revolution technology, India focused on the goal of food grain self-sufficiency.
- The important crops grown in India are rice, wheat, pulses, millets, barley, jowar, gram, oats, maize, rye, etc. and fall in the category of food crops called Cereals.
- **Rice :**
  - (i) It is the most important staple food crop of India.
  - (ii) India is one of the world's largest producers of white and brown rice.
  - (iii) Rice is an indigenous crop and is grown in all parts of the country specially in the north eastern part of India and in the coastal part of southern India.
  - (iv) Rice is grown in the rain fed areas where the annual rainfall is heavy and is thus a Kharif crop.
  - (v) **The climatic conditions of rice are as follows :**
    1. **Temperature :** 18°C - 32°C
    2. **Rainfall :** 150 cm- 300cm
    3. **Soil :** Deep fertile clayey or loamy soils  
The soil should be able to retain standing water in the field.
- In India the rice crops are grouped into two categories :
  - (i) **The Upland Rice :** grown on mountainous regions, sown in March-April and harvested in September and October, crop is locally used and depends entirely on rainfall.
  - (ii) **The Lowland Rice :** grown in low lying areas, sown in June and harvested in October, requires plenty of water and is locally used and supplied to other regions too.
- **Methods of cultivation :** Rice is cultivated in two methods in India. They are : Dry Method and Puddled or Wet Method.
- Rice grown by dry methods are confined to rain fed areas and do not have any irrigation facilities.
- Wet method of cultivation is practiced in areas which have a good supply of water. The field is ploughed and filled with 3 to 5 cms of standing water.
- **The steps followed were :**
  - (i) Sowing
  - (ii) Transplanting
  - (iii) Harvesting
  - (iv) Processing
- In India rice is sown in the following ways- Broadcasting Method, Drilling Method, Dibbling Method, Transplanting Method and Japanese Method.
  - (i) **Broadcasting Method :** After ploughing, the seeds are scattered all over the field before the onset of monsoon.
  - (ii) **Drilling Method :** In this method the seeds are sown in the furrows with the help of a drill made of bamboo.
  - (iii) **Dibbling Method :** It refers to sowing of seeds at regular intervals in the furrows.

- (iv) **Transplanting Method** : Seedlings are first grown in nurseries and after 4 to 5 weeks when the saplings attain a height of 25 to 30 cm they are transplanted to prepared rice fields. It is a popular method because it gives a higher yield.

**Advantages of Transplanting Method :**

- (1) It enables to select only healthy seedlings for the plants.
  - (2) Less wastage of seeds.
  - (3) It minimizes weed pressure by resowing.
  - (4) It gives higher yield.
- (v) **Japanese Method** : It was introduced in 1953 and is the most popular method. In this method, High Yielding Variety (HYV) seeds called Japonica are used.

**Important features of Japanese method of rice cultivation :**

- (i) Use of High Yielding Variety (HYV) of seeds.
  - (ii) Saplings are sown in the nursery and raised in the nursery beds for 4-5 weeks.
  - (iii) Manure is extensively used to enhance the yield.
- **Processing of Rice**
- (i) **Harvesting** : A sickle is used to cut the stalk. It is labour intensive.
  - (ii) **Threshing** : It is done by beating the sheaves against the wooden bars for separating the grains from the stalks.
  - (iii) **Winnowing** : It is the process of removing the unwanted husk from the grains.
  - (iv) **Milling** : It is done to remove the yellowish husk from the grains. Traditionally it was done by hitting in a wooden mortar but now it is done by machines.
- The leading producers of rice in India are West Bengal, Punjab, Uttar Pradesh, Andhra Pradesh and Tamil Nadu.
- **Wheat-**
- (i) It is a staple food for the people of Northern and Northern-western parts of the country.
  - (ii) It grows best in cool, moist climate and ripens in a warm and dry climate.
  - (iii) It is mostly confined to the cool winter regions.
  - (iv) In south, the growing period is shorter than in the north.
  - (v) Wheat is a Rabi crop.
  - (vi) **The climatic conditions are :**
    1. Sown in October-November and harvested in January in south, by March-April in north
    2. **Temperature** : 10°C-15°C is suitable for sowing and 20°C-25°C during harvest.
    3. **Rainfall** : 50 cm to 100 cm.
    4. **Soil** : It grows best in well-drained loamy and clay loams.
- **Methods of Wheat cultivation :**
1. **Sowing :**
    - (i) The seeds can be sown by using drilling or the broadcasting method.
    - (ii) The seeds germinate in about three or four days.
    - (iii) The temperature should be low during the growing season.
  2. **Harvesting :**
    - (i) Wheat is harvested in April when the temperature is 27.5°C.
    - (ii) The crop is harvested by using a sickle.
    - (iii) States like Punjab, Haryana, Uttar Pradesh, Rajasthan and Bihar uses machines for harvesting.
    - (iv) Threshers are used to separate the grain from the husk.
- India has shown a tremendous increase in the production of wheat in comparison to other crops grown in the country.
- The leading producers of wheat in the country are Uttar Pradesh, Punjab, Haryana, Rajasthan and Madhya Pradesh.
- **Millets [Jowar, Bajra and Ragi] :**
- (i) Millets refers to inferior grains like jowar, bajra and ragi which serves as food grains for the poor sections of the society.
  - (ii) The straw of these grains are a valuable cattle fodder.
  - (iii) These crops can grow in infertile soil with harsh climatic conditions.
  - (iv) They grow for a short period of time i.e. for 3 to 4 months.

➤ **Jowar :**

- (i) It is both, a Kharif and a Rabi crop.
- (ii) It grows well in dry areas even without irrigation.
- (iii) Temperature- Between 27°C and 32°C
- (iv) Rainfall- under 45 cms. The crop can grow in arid and semi-arid areas.
- (v) Jowar can grow on different kinds of soil ranging from heavy and light alluvium to red, grey and yellow loams.
- (vi) It is widely grown in Maharashtra, Madhya Pradesh, Karnataka, Andhra Pradesh, Telangana, Tamil Nadu, Uttar Pradesh, Gujarat and Rajasthan.

➤ **Bajra :**

- (i) It is a rain fed kharif crop and is grown as a pure and mixed crop.
- (ii) It is grown along with cotton, jowar and ragi.
- (iii) It is sown in June-July and harvested in September- October.
- (iv) Temperature- 25°C and 30°C.
- (v) Rainfall- Less than 50 cm.
- (vi) Bajra is grown on red soil or sandy loams soil.
- (vii) It is grown mainly in Rajasthan, Maharashtra, Gujarat, Uttar Pradesh and Haryana.

➤ **Ragi or Buckwheat :**

- (i) It is grown in drier parts of South India almost throughout the year with the help of irrigation.
- (ii) Temperature- 20°C to 30°C.
- (iii) Rainfall- 50 cm to 100 cm.
- (iv) Ragi is sown between May and August and harvested between September and January.
- (v) It can grow in drier conditions and can withstand severe drought conditions.
- (vi) It is grown on red, light black and sandy loam soil in Karnataka and Tamil Nadu and on alluvial loam soil in Uttarakhand, Jharkhand and Gujarat.
- (vii) It gives higher yield than jowar and bajra and lower yield than wheat and rice.
- (viii) Karnataka is the leading producer of Ragi in India. The other producers are Tamil Nadu, Uttarakhand, Maharashtra and Andhra Pradesh.

➤ **Pulses :**

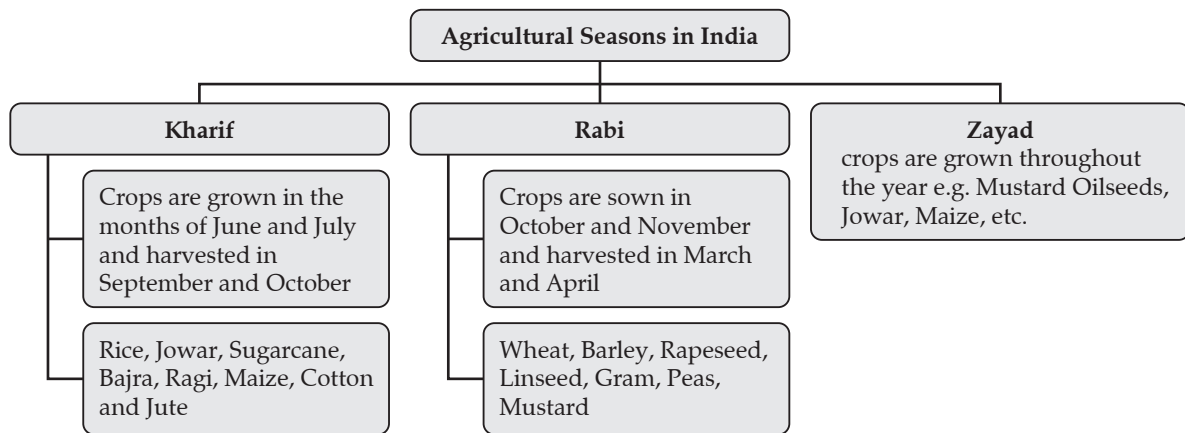
- (i) Pulses form an important part of the Indian diets because they are full of protein.
- (ii) Pulses are grown as rotation crops as they are leguminous crops that fix atmospheric nitrogen in the soil and increase the natural fertility of the soil.
- (iii) Pulses are good cattle fodder too.
- (iv) The two most important pulses are *gram* and *tur*. Other important pulses are *urad*, *moong*, *masur*, *kulthi*, *matar*, *khesari* and *moth*.
- (v) Temperature- 20°C to 25°C.
- (vi) Rainfall- 50 cm -75 cm.
- (vii) Pulses grow on dry light soil, light loams and alluvial soil, black and red soil too.
- (viii) *Gram* is raised as Rabi crop and is sown mixed with wheat.
- (ix) *Tur*, *urad* and *moong* are raised as Kharif crop in most part of India but *khesari* and *masur* are raised as Rabi crops in north India.
- (xi) India is the largest producer and consumer of pulses in the world.
- (xii) The important pulses producing states are Madhya Pradesh, Maharashtra, Uttar Pradesh, Rajasthan and Andhra Pradesh.

## Know the terms

- **Kharif Season :** This cropping season is from July to October during the south west monsoon. The main crops are millet and rice.
- **Rabi Season :** This cropping season is from October to March. The main crops are wheat and barley.
- **Zayad :** These crops grow on irrigated lands during summer season from April to June.
- **Cereals :** It denotes all kinds of grass-like plants which are starchy and edible seeds like, rice, wheat, barley, maize, oats, millets, etc.

- **The Upland Rice** : It is grown on mountainous regions, sown in March-April and harvested in September and October.
- **The Lowland Rice** : It is grown in low lying areas, sown in June and harvested in October, requires plenty of water and is locally used and supplied to other regions too.
- **Broadcasting Method** : After ploughing, the seeds are scattered all over the field before the onset of monsoon.
- **Drilling Method** : In this method the seeds are sown in the furrows with the help of a drill made of bamboo.
- **Dibbling Method** : It refers to sowing of seeds at regular intervals in the furrows.
- **Transplanting Method** : Seedlings are first grown in nurseries and after 4 to 5 weeks when the saplings attain a height of 25 to 30 cm they are transplanted to prepared rice fields.
- **Threshing** : It is done by beating the sheaves against the wooden bars for separating the grains from the stalks.
- **Winnowing** : It is the process of removing the unwanted husk from the grains.
- **Milling** : It is done to remove the yellowish husk from the grains. Traditionally it was done by hitting in a wooden mortar but now it is done by machines.

## Flowchart



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## Chapter -10: Agriculture III and IV [Cash Crops (1) and (2) ]



### TOPIC-1

### Cash Crops-Sugarcane and Oilseeds

## Quick Review

- Cash crops are those crops which are basically grown for sale and not for the use of the farmers and his family. E.g. Tea, Sugarcane, etc.
- The cash crops provide raw material to agro-based industries and support the farmers financially to improve their living conditions and their farming practices.
- The main cash crops are- Sugarcane, oilseeds, tea, coffee, cotton, jute, tobacco and rubber.
- **Sugarcane** :
  - (i) It belongs to grass family and grows to a height of more than 3.5 m.
  - (ii) The sugar in the sugarcane plant is stored in the stem.
  - (iii) Sugarcane is the main source of sugar, *gur* and *khandsari*.
  - (iv) The sugar cane yield per hectare is higher in south due to the tropical climate of Peninsular India and long crushing season of about 8 months.



**(v) Climatic conditions required for sugarcane are :**

1. Temperature- Grows best in areas with temperature between 20°C and 24°C.
2. Frosts are dangerous and injurious for sugarcane crop.
3. During ripening and harvesting period dry cool winter season is necessary.
4. It requires 100 cm-150 cm of rainfall throughout the year.
5. Areas of low rainfall need irrigation.
6. The crop grows well in well drained rich alluvial, heavy loam or lava soil.
7. It is also grown on black soil, reddish loam and laterite soil in the Peninsular region.
8. Sugarcane is soil-exhausting crop and thus needs fertilizers, manures and good irrigation facilities.

**(vi) Methods of Cultivation :**

1. Sowing- Sugarcane is a labour intensive crop.

Sugarcane is planted by the following methods :

**(a) Set Method :**

- (i) In this method new canes are planted by taking cuttings from old sugarcane plants.
- (ii) These cuttings are called Setts from which buds sprout to form new stalks after a few days.
- (iii) From these cuttings 4 to 5 stalks grow.
- (iv) A sugarcane plant takes 8 months to mature.

**(b) Ratooning Method :**

- (i) It is a method in which during harvesting of sugarcane plant, the roots and the lower parts of the plant are left uncut to give the ratoon or the subtle crop.
- (ii) The successive crops that grow from the left out subtle is called the Ratoon.
- (iii) Sugarcane keeps producing for two to three years and with each successive year the production is lesser than the previous year.

**(iv) Advantages of Ratooning :**

1. It saves labour as the crop need not be planted again.
2. This method is inexpensive as no preparation of the field is required .
3. The ratoon matures early.

**(v) Disadvantages of Ratooning :**

1. Ratoons produce low quality crop as with successive year the canes are thinner with low sucrose content.
2. There is high risk of pests and diseases.

**(c) By Seeds :**

- (i) Sugarcane was grown by sowing seeds but now this method is obsolete.
- (ii) It is planted in furrows and covered with soil.
- (iii) It is grown as a mixed crop in some states of India.

**2. Harvesting :**

- (i) Sugarcane is harvested when the crop matures in 10-12 months.
- (ii) It is done before the cane begins to flower.
- (iii) The sugarcane harvesting season begins in October-November and ends in April.
- (iv) Harvesting is done manually by hand knives, cutting blades or hand axes.
- (v) It requires skilled labourers as the stalks must be cut very close to the ground level because the maximum sucrose content is in the bottom of the stem.

**3. Processing :**

1. After harvesting the canes are taken to the sugar mills as soon as possible so that they can be processed within 48 hours of cutting to preserve the sucrose content.
2. In the mills the canes are crushed between the rollers to extract a large part of the juice.
3. To remove the soluble and insoluble impurities, the juice is boiled with lime.
4. The non-sugar impurities are removed by continuous filtration.
5. Then the juice is concentrated by removing the water through vacuum evaporation.
6. Crystallization takes place and forms raw brown sugar.
7. The by-products of sugarcane are Bagasse, Molasses and Press-mud.
8. In India, two thirds of the sugar produced is used by the *gur* and *khandsari* industries.

