

LEARNSEA

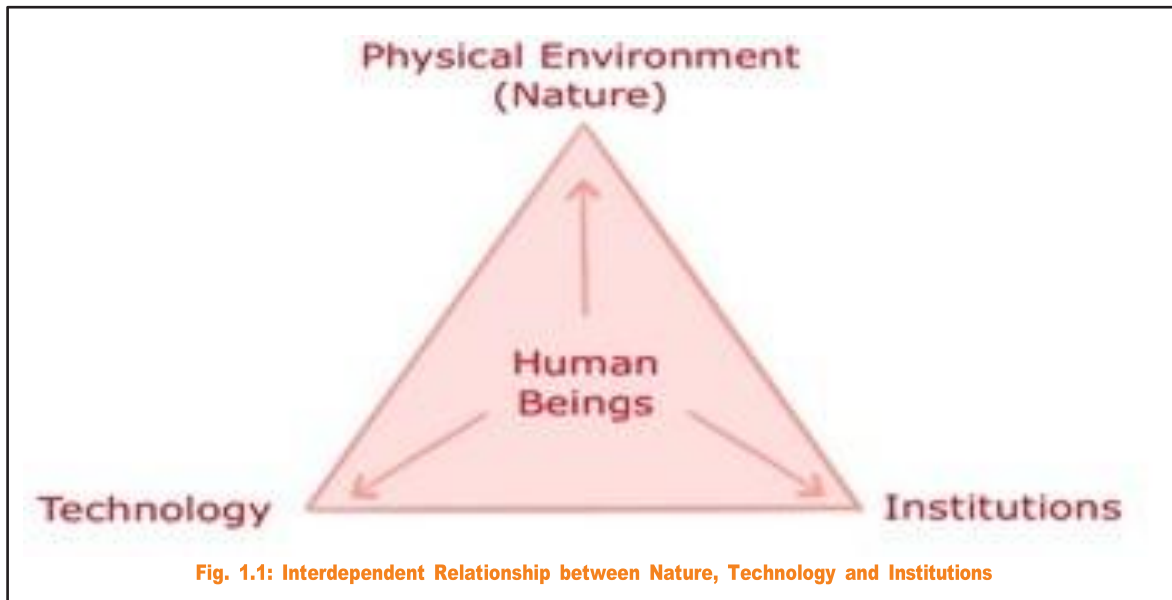
NCERT NOTES FOR GEOGRAPHY

10th Standard

CONTENTS

Resources and Development	1 - 9
Forest and Wildlife Resources	10 - 12
Water Resources	13 - 15
Agriculture	16 - 23
Minerals and Energy Resources.....	24 - 35
Manufacturing Industries	36 - 47
Lifelines of National Economy	48 - 55

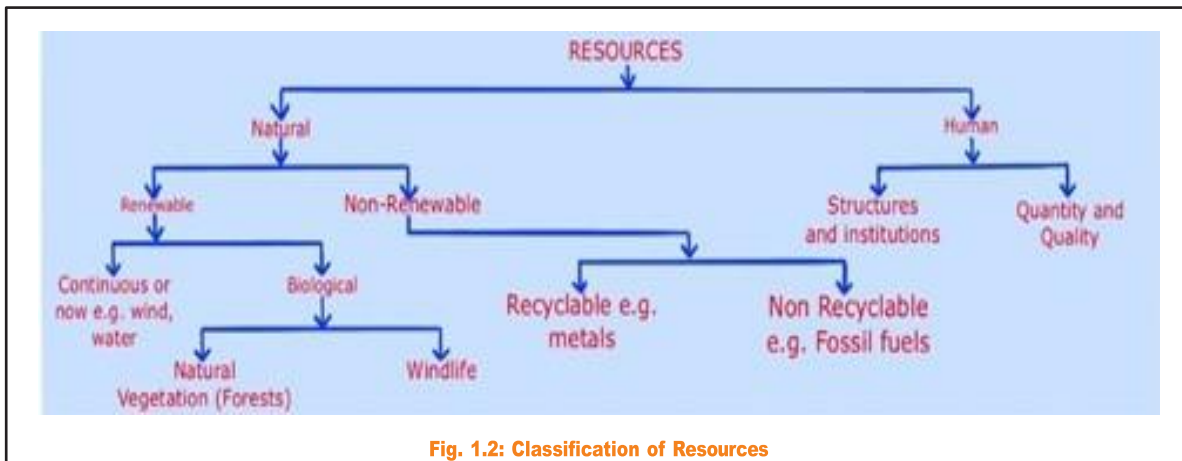
Resources are everything available in the environment which can be used to satisfy human needs provided, it is technologically accessible, economically feasible and culturally acceptable. Human beings interact with nature through technology and create institutions to accelerate their economic development.



Resources are a function of human activities. Human beings themselves are essential components of resources. They transform material available in our environment into resources and use them.

Classification of Resources:

- **On the basis of Origin** – biotic and abiotic.
- **On the basis of Exhaustibility** – renewable and non-renewable.
- **On the basis of Ownership** – individual, community, national and international.
- **On the basis of Status of Development** – potential, developed stock and reserves.



Types of Resources

On the basis of Origin:

- **Biotic Resources:** These resources are obtained from biosphere and **have life** such as human beings, flora and fauna, fisheries, livestock etc.
- **Abiotic resources:** These are things which are composed of **non-living things** such as rocks and metals.

On the basis of Exhaustibility:

- **Renewable (or Replenishable) Resources:** These are resources which can be **renewed** or **reproduced** by physical, chemical or mechanical processes. For example – solar, wind energy, water, etc. They may further be divided into continuous or flow.
- **Non-Renewable Resources:** These occur over a very long geological time. For example – Minerals, fossil fuels etc. Some of them like metals are recyclable and some like fossil fuels cannot be recycled.

On the basis of Ownership:

- **Individual Resources:** These are also **owned privately** by individual. Such as Plantation, pasture lands, ponds, water in wells etc.
- **Community Owned Resources:** These are resources that are **accessible to all** the members of the community. For example - Village commons (grazing grounds, village ponds etc.).
- **National Resources:** Technically, all the resources belong to the nation. All the minerals, water resources, forests, land within the political boundaries and oceanic area up to **12 nautical miles (22.2 km)** from the coast termed as territorial water and resources therein belong to the nation.
- **International Resources:** The oceanic resources beyond 200 nautical miles of the Exclusive Economic Zone belong to open ocean and no individual country can utilise these without the concurrence of international institutions. **(ISBA, UNCLOS).**

On the basis of the Status of Development:

- **Potential Resources:** These are those resources which are **found** in a region but they have **not been utilised**. For example - The Western parts of India have not developed the wind and solar energy properly despite having enormous potential.
- **Developed Resources:** These are resources which are surveyed and their **quality and quantity** have been **determined** for **utilisation**. Their development depends on technology and level of their feasibility.
- **Stock:** They are the materials in the environment which have the potential to satisfy human needs but human beings do not have the appropriate technology to access these. For example, Human beings do not have the advanced technology to utilize hydrogen from water as a source of energy.
 - **Reserves:** They are the **subset of the stock** which can be put into use with the help of existing technical 'know-how' but their use has not been started. For example, River water can be used for generating hydroelectric power but it is being utilised only to a limited extent.

Development of Resource:

Resources are vital for human survival as well as for maintaining the quality of life. Human beings considered resources are free gift which resulted into indiscriminate use of the resources.

- **Depletion of resources** for satisfying the greed of a few individuals.
- **Accumulation of resources** in few hands which divided the society into two segments i.e. haves and have nots or rich and poor.
- **Indiscriminate exploitation** of resources has led to **global ecological crises** such as, global warming, ozone layer depletion, environmental pollution and land degradation.

Resource Planning:

Resource planning is essential for sustainable existence of all forms of life. Sustainable existence is a component of sustainable development.