➤ **Problems of Sugarcane Cultivation :**

- (i) Sugarcane is a soil-exhausting crop and thus need good amount of fertilizers which increases the cost of production.
- (ii) In India the yield per hectare is extremely low as compared to other countries of the world.
- (iii) Sugarcane has a short crushing season normally from 4 to 7 months in a year which results in financial problems for the industry as the mills and the workers remain idle.
- (iv) The location of sugar mills are far from the fields, thus, a delay of more than 24 hours results in the reduction of sucrose content in the canes.
- (v) Sugarcane is an annual crop but the land available for sugarcane is less as compared to other crops, thus, the farmers are unable to cultivate any other crop.
- (vi) The production cost of sugarcane in India is the highest in the world due to uneconomic process of production, inefficient technology and heavy excise duty.
- (vii) Small and uneconomic size of mills.
- (viii) Old and obsolete machinery are used in most of the Indian sugar mills and needs rehabilitation.
- (ix) Sugar industry is facing competition with *gur* and *khandsari* since *Khandsari* industry is free from excise duty and can offer higher prices of cane to the cane growers.
- (x) Sugarcane cultivation needs good amount of water but lacks irrigation facilities.
- (xi) The government has fixed prices for the sugarcane farmers which is not profitable for them.

➤ **Role of Government in Solving Farmer's Problems :**

- (i) To set up a number of Cooperative Societies.
- (ii) To develop various means of irrigation to provide regular supply of water to the sugarcane fields.
- (iii) To provide adequate and timely loans to farmers on easy terms so that they can buy farm machinery and other agricultural items.
- (iv) To educate farmers with latest farming techniques and help farmers through specially developed programmes on radio and television.

➤ **Oilseeds :**

- (i) India produces a wide variety of oilseeds.
- (ii) India has the largest area and production of oilseeds in the world and are a great source of foreign exchange.
- (iii) The principal oilseeds are- groundnut, linseed, castor, sesamum, soyabean, cotton seeds, sunflower, rapeseed, mustard, etc.
- (iv) All these oilseeds are used for different purposes like they are used for cooking, as industrial raw materials in the manufacture of paints, varnishes, hydrogenated oil, soaps and lubricants.
- (v) Linseed oil and Castor oil are the two non-edible oilseeds.
- (vi) Groundnut is the leading oilseed followed by rapeseed and mustard.
- (vii) After the extraction of oil from the oilseeds the residue left is known as the Oilcake.
- (viii) Oilcake is used as animal fodder and is also used as good manure in the farms.
- (ix) India is one of the largest producers of groundnuts in the world.

➤ **Groundnut :**

- (i) Groundnut is a Kharif crop in most parts of India except Odisha and the Southern states where it is a Rabi crop.
- (ii) It is mainly used for the manufacture of hydrogenated oil and is used in making margarine, soap, medicines, cooking oil, etc.
- (iii) It is eaten raw, roasted and salted.
- (iv) Its oilcake is used as cattle fodder.
- (v) **There are two types of Groundnut Plants :**
  1. The Runner Type
  2. The Bunch Type
- (vi) **Climatic conditions-**
  1. Temperature- 20°C to 25°C
  2. Rainfall- Between 50 cm-100 cm
  3. Black soil, sandy loams and loamy soil are ideal for the crop.
  4. The crop is highly susceptible to frost.
- (vii) **Methods of Cultivation-**

**A. Sowing:**

1. After ploughing the seeds are sown by scattered or broadcasting or drilling method.
2. In most part of India the seeds are sown in the month of June or July but in South it is sown in the month of February and March.
3. The seeds are placed at 5-6 cm depth in the soil.
4. Adequate water in the top 60 cm of layer of soil is important for high yield and good quality of groundnut seeds.
5. Weeds cause damage to the crop so mechanically and chemically it is controlled.
6. The mature fruits have wrinkled shells with one to four seeds per pod.

**B. Harvesting:**

1. The crop should be harvested at the right time for obtaining higher yields of pods and oil.
  2. To facilitate easy harvesting, irrigation before harvesting is ideal which make the soil loose.
  3. The groundnut plant along with roots is uprooted from the soil by hand or by machine.
  4. After the peanuts dry sufficiently, they are threshed, removing the peanut pods from the rest of the bush.
  5. The groundnuts are then packed and sent for processing either to mills or to the market for trading.
- (viii) India is the second largest producer of groundnut in the world.
- (ix) It is widely grown in Peninsular India, Telangana and Tamil Nadu, being the largest producers in the country.
- (x) In India, Gujarat is the leading producer of groundnuts followed by Maharashtra, Karnataka, Andhra Pradesh, Rajasthan, Madhya Pradesh, Uttar Pradesh and Punjab.

**➤ Mustard :**

- (i) Mustard is edible oil and one of the most important oilseeds produced in India.
- (ii) Mustard grows well in temperate regions thus it is widely grown in Northern India in states like Uttar Pradesh, Punjab and Haryana.
- (iii) It is a Rabi crop and is also grown mixed with wheat, gram and barley.
- (iii) In North it is mainly used for cooking and the oilcake is used as animal fodder.
- (iv) The leaves of the mustard are eaten as vegetable in North and is also used as a manure.
- (v) Mustard grows well in cool climatic conditions and is widely grown along the Ganga-Sutlej plains.
- (vi) **Climatic conditions :**
  1. Temperature- 10°C to 20°C
  2. Rainfall- 25 cm to 40 cm.
  3. Soil- Alluvial loam is the best soil and even it grows in sandy to heavy clay soils.

**(vii) Methods of Cultivation :**

1. The crop is grown in the winter season.
  2. It is grown with wheat, gram and barley in rows.
  3. It is sown by broadcasting or drilling method.
  4. Harvesting is to be carried out as soon as the pods begins to turn yellow and the seed becomes hard.
  5. Sickle is used to cut the mustard plants.
  6. The plants are tied and kept for 5 to 6 days to dry.
  7. Threshing is carried out with a stick and Winnowing is done to separate the grain from the husk.
- (viii) It is extensively found in Uttar Pradesh, Punjab, Haryana, Rajasthan, West Bengal, Assam, Bihar, Odisha, Gujarat and Jammu and Kashmir.

**➤ Soyabean :**

- (i) Soyabean is grown as a Kharif crop in India.
- (ii) It is high in protein and is in great demand.
- (iii) It is considered to be a substitute for animal protein.
- (iv) It is consumed as soya milk or tofu (cheese).
- (v) **Climatic Conditions :**
  1. Temperature- 13°C to 24°C
  2. Rainfall- 40 cm to 60 cm
  3. Soil- Moist alluvial soil and friable loamy acidic soils but grows best on sandy loam having good organic matter.

**(vi) Methods of Cultivation :**

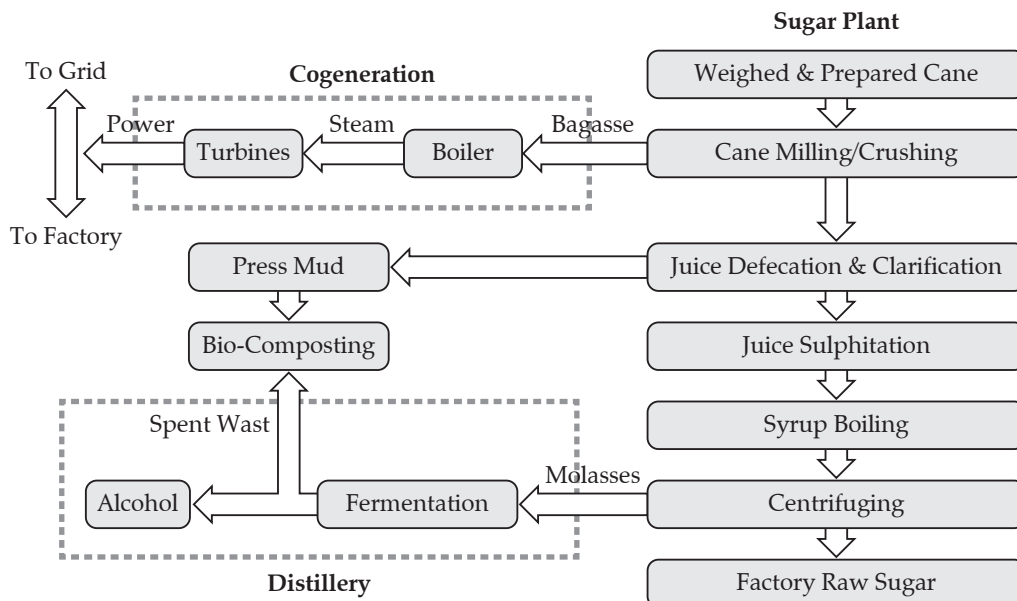
1. Soyabean is sown in 40 to 50 cm apart through drilling method.
2. Irrigation is not required and is grown rainfed.
3. At the time sowing one deep ploughing and two harrowings should be given to maintain optimum moisture.
4. Harvesting is carried out in mid- October as usual by threshing machine.

**(vii)** Soyabean is produced in Madhya Pradesh, Rajasthan and Maharashtra.

## Know the terms

- **Cash Crop s:** Cash crops are those crops which are basically grown for sale and not for the use of the farmers and his family. *e.g.*, Tea, Sugarcane, etc.
- **Soil-exhausting Crop :** Soil that loses the nutrients due to the farming of the same crop over and over again.
- **Setts :** When new canes are planted by taking cuttings from old sugarcane plants then these cuttings are called Setts from which buds sprout to form new stalks after a few days.
- **Ratoon :** A new shoot that grows from near the root or crown of crop plants after the old plant has been cut *e.g.* sugarcane.
- **Crystallization :** A process that separates a pure solid in the form of its crystals from a solution.
- **Bagasse :** The dry fibrous residue remaining after the extraction of juice from the crushed stalks of sugarcane. They are used in manufacturing pulp and as biofuel. It is a by-product of sugarcane.
- **Molasses :** It is a viscous by-product of refining sugarcane or sugar beets into sugar. It is used for making yeast, chemicals and pharmaceuticals.
- **Press-mud :** It is the organic solid waste and the sugar mill effluent- the liquid waste of sugar mill which is converted into nutrient rich and good quality organic manure. It is used as fertilizer.
- **Hydrogenated oil :** It is oil with trans-fatty acids that has been chemically changed from a room-temperature liquid state into a solid.
- **Oilcake :** The residue that is left after the extraction of oil from the oilseeds.
- **Weeds :** Wild or unwanted plants that grow around the main plant and absorbs the nutrients of the main plant.
- **Harrowing :** An agricultural implement with spikelike teeth or upright disks drawn chiefly over plowed land to level it, root up weeds, etc.

## Flowchart





## TOPIC-2

### Cash Crops- Cotton, Jute, Tea and Coffee

## Quick Review

### ➤ Cotton :

- (i) Cotton is one of the most important fiber and major cash crops grown in India.
- (ii) It plays an important role in the textile industry and agricultural economy of the country.
- (iii) It is a tropical crop and is raised as a Kharif crop.
- (iv) Cotton in India provides direct livelihood to 6 million farmers and about 40-50 million people are employed in cotton trade.
- (v) Cotton grown in Black soil is also called Regur soil, Black Cotton soil and Black clay soil.
- (vi) **Climatic Conditions :**
  1. Temperature- Between 21°C and 30°C.
  2. Rainfall- Moderate rainfall from 60 cm to 120 cm is ideal.
  3. A long growing period of atleast 200 frost free is necessary for the plant to mature.
  4. Cotton grows on a variety of soils ranging from well drained deep alluvial soils in the North to deep and medium black clay soils in the Deccan and Malwa Plateau and Gujarat.

### (vii) **Methods of Cultivation :**

#### A. **Sowing :**

1. The seeds are sown by the broadcasting or drilling methods.
2. The duration of crop season is 6 to 8 months.
3. The sowing is ideal before the onset of monsoon i.e. April-May till September-October.
4. Drip irrigation is the most effective way of watering in cotton farming.

#### B. **Harvesting :**

1. Cotton can either be picked by hand or by machines.
2. The cotton balls after ripening burst into white, fluffy and shiny balls of fibre.
3. In Punjab and Haryana cotton is harvested in December-January that is before the winter frost can damage the crop.
4. In the peninsular part of India, it is harvested between January and May because there is no danger of winter frost in these areas.

#### C. **Processing :**

The cotton crop after harvesting goes through the following process-

1. The freshly picked cotton is pressed into large modules.
2. The cotton gin mechanically separates the fibres from the seed and turns it into ginned cotton also called lint.
3. This process of separation of cotton fibre from the cotton seed is called Ginning.
4. The cotton lint or fibre is pressed into large bales and transported to the textile mills.
5. At the mill, the bales are cleaned by washing and then combed and made into an untwisted rope called a silver.
6. A spinning frame turns these silvers directly into cotton yarns.
7. Lastly, the yarn is dyed and looms are used to weave it into ready-to-use fabrics.

### ➤ **Varieties of Cotton :**

There are five varieties of cotton grown in India-

1. Superior Long Staple
2. Long Staple
3. Superior Medium Staple
4. Medium Staple
5. Short Staple

➤ Cotton is extensively produced in Gujarat, Maharashtra, Andhra Pradesh, Telangana and Punjab.

### ➤ **In India, the chief cotton growing areas are :**

- (i) North-Western Deccan Region
- (ii) Central and Southern Deccan of Karnataka
- (iii) The Upper Ganges Valley

➤ **Jute :**

- (i) Jute is obtained from the inner bark of two important species- White Jute and Tossa Jute.
- (ii) The White Jute is hardy, highly adaptable and grows well on both lowlands and uplands.
- (iii) The Tossa Jute is grown only on uplands.
- (iv) Jute is used for manufacturing a variety of products like rugs and clothes, gunny bags, hessian, ropes, carpets, strings, tarpaulins, upholstery, etc.
- (v) Jute is in great demand because it is cheap and the fibres are soft, strong, long, smooth, shiny and uniform.
- (vi) Jute is referred to as 'Golden Fibre' for its colour, silky shine and high cash value as it earns good revenue.
- (vii) It is also called the 'Brown Paper Bag'.
- (viii) Mesta is inferior substitute for jute, can withstand drought conditions and can be grown anywhere under wider climatic and soil conditions.
- (ix) Rough bags are made out of Mesta.
- (x) Jute is 100% biodegradable, recyclable and environmental friendly.
- (ix) **Climatic Conditions :**
  1. Temperature- Between 24°C and 35°C.
  2. Rainfall- About 150-200 cm is ideal.
  3. Warm and wet climate with relative humidity of 90% are favourable.
  4. Jute requires 2-3 inches of rainfall weekly during the sowing period.
  5. New alluvium fertile soil in the Ganga delta region is most suitable for jute cultivation.
- (x) **Methods of Cultivation :**
  - A. Sowing :**
    1. The land should be ploughed properly before sowing the jute seed.
    2. Since the jute seed is small, land should be prepared to fine tilth.
    3. Sowing of seeds is done by drilling or broadcasting methods.
    4. The seeds are sown in the month of February on lowlands and in March-June on uplands.
  - B. Harvesting :**
    1. The jute crop takes 8-10 months to mature.
    2. The harvesting period starts from July and continues till October.
    3. The harvesting is done by hand by pulling up the stem or cut to the ground and tied into bundles.
  - C. Processing :**
    1. After harvesting, the sheafs of jute bundles are immersed in flood water or stagnant water for about 2-3 weeks for retting.
    2. Retting is a microbiological process which loosens the outer bark and facilitates removal of the fibre from the stalk.
    3. After retting the bark is peeled from the plant and fiber is removed.
    4. Then the fibers are stripped, washed, rinsed and cleaned and dried in the sun and pressed into bales.
- (xi) West Bengal is the leading producer of jute in the country followed by Assam, Bihar, Odisha and Uttar Pradesh.

➤ **Tea :**

- (i) It is an important beverage for the people of India as it works as a stimulant.
- (ii) Tea gardens are set up in the hill slopes where shade trees are planted in advance.
- (iii) It grows well on hill slopes due to the favourable climatic conditions, high altitude and also because it prevents from water stagnation.
- (iv) Though tea requires heavy rainfall but water logging at the roots of the plant is injurious.
- (v) A good amount of iron, humus, nitrogenous fertilizers like ammonium and sulphate are ideal for tea growth which gives a higher yield.
- (vi) High humidity, heavy dew and morning fog are good for the growth of new leaves.
- (vii) **Climatic Conditions-**
  1. Temperature- 24°C to 30°C
  2. Rainfall- 150 cm- 500 cm
  3. Soil- Well drained, deep friable loamy soil
- (viii) **Methods of Cultivation-**
  1. **From Seeds-** High quality seeds are sown in nurseries and then transplanted in the tea gardens at the distance of one metre from all sides.
  2. **From Cuttings-**
    - (a) Tea plants are grown in nurseries from cuttings of high yielding variety of crops. This is known as clonal planting.
    - (b) When the tea saplings grow 20 cm of height, they are transplanted in the garden.

**(ix) Harvesting :****1. Plucking and Pruning of Tea Leaves :**

- (a) Plucking of leaves are done by women labourers.
- (b) Tea is picked every 10 days in the lower altitudes but in higher altitudes they are picked every 15 days.
- (c) Tea picking is carried out from early April to mid-November.
- (d) Two tender leaves and a bud or shoot are usually plucked from each stem and is considered to be fine plucking.
- (e) Pruning is an essential part of tea cultivation as it helps in maintaining the proper shape of tea bush to a height of about one metre.
- (f) The objective of pruning is to have new shoots bearing plenty of soft leaves and also to facilitate the plucking of leaves.

**2. Processing :Tea is classified into six types- Black Tea, Green Tea, Oolong Tea and Brick Tea.****(a) Black Tea :**

- i. **Withering :** The tea leaves are spread out on laths and left for 14-18 hours to dry. They are also dried in the sun and left for a day or two.
- ii. **Rolling :** Through CTC (Crushing, Tearing and Curling) method, the leaves are processed. The leaves are rolled mechanically for 30 minutes between steel rollers to break up the fibres. Then the leaves are dried again or baked lightly over charcoal fires until they become reddish brown in colour.
- iii. **Fermentation :** The tea leaves are spread out on large boards in 10-15 cm thick layers in a special room with a room temperature of 40 °C for 2-3 hours. The leaves turn copper red to brown colour and starts to unfold its unique aroma.
- iv. **Drying :** After fermentation, the leaves are transported through tiered dryers on metal conveyor belts and is dried for approximately 20 minutes which ultimately gives leaves its dark brown to black colour.
- v. **Blending :** The tea-tasters and expert blenders blends the various grades of tea.

**(b) Green Tea :** These are of good flavour and are stronger stimulants due to their higher tannin or tannic acid content.

- i. **Withering :** The good qualities of tea leaves are spread out on laths and are placed out in the sun to wither.
- ii. **Heating :** The tea leaves heated for 10 minutes with 280°C in cast-iron pans. Then the leaves are pressed against the hot surface.
- iii. **Rolling-** The tea leaves are rolled in a rolling machine for 10-15 minutes between two rotating metal plates.
- iv. **Drying-** The leaves are dried with a temperature of 60°C for 20-30 minutes.

**(c) Oolong Tea :** It is a kind of tea which is produced through a process including withering the plant under strong sun and oxidation before curling and twisting. Withering, rolling, shaping and firing are similar to black tea but baking or roasting is exclusive to oolong tea.**(d) Brick Tea :** This variety of tea is also called compresses tea. They are blocks of whole or finely ground black tea or green tea leaf dust that have been packed in molds and pressed into rectangular lock form.

- India is the world's second largest producer of tea in the world and the fourth largest exporter of tea in the world. Assam, West Bengal, Tamil Nadu, Kerala, Tripura, Arunachal Pradesh, Himachal Pradesh, Karnataka, Sikkim, Nagaland, Uttarakhand, Manipur, etc. are the states where tea is widely grown.

**➤ Coffee :**

- (i) It is the second most important beverage crop in India.
- (ii) The first seedlings of coffee were sown in the Bababudan Hills in Karnataka.
- (iii) Coffee cultivation requires plenty of cheap and skilled labour for various operations like sowing, transplanting, pruning, plucking, drying, grading and packing.
- (iv) The two main varieties of coffee grown in India are Arabica Coffee and Robusta Coffee.
- (v) The coffee plant cannot stand direct sunrays and is thus grown under shady trees such as silver oak, orange, banana, jackfruit, cardamom, pepper, etc.

**(vi) Climatic Conditions :****1. Temperature :**

- (a) Between 15°C and 28°C.
- (b) It can neither stand frost, snow nor high temperatures above 30°C and strong sunshine.

**2. Rainfall :** Between 150 cm and 200 cm of annual rainfall. Stagnant water is harmful and is thus grown on hill slopes at elevations from 600 to 1600 metres.

3. **Soil** : Well drained, rich friable loams containing a good deal of humus and minerals like iron and calcium are ideal for coffee cultivation.

4. **Methods of Coffee Cultivation** :

1. **Sowing** :

- (a) Coffee seeds are sown in December-January in the bed 1.5 -2.5 cm apart.
- (b) They are propagated from seeds or cuttings in a nursery and then transplanted in the large coffee fields.
- (c) Pruning is regularly done to ensure easy picking and heavy bearing of coffee berries.

2. **Harvesting-**

- (a) Arabica Coffee is harvested from November to January and for Robusta Coffee it is from December to April.
- (b) Coffee berries are picked by hand.
- (c) The two methods of coffee harvesting is- Selective harvesting and Strip harvesting.
- (d) Selective harvesting is the picking of only ripe coffee berries by hand and Strip harvesting is where coffee berries are stripped mechanically.

3. **Processing-**

- (a) There are two methods of coffee processing- Wet Parchment Method and the Dry Parchment Method.
- (b) In the Wet Parchment Method, the fruit covering of the beans is removed before they are dried and then pulping, fermenting, washing and drying takes place.
- (c) **The Dry Parchment Method has the following process-**
  - 1. The coffee berries are sorted, cleaned and the ripe, overripe and damaged cherries are separated.
  - 2. The dirt, soil, twigs and leaves are removed from the cherries.
  - 3. The coffee cherries are then dried in the sun and are further fermented by drying in the sun for a week.
  - 4. After drying, the machines peel off the two layers of inner husks.
  - 5. The coffee beans are then sorted according to their size and quality and then packed in sacks for use.
  - 6. The beans are roasted at temperatures of about 99°C and then ground into coffee powder. Roasting gives the brown colour, aroma and taste.

- The traditional coffee producers in India are Karnataka, Kerala and Tamil Nadu.
- The other states where coffee is grown is Andhra Pradesh, Odisha, Assam, Manipur, Nagaland, Mizoram, Meghalaya, Tripura and Arunachal Pradesh.

## Know the terms

- **Drip Irrigation** : It consists of perforated pipes that are placed between rows of crops or buried along their root lines and give water directly on to the crops.
- **Module** : Cotton is mechanically pressed into large rectangular sized blocks called modules.
- **Lint** : It is a short, fine fibre which separates from the surface of cloth or yarn during processing.
- **Ginning** : It is a process of separation of cotton fibre from the cotton seed.
- **Mesta** : It is an inferior substitute for jute, can withstand drought conditions and can be grown anywhere under wider climatic and soil conditions.
- **Retting** : It is a microbiological process which loosens the outer bark and facilitates removal of the fibre from the stalk.
- **Clonal Planting** : Tea plants that are grown in nurseries from cuttings of high yielding variety of crops are called Clonal Planting.
- **Pruning** : Trimming of shrubs to encourage growth and to remove superfluous or unwanted branches.
- **Withering** : It means to reduce the moisture content in the tea leaves, make the leaves soft and to allow the flavour compounds to develop.



## Flowchart

Cotton	Jute	Tea
A tropical crop raised as a Kharif crop	Jute is obtained from the inner bark of two important species- White Jute and Tossa Jute	Tea gardens are set up in the hill slopes where shade trees are planted in advance.
<b>Temperature-</b> 21°C and 30°C <b>Rainfall-</b> 60 cm to 120 cm <b>Soil-</b> Deep black clay soil and Alluvial soil	<b>Temperature-</b> 24°C and 35°C <b>Rainfall-</b> 150 cm to 200 cm <b>Soil-</b> New Alluvial fertile soil	<b>Temperature-</b> 24°C to 30°C <b>Rainfall-</b> 150 cm to 500 cm <b>Soil-</b> Well drained, deep friable loamy soil
Five varieties of Cotton grown in India:- Superior Long Staple Long Staple Superior Medium Staple Medium Staple Short Staple	The White Jute is hardy, highly adaptable and grows well on both lowlands and uplands. Tossa Jute is grown only on uplands	Four varieties of Tea grown in India:- Black Tea Green Tea Oolong Tea Brick Tea



## Chapter -11: Agro-Based Industry



### TOPIC-1

### Importance and Classification of Industries

## Quick Review

- India is one of the newly industrialized country and making a significant progress in the industrial development.
- Industrialisation can help the progress of agriculture, trade, transport and all other economic activities.
- Industrialisation is the key to economic development in India with its vast manpower and varied resources.
- It is the process of manufacturing consumer goods and capital goods and of building infrastructure.
- **Need for Rapid Industrialisation in India :**
  - (i) India is an agricultural country and through industrialisation the development of agriculture can be initiated.
  - (ii) Only agriculture cannot generate employment and thus establishment of industries can generate employment opportunities at a large scale.
  - (iii) The development of industries producing capital goods i.e. machines, equipment etc. enables a country to produce a variety of goods in large quantities and at low costs and make for technological progress.
  - (iv) Through industrialization infrastructures like railways, roadways, dams, etc. can be constructed which can enhance the future growth of Indian economy.
  - (v) Industrialisation is a necessity for country's security because only through industrial development self-reliance in defence can be achieved where she can produce her own defence materials.
  - (vi) Expansion of industries in the backward regions of India are needed to counter the regional imbalance.
  - (vii) India through industrialisation should free herself from the adverse effects of fluctuations in the prices globally and should adopt the policy to import less of primary products and export more manufactured goods.
- **Factors affecting the Location of Industries :**
  1. Geographical Factors
  2. Commercial Factors
  1. **Geographical Factors :**
    - (i) Raw Materials
    - (ii) Water Supply
    - (iii) Energy

(iv) Transport

(v) Labour

(vi) Market

(vii) Climate

2. **Commercial Factors :**

(i) Government's role

(ii) Financiers and Capitalists

(iii) Organisational or Management Skills

➤ **Classification of Industries :**

1. **On the Basis of Raw Material**, industries can be divided into-

(a) **Agro-Based Industries :** Industries that are depended on the raw materials produced by the agricultural sector e.g. cotton, jute, textile, sugar, tea, coffee, etc.

(b) **Mineral-Based Industries :** These industries are depended on minerals, both metallic and non-metallic as raw materials and are based on ferrous and non-ferrous metallurgical processes e.g. iron and steel, heavy engineering, cement, machine tool, basic and light chemicals, fertilizers, etc.

(c) **Forest-Based Industries :** These industries uses forest resources like wood, rubber, lac, resin, etc.

(d) **Animal-Based Industries :** The industries which utilizes the raw materials provided by animals like woollens, silk, dairy products, hides, skin and leather industry, poultry, etc.

2. **On the Basis of Nature of Products**, industries can be divided into :

(a) **Heavy Industries :** These industries produce capital goods and consumer durables which are heavy and bulky and thus called heavy industries, e.g. huge capital, large quantity of raw material, scientific knowledge, etc.

(b) **Light Industries :** These industries produce light weight goods like sewing machines, cycles, toys, electronic goods, etc. They require less capital and less number of workers.

3. **On the Basis of Size and Investment :**

(a) **Large Scale Industries :** These kinds of industries need huge capital, large number of workers-skilled and non-skilled and produce large goods and machineries for industries like iron and steel, ship building, automobile, etc.

(b) **Medium Scale Industries :** These industries are neither big nor small and includes industries like cycle manufacturing industry, paper mills, radio and television, etc.

(c) **Small Scale Industries :** These industries are mostly managed by private individuals on a small scale with less capital investment, less workers, etc. e.g. weaving industry, toy industry, food processing industry, etc.

4. **On the Basis of Ownership :**

(a) **Public Sector Industries :** These industries are owned and managed by Central Government or State Government which includes industries of public utility like post and telegraph, railways, oil refineries, heavy engineering industries, defence establishments, etc. e.g. Bharat Heavy Electricals Limited (BHEL), Steel Authority of India Limited (SAIL), Gas Authority of India Limited (GAIL), etc.

(b) **Private Sector Industries :** These industries are owned and managed privately by individuals or group of individuals. Industries like Reliance India Limited, Wipro, Infosys, TCS, etc.

(c) **Joint Sector Industries :** These industries are owned, managed and controlled jointly by private entrepreneur and the government e.g. Automobile Corporation of Goa Ltd. and Ipitata Sponge Iron Ltd. have been established with TISCO and TELCO of the Tata House as private promoters respectively.

(d) **Co-operative Sector Industries :** In these industries people with limited means and resources pool their physical and material resources e.g. Anand Cooperative Society, etc.

5. **On the Basis of Location and Market :**

(a) **The Village Industries :** The basic needs of the local market and its requirement like raw materials, labour, etc. are availed from the village itself e.g. pottery making, match box making, weaving, food processing, khadi, etc.

(b) **Cottage Industries-** These industries are organised by individuals with private resources and with the help of their family members and their skills e.g. weaving, handloom, carpet industry, etc.