- Planning is the widely accepted strategy for **judicious use** of resources. It has importance in a country like India, which has enormous diversity in the availability of resources.
- There are some regions which can be considered self-sufficient in terms of the availability of resources and there are some regions which have acute shortage of some vital resources.
- For example - The state of Rajasthan is very well endowed with solar and wind energy but lacks in water resources.
- A balanced resource planning at national, state, regional and local level is necessary.

Resource Planning in India:

- Resource Planning is a complex process which involves:
 - **Identification and Inventory of resources:** Across the regions of the country. It involves surveying, mapping and qualitative and quantitative estimation and measurement of the resources.
 - **Evolving a Planning Structure:** It is endowed with appropriate technology, skill and institutional set up for implementing resource development plans.
 - **Matching the resource development** plans with overall **national development** plans.
- India has been working for resources planning since **first five-year plan**.
- Resources can contribute to development only when they are accompanied by appropriate technological development and institutional changes.
- In India, development, in general, and resource development in particular does not only involve the availability of resources, but also the technology, quality of human resources and the historical experiences of the people.

Conservation of Resources:

Then irrational consumption and over-utilisation of resources may lead to socio-economic and environmental problems. To overcome this problems resource conservation at various level is important.

Land Resources:

- Land is natural resource of utmost importance and supports natural vegetation, wild life, human life, economic activities, and transport and communication systems.
- In India **43 per cent** of the land area is **plain**, 30 per cent Mountains and about **27 per cent** of the area of the country is the plateau region.

Land Use Pattern:

It is determined by:

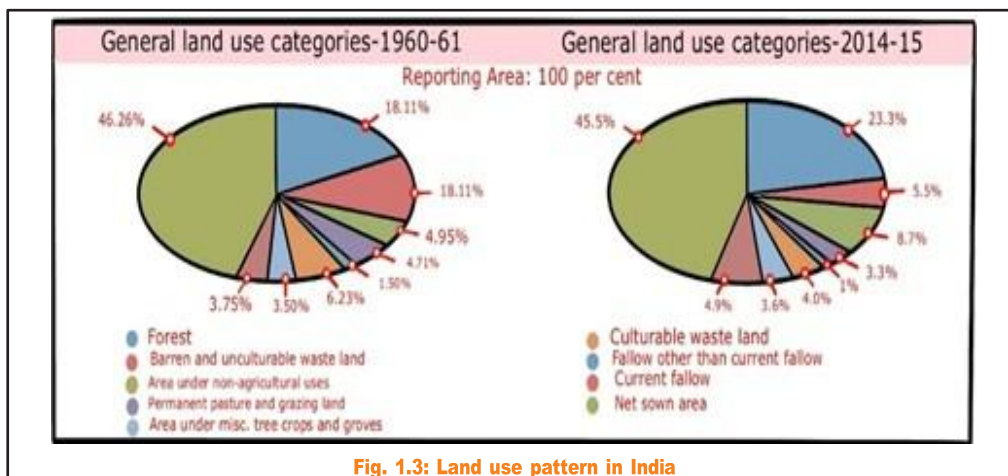
- **Physical factors:** Physical factors like topography, climate, soil types.
- **Human factors:** It includes population density, technological capability and culture and traditions etc.

Categories of Land use pattern:

- **Forests**
- **Land not available for Cultivation:**
 - Barren and waste land.
 - Land put to non-agricultural uses, e.g. buildings, roads, factories, etc.
- **Other Uncultivated land (excluding fallow land):**
 - Permanent pastures and grazing land.
 - Land under miscellaneous tree crops groves (not included in net sown area).
 - Cultural waste land (left uncultivated for more than 5 agricultural years).
- **Fallow Lands:** Fallow land includes,
 - **Current fallow**-(left without cultivation **for one or less** than **one agricultural year**).
 - Other than current fallow-(left uncultivated for the past 1 to 5 agricultural years).
- **Net Sown area:** The area sown more than once in an agricultural year is called net sown area and it is also known as **gross cropped area**.

Land Use Pattern in India:

- **Variation of Net Sown Area in states:** It is over 80 per cent of the total area in Punjab and Haryana and less than 10 per cent in Arunachal Pradesh, Mizoram, Manipur and Andaman Nicobar Islands.
- **Forest Area:** It is far lower than the desired **33 per cent of geographical area** as outlined in the National Forest Policy (1952).
- **Waste Land:** It includes rocky, arid and desert areas and land put to other non-agricultural uses includes settlements, roads, railways, industry etc.
- **Land Conservation:** Continuous use of land over a long period of time without taking appropriate measures to conserve and manage it has resulted in land degradation.

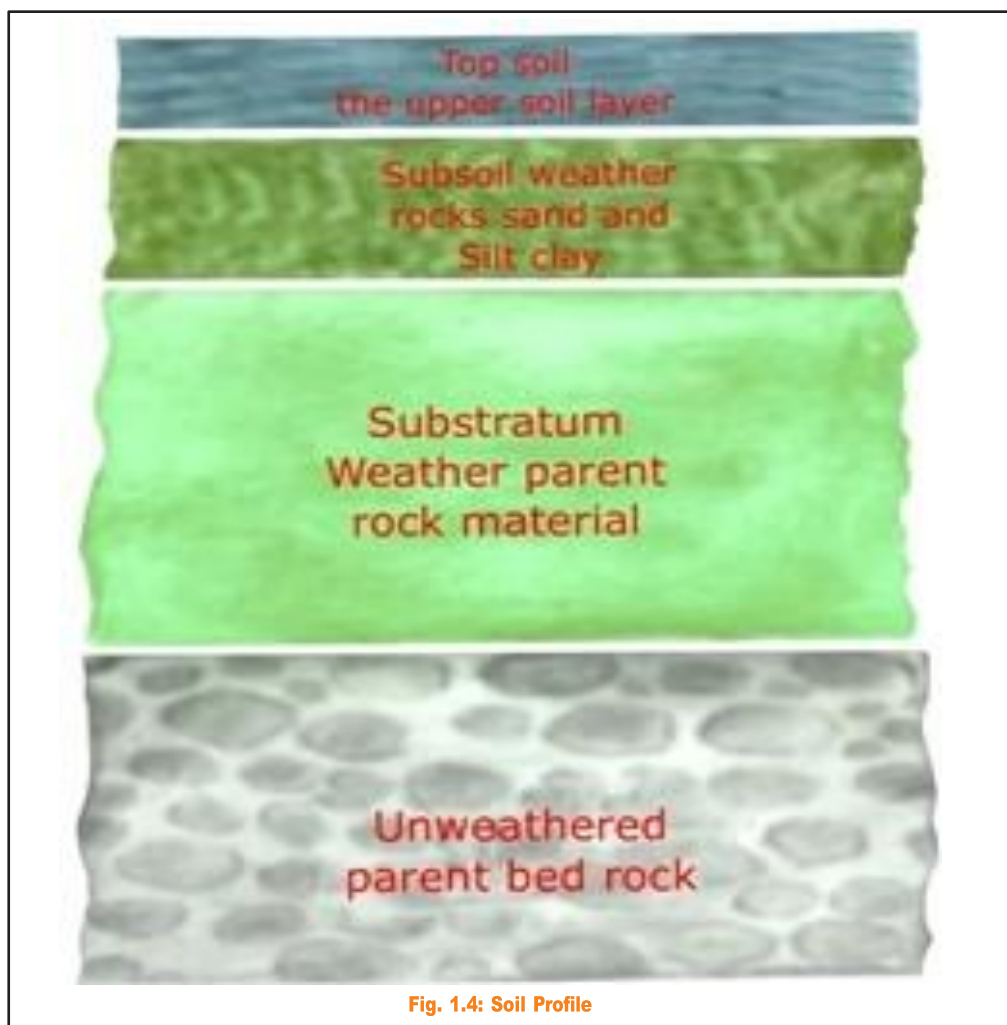


Land Degradation and Conservation Measures:

- **Land Degradation:** It is caused by the Mining, over grazing, over irrigation, water logging, formation of dust which prevents infiltration of water, etc.
- **Conservation of Land Degradation:** Some of the ways are - Afforestation and proper management of grazing, Planting of shelter belts of plants, control on over grazing and stabilisation of sand dunes by growing thorny bushes etc.