6. **On the Basis of Finished Product :**

(a) **Basic Industries :** Industries which depend on other industries for their manufacturing are called Basic

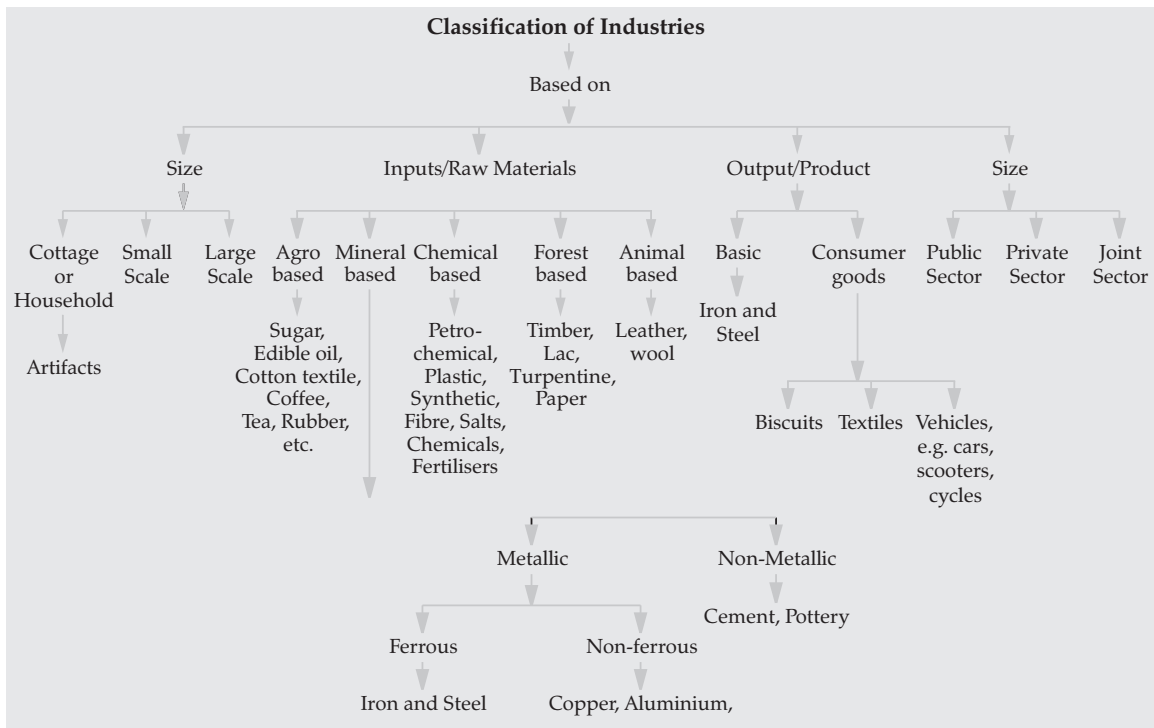
Industries e.g. iron and steel industry, petroleum industry, etc.

- (b) **Secondary or Consumer Industries** : These industries process the basic raw materials into primary goods for direct use by the consumers e.g. textiles, sugar, etc.
  - (c) **Tertiary Industries** : These industries provide public utility based services like railways, transport, post and telegraph, banking, etc.
  - (d) **Ancillary Industries** : These industries provide spare parts or components required by large industries like heavy electrical industry locomotives, aircraft industry, etc.
- The distribution of industries is highly uneven in India due to the non-accessibility of the raw materials and energy resources in different regions.
  - The main financial resources and other necessary enterprises are concentrated in big towns and cities.
  - There are a number of factors responsible for the uneven distribution of industries in India. They are-
    - (i) All the agro-based industries like cotton, jute and sugar are located in the areas where the raw materials are available.
    - (ii) The forest based industries like paper, resins, plywood, etc. is located in the forest areas.
    - (iii) The coastal regions have huge availability of copra, coir and fish canning and so the industries are also located there.
    - (iv) Most of the oil refineries are located near the major ports.
    - (v) The heavy metallurgical industries are concentrated in the regions of metallic reserves in Karnataka, Jharkhand, Odisha, Madhya Pradesh, Rajasthan and Tamil Nadu.
  - **On the basis of major industries, India can be divided into the following industrial regions-**
    - (a) The Hoogly Belt
    - (b) The Mumbai-Pune Belt
    - (c) The Ahmedabad-Vadodara Region
    - (d) The Chennai-Coimbatore-Bengaluru Region
    - (e) The Chotanagpur Plateau Region
    - (f) The Mathura-Delhi-Saharanpur-Ambala Region

## Know the terms

- **Industrialisation** : It is the period of social and economic change that transforms a human group from an agrarian society into an industrial one.
- **Consumer Durables** : Are a category of consumer products that do not have to be purchased frequently because they are made to last for an extended period of time e.g. washing machine, automobile, refrigerator, etc. They are also called durable goods.
- **Animal-Based Industries** : The industries which utilizes the raw materials provided by animals like woollens, silk, dairy products, hides, skin and leather industry, poultry, etc.
- **Entrepreneur** : A person who sets up his own business, taking on financial risks in the hope of profit.
- **Ancillary Industries** : These industries provide spare parts or components required by large industries like heavy electrical industry locomotives, aircraft industry, etc.
- **Enterprise** : An organisation, especially a business, or a complicated, difficult and important plan that will earn money.

## Flowchart



### TOPIC-2

## Agro-Based Industries (Sugar, Cotton and Silk)

### Quick Review

- Industries based on the raw materials of the agricultural produce are known as Agro-based industries.
- Sugar Industry is India's second largest organised industry and is the second largest producer of sugarcane in the world.
- Sugarcane is an important cash crop and is crushed in the sugar mills to obtain sugar, and to make *gur* and *khandsari*.
- Molasses, Bagasse and Pressmud are the by-products of sugar.
- Molasses are thick, dark brown juice obtained from raw sugar during the refining process.
- It is used, in the alcohol industry for the distillation of liquor, in the production of citric acid, chemicals, synthetic rubber and as fuel for mills.
- Bagasse is the dry pulpy residue left after the extraction of juice from sugarcane.
- It is used as a biofuel and in the manufacture of pulp and building materials and also used for the generation of steam and power required to operate the sugar factory.
- Press mud is a residue of the filtration of sugarcane juice.
- It is used for making wax, carbon paper and shoe polish.
- Maharashtra is the leading producer of sugar in India followed by Uttar Pradesh.
- Formerly, Uttar Pradesh was the leading producer of sugar but was relegated to second position due to old mills, management and labour problems and shorter crushing period.
- The other sugar producing states are Punjab, Haryana, Madhya Pradesh, Bihar and Gujarat.
- In Peninsular India, Tamil Nadu is the leading producer due to higher per hectare yield, higher sucrose content and long crushing season and is emerging as the leading producer in the country.
- Besides Tamil Nadu, Karnataka and Andhra Pradesh are also big producers of sugar.
- In recent decades, there has been a tendency of sugar industry's growth towards the south.

- There are a number of reasons about the tendency of sugar industry to migrate to South. They are–
  - (i) The maritime climate of South which is free from loo and frost.
  - (ii) The availability of black soil which is well drained and more fertile than alluvial soil.
  - (iii) The sugarcane of the South is of superior quality with higher yield as compared to north.
  - (iv) Excellent transport facilities in Maharashtra and Tamil Nadu which has given them an advantageous position in relation to export markets.
  - (v) The cooperative societies in South are managing the sugarcane farms which are large in size by providing better seeds, fertilizers, irrigation facility.
  - (vi) The sugar factories in South are located close to the sugarcane farms which prevents the loss of sucrose content due to minimum transportation time.
  - (vii) In South, the farmers have new machinery and crushing devices which ensures high yield.
- **Problems of Sugar Industry :**
  - (i) The sugarcane produced in India is of poor quality with low sucrose content.
  - (ii) Due to inefficient and uneconomic nature of production, short crushing season, low yield and far off locations, the cost of production is quite high.
  - (iii) Since sugarcane is harvested almost at the same time, there is lot of pressure on sugar mills and cannot crush all canes which results in the wastage of canes.
  - (iv) The supply of raw materials to sugar factories is irregular.
  - (v) The government has fixed the prices of sugarcane, thus if the farmers are not offered good prices they tend to switch over to other crops.
  - (vi) Old and obsolete machineries are used in sugar factories which should be replaced by modern and new technological machinery.
  - (vii) In rural areas, instead of sugar, *gur* and *khandsari* are in more demand.
- **Cotton Textile**
  - (i) India is one of the largest manufacturing countries and one of the largest exporters of cotton textiles in the world.
  - (ii) Cotton textile industry is divided into two sectors- Powerloom and Handloom.
  - (iii) The important powerloom cotton mills are located in Maharashtra, Gujarat and Tamil Nadu and the handloom cotton mills are situated in Mumbai, Ahmedabad, Kanpur, Coimbatore, Howrah, etc.
  - (iv) Maharashtra and Gujarat are the two most important cotton textile manufacturing states in India.
  - (v) Mumbai and Ahmedabad contribute 50% of the total installed looms.
  - (vi) Mumbai is called the 'Cottonopolis' of India and is also known as the 'Lancashire of India'.
  - (vii) Ahmedabad is known as the 'Manchester of India'.
  - (viii) There are many factors responsible for Mumbai and Ahmedabad to emerge as the most important cotton manufacturing centres. They are as follows-
    - (i) Regular supply or proximity to raw material.
    - (ii) Favourable climatic conditions specially the humid climate.
    - (iii) Good network of road and rail transportation within the country and sea routes for the international market.
    - (iv) Location of major ports facilitates the export and import facilities.
    - (v) Availability of cheap and skilled labours.
    - (vi) Accessibility to capital since Mumbai and Ahmedabad are centres of financial and commercial resources. Even large number banks and financial institutions exist which provide loans to the manufacturers.
    - (vii) Electricity supply by the Tata Hydroelectricity system in the Western Ghats to Mumbai and the Ukai and Kakrapara hydroelectric units to Gujarat.
    - (viii) Good demand of cotton garments in India both in the Northern and Southern States and in the foreign markets.
- **Problems of Cotton Textile Industry :**
  - (i) Long staple cotton is not adequately grown in India and thus there is shortage of it.
  - (ii) Many factories are old, obsolete and sick industrial units and thus faces low productivity.
  - (iii) The cost of maintenance and replacement of old machineries with the new ones require heavy financial investments.

- (iv) Due to the development of cotton textile industries in countries like China and Japan and in African countries, the Indian cotton textile industry is facing a tough competition and losing foreign markets.
- (v) The cotton textile is also facing a tough competition from synthetic fabrics like polyester, nylon, rayon, etc. which is in increasing demand.
- (vi) The cotton textile industry is also facing a problem from inadequate production due to lack of regular power supply.
- (vii) Great difficulties are being experienced by mill-owners in obtaining the capital needed for modernization.
- (viii) Acute shortage of power and obsolete machinery results in low productivity and poor quality of goods and thus effectively retarding the growth of cotton textile industry.
- **Handloom and Khadi Industry :**
  - (i) Handloom industry is one of the oldest industries of India providing employment to millions of people.
  - (ii) The handloom industry is mainly located in small town and rural areas.
  - (iii) Tamil Nadu, Odisha, Uttar Pradesh, Assam and Andhra Pradesh generate 50% of the total production while Manipur, Maharashtra, West Bengal, Kerala, Rajasthan, Jammu and Kashmir, Karnataka, etc. are some other important centres of handloom industry.
- **Problems of Handloom and Khadi Industries :**
  - (i) Inadequate, insufficient and low quality availability of raw materials.
  - (ii) The workers employed are mostly unskilled and belong to poor families.
  - (iii) These industries use old and obsolete technology which lack in competing with the fast changing new and modern fashions and designs.
  - (iv) The industries face a dearth of capital which force them to buy capital-saving techniques.
  - (v) These industries also face a stiff competition from mill-made cloth which is of superior quality and more in demand.
- **Silk Textile Industry :**
  - (i) The Indian silk industry is an integral part of Indian Textile Industry and is one of the largest producers of silk in the world.
  - (ii) The silk industry in India employs 60 lakh workers.
  - (iii) There are four varieties of silk produced in India. They are- Mulberry, Muga, Tasar and Eri.
  - (iv) Assam has the monopoly of producing Golden-Yellow Muga silk in the world.
  - (v) The rearing of silk worms for the production of silk is called Sericulture.
  - (vi) The silkworms are reared on Mulberry trees.
  - (vii) 90% of natural silk produced in India is from the Mulberry silk.
  - (viii) 92% of country's Mulberry silk is produced in Karnataka, Andhra Pradesh, West Bengal, Tamil Nadu and Jammu and Kashmir.
  - (ix) The silk industry is located only in the states of Karnataka, Assam, Andhra Pradesh, West Bengal, Telangana, Tamil Nadu, Jammu and Kashmir, Jharkhand, Chhattisgarh, Manipur and Meghalaya.
- **Problems of Silk Industry :**
  - (i) Competition from artificial silk which is cheap and of better quality.
  - (ii) Import of cheap and alternative textiles from China and other Asian countries.
  - (iii) Use of outdated manufacturing technology, primitive and unscientific 'reeling' and 'weaving' techniques, etc.
  - (iv) The price fluctuation of raw silk affects the weavers and the industry.
  - (v) The high production cost and absence of proper market.
  - (vi) Poor knowledge of farm disease amongst the farmers.
  - (vii) Poor and unorganised management with no systematic of testing and grading of Silk like in Japan.
  - (viii) Lack of new technologies and modern power looms is affecting the growth of production.

## Know the terms

- **Molasses :** It is thick, dark brown juice obtained from raw sugar during the refining process.
- **Bagasse :** It is the dry pulpy residue left after the extraction of juice from sugarcane.
- **Press mud :** It is a residue of the filtration of sugarcane juice.

- **Gur and Khandsari** : Gur (Jaggery) is a natural product of sugarcane but is in more unrefined form than sugar and *Khandsari* is a type of unrefined raw white sugar made from thickened sugar cane syrup.
- **Powerloom** : It is a type of loom that is powered mechanically instead of using human power to weave.
- **Handloom** : A manually operated fabric weaver unlike motorized or electrically powered looms.
- **Cottonopolis** : It denotes a metropolis centred on cotton trading servicing the cotton mills in its hinterland.
- **Sericulture** : The rearing of silk worms for the production of silk.

## Flowchart

Sugar	Cotton	Silk
Poor quality of sugarcane with low sucrose content	Long staple cotton is not adequately grown in India	Competition from artificial silk
Cost of production is high	Factories are old, obsolete and sick	Outdated manufacturing technology, primitive and unscientific 'reeling' and 'weaving' techniques
Use of old and obsolete machineries	Tough competition from synthetic fabrics	Poor and unorganised management
<i>Gur</i> and <i>khandsari</i> are in more demand in rural areas	Difficulty for mill-owners in obtaining the capital needed for modernisation	Lack of new technologies and modern power looms



## Chapter -12: Mineral Based Industries



### TOPIC-1

### Iron and Steel Industries

## Quick Review

- Iron and steel is the mother of all industries and forms the backbone of industrial development.
- It provides raw material to industries for manufacturing industrial machinery, railway engines, railway tracks, electrical machinery, defence equipments, bridges, dams, shops, automobiles, etc.
- India has one of the richest reserves of all the raw materials required for the industry, namely, capital, cheap labour, iron ore, power, coal, etc.
- India is the fifth largest crude steel producing country in the world.
- The main raw materials required for iron and steel is iron ore, manganese, limestone, silica, chromate, feldspar, scrap iron, flux and fuel.
- To make steel, impurities in the iron ore like, sulphur, silica, phosphorous, lime, etc. needs to be removed. It is done through the following process-
  - (a) During the iron making process, a blast furnace is fed with the iron ore, coke and small quantities of fluxes such as limestone.
  - (b) This slag floats on the molten iron and is collected at the base of the furnace at regular intervals.
  - (c) The product obtained is known as pig iron which can be converted into wrought iron, steel and cast iron.
  - (d) Through deoxidation the impurities are removed to convert pig iron into steel.
  - (e) The steel is cast into ingots and rolled into different sizes.
- **Tata Iron and Steel Company (TISCO)**
  - (i) TISCO is situated at Jamshedpur and is the oldest steel plant in the country.
  - (ii) It was established by Jamshedji Tata in 1907 and the production started in 1911.

- (iii) The plant obtains its raw materials from the following places :
  - (a) **Iron ore** from **Gurumahisani mines** in Mayurbhanj district of Odisha and **Noamundi mines** in Singhbhum district of Jharkhand.
  - (b) **Manganese** from **Joda** in Keonjhar district.
  - (c) **Limestone, dolomite and fire-clay** from **Sundargarh district** of Odisha.
  - (d) **Coal** from the **Jharia** and **Bokaro coalfields**.
- (iv) Kharkai and Subarnarekha are the two perennial rivers that supply water throughout the year.
- (v) Labour is employed from the states of Bihar, West Bengal, Jharkhand, Chhattisgarh and Uttar Pradesh.
- (vi) It has a good accessibility to market in Kolkata which is not only a market but also has facilities for export of finished goods.
- (vii) Jamshedpur has a good network of roads and railways that are connected to other parts of the country.
- (viii) TISCO produces high grade carbon steel, acid steel and special alloy steel. Carbon steel is used in structural fittings and tin plates and Acid steel is used for making railway wheels, axels, bars, rods, sheets, etc.

➤ **Bhilai Iron and Steel**

- (i) Bhilai steel plant was established in 1953.
- (ii) It is in collaboration with the erstwhile USSR.
- (iii) It is located in Durg district of Chhattisgarh.
- (iv) The plant obtains its raw materials from the following places-
  - (a) **Iron Ore** from **Dalli Rajhara mines**
  - (b) **Limestone** developed in **Nandin** inear Bhilai.
  - (c) **Manganese** obtained from neighbouring district of **Balaghat**.
  - (d) **Coal** is obtained from **Bokaro, Kargati and Jharia** fields in Jharkhand and **Korba** in Chhattisgarh.
- (v) The main source of power is from the thermal station at Korba.
- (vi) Water is supplied to the plant from a system of reservoirs at Tendula.
- (vii) Bhilai steel plant has excellent transport facility as it lies on the Mumbai-Nagpur-Kolkata railway line which links to major markets.
- (viii) A large number of labourers are employed from the states of Bihar, Jharkhand and Madhya Pradesh.
- (ix) Bhilai plant produces heavy rails, structural beams, billets and rolled wire, plates for ship building industry.
- (x) The plant also produces by-products like ammonium sulphate, benzol, coal tar and sulphate acid.

➤ **Rourkela Steel Plant :**

- (i) This steel plant was established in 1959 with the technical collaboration from the German firm, Krupps and Demag.
- (ii) It is located in the Sundargarh district of Odisha.
- (iii) **The plant obtains its raw materials from the following places-**
  - (a) **Iron ore** from the reserves of **Sundargarh** and **Keonjhar district** of Odisha.
  - (b) **Manganese** is obtained from **Barajmda**.
  - (c) **Limestone** from **Bhirmitrapur**.
  - (d) **Dolomite** from **Baradwar**.
  - (e) **Coal** is obtained from **Jharia, Talcher and Korba fields**.
  - (f) **Electricity** is supplied from **Hirakud Project**.
- (iv) Water is obtained from the **Mandira dam** across the **Sankha river** and **Mahanadi river**.
- (v) Good transportation on the **Kolkata-Nagpur rail line** provides easy access to the raw material producing areas and to the markets.
- (vi) Labourers are employed from the states of Bihar, West Bengal, Jharkhand and Odisha.
- (vii) Rourkela Steel plant produces products like hot-rolled sheets, cold-rolled sheets, galvanized sheets and electrical steel plates.
- (viii) It also produces large quantity of nitrogen which is used for the manufacture of fertilizers and various chemicals.

➤ **Vishakhapatnam Steel Plant**

- (i) It is located at the port city of Vishakhapatnam in Andhra Pradesh.
- (ii) It is the first shore based steel plant in India.
- (iii) The plant obtains its raw materials from the following places-
  - (a) **Iron ore** is obtained from **Bailadila** in Chhattisgarh.
  - (b) **Limestone, Dolomite and Manganese** is obtained from the **mines of Andhra Pradesh and Odisha**.



(iv) It gets its power supply from the coalfields of the Damodar Valley.

(v) The plant produces liquid steel and saleable steel.

➤ **Mini Steel Plants :**

(i) Mini Steel plants are smaller units, work through electric furnaces and mainly uses steel scrap and sponge iron or pig iron as their raw material.

(ii) Mini steel plants are distributed throughout the country far away from the integrated steel plants.

(iii) **Mini steel plants have the following advantages :**

(a) Scarp iron is used as raw material which is cheap and easily accessible.

(b) These plants can be built with less capital investment.

(c) It does not cause pollution since it runs on electric power.

(d) These plants cater the needs of the local market and thus reduce the burden from the large steel plants.

(e) Their construction and gestation period is short.

➤ **Problems of Iron and Steel Industry :**

(i) Iron and Steel industry is a capital intensive industry.

(ii) The industry lacks behind in using advanced technological inputs.

(iii) The high grade coking coal used for smelting iron ore is limited.

(iv) Many small iron and steel plants have closed down due to inadequate supply of power and increasing cost of raw material

(v) The government has controlled and fixed the prices of the iron and steel which leaves for a marginal profit for the manufacturers.

(vi) Inefficient management and improper functioning of the iron and steel plants in the Public Sector.

(vii) Increasing demand of iron and steel results in the import of large quantities of iron and steel.

## Know the terms

➤ **Scrap Iron :** The discarded or waste pieces of iron to be recast or reworked.

➤ **Pig Iron :** Crude iron that is the direct product of the blast furnace poured into moulds and is refined to produce steel, wrought iron or ingot iron.

➤ **Ingots :** It is a piece of pure material, usually metal, that is cast into a shape suitable for further processing.

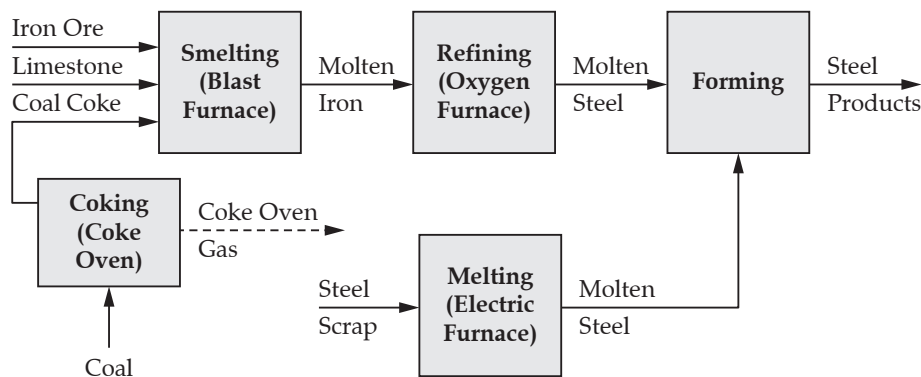
➤ **Galvanized Sheets :** It is a sheet, strip or other steel item coated with a thin layer of zinc to prevent rusting.

➤ **Mini Steel plants** are smaller units, work through electric furnaces and mainly uses steel scrap and sponge iron or pig iron as their raw material.

➤ **Integrated Steel Plants :** A unified steel mill where all the primary functions of producing steel is carried out like iron making, steel making, casting, roughing rolling and product rolling.

## Flowchart

**The Iron and Steel Manufacturing Process**





## TOPIC-2

# Petrochemicals and Electronics

## Quick Review

### ➤ Petrochemical Industry :

- (i) Chemical obtained either directly or indirectly from chemical processing, of petroleum oil or natural gas is called Petrochemical.
- (ii) India is amongst the fastest growing petrochemicals market in the world.
- (iii) Major petrochemicals are acetylene, benzene, ethane, ethylene, methane, propane, and hydrogen, from which hundreds of other chemicals are derived.
- (iv) Basically this industry is located near an oil refinery which can supply the basic requirements of Naptha or Ethylene and Benzene.
- (v) These chemicals are used for manufacturing products like synthetic fibres, synthetic rubber, ferrous and non-ferrous metals, plastics, drugs and pharmaceuticals.
- (vi) All these products are largely used in the domestic, industrial and agricultural fields.
- (vii) The Petrochemical Industry produces the following products-  
Adhesives, fertilizers, dyes, detergents, insecticides, pesticides, resins, crayon, plastic sheets, printing inks, paints, carbon paper, etc.
- (viii) **Advantages of Petrochemical Products-**
  - (a) Petrochemicals are cost effective, economic and cheap.
  - (b) The raw material is easily available and not depended on agricultural raw material.
  - (c) It is a highly compact portable source of energy.
  - (d) It is an excellent source of organic molecules for building plastics, medicines, rubber, fiber, etc.
- (ix) There are many Petrochemical Production Units in India. Some of them are as follows-
  1. Herdillia Chemicals Ltd. in Chennai.
  2. National Organic Chemicals Industries Ltd. near Mumbai.
  3. Petrofils Cooperative Limited (PCL) in Vadodara.
  4. Indian Petrochemical Corporation Ltd. near Vadodara.
  5. The Reliance Industries in Gujarat.
  6. Haldia Petrochemical Ltd. in West Bengal.
  7. The Bongaigaon Petrochemicals Ltd. in Assam.
  8. The Indian Oil Corporation in Gujarat and Panipat.

### ➤ Electronics-

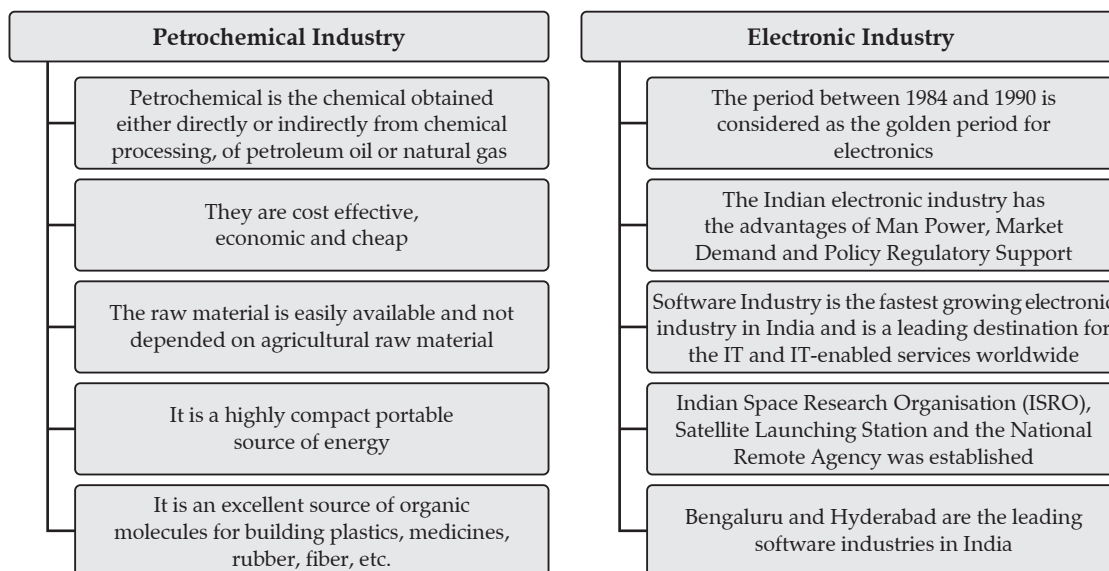
- (i) The Electronics Industry in India began around 1965 with an objective towards space and defence technologies.
- (ii) India gradually developed in consumer electronics mainly with transistor radios, Black and White TV, Calculators and other audio products and later Colour Televisions were introduced.
- (iii) The period between 1984 and 1990 is considered as the golden period for electronics during which the industry in India witnessed continuous and rapid growth.
- (iv) India is also an exporter of a vast range of electronic components and products, e.g. display technologies, entertainment electronics, telecom equipment, Semiconductor designing, Electronic Manufacturing Services (EMS), etc.
- (v) The Indian electronic industry has the following advantages which can effectively enhance its growth. They are Man Power (Skilled and Unskilled), Market Demand and Policy Regulatory Support.
- (vi) India has been experiencing a strong growth in the demand of consumer products and durables in recent years which have facilitated the growth in the electronics sector both directly and indirectly.
- (vii) The electronic industry in India is widely concentrated in the Southern States of India. Some of them are-
  1. The Indian Telephone Industries (ITI) in Bengaluru.
  2. The Electronics Corporation of India Ltd. (ECIL) in Hyderabad.
  3. The Bharat Electronics Ltd. (BEL) in Bengaluru.

- (i) **Space Technology** in India was established in 1960s by the Department of Atomic Energy.
- (ii) Indian Space Research Organisation (ISRO) at Bengaluru, Satellite Launching Station at Sriharikota and the National Remote Agency at Hyderabad was established which gave further impetus to space research programmes in India.
- (iii) India made remarkable achievement by launching Aryabhata, India's first master satellite which was aimed at growing advanced technology regarding the agricultural fields, weather forecasting etc.
- (iv) Then Bhaskara-I was launched followed by the launching of Polar Satellite launching Vehicles popularly known as PSLV and Geosynchronous Satellite Launch Vehicle known as GSLV.
- (v) In 2008, India's first Scientific Mission, Chandrayaan-I, was launched to Moon.
- (vi) India made further progress by launching its indigenously built satellites such as APPLE and INSAT series.
- (i) **Software Industry** is the fastest growing electronic industry in India.
- (ii) The software industry is a leading destination for the IT and IT-enabled services worldwide.
- (iii) The Department of Electronics has played an important role to enhance the competitiveness of India in IT.
- (iv) The Department has initiated a number of programmes for manpower development, quality upgradation, stimulation of software engineering and research.
- (v) The BPO (Business Process Outsourcing) industry is continuously growing.
- (vi) Software giants, such as Infosys, Wipro, and TCS, are providing software solutions to clients overseas.
- (vii) Bengaluru and Hyderabad are the leading software industries in India.
- (viii) Bengaluru is referred to as the Silicon Valley of India and many MNCs, such as Capgemini and Yahoo, have forayed into the Indian market.

## Know the terms

- **Petrochemical** : Chemical obtained either directly or indirectly from chemical processing, of petroleum oil or natural gas.
- **Organic Molecules** : These are usually composed of carbon atoms in rings or long chains, to which are attached other atoms of such elements as hydrogen, oxygen and nitrogen.
- **Consumer Electronics** : It is an electronic device or digital equipment which is used everyday by people.
- **Regulatory Policy** : It is about achieving government's objectives through the use of regulations, laws and rules to deliver better economic and social outcomes.
- **Space Technology** : It is a technology developed by space science or the aerospace industry for use in spaceflight, satellites or space exploration.
- **Chandrayaan-I** : India's first Scientific Mission, launched to Moon in 2008.