Soil as a Resource:

Soil is the most important **renewable natural resource** and is a living system. The important factors in its formation are Relief, parent rock or bed rock, climate, vegetation and other forms of life and time. It also consists of organic (humus) and inorganic materials.



Classification

of

Soils:

The soils in India are classified into different types on the basis of the factors responsible for soil formation, colour, thickness, texture, age, chemical and physical properties.

Alluvial Soils:

- **Source:** These have been deposited by three important **Himalayan river systems** – the Indus, the Ganga and the Brahmaputra.
- **Regions:** It covers entire northern plains, extended through narrow corridor into Gujarat and Rajasthan, eastern coastal plain particular in deltas of the Mahanadi, the Godavari, etc.
- It consists of various proportions of **sand, silt and clay**. The inland soil near the river valley appears bigger in size and in upper reaches of the river valley, near the place of break of slope, soil are coarse as found in piedmont plains such as **Duars, Chos and Terai**
- **Classification based on age:** These can be classified as **old alluvial (Bangar) and new alluvial (Khadar)**. The **bangar** soil has higher concentration of **kanker** nodules than the Khadar. The khadar has more fine particles and is more fertile than the bangar.
- **Chemical components:** Potash, phosphoric acid and lime.
- **Important crops:** Sugarcane, paddy, wheat and other cereal and pulse crops.
- Soils in the drier areas are more alkaline.

Black Soil:

- These soils are black in colour and are also known as **regur soils**. It is ideal for growing cotton and is also known as **black cotton soil**. It is made up of lava flows.
- The most important factors for its development are climatic conditions and parent rocks.
- It is made up of extremely fine i.e. clayey material. They are rich in **soil nutrients**, such as calcium carbonate, magnesium, potash and lime and poor in phosphoric contents.
- **Regions:** It cover the plateaus of Maharashtra, Saurashtra, Malwa, Madhya Pradesh etc. and extend in the south east direction along the Godavari and the Krishna valleys.
- They are well-known for **capacity to hold water**. It is **sticky when wet** and difficult to work on unless tilled immediately after the first shower or during the pre-monsoon period.

Red and Yellow Soils:

- Red soil develops on **crystalline igneous rocks** in areas of low rainfall in the eastern and southern parts of the Deccan plateau.
- These soils develop a **reddish colour** due to **diffusion of iron** in crystalline and metamorphic rocks. It looks **yellow** when it occurs in a **hydrated form**.
- **Regions:** They are found in parts of Odisha, Chhattisgarh, southern parts of the middle Ganga plain and along the piedmont zone of the Western Ghats.

Laterite Soil:

- Laterite has been derived from the Latin word 'later' which means **brick**.
- It develops under **tropical and subtropical climate** with alternate wet and dry season and result of **intense leaching** due to heavy rain. It is mostly deep to very deep acidic.
- They are **lacking in plant nutrients**.

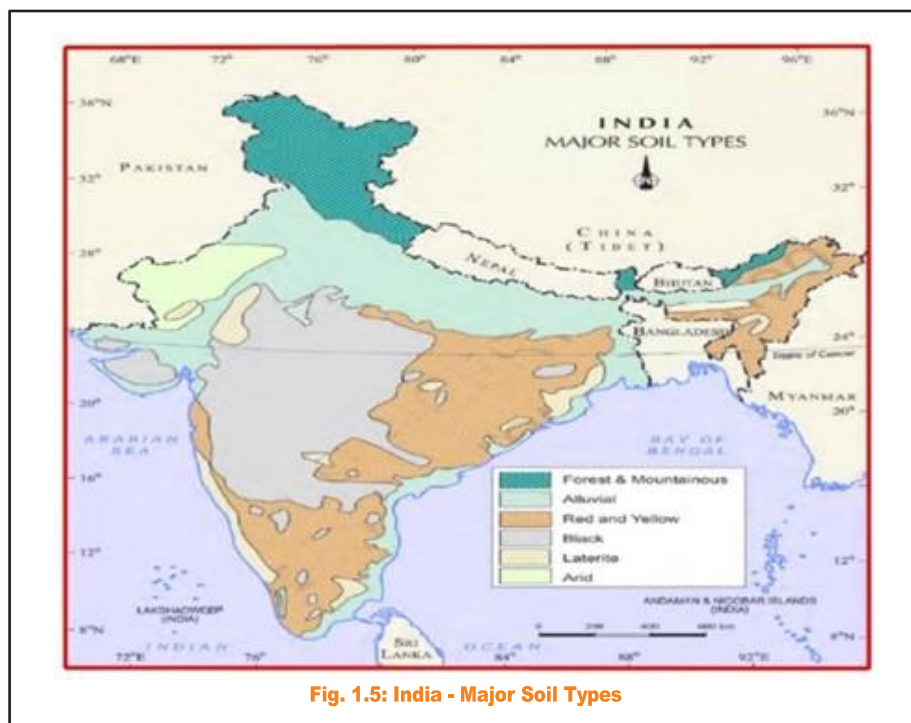
- **Presence of Humus:** It is humus rich where it support deciduous and evergreen forests whereas it humus poor when under sparse vegetation and in semi-arid environment.
- **Areas:** They are found in southern states, Western Ghats region of Maharashtra, Odisha, some parts of West Bengal and North-east regions.
- This soil is very useful for **growing tea and coffee**. Red laterite soils in Tamil Nadu, Andhra Pradesh and Kerala are more suitable for crops like **cashew nut**.

Arid Soils:

- Arid soils range from red to brown in colour and are generally **sandy in texture** and **saline in nature** and sometime salts can be obtained from it. **Soil lacks in humus and moisture.**
- **Lacks humus and moisture:** Due to the dry climate, high temperature, evaporation is faster.
- The lower horizons of the soil are occupied by Kankar because of the increasing calcium content downwards. Kankar formation prevents water infiltration.
- With proper irrigation this soil can be used for cultivation.

Forest Soil:

- These soils are found in the hilly and mountainous areas where sufficient rain forests are available.
- They are **loamy and silty** in **valley sides** and **coarse grained** in the **upper slopes**.
- In the snow covered areas of Himalayas, these soils experience denudation and are acidic with low humus content.
- The soils found in the lower parts of the valleys particularly on the river terraces and alluvial fans are fertile.



Soil Erosion and Soil Conservation:

Soil Erosion: It is the denudation of the soil cover and subsequent washing down. The processes of soil formation and erosion go on simultaneously and generally there is a balance between the two.

Reasons for Soil Erosion:

- **Natural Reasons:** It includes natural forces like wind, glacier and water. The running water cuts through the clayey soils and makes deep channels called as **gullies**, due to gullies the land becomes **unfit for cultivation** and is known as **bad land**. In the Chambal basin such lands are called **ravines**.
- **Human Reasons:** Deforestation, over-grazing, construction and mining etc.

Various Types of Soil Erosion:

- **Sheet Erosion:** Sometimes water flows as a sheet over large areas down a slope which wash away the top soil.
- **Wind Erosion:** Wind blows loose soil off flat or sloping land.
- Soil erosion is also caused due to **defective methods of farming**. Like- Wrong ploughing.

Measures to Reduce Soil Erosion:

- **Contour Ploughing:** Ploughing along the contour lines which decelerate the flow of water down the slopes.
- **Terrace Cultivation:** Steps can be cut out on the slopes making terraces.
- **Strip Cropping:** Strips of grass are left to grow between the crops which breaks up the force of the wind.
- **Shelter Belt:** Rows of trees planted in lines to create shelter.