## Flowchart



## Chapter -13: Transport



### TOPIC-1

## Importance of Transportation Roadways and Railways

### Quick Review

- Transportation is the life line of people all over the world.
- Transport refers to the activity that facilitates physical movement of goods as well as Individuals from location to another.
- Transportation in India has recorded a substantial growth over the years in terms of network and in its system.
- **Importance of Transportation**
  - (i) Transportation facilitates utilisation of natural resources lying unutilized in the hills, forests and mines.
  - (ii) It links the backward areas to the urban cities and reduces regional industrial disparity.
  - (iii) Transport system helps in transporting the raw materials and other necessary machineries to the industries.
  - (iii) Transportation protects the people during war, natural calamities and other crisis.
  - (iv) It helps in the process of industrialisation and urbanisation.
  - (v) The transport system helps to enhance and strengthen the feeling of unity and brotherhood among the people.
- The present transport system of India comprises different means of transport i.e. rail, road, water, air transport, etc.
- **Road Transport-**
  - (i) India has excellent network of roads in the country connecting all the towns and cities to each other.
  - (ii) According to National Highways Authority of India, India has the second largest road network in the world.
  - (iii) Road transport is significant to India's economy and contribute 4.7 percent towards India's gross domestic product (GDP).
  - (iv) The road network is important for the country's growth, social integration and for the security of the citizens.
  - (v) **The Indian roads are categorized into the following:**
    1. National Highways
    2. State Highways
    3. Major District Roads
    4. District Roads
    5. Rural and other Roads
- **National Highways-**
  1. The National Highways are constructed and maintained by the Central Government.
  2. These Highways facilitate inter-state transport and movement of defence personnel, defence materials in strategic areas, connect to manufacturing centres, etc.
  3. The National Highways Authority of India (NHAI) was constituted in 1988 and is responsible for the development, maintenance and management of National Highways.
  4. The NHAI is presently undertaking the developmental activities under National Highways Development Project (NHDP).
  5. The two major Projects undertaken by NHAI are :
    - A. Golden Quadrilateral (GQ) :**
      - (a) The largest Express Highway project in India.
      - (b) It connects India's four biggest metropolitan cities-Delhi, Mumbai, Kolkata and Chennai.
      - (c) The main economic benefits of this project is-
        - (i) Establishing faster transport networks between major cities and ports.

- (ii) Providing fast and smooth movement of products and people within India.
- (iii) Developing industries and creating job opportunities in smaller towns through access to markets.
- (iv) It is also providing opportunities for farmers, through better transportation so that the agricultural produce could be transported to major cities and ports for exports.
- (v) Driving economic growth directly, through construction as well as through indirect demand for cement, steel and other construction materials.
- (vi) Provides and impetus to truck transport throughout India.

**B. North-South and East-West Corridors (NS-EW) :**

- (a) NS-EW Corridors is the largest ongoing highway project in India and is the second phase of the National Highway Development Project(NHDP).
- (b) It is a four/six lane expressways connecting Srinagar, Kanyakumari, Porbandar and Silchar.
- (c) The North-South Corridor would connect Srinagar in Jammu and Kashmir with Kanyakumari in Tamil Nadu and the East-West Corridor would connect Silchar in Assam with Porbandar in Gujarat.

- **Express Highways :** These highways are six lanes roads designed for high-speed movement of vehicles without any obstacles. The major Express Highways are-
  1. Yamuna Expressway
  2. Ahmedabad-Vadodara Expressway
  3. Delhi-Gurgaon Expressway
  4. Mumbai-Pune Expressway
  5. Noida-Greater Noida Expressway
  6. Delhi-Noida Direct Flyway
  7. Panipat Expressway
  8. Bengaluru-Mysuru Infrastructure Corridor
- **State Highways :**
  1. The State Highways are constructed and maintained by the State Governments.
  2. The State Highways are usually roads that link important cities, towns and district headquarters within the state and connect them with National Highways or highways of neighbouring states.
  3. These Highways also connect the industries, or tourist places to important areas in the state.
- **District Roads :**
  1. These are important roads that connect *talukas*, rural areas and important towns in the districts to the District Headquarters.
  2. These roads are within the district connecting areas of production with markets.
- **Rural Roads :**
  1. Village roads are inter-connected to each other.
  2. Most of the village roads are unmetalled roads; they become muddy and sticky during the rainy season.
  3. It constitutes over 80% of total road network.
  4. Rural roads sector suffered from lack of Systematic Planning, Quality and Sustained Maintenance.
  5. These roads are in poor shape, affecting the rural population's quality of life and Indian farmer's ability to transfer produce to market post-harvest.
  6. In 2000, the *Pradhan Mantri Gram Sadak Yojana* was launched by the Government of India with an aim to provide connectivity to rural areas.
- **Other Roads-** The Border Roads and International Highways.
- **The Border Road Organisation (BRO) :**
  1. The Border Road Organisation was established on 7<sup>th</sup> May 1960 to secure India's borders and develop infrastructure in remote areas of the North and North-East states of the country.
  2. This organization has constructed the world's highest road from Manali to Leh at an average height of 4,270 metres.
  3. Besides constructing roads in strategic areas, the BRO also undertakes the task of snow clearance in high altitude areas, construction of airfields, buildings and permanent bridges.
- **Advantages of Roadways :**
  - (i) Roadways are ideal for short distances as through it every village and hamlet can be reached.
  - (ii) It is cost effective in comparison to other means of transport.

- (iii) It transports people and goods quickly and easily.
- (iv) It provides door-to-door services.
- (v) Roads are easily constructed on hilly terrain where building railway line is not possible or the air services are inaccessible.
- (vi) The movement of goods through roadways is safer and convenient.
- (vii) Road transport is most suited for carrying goods and people to and from rural areas which are not served by rail, water or air transport.

➤ **Disadvantages of Roadways :**

1. Road transport is not as reliable as rail transport. During rainy or flood season, roads become unfit and unsafe for use.
2. Road accidents frequently takes place and thus, it is not safe.
3. This mode of transport is unsuitable and costly for transporting cheap and bulky goods over long distances.
4. It gets delayed often due to heavy traffic, high concentration of all types of vehicles plying on road, check posts, toll tax and octroi duties collection points.
5. The road transport is comparatively less organised, irregular and undependable. The rates charged for transportation are also unstable and unequal.

➤ **Rail Transport :**

- (i) It is an important mode of transportation for both freight and passengers.
- (ii) It is the fourth largest and busiest railway network in the world and is the world's largest commercial or utility employer, with more than 1.4 million employees.
- (iii) Kolkata, Delhi, Mumbai and Chennai have their own metro networks.
- (iv) The suburban train that handles commuter traffic are mostly Electric Multiple Units(EMUs).
- (v) The railways transport all kinds of goods from mineral ores, fertilizers, agricultural produce to iron and steel.
- (vi) The Railway System has been divided into 17 zones.
- (vii) On the basis of the width of the railway track, the Indian Railways are divided into three categories-
  1. Broad Gauge
  2. Metre Gauge
  3. Narrow Gauge

➤ **Advantages of Railways-**

1. **Railways help in the easy movement of goods and people** from one place to another.
2. It helps in **reaching the far and inaccessible areas**.
3. It helps in **transporting bulky goods and in extending the market**.
4. It has **developed and commercialised agriculture** since the farmers can sell their agricultural produce easily.
5. Railways are an **important source of employment** in India since lakhs of skilled and unskilled people are employed in operating the railways.
6. It **helps during famines or other crisis** by carrying the food-grains and other necessary materials to the affected areas.
7. They are **instrumental in providing internal security** and in making efficient arrangements in transporting defence equipments to the strategic areas.
8. It has **enhanced tourism**.
9. **It has made travel safe and comfortable**.
10. Railways **act as an integrating force** irrespective of any social barriers and binding the people into one whole nation through its network.
11. It has **bridged the gap between the villages and the cities** and helped in developing the villages with new and innovative ideas.
12. It is **cheaper** than air transport.

➤ **Disadvantages of Railways :**

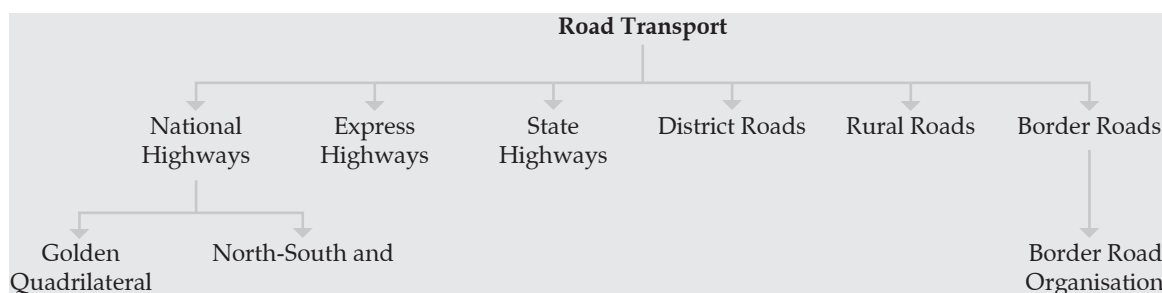
1. Railway lines **cannot be constructed everywhere** specially in the hilly regions and remote dense forested regions.
2. The railway requires **large investment of capital**. The cost of construction, maintenance and overhead expenses are very high as compared to other modes of transport.
3. Rail transport **cannot provide door to door service**.
4. Railway transport is **unsuitable and uneconomical for short distance** and small traffic of goods.

5. It involves much time and labour in booking and taking delivery of goods through railways as compared to road transport.
6. Travelling by train to long distances are tedious and uncomfortable.
7. Many industrial regions are deprived of train tracks and thus depends on other transport for transporting the cargoes from the station.
8. Travelling by train is limited to land only; it cannot cross the oceans.

## Know the terms

- **Social Integration** : It is the blending and unifying of social groups through peaceful social relations of coexistence, collaboration and cohesion.
- **Gross Domestic Product** : The total value of goods produced and services provided in a country during one year.
- **Express Highway** : A highway especially planned for high-speed traffic, limited points of access or exit, and a divider between lanes for traffic moving in opposite directions.
- **National Highways** : They are constructed and maintained by the Central Government and facilitate inter-state transport and movement of defence personnel, etc.
- **State Highways** : They are usually roads that link important cities, towns and district headquarters within the state and connect them with National Highways or highways of neighbouring states.
- **Golden Quadrilateral (GQ)** : The largest Express Highway project in India that connects India's four biggest metropolitan cities-Delhi, Mumbai, Kolkata and Chennai.
- **Border Road Organisation** : It was established to secure India's borders and develop infrastructure in remote areas of the North and North-East states of the country.
- **Electric Multiple Units (EMUs)** : An electric multiple unit or EMU is a multiple unit train consisting of self-propelled carriages, using electricity as the motive power.
- **Broad Gauge** : A distance between the rails of a rail road track that is greater than the standard width of 56 ½ inches (143.5 centimeters).
- **Metre Gauge** : They are narrow-gauge railways with track gauge of 1,000 mm (3 ft 3 ¾ in).
- **Narrow Gauge** : It is a railway with a track gauge narrower than the 1,435 mm (4 ft 8 ½ in) of standard gauge railways.

## Flow chart



## TOPIC-2

### Air Transport and Water Transport

## Quick Review

- (i) It is the most modern means of transport which is fast and time saving.
- (ii) India has both domestic and international airlines which carry passengers, freight and mail.
- (iii) The Airports Authority of India (AAI) came into existence on April 1, 1995 after merging the then two authorities- National Airports Authority and International Airports Authority.
- (iv) The air transport in India was managed by two corporations- Air India and Indian Airlines.
- (v) In 2007, Air India and Indian Airlines merged into one and is called Air India.
- (vi) Air India is the 16th largest airline in Asia.

- (vii) There are a number of private airlines too like Spicejet, Jet Airways (India) Ltd., Inter Globe Aviation Ltd. (Indigo), Go Airlines (India) Pvt. Ltd., etc.
- (viii) There are three Cargo Airlines which are operating and providing cargo services in the country. They are- Blue Aviation Pvt. Ltd., Deccan Cargo and Express Logistics Pvt. Ltd.
- (ix) Pawan Hans Helicopters Ltd., established in 1985, aimed to provide helicopter services to the oil sector in offshore exploration, hilly regions, remote areas and for the promotion of tourism.

➤ **Advantages of Air Transport**

- (i) Air transport is the fastest and most comfortable mode of transport.
- (ii) It can easily reach to remote and inaccessible areas like mountains, forests, deserts etc.
- (iii) It is very useful during the times of war and natural calamities like floods, earthquakes, famines, epidemics, hostility and collapse of law and order.

➤ **Disadvantages of Air Transport**

- (i) Air transport is expensive.
- (ii) It connects only major cities.
- (iii) It is dependent on weather conditions and can get delayed or cancelled causing inconvenience to passengers.
- (iv) It causes pollution as it runs on petroleum which is a non-renewable source of energy.
- (v) It gives limited and restricted services between two destinations.
- (vi) It carries small tonnage but has high freight charges.
- (vii) Its maintenance and overhead cost is too high.

➤ **Water Transport-**

- (i) Water transport is the most easy and cheap mode of transport.
- (ii) Like road and rail transport, no infrastructure is required to be built since water is available naturally.
- (iii) It has the largest carrying capacity and is most suitable for carrying bulky goods over long distances.
- (iv) It has played a very significant role in bringing different parts of the world closer and is indispensable to foreign trade.
- (v) Water transport can be divided into two categories-
  1. Inland Waterways
  2. Oceanic Waterways

**1. Inland Waterways-**

- (a) India has an extensive network of inland waterways in the form of rivers, canals, backwaters and creeks.
- (b) The Inland Waterways Authority of India (IWAI) came into existence on 27 October, 1986 for the development and regulation of inland waterways for shipping and navigation.
- (c) Inland waterways should be free of barriers i.e. from waterfalls and rapids.
- (d) The rivers of Peninsular India are not suitable for navigation due to the following reasons-
  1. The rivers are rain-fed and seasonal.
  2. They are shorter.
  3. These rivers have a number of waterfalls.
- (e) The Inland Waterways Authority has declared five inland waterways as National Waterways-
  1. **National Waterway No.1 (NW-1)**- It comprises Ganga-Bhagirathi-Hoogly river system which connects Haldia-Kolkata-Farakka-Munger-Patna-Varanasi-Allahabad.
  2. **National Waterway No.2 (NW-2)**- The River Brahmaputra connects Dhubri-Pandu-Tezpur-Neamati-Dibrugarh-Sadiya and connects the North East region with Kolkata and Haldia Ports.
  3. **National Waterway No.3 (NW-3)**- It connects between Kollam and Kottapuram. It is the most navigable and tourism potential area.
  4. **National Waterway No.4 (NW-4)**- It connects the states of Andhra Pradesh, Tamil Nadu and the Union Territory of Puducherry.
  5. **National Waterway No. 5 (NW-5)**- It comprises Talcher-Dharma stretch of river Brahmani, Geonkhali-Charbatia stretch of East Coast Canal.
  6. **National Waterway No.6. (NW-6)**- It is a proposed waterway between Lakhimpur and Bhanga of the Barak river. This would help cargo transport through Assam, Nagaland, Mizoram, Manipur, Tripura and Arunachal Pradesh.