Interesting points

- “There is enough for everybody's need and not for any body's greed.” – **Gandhiji**.
- In India, Land use data is available only for 93 per cent of the total geographical area because:
 - The land use reporting for most of the north-east states except Assam has not been done fully.
 - Moreover, some areas of Jammu and Kashmir occupied by Pakistan and China have also not been surveyed.
- India has got the right to mine manganese nodules from the bed of the Indian Ocean from that area which lies beyond the exclusive economic zone (EEZ).
- **Sustainable development:** Sustainable economic development means 'development should take place without damaging the environment, and development in the present should not compromise with the needs of the future generations.'
- At the international level, **the Club of Rome** advocated resource conservation for the first time in a more systematic way in 1968. **Gandhian philosophy** was presented by Schumacher in his book **Small is Beautiful**.

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- **Brundtland Commission Report, 1987:** This report introduced the **concept of 'Sustainable Development'** and advocated it as a means for resource conservation, which was subsequently published in a book entitled **Our Common Future**.
 - **Rio de Janeiro Earth Summit, 1992:**
 - It was the first International Earth Summit which was convened for addressing urgent problems of environmental protection and socioeconomic development at the global level.
 - The assembled leaders signed the Declaration on Global Climatic Change and Biological Diversity.
 - The Rio Convention **endorsed** the global Forest Principles and adopted **Agenda 21** for achieving Sustainable Development in the 21st century.
 - **Agenda 21:** It is the declaration signed by world leaders in 1992 at the United Nations Conference on Environment and Development (UNCED), which took place at Rio de Janeiro, Brazil. It aims at achieving global sustainable development.

2 FOREST AND WILDLIFE RESOURCES

Humans along with all living organisms form a complex web of ecological system. Forests play a key role in the ecological system as these are also the primary producers on which all other living beings depend. India is one of the world's richest countries in terms of its biological diversity.

Flora and Fauna in India:

- It is estimated that at least 10 per cent of India's recorded wild flora and 20 per cent of its mammals are on the threatened list.
- Many of these have been categorised as '**critical**' and are on the verge of extinction, such as:
 - **Animals:** Cheetah, pink-headed duck, mountain quail, forest spotted owlet, and
 - **Plants:** madhuca insignis (a wild variety of mahua) and hubbardia heptaneuron, (a species of grass).

Different categories of plants and animal species:

The following classification is done based on the International Union for Conservation of Nature and Natural Resources (**IUCN**):

- **Normal Species:** Species whose population levels are considered to be **normal** for their survival, such as cattle, sal, pine, rodents, etc.
- **Endangered Species:** These are species which are in **danger of extinction**. For example - Asian lion, Bengal tiger etc.
- **Vulnerable Species:** These are species whose population has **declined** to levels from where it is likely to move into the endangered category in the near future.
- **Rare Species:** Species with **small population** may move into the endangered or vulnerable category if the negative factors affecting them continue to operate. For example - Himalayan brown bear, wild Asiatic buffalo, desert fox and hornbill, etc.
- **Endemic Species:** These are species which are **only found** in some particular areas usually isolated by natural or geographical barriers. For examples - the Andaman teal, Nicobar pigeon, Andaman wild pig, mithun in Arunachal Pradesh.
- **Extinct Species:** These species are not found after searches of known or likely areas where they may occur. A species may be extinct from a local area, region, country, continent or the entire earth. Examples of such species are the Asiatic cheetah, pink head duck.

Reasons for Depletion of Flora and Fauna:

- Habitat destruction, hunting, poaching, over-exploitation, environmental pollution, poisoning and forest fires are factors.
- Other causes of environmental destruction are unequal access, inequitable consumption of resources and differential sharing of responsibility for environmental well-being.

Socio-Cultural Impact of Loss of Forest:

The biological loss is strongly correlated with the loss of cultural diversity.

- Such losses have increasingly marginalised and impoverished many indigenous and other forest-dependent communities.

- Forest communities directly depend on various components of the forest and wildlife for food, drink, medicine, culture, spirituality, etc.

• **Conservation of Forest and Wildlife in India**

Conservation preserves the ecological diversity and our life support systems – water, air and soil. It also preserves the genetic diversity of plants and animals for better growth of species and breeding.

Steps Taken to Protect and Conserve Wildlife

- **Wildlife (Protection) Act 1972:** It has various provisions for protecting habitats. An all India list of protected species was also published. The thrust of the programme was towards protecting the remaining population of certain endangered species by banning hunting, giving legal protection to their habitats, and restricting trade in wildlife.
- The central government also announced several projects for protecting specific animals, which were gravely threatened, including the tiger, the one-horned rhinoceros, etc.
- The plants were also added to the list for the first time in 1991.

Types and Distribution of Forest and Wildlife Resources

In India, much of its forest and wildlife resources are either owned or managed by the government through the Forest Department or other government departments. These are classified under the following categories:

- **Reserved Forest:** These are regarded as the **most valuable** as far as the conservation of forest and wildlife resources are concerned. It covers **more than half** of the total forest land.
- **Protected Forests:** It covers almost **one-third** of the total forest area and as declared by the Forest Department. This forest land are protected from any further depletion.
- **Unclassed Forests:** These are other forests and wastelands belonging to both government and private individuals and communities.

Reserved and Protected Forests are also referred to as **permanent forest estates** maintained for the purpose of producing timber and other forest produce, and for protective reasons. The largest area under permanent forests is in **Madhya Pradesh**.

Community and Conservation

Conservation strategies are not new in India and forests are also home to some of the traditional communities. In some areas of India, local communities are struggling to conserve these habitats along with government officials, recognising that only this will secure their own long-term livelihood.

- The famous Chipko movement in the Himalayas has not only successfully resisted deforestation in several areas but has also shown that community afforestation with indigenous species can be enormously successful.
- Farmers and citizen's groups like the **Beej Bachao Andolan** in **Tehri** and Navdanya have shown that adequate levels of diversified crop production without the use of synthetic chemicals are possible and economically viable.

- **Joint Forest Management (JFM) programme:** It furnishes a good example for involving local communities in the management and restoration of degraded forests. (**Odisha passed the first resolution** for joint forest management). It depends on local institutions which took forestation drive on degraded land, mostly controlled by forest department.
- **Sacred Grooves:** Nature worship is an age old tribal belief based on the premise that all creations of nature have to be protected. Such beliefs have preserved several **virgin forests in pristine form** called Sacred Groves (the forests of God and Goddesses).



Interesting points

- **Biodiversity or Biological Diversity:** It is immensely rich in wildlife and cultivated species, diverse in form and function but closely integrated in a system through multiple network of interdependencies.
- **Asian cheetah:** It is world's fastest land mammal and is nearly extinct due to a decline of available habitat and prey. The species was declared extinct in India long back in 1952.
- The **Buxa Tiger Reserve** is in **West Bengal**.
- **Enrichment Plantation:** In this single commercially valuable species is extensively planted and other species are eliminated. For instance, teak monoculture has damaged the natural forest in South India and Chir Pine plantations in the Himalayas have replaced the Himalayan oak and Rhododendron forests.
- **The Himalayan Yew (Taxus wallachiana):** This is a **medicinal plant** found in various parts of Himachal Pradesh and Arunachal Pradesh. A chemical compound called '**taxol**' is extracted from the bark, needles, twigs and roots of this tree, and it has been successfully used to treat some cancers – the drug is now the biggest selling anti-cancer drug in the world.
- **“Project Tiger”:** It is one of the well-publicised wildlife campaigns for saving tigers and was launched in **1973**.

3

WATER RESOURCES

The **three fourth** surface of the earth is covered with water but only small proportion of it accounts for fresh water that can be put to use. This freshwater is mainly obtained from surface run off and ground water that is continually being renewed and recharged through hydrological cycle.

Water

Scarcity:

Water scarcity refers to less availability of water for fulfilling human and environment needs.

Quantitative Aspects of Water Scarcity:

- The water availability varies over space and time due to the variations in seasonal and annual precipitation. For example - drought are common in Rajasthan.
- Mostly water scarcity is caused by over-exploitation, excessive use and unequal access to water among different social groups.
- **Growing Population:** It leads to greater domestic demands for food grains. Irrigation requires lot of water and infact agriculture is biggest consumer of water.
- **Falling Groundwater Level:** Irrigation is one of the main reason behind it. Falling groundwater levels may adversely affect water availability and food security of the people.
- **Increasing Urbanisation and Industrialisation:** It increased water demand manifold as multiplying urban centres with large and dense populations and urban lifestyles have not only added to water and energy requirements but have further aggravated the problem.

Qualitative Aspects of Water Scarcity:

- The quality of the water is decreasing due to the **pollution** by domestic waste, industrial wastes, chemicals, fertilisers used in agriculture which makes it hazardous for human use.
- India's major rivers are highly polluted like Yamuna and Ganga which makes them unfit for human consumption.

Water Conservation and Management

Multi-Purpose River Projects and Rainwater harvesting are some major techniques of Water Conservation and Management.

Multi-Purpose River Projects:

- In ancient times construction of structures like dams built of stone rubble, reservoirs or lakes, embankments and canals for irrigation were built.
- **Considered Vehicle of Development:** They has been constructed since independence for conservation and **integrated water management**.
- They are meant for irrigation, electricity generation, water supply for domestic and industrial uses, flood control, recreation, inland navigation and fish breeding.
- **Example of Multi-Purpose Rivers:** The **Bhakra – Nangal** in the **Sutluj-Beas river basin** and the **Hirakud project** in the **Mahanadi basin**.

Issues with Large Dams and Multi-Purpose Projects:

- The regulating and damming of rivers affect their **natural flow** causing poor sediment flow and

excessive sedimentation at the bottom of the reservoir, resulting in rockier stream beds and poorer habitats for the rivers' aquatic life.

- Sedimentation also meant that the flood plains were **deprived of silt**, a natural fertiliser which adds to the problem of land degradation.
- Dams fragment rivers which makes it difficult for aquatic fauna to migrate.
- The reservoirs that are created on the floodplains also submerge the existing vegetation and soil leading to its decomposition over a period of time.
- **Large-Scale Displacement of Local Communities:** It led to various environment movements like 'Narmada Bachao andolan', Tehri dam Andolan.
- Irrigation has also **changed the cropping pattern** of many regions with farmers shifting to water intensive and commercial crops. It led to ecological consequences like salinisation of the soil.
- **Increased Social Inequality:** Irrigation has also increased the social gap between the richer landowners and the landless poor.
- **Inter-State Water Disputes:** They are also becoming common with regard to sharing the costs and benefits of the multi-purpose project.
- The dams that have triggered floods due to sedimentation in the reservoir. Also, the big dams have mostly been unsuccessful in controlling floods at the time of excessive rainfall.
- They also induced earthquakes, caused water-borne diseases and pests and pollution resulting from excessive use of water.



Fig. 3.1: India- Major Rivers and Dams

Rainwater Harvesting:

It is a viable alternative, both socio-economically and environmentally.

- In ancient India people had developed wide ranging techniques to harvest rainwater, groundwater, river water and flood water in keeping with the local ecological conditions and water needs.
- **In Hill and Mountainous Regions:** People built diversion channels like the '**guls**' or '**kuls**' of the Western Himalayas for agriculture.
- **Rooftop Rainwater Harvesting':** It was commonly practised to store drinking water, particularly in Rajasthan.
- **In the Flood Plains of Bengal:** People developed **inundation channels** to irrigate their fields.
- **In Arid and Semi-Arid Regions:** Agricultural fields were converted into rain fed storage structures that allowed the water to stand and moisten the soil like the '**khadins**' in **Jaisalmer** and '**Johads**' and traditional underground water storage like tankas in Rajasthan. **Rainwater**, or **palar pani**, as commonly known in these parts is considered the purest form of natural water.



Interesting points

- **Some Important Water Conservation Techniques in Ancient India:**
 - In the **first century B.C.**, **Sringaverapura near Allahabad** had sophisticated water harvesting system channelling the flood water of the river Ganga.
 - In the **14th Century**, the **tank in Hauz Khas**, Delhi was constructed by **Iltutmish** for supplying water to **Siri Fort area**.
- **Sardar Sarovar Dam:** It has been built over the **Narmada River** in **Gujarat**. It covers **four states**—Maharashtra, Madhya Pradesh, Gujarat and Rajasthan.
- **Narmada Bachao Andolan or Save Narmada Movement:** It is a Non Governmental Organisation (NGO) that mobilised tribal people, farmers, environmentalists and human rights activists against the Sardar Sarovar Dam.
- **Krishna-Godavari Dispute:** It is due to the objections raised by **Karnataka and Andhra Pradesh** governments. It is regarding the diversion of more water at Koyna by the Maharashtra government for a multipurpose project.
- **Jawaharlal Nehru** proudly proclaimed the **dams** as the '**temples of modern India**'.

4

AGRICULTURE

Agriculture is a primary activity which produces food grains, raw material for various industries etc. Two-thirds of India's population is engaged in agricultural activities.

Types of Farming:

Over the years, cultivation methods have changed significantly depending upon the characteristics of physical environment, technological know-how and socio-cultural practices. At present, in different parts of India, the following farming systems are practised:

Primitive Subsistence Farming:

- Primitive subsistence agriculture is practised on **small patches of land** with the help of **primitive tools** like hoe, dao and digging sticks, and family or community labour.
- It depends upon monsoon, natural fertility of the soil and suitability of other environmental conditions to the crops grown.
- **Slash and Burn' Agriculture:** Farmers clear a patch of land and produce cereals and other food crops to sustain their family. The shifting allows nature to **replenish the fertility** of the soil through natural processes. Here the **land productivity** is **low** as the farmer does not use fertilisers or other modern inputs.
- **Different Names of Primitive Subsistence Farming**

In India	In World
• Bewar or Dahiya: Madhya Pradesh • Podu or Penda: Andhra Pradesh • Pama Dabi or Koman or Bringa: Odisha • Kumari: Western Ghats • Valre or Waltre: South-eastern Rajasthan • Khil: Himalayan belt • Kuruwa: Jharkhand • Jhumming: North-eastern states namely Assam, Meghalaya, Mizoram and Nagaland • Pamlou: Manipur • Dipa: Bastar (Chhattishgarh), Andaman and Nicobar Islands	• Milpa: Mexico and Central America • Conuco: Venezuela • Roca: Brazil • Masole: Central Africa • Ladang: Indonesia • Ray: Vietnam

Intensive Subsistence Farming:

- This type of farming is practised in areas of **high population pressure** on land.
- It is **labour-intensive farming** where high doses of biochemical inputs and irrigation are used for obtaining higher production.

Issues in Indian Farming: Right to inheritance leads to **division of land** among successive generations has rendered land-holding size uneconomical. Farmers are continuously taking increased output from limited land resources which is leading to **increased pressure** on land.

Commercial Farming:

- The main characteristic of this type of farming is the use of **higher doses of modern inputs**, e.g., high yielding variety (HYV) seeds, chemical fertilisers, insecticides and pesticides in order to obtain **higher productivity**.
- The degree of commercialisation of agriculture varies from one region to another. For example – Rice is a commercial crop in Haryana and Punjab whereas it is a subsistence crop in Odisha.
- **Plantation:** It is one type of commercial agriculture, in this type of farming, a single crop is grown on a large area. The plantation has an **interface** of agriculture and industry. Some of the features of Plantation are:
 - Plantations cover large tracts of land, using capital intensive inputs, with the help of migrant labourers. All the produce is used as raw material in respective industries.
 - In India, tea, coffee, rubber, sugarcane, banana, etc., are important plantation crops. **Tea in Assam** and **North Bengal** and **coffee in Karnataka** and **Bamboo in north eastern states**.
 - **Production is mainly for market:** A well-developed network of transport and communication connecting the plantation areas, processing industries and markets plays an important role in the development of plantations.