**2. Oceanic Waterways-**

- (a) Oceanic waterways play an important role in the transport sector of India's economy.
- (b) India has a vast coastline of approximate 7,517 kilometres, including islands.
- (c) 12 Major Ports, 185 Minor Ports and Intermediate Ports provide support to these routes.
- (d) These routes are also used for transportation between the islands and the rest of the country.



- (e) 80% of cargo traffic is handled by the Major Ports.
- (f) The Indian Ports are classified into- Major Ports, Minor Ports and Intermediate Ports.
- (g) **The Major Ports of India are-**
  - (i) Kolkata (West Bengal)
  - (ii) Haldia (West Bengal)
  - (iii) Paradip (Odisha)
  - (iv) Vishakhapatnam (Andhra Pradesh)
  - (v) Chennai (Tamil Nadu)
  - (vi) Tuticorn (Tamil Nadu)
  - (vii) Kandla (Gujarat)
  - (viii) Mumbai (Maharashtra)
  - (ix) Jawaharlal Nehru (Nava Sheva) Port near Mumbai
  - (x) Mormugao (Goa)
  - (xi) New Mangalore (Karnataka)
  - (xii) Kochi (Kerala)
- (g) Ennore Port near Chennai Port, is the first Public Company Port in India and is a Corporate Entity and not a Port Trust.

➤ **Advantages of Waterways :**

- (i) Water transport is cheap and its maintenance cost is low.
- (ii) Heavy and bulky goods can be transported easily.
- (iii) It is very useful during natural calamities like flood and rain when the relief operations are carried out through waterways.
- (iv) Development of shipping is essential for the defence of the country also.
- (v) It is a fuel-efficient and eco-friendly mode of transport.
- (vi) It is a safe mode of transport.
- (vii) Water transport plays important role in foreign trade.

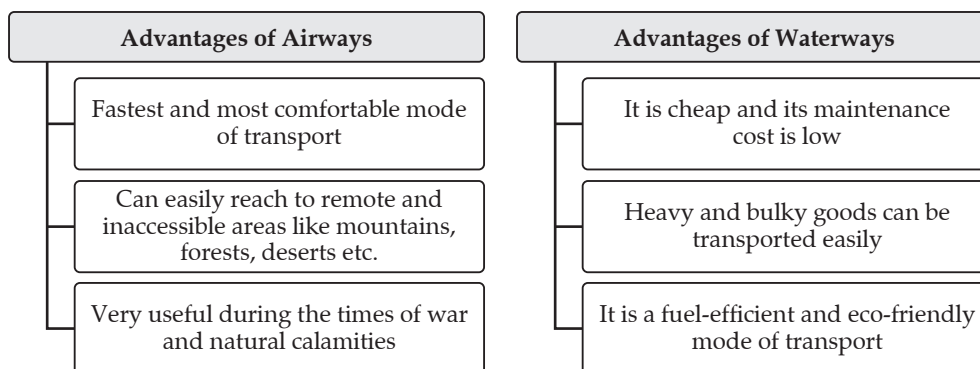
➤ **Disadvantages of Waterways :**

- (i) It is a slow means of transport.
- (ii) It depends on weather conditions.
- (iii) The long hours of travelling causes sea sickness.
- (iv) Area of water transport is restricted. Unlike railways and roads, man cannot construct waterways.
- (v) It is less safe as there is a danger of sinking of boats and ships.

## Know the terms

- **National Airport Authority :** It is constituted for the better administration and cohesive management of airports.
- **Inland Waterways :** They are in the form of rivers, canals, backwaters and creeks which facilitate the movement of goods and people within the territories.
- **Oceanic Waterways :** These are routes used for transportation between the islands and the rest of the country.

## Flowchart



## Chapter -14: Waste Management



### TOPIC-1

### Impact of Waste Accumulation

## Quick Review

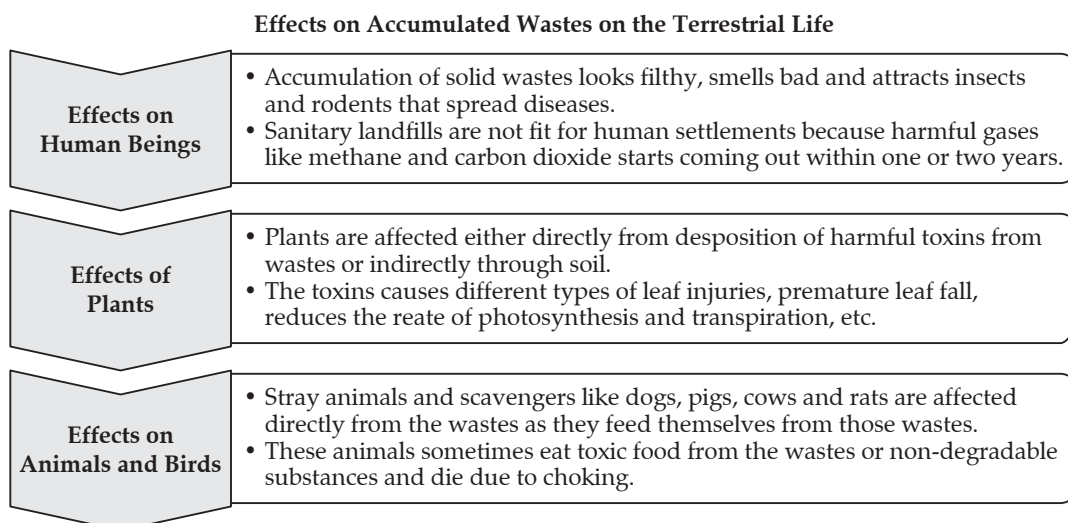
- Waste is unwanted and unused material which is rejected for any further usage.
- Solid Wastes are accumulated in different places of an area like in the backyards of the houses, street corners, outside hospitals and schools, near water bodies, etc.
- When these accumulated solid wastes are dumped and left uncared, the wastes starts decomposing which leads to the growth of a number of pathogenic bacteria, virus and fungi.
- The mosquitoes, flies, rodents, insects, etc. also spread diseases due to the accumulation of wastes around the houses or nearby places.
- The pathogenic bacteria are also carried to our water bodies during rains as the rainwater carries the decomposed waste along with pathogens.
- The decomposed also causes pollution.
- The world's landscape is spoiled due to the accumulation of solid wastes that is dumped and left for decomposition.
- Sulphur and nitrogen gases are produced due to burning of coal, fuel wood or petroleum which when reacts with oxygen converts into sulphur oxide and nitrogen dioxide.
- These oxides react with water vapour present in the atmosphere to form acids like sulphuric acid and nitric acid. These acids mix with rain and forms acid rain.
- When the acid of acid rains falls on the building, a chemical reaction occurs that corrodes the building causing damaging marks on the statues and buildings.
- Examples of buildings and monuments affected by acid rain are the Taj Mahal of Agra, Houses of Parliament in London, Parthenon of Athens, etc.
- Pollution is the unwanted and harmful substances or gases that contaminate the atmosphere and cause adverse change and effect to the natural environment.
- The major causes of pollution are from the burning of fossil fuels, like coal, oil, natural gas and petroleum used to generate electricity and power our vehicles.
- Accumulation of wastes, industrial wastes, solid wastes, etc. also causes pollution.
- The main sources of waste are from domestic, commercial, industrial, municipal, food processing and agricultural wastes.
- When the accumulated waste decomposes, it produces large quantity of methane gas which is highly explosive, if not managed properly.
- Eutrophication is the process by which a body of water becomes enriched in dissolved nutrients that stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen.
- Algae, plankton and other microorganisms use carbon dioxide, inorganic nitrogen and phosphate from the water as food.
- When aquatic systems have an overabundance of nutrients, the entire system suffers from eutrophication and become unlivable and even causes death to many aquatic organisms.
- Unattended waste, domestic waste, dumped wastes spread diseases through contamination.
- Choking of drains and gully pits by the solid wastes results in water logging which in turn gives birth to mosquitoes and ultimately spreads diseases like malaria and chikungunya.
- Hazardous wastes are toxic substances like lead which can affect in the development of a child's brain.
- Harmful toxics like Asbestos cause's chest and lung cancer, Mercury causes brain damage and death and Arsenic causes cancer.
- Radioactive waste produced by nuclear reactors and weapon factories causes serious environmental problems.
- Accumulated Wastes also affects the terrestrial life which includes human beings, plants and animals.
- **Effects on Human Beings:**
  - (i) Accumulation of solid wastes looks filthy, smells bad and attracts insects and rodents that spread diseases.
  - (ii) Sanitary landfills are not fit for human settlements because harmful gases like methane and carbon dioxide starts coming out within one or two years.

- **Effects on Plants:**
  - (i) Plants are affected either directly from deposition of harmful toxins from wastes or indirectly through soil.
  - (ii) The toxins causes different types of leaf injuries, premature leaf fall, reduces the rate of photosynthesis and transpiration, deposited dust on leaves block the stomata and smoke produced due to burning of waste affects the length of the root and shoot, etc.
- **Effects on Animals and Birds:**
  - (i) Stray animals and scavengers like dogs, pigs, cows and rats are affected directly from the wastes as they feed themselves from those wastes.
  - (ii) These animals sometimes eat toxic food from the wastes or non-degradable substances and die due to choking.
- Waste accumulation also affects aquatic organisms both in fresh water and marine.
- Pesticides and industrial and domestic wastes are the two categories of waste that causes harm to aquatic life.
- Biomagnification means the increasing concentration of substance such as a toxic chemical, in the tissues of organisms at successively higher levels in a food chain.
- The phenomenon of concentrated toxic deposition at the higher trophic level is known as bio-accumulation.
- Methyl mercury can break the barrier between blood cells and nerve cells and reaches the brain causing progressive irreversible damage. This was found in the Minamata Bay where people consumed fish which had toxic methyl mercury and fell ill.
- Mercury contamination also results from wastes of other industries like paper and pulp industry, chlorine industry, pesticide industry, etc.

## Know the terms

- **Pathogenic :** It is a medical term that describes viruses, bacteria and other types of germs that can cause some kind of disease.
- **Acid Rain :** When Sulphur oxide and Nitrogen dioxides react with water vapour present in the atmosphere to form acids like sulphuric acid and nitric acid then these acids mix with rain and form acid rain.
- **Eutrophication :** It is the process by which a body of water becomes enriched in dissolved nutrients that stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen.
- **Sanitary Landfills :** These are the sites where waste is isolated from the environment until it is safe. They are a method of waste disposal where the waste is buried underground or in large piles.
- **Toxins :** It is an organic poison produced.
- **Biomagnification :** It means the increasing concentration of substance such as a toxic chemical, in the tissues of organisms at successively higher levels in a food chain.
- **Bio-accumulation :** The phenomenon of concentrated toxic deposition at the higher trophic level.
- **Methyl Mercury:** It is an organic form of mercury that is highly toxic and is the main culprit in mercury poisoning.

## Flow chart





## TOPIC-2

# Need for Waste Management

## Quick Review

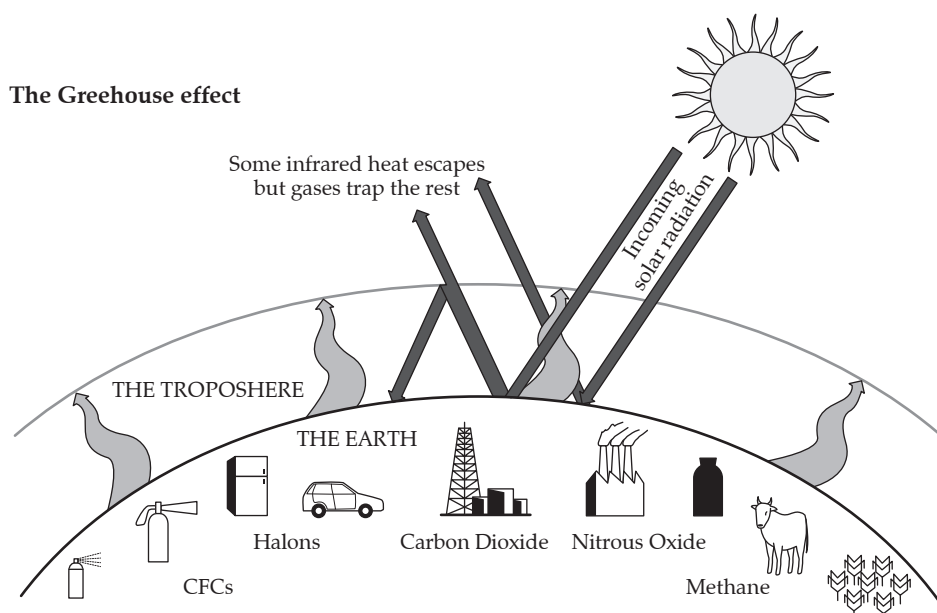
- Waste is a big problem today as it causes air and water pollution.
- The rotting garbage produces harmful gases and mixes with the air causing breathing problems to the people.
- Waste management is a necessity because improperly stored refuse can cause health, safety and economic problems.
- Transmission of diseases due to accumulation of wastes is a major threat to people and environment.
- Due to waste accumulation on land and water bodies, diseases are spread through flies, mosquitoes, rodents and pet animals.
- Various diseases are spread by the following flies, rodents and pet animals-
  - (i) **Housefly**- Typhoid, diarrhoea, dysentery, cholera, etc.
  - (ii) **Sandfly**- Kala-azar, sandfly fever, etc.
  - (iii) **Tsetse fly**- Sleeping sickness.
  - (iv) **Mosquitoes**- Malaria, filarial, chikungunya, dengue, yellow fever, etc.
  - (v) **Rodents**- Plague, salmonellosis, etc.
  - (vi) **Dog**- Rabies, etc.
  - (vii) **Cat**- Dermatophytosis, anthrax, etc.
- **The water is polluted due to the industrialization and urbanisation because-**
  - (i) Sewage contains organic matter that cannot be decomposed.
  - (ii) Industrial and commercial waste has toxic agents.
  - (iii) Fertilizers and pesticides produce pollutants.
- People are also affected by pollution because they drink contaminated water and also uses it for personal uses and recreation.
- Viral, Bacterial, Protozoan, Helminthic are some of the common water-borne diseases.
- The Greenhouse effect is a natural process that warms the Earth's surface.
- When the sun's energy reaches the Earth's atmosphere, some of it is reflected back to space and the rest is absorbed and re-radiated by greenhouse gases.
- The warming up of the atmosphere is due to the greenhouse effect and hence Global Warming is also known as Greenhouse Effect.
- There are five gases which are mainly responsible for Greenhouse Effect and Global Warming. These gases are known as Greenhouse Gases. They are: Carbon Dioxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>), Nitrogen Oxide (Nitrous Oxide), Chlorofluorocarbons (CFC) and Water Vapour.
- **Global Warming has many effects. They are-**
  - (i) It is assumed that Global temperature is likely to rise by 2°C to 5°C during the next century.
  - (ii) Because of the rise of temperature, there is a possibility of melting of ice caps at the poles of the Earth.
  - (iii) There will be changes widely in the climate in the wind and rain pattern due to increase in temperature all over the surface of the world.
  - (iv) Higher temperature will cause rise in transpiration which in turn will affect the groundwater table.
  - (v) Due to climatic changes, pathogenic diseases would increase and there will be rise in the insects and pests.
- Ozone layer has significance in the Atmosphere. The atmosphere is divided into four layers like, Troposphere, Stratosphere, Ionosphere and Exosphere.
- The Ozone layer absorbs the ultraviolet rays and infrared rays coming from the sun and protects the life on the Earth from its harmful effects.
- **Causes of the Depletion of Ozone Layer-**
  - (i) The chemical reaction that is produced due to the contact of Oxides of Nitrogen with Ozone destroys the ozone layer.
  - (ii) The presence of Chlorofluorocarbons (CFC's) is another cause of the ozone layer depletion.
  - (iv) The ultraviolet rays of the sun that reaches the earth's surface causes many diseases like skin cancer and cataract.
  - (v) The ultraviolet rays cause genetic disorders which affect the heredity.
  - (vi) These rays also disturb the ecological balance in marine ecosystem, e.g. algae, fish, etc.
  - (vii) The ultraviolet rays also damage the physical and chemical properties of any complex chemical substance.