Cropping Pattern

- The physical diversities and plurality of cultures in India are reflected in agricultural practices and cropping patterns in India.
- Various types of food and fibre crops, vegetables and fruits, spices and condiments, etc. constitute some of the important crops grown in India.
- India has **three Cropping Seasons — Rabi, Kharif and Zaid**.

Rabi Season:

- Rabi crops are **sown in winter** from October to December and **harvested in summer** from April to June.
- **Important Crops:**
 - **Cereals:** Wheat and barley.
 - **Pulses:** Peas and gram.
 - **Oil seeds:** Mustard.
- **Major producing states:** States from the north and north-western parts such as Punjab, Haryana, Himachal Pradesh, Jammu and Kashmir, Uttarakhand and Uttar Pradesh.
- The western temperate cyclone, also called **western disturbances**, helps in to grow these crops in these states as it brings rainfall.
- The Green revolution in Punjab, Haryana, western Uttar Pradesh and parts of Rajasthan has also been an important factor in the growth of the abovementioned rabi crops.

Kharif Crops:

- kharif crops are **grown** with the **onset of monsoon** in different parts of the country and these are **harvested** in **September-October**.
- **Important Crops:**
 - **Cereals:** Paddy, maize, jowar, bajra.
 - **Pulses:** Tur (arhar), moong, urad.
 - **Fibre crops:** Cotton and jute.
 - **Oil seeds:** Groundnut and soyabean.
- **Important Rice Growing Regions:** Assam, West Bengal, coastal regions of Odisha, Andhra Pradesh, Telangana, Tamil Nadu, Kerala and Maharashtra.
- In states like Assam, West Bengal and Odisha, three crops of paddy are grown in a year and varieties are called **Aus, Aman and Boro**.

Zaid Season:

- Zaid season is the short season during the summer season between the rabi and the kharif seasons.
- **Important Crops:** Watermelon, muskmelon, cucumber, vegetables and fodder crops. Sugarcane takes almost a year to grow.

Major Crops

- A variety of food and non food crops are grown in India which depends upon the variations in soil, climate and cultivation practices.
- Major crops grown in India are rice, wheat, millets, pulses, tea, coffee, sugarcane, oil seeds, cotton and jute, etc.

Rice:

- It is the staple food crop of a majority of the people in India. **India** is the **second largest producer** of rice in the world after China.
- **Necessary Conditions:** It is a **kharif crop** which **requires high temperature**, (above 25°C) and **high humidity** with annual rainfall above 100 cm.
- **Major Producing States:** It is grown in the **plains of north and north-eastern India**, coastal areas and the deltaic regions.
- Development of dense network of canal irrigation and tubewells have made it possible to grow rice in areas of less rainfall such as Punjab, Haryana and western Uttar Pradesh and parts of Rajasthan.

Wheat:

- Wheat is the second most important cereal crop in north and north-western part of India.
- **Conditions:** It is a **rabi crop** which requires a **cool growing season** and a **bright sunshine** at the time of ripening. It requires **50 to 75 cm of annual rainfall** evenly distributed over the growing season.
- **Major Producing States:** Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Bihar and Rajasthan. There are **two important wheat-growing zones** in India – **The Ganga-Satluj plains** in the **North-West** and **black soil region** of the **Deccan**.

Millets:

These are known as **coarse grains** and have very **high nutritional value**. Jowar, bajra and ragi are the important millets grown in India.

Ragi:

- **High Nutritional Value:** This is very rich in iron, calcium, other micro-nutrients and roughage.
- It is a crop of **dry regions** and grows well on red, black, sandy, loamy and shallow black soils.
- **Major Producing States:** Karnataka, Tamil Nadu, Himachal Pradesh, Uttarakhand, Sikkim, Jharkhand and Arunachal Pradesh.

Jowar:

- It is a **rain-fed crop** mostly grown in the moist areas which hardly needs irrigation. It is the **third** most important food crop with respect to area and production.
- **Major Producing States:** Maharashtra, Karnataka, Andhra Pradesh and Madhya Pradesh.

Bajra:

- It grows well on **sandy soils** and **shallow black soil**.
- **Major Producing States:** Rajasthan, Uttar Pradesh, Maharashtra, Gujarat and Haryana.

Maize:

- It is a **kharif crop** which requires temperature between 21°C to 27°C and grows well in **old alluvial soil**. In some states like Bihar maize is grown in rabi season also.
- It is a crop which is used both as food and fodder.
- Its production has increased due to the use of modern inputs such as HYV seeds, fertilisers and irrigation.
- **Major Producing States:** Karnataka, Madhya Pradesh, Uttar Pradesh, Bihar, Andhra Pradesh and Telangana.

Pulses:

- Pulses need **less moisture** and they survive even in dry conditions. Being leguminous crops, all these crops **except arhar** help in **restoring soil fertility** by fixing nitrogen from the air. These are mostly grown in rotation with other crops.
- These are the major source of protein. Major pulses that are grown in India are **tur (arhar), urad, moong, masur, peas and gram**. **India** is the **largest producer** as well as the **consumer** of pulses in the world.
- **Major Producing States:** Madhya Pradesh, Rajasthan, Maharashtra, Uttar Pradesh and Karnataka.

Food Crops other than Grains**Sugarcane:**

- It is a **tropical** as well as a **subtropical crop**.
- **Conditions:**
 - It grows well in **hot and humid climate** with a temperature of **21°C to 27°C** and an annual rainfall

between **75cm. and 100cm.** Irrigation is required in the regions of low rainfall.

- It can be grown on a variety of soils and needs manual labour from sowing to harvesting.
- India is the second largest producer of sugarcane after Brazil and is the main source of sugar, gur (jaggary), khandsari and molasses.
- **Major Producing States:** Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Bihar, Punjab and Haryana.

Oil Seeds:

- Different oil seeds are grown covering approximately 12 per cent of the total cropped area of India.
- Most of these are **edible** and used as cooking mediums but some of these are also used as raw material in the production of soap, cosmetics and ointments.
- Main oil-seeds produced in India are groundnut, mustard, coconut, sesamum (til), soyabean, castor seeds, cotton seeds, linseed and sunflower.
- **Groundnut:**
 - It is a **kharif crop** and accounts for about half of the major oilseeds produced in India.
 - In 2016 India was the second largest producer of groundnut in the world after china.
 - **Major groundnut producing states:** Gujarat was the largest producer followed by Rajasthan and Andhra Pradesh.
- **Other Oil Seeds:**
 - **Linseed** and **Mustard** are rabi crops.
 - **Sesamum** is a kharif crop in north and rabi crop in south India.
 - **Castor** seed is grown both as rabi and kharif crop.
 - In **rapeseed** production India was third largest producer in the world after Canada and China in 2016.

Plantation Crops:

Tea:

- It is an important beverage crop **introduced** in India initially **by the British**.
- **Conditions:**
 - The tea plant grows well in **tropical and sub-tropical climates** endowed with **deep and fertile well-drained soil** and **rich in humus and organic matter**.
 - Tea bushes require **warm and moist frost-free climate** all through the year. Frequent showers evenly distributed over the year ensure continuous growth of tender leaves.
- **Labour-intensive industry:** It requires abundant, cheap and skilled labour.
- Tea is processed within the tea garden to restore its freshness.
- **Major Producing States:** Assam, hills of Darjeeling and Jalpaiguri districts, West Bengal, Tamil Nadu and Kerala. They are also produced in Himachal Pradesh, Uttarakhand, Meghalaya, Andhra Pradesh and Tripura.

Coffee:

- Indian coffee is known in the world for its good quality.
- **The Arabica** variety initially **brought from Yemen** is produced in the country and Initially its cultivation was introduced on the Baba Budan Hills and even today its cultivation is confined to the **Nilgiri** in Karnataka, Kerala and Tamil Nadu.

Horticulture Crops:

- In 2016, India was the second largest producer of fruits and vegetables in the world after China. India is a producer of tropical as well as temperate fruits.
- India is an important producer of pea, cauliflower, onion, cabbage, tomato, brinjal and potato.
- There is great demands of:
 - **Mangoes** of Maharashtra, Andhra Pradesh, Telangana, Uttar Pradesh and West Bengal.
 - **Oranges** of Nagpur and Cherrapunjee (Meghalaya).
 - **Bananas** of Kerala, Mizoram, Maharashtra and Tamil Nadu.
 - **Lichi and guava** of Uttar Pradesh and Bihar.
 - **Pineapples** of Meghalaya.
 - **Grapes** of Andhra Pradesh, Telangana and Maharashtra.
 - **Apples, Pears, Apricots and Walnuts** of Jammu and Kashmir and Himachal Pradesh.

Non-Food Crops**Rubber:**

- It is an **equatorial crop**, but under special conditions, it is also grown in tropical and sub-tropical areas. It is an important industrial raw material.
- **Conditions:** It requires **moist and humid climate** with rainfall of more than 200 cm. and temperature **above 25°C**.
- **Major Producing States:** It is mainly grown in Kerala, Tamil Nadu, Karnataka and Andaman and Nicobar Islands and Garo hills of Meghalaya.

Fibre Crops:

- Cotton, jute, hemp and natural silk are the four major fibre crops grown in India. The first three are derived from the crops grown in the soil and the **silk** is obtained from **cocoons** of the **silkworms** fed on green leaves specially mulberry.
- Rearing of silk worms for the production of silk fibre is known as sericulture.

Cotton:

- It is a **kharif crop** and requires **6 to 8 months** to **mature**.
- India is believed to be the original home of the cotton plant. India was second largest producer of cotton after China.
- **Conditions:** Cotton grows well in **drier parts** of the **black cotton soil** of the Deccan plateau. It requires

high temperature, light rainfall or irrigation, **210 frost-free days** and bright sun-shine for its growth.

- **Major Producing States:** Maharashtra, Gujarat, Madhya Pradesh, Karnataka, Andhra Pradesh, Telangana, Tamil Nadu, Punjab, Haryana and Uttar Pradesh.

Jute:

- Jute is known as the **golden fibre**.
- **Conditions:** It grows well on **well-drained fertile soils** in the **flood plains** where soils are renewed every year and high temperature is required during the time of growth.
- **Major Producing States:** West Bengal, Bihar, Assam, Odisha and Meghalaya.
- It is used in making gunny bags, mats, ropes, yarn, carpets and other artefacts.
- It is losing market due to high cost to synthetic fibres and packing materials such as the nylon.

Issues with Indian Agriculture:

- **Technological Issues:** Sustained uses of land without compatible techno-institutional changes have hindered the pace of agricultural development.
- **Monsoon Dependent:** Most of the farmers in large parts of the country still depend upon monsoon and natural fertility in order to carry on their agriculture.
- **Land Fragmentation:** The inheritance right had lead to fragmentation of land holdings.
- **Small and Marginal Farmers:** Indian agriculture is dominated by small and marginal land holding which impact the overall agricultural development.
- **Investments and Other Issues:** Farmers are withdrawing their investment from agriculture causing a downfall in the employment in agriculture. The growth rate in agriculture has been decelerating. Reduction in import duties on agricultural products have proved detrimental to agriculture in the country.

Institutional and Technological Reforms:

- The collectivisation, consolidation of holdings, cooperation and abolition of zamindari, etc. were given priority to bring about institutional reforms in the country after Independence. Land reform was the main focus of our First Five Year Plan.
- The **Green Revolution** based on the use of package technology and the **White Revolution** (Operation Flood) were some of the strategies initiated to improve the situation.
- **Important Policy Initiatives:** In the 1980s and 1990s, a comprehensive land development programme was initiated. It includes the provision for crop insurance against drought, flood, cyclone, fire and disease, establishment of Grameen banks, cooperative societies and banks for providing loan facilities to the farmers at lower rates of interest.
- **Institutional Credit Facilities:** Kissan Credit Card (KCC), Personal Accident Insurance Scheme (PAIS) were introduced. The government also announces minimum support price, remunerative and procurement prices for important crops to check the exploitation of farmers by speculators and middlemen.

Other Ways to Improve Agriculture:

- **Efforts to Modernise Agriculture:** Establishment of Indian Council of Agricultural Research (ICAR), agricultural universities, veterinary services and animal breeding centres, horticulture development, research and development in the field of meteorology and weather forecast.
- **To make Agriculture Successful and Profitable:** Proper thrust should be given to the improvement of the condition of marginal and small farmers.
- Indian farmers should diversify their cropping pattern from cereals to high-value crops. This will increase incomes and reduce environmental degradation. India's diverse climate can be harnessed to grow a wide range of high-value crops.

Impact of Globalisation on Agriculture:

- In the nineteenth century when European traders came to India, Indian spices were exported to different countries of the world and farmers of south India were encouraged to grow these crops.
- During the British period cotton belts of India attracted the British and ultimately cotton was exported to Britain as a raw material for their textile industries.
- Cotton textile industry in Manchester and Liverpool flourished due to the availability of good quality cotton from India.
- Under globalisation, particularly after 1990, the farmers in India have been exposed to new challenges. Despite being an important producer of rice, cotton, rubber, tea, coffee, jute and spices our agricultural products are not able to compete with the developed countries because of the highly subsidised agriculture in those countries.



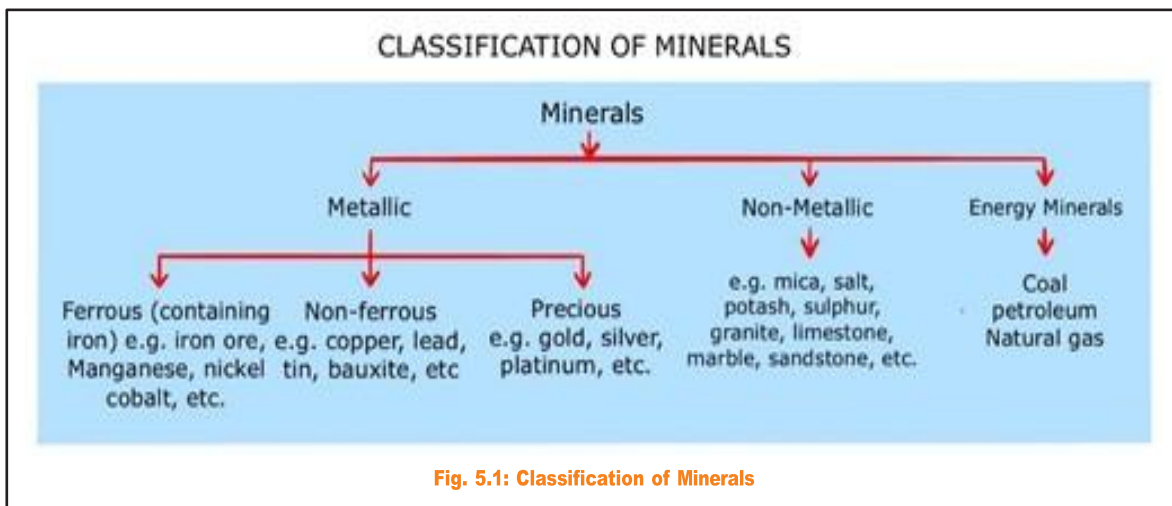
Interesting points

- **Vinobha Bhave:** Mahatma Gandhi declared Vinoba Bhave as his spiritual heir. He was one of the votaries of Gandhi's concept of gram swarajya.
- **Bhoodan:** Once, when Vinoba Bhave was delivering a lecture at Pochampalli in Andhra Pradesh, some poor landless villagers demanded some land for their economic well-being. Suddenly, Shri Ram Chandra Reddy stood up and offered 80 acres of land to be distributed among 80 land-less villagers. This act was known as '**Bhoodan**'.
- **Gramdan:** Some zamindars, owners of many villages offered to distribute some villages among the landless. It was known as Gramdan.
- The **Bhoodan-Gramdan movement** initiated by Vinoba Bhave is also known as the **Blood-less Revolution**.
- Genetic engineering is recognised as a powerful supplement in inventing new **hybrid varieties** of seeds.