- **Acid Rain-** Rain that contains large amounts of harmful chemicals as a result of burning substances such as coal and oil.
- It is a popular term referring to the deposition of a mixture from wet (snow, fog, dew, sleet, etc.) and dry (acidifying particles and gases, etc.) acidic components.
- Acid rain is caused by emissions of sulphur dioxide and nitrogen oxide, which react with the water molecules in the atmosphere to produce acids.
- **Effects of the Acid Rain-**  
Acid rain has shown adverse effects on-
  - (i) Forests
  - (ii) Freshwaters
  - (iii) Soils, killing insects as acid rain increases acidity in the soil
  - (iv) Buildings, monuments and statues, etc.
  - (v) On human health like nervous system
  - (vi) Aquatic species and growth of the plants
- Due to acid rain and dry deposition of pollutants on the land surface, soil pollution occur.
- Polluted soils cause reduction in mineralisation and decomposition processes.
- The toxic chemicals present in the soil destroy the earthworms, nematodes, etc.
- In order to protect the biosphere and prevent it from destruction, accumulation of waste needs to be checked.

## Know the terms

- **Waste Management:** The concept of waste management involves the collection, removal, processing, and disposal of materials considered waste.
- **Dermatophytosis:** It is a fungal infection of the skin, especially the feet.
- **Global Warming:** A gradual increase in the overall temperature of the earth's atmosphere, especially a sustained increase great enough to cause changes in the global climate.
- **Greenhouse:** A greenhouse is a house made of glass. It has glass walls and a glass roof. People grow tomatoes and flowers and other plants in them.
- **Ozone layer:** It is a layer in the stratosphere that prevents dangerous radiation from the sun from reaching the surface of the Earth.
- **Chlorofluorocarbons (CFC's):** It is an organic compound that contains only carbon, chlorine and fluorine, produced as volatile derivative of methane, ethane and propane.
- **Acid Rain-** Rain that contains large amounts of harmful chemicals as a result of burning substances such as coal and oil.

## Flowchart





## TOPIC-3

### Safe Disposal of Waste

## Quick Review

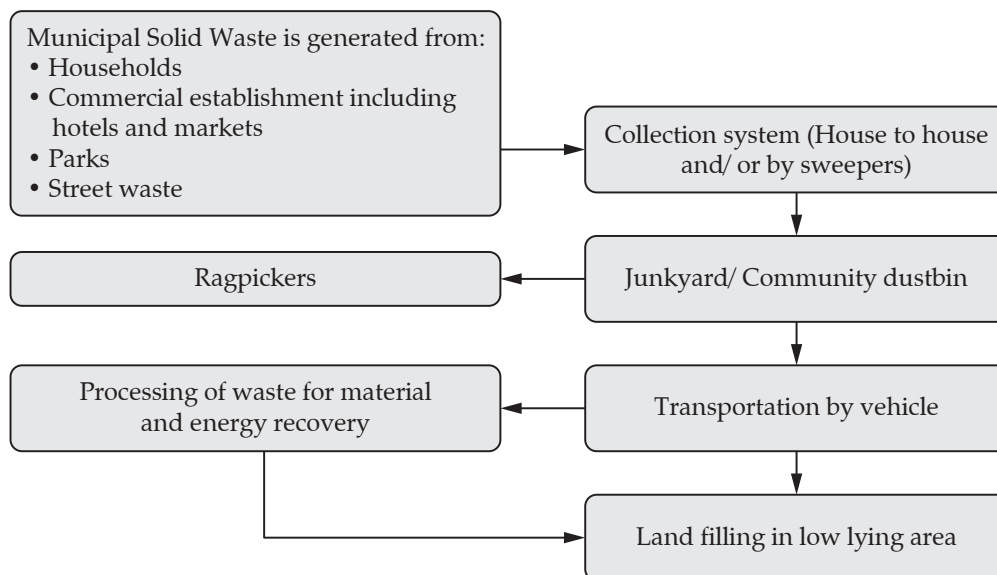
- Waste Management is collection, transportation and disposal of garbage, sewage and other waste products.
- **Segregation of Waste** before its disposal is important.
- To segregate the garbage various types of dustbins are used to separate glass, paper, cloth, metal, wet and dry food wastes, etc.
- Two types of dustbins are used to throw the wastes in the domestic areas- Biodegradable and Non-Biodegradable dustbins.
- Biodegradable products are converted into useful products like compost or gobar gas.
- After Segregation, **Dumping** of waste disposal is the next procedure.
- Waste materials are dumped in open low lands far from the city though not environment friendly but it is the cheapest method.
- The dumping grounds are open pits and thus become the breeding ground for mosquitoes, flies, insects, etc.
- When these waste materials are burned, they pollute the air and give out foul odour.
- Sanitary Landfill is another method by which the waste is packed and dumped daily.
- These are the sites where waste is isolated from the environment until it is safe. It is considered when it has completely degraded biologically, chemically and physically.
- The Sanitary Landfill system of disposing wastes is a biological method and is carried out with minimal environmental damage.
- **Five phases are followed for the disposing of wastes-**
  - (i) In the first phase, aerobic bacteria deplete the available oxygen which results in the increase of temperature.
  - (ii) In the second phase, anaerobic conditions become established and hydrogen and carbon dioxide are evolved.
  - (iii) In third phase, lots of bacteria and methanogenic activity, i.e. production of methane is established.
  - (iv) In the fourth phase, the methanogenic activity becomes stabilized.
  - (v) In the fifth phase, the organic matter depletes and the system returns to aerobic state.
- **The Sanitary Landfills have many advantages over Open Dumping-**
  - (i) The waste products of landfills can be used as direct fuel for combustion.
  - (ii) The location of waste deposition in the landfills is monitored.
  - (iii) After the landfills are completed they can be used as parks or farming land.
  - (iv) Landfills are free from pollution and burning.
- The landfill sites are supposed to have vegetative cover by planting the non-edible perennial plants that are resistant to drought.
- The selected plants should be able to thrive on low nutrient soil.
- **Municipal Waste Management-** The Municipal authorities take the following steps to manage wastes. They are-
  - (i) Collection of Municipal Solid Wastes
  - (ii) Storage of Municipal Solid Wastes
  - (iii) Transportation of Municipal Solid Wastes
  - (iv) Segregation of Municipal Solid Wastes
- **Composting** is a form of waste disposal where organic waste decomposes naturally under oxygen-rich conditions.
- A mixture of decayed or decaying organic matter used to fertile soil.
- Compost is usually made by plants such as leaves, grass, vegetable peels, etc. and allow it to decompose as a result of the action of aerobic bacteria, fungi and other organisms.
- **Advantages of Composting-**
  - (i) Composting is a highly nutrient rich fertilizer source that will reduce the amount of synthetic fertilizers used in the farming fields.
  - (ii) Compost decreases the erosion potentiality on the fields and enhances the structural ability of soil.
  - (iii) It prevents plant diseases and also from spread of pathogen diseases.

- (iv) The presence of microorganisms like bacteria, fungi, etc. aerate the soil which speeds up composting and convert nitrogen to a usable form.
- (v) Compost increases the water content and retention of sandy soil.
- (vi) It prevents pollution by preventing pollutants in storm water run-off from draining into water resources.
- (vii) Compost replenishes and revitalizes exhausted farm soils by replacing trace minerals and organic material.
- (viii) Composting is an effective way to reduce greenhouse gas emissions.

## Know the terms

- **Segregation of Waste:** It means to segregate the garbage various types of dustbins are used to separate glass, paper, cloth, metal, wet and dry food wastes, etc.
- **Dumping of Waste Disposal :** Waste materials are dumped in open pits and become the breeding ground for mosquitoes, flies, insects, etc.
- **Sanitary Landfill :** It is a system of disposing wastes is a biological method and is carried out with minimal environmental damage.
- **Composting :** It is a form of waste disposal where organic waste decomposes naturally under oxygen-rich conditions.

## Flowchart



### TOPIC-4

## Reduce-Reuse-Recycle Waste

## Quick Review

- The three R's- reduce, reuse and recycle help to cut down on the amount of waste and manages the waste in a constructive way.
- The R's are- Reducing the waste, Reusing the waste and Recycling the waste.
- The three R's are intended to classify waste management into three important factors relative to suitability in terms of waste reduction.
- The wastes can be **Reduced** by the Change of Process, Waste Concentration and Segregation of Waste.
- Wastes can be reduced by the process of changing the waste and non-useable materials into potentially useful materials.
- Reducing the amount of waste produced is the best way to help the environment.
- Buying products with minimum packaging, borrowing things which are not used often, starting a compost bin, saving energy and water by turning them off when not required are some ways of reducing wastes.

- By using scientific techniques such as precipitation and evaporation the amount of liquid waste can be reduced.
- Wastes are segregated by separating the hazardous waste from non-hazardous waste and then treating a small amount of hazardous waste.
- To reduce the environment damage caused by cars, increase use of carpooling with friends, walking, taking the bus or riding your bike instead of unnecessary driving.
- The wastes can be **reused** without discarding them or throwing away the articles.
- Many materials like glass, metal, plastics, cloths, paper, etc. that is used in our day to day life can be reused. E.g. cloth bags can be used instead of plastic bags by making bags out of old clothes, donating old clothes, toys and furnitures, etc.
- Old tyres and leathers are reused for making chappals, shoes, water bags, etc.
- Many artisans and artists reuse old materials to create beautiful home decors, decorating gardens with materials like tins, cans, bottles, broken crockery pieces, etc. e.g. Rock Garden created by Nek Chand in Chandigarh.
- Some solid wastes from the industry can be utilized directly, e.g. flyash from power plant is used as a substitute for cement, for making roads and filling up low lying areas.
- The process of changing the waste and non-usable materials into potentially useful materials is called **Recycling**.
- It is the key component of modern waste reduction procedure.
- Recycling reduces the consumption of raw materials and energy usage and also reduces air and water pollution.
- Bagasse, a by-product of sugarcane, is used for manufacturing paper pulp, for making packaging material of dairy products which helps in saving the cutting of trees which are normally used for making paper pulp.
- Plastic is non-biodegradable because the bonds of carbon in plastic are impossible to break down through a physical or chemical process.
- Waste plastic materials need to be incinerated, recycled or buried in landfills.
- The Environment Protection Act (1986) empowers the Central Government to coordinate actions of State Governments, plan and execute a nationwide programme for the prevention, control and abatement of environmental pollution.
- The Ministry of Environment and Forests of the Government of India is taking initiatives, measures and making policies to protect environment through various schemes.
- **The Government's environmental policy emphasizes on the following:**
  - (i) To check the degradation of land and water through Wasteland Management and Restoration of river water quality programmes.
  - (ii) To conserve and survey flora, fauna, forests and wildlife.
  - (iii) To prevent and control pollution, afforestation and regeneration of degraded areas and protection of environment.
  - (iv) To monitor the development, surveys, impact assessment, control of pollution, research to solve solutions, collection and dissemination of environmental information and environmental awareness is being utilized for the implementation of various policies.
  - (v) To make laws, regulations, acts for environment protection and other policy mechanisms concerning environmental issues.
- The government plays a major role in environmental protection.
- It is the government's duty to protect and conserve critical environmental resources, ensure judicious use and ensure equitable access to environmental resources, minimise adverse environmental impacts on society, etc.
- The National Environmental Engineering Research Institute (NEERI) in Nagpur, Central Pollution Control Board (CPCB) and Cleaner Technology Centre in New Delhi has applied cleaner technology concept for liquid waste management and gaseous and solid materials.
- Government alone is not responsible for protecting environment. Each and every individual citizen need to participate in preventing and protecting environmental crisis.
- Society plays an important role in Sustainable Environmental Management Processes.
- **Through the following ways, society can play an important role for maintaining environmental standards-**
  - (i) All individuals have to contribute substantially and take it as a responsibility to protect the environment from pollution.
  - (ii) The people together can organise themselves and take initiative in making the responsible agencies take actions if the air and water resources are unfit and do not meet the required standards.
  - (iii) Groups of individuals together can educate people by creating awareness about environmental protection.
  - (iv) The group housing societies can initiate steps for waste management by making provisions for segregating wastes and by making composting pits.



- (v) Group of individuals can reduce the environment damage caused by cars by increasing the use of carpooling with friends, walking or taking the bus.
- (vi) Housing societies can make provisions for rain water harvesting to conserve rain water.
- Like society, individuals also play an important role in protecting environment.
- It is the responsibility of each individual to protect the earth and provide conducive environment for itself and several other species that evolves on the earth.
- **Each individual should take the following steps for environmental protection-**
  - (i) Each individual should carry cloth bag or paper bag instead of polythene bags.
  - (ii) Should use eco-friendly products.
  - (iii) Should avoid the use of chlorofluorocarbons (CFCs) as they destroy the ozone layer.
  - (iv) Instead of CFCs, chemicals derived from peaches and plums can be used to clean the computer chips and circuit boards.
  - (v) Use CFC free refrigerators.
  - (vi) Should save electricity by switching off as and when not required.
  - (vii) Use of renewable energy resources should be adopted, e.g. solar energy cooker.
  - (viii) Must use rechargeable batteries which will help to reduce metal pollution.
  - (ix) Use of mass transport system.
  - (x) Should reduce, reuse and recycle the wastes whenever possible.
  - (xi) Use biodegradable dish washing liquid, laundry detergent and shampoo.
  - (xii) Use of organic manure should be encouraged instead of synthetic fertilizers.
  - (xiii) Each individual should take a vow to plant trees as much as possible which can help to purify the atmosphere.
  - (xiv) Should initiate paperless system by encouraging the use of computer storage system and should go for recycle used paper.

## Know the terms

- **Waste Concentration:** By using scientific techniques such as precipitation and evaporation the amount of liquid waste can be reduced.
- **Recycling:** It is the process of changing the waste and non-usable materials into potentially useful materials.
- **Bagasse :** It is a by-product of sugarcane, is used for manufacturing paper pulp, for making packaging material of dairy products.
- **Wasteland Management :** Degraded land which can be brought under vegetative cover with reasonable effort and which is currently underutilized.

## Flowchart