The earth's crust is made up of different minerals embedded in the rocks. Various metals are extracted from these minerals after proper refinement. They are an indispensable part of the lives of human.

Mineral:

- Geologists define mineral as a **“homogenous, naturally occurring substance with a definable internal structure.”** They are found in varied forms in nature ranging from the hardest diamond to the softest talc.
- Rocks:** They are combinations of homogenous substances called minerals. Some rocks such as limestone consist of a single mineral only but majority of the rock consist of several minerals in varying proportions.
- A particular mineral that will be formed from a certain combination of elements depends upon the physical and chemical conditions under which the material forms. This results in a wide range of colours, hardness, crystal forms, lustre and density of particular minerals.



Mode of Occurrence of Minerals:

- Minerals are usually found in **“ores”** (ore is used to describe an accumulation of any mineral mixed with other elements).
- The mineral content of the ore must be in sufficient concentration to make its extraction commercially viable.
- The type of formation or structure determines the relative ease with which mineral ores may be mined.

Forms of Minerals

Igneous and Metamorphic Rocks:

- In igneous and metamorphic rocks, minerals may occur in the cracks, crevices, faults or joints. The **smaller occurrences** are called **veins** and the **larger** are called **lodes**.

- Mostly they are formed when minerals in liquid/ molten and gaseous forms are forced upward through cavities towards the earth's surface. They cool and solidify as they rise.
- Major metallic minerals like tin, copper, zinc and lead etc. are obtained from veins and lodes.

Sedimentary Rocks:

- In sedimentary rocks, a number of minerals occur in beds or layers and they have been formed as a result of deposition, accumulation and concentration in **horizontal strata**.
- Coal and some forms of iron ore have been concentrated as a result of long periods under great heat and pressure.
- Another group of sedimentary minerals include gypsum, potash salt and sodium salt. These are formed as a result of evaporation especially in arid regions.

Decomposition of Surface Rocks and the Removal of Soluble Constituents:

It leaves a **residual mass of weathered material** containing ores. This way is used to produce Bauxite.

Placer Deposits:

- Certain minerals may occur as **alluvial deposits** in sands of valley floors and the base of hills.
- Generally it contains minerals which are not corroded by water.
- Gold, silver, tin and platinum are most important among such minerals.

Minerals in Ocean:

- The ocean waters contain vast quantities of minerals but most of these are too widely diffused to be of economic significance.
- The common salt, magnesium and bromine are largely derived from ocean waters.
- The ocean beds, too, are rich in manganese nodules.

Minerals in India:

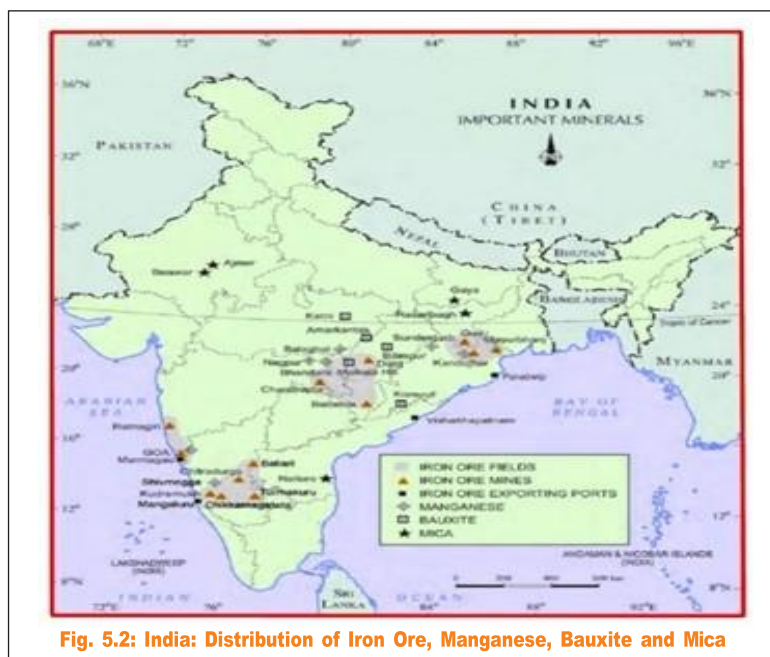


Fig. 5.2: India: Distribution of Iron Ore, Manganese, Bauxite and Mica

India is fortunate to have fairly rich and varied mineral resources which are unevenly distributed.

- The Peninsular rocks contain most of the reserves of coal, metallic minerals, mica and many other non-metallic minerals. Rajasthan with the rock systems of the peninsula, has reserves of many non-ferrous minerals.
- Sedimentary rocks on the western and eastern flanks of the peninsula, in Gujarat and Assam have most of the **petroleum deposits**.
- The vast **alluvial plains of north India** are almost **devoid of economic minerals**.

These variations exist largely because of the differences in the geological structure, processes and time involved in the formation of minerals.

Factors Affecting Economic Viability of Minerals:

- The concentration of mineral in the ore.
 - The ease of extraction.
 - The closeness to the market.
- When this is done a mineral 'deposit' or 'reserve' turns into a mine.

Major Minerals in India

Ferrous Minerals:

- It accounts **three-fourth** of total metallic minerals and provide a strong base for the development of metallurgical industries.
- India exports substantial quantities of ferrous minerals after meeting her internal demands.

Iron Ore:

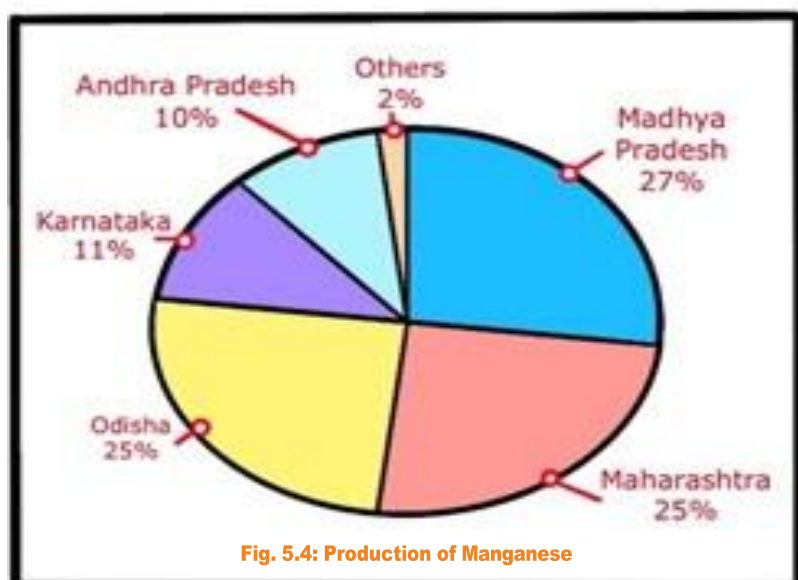
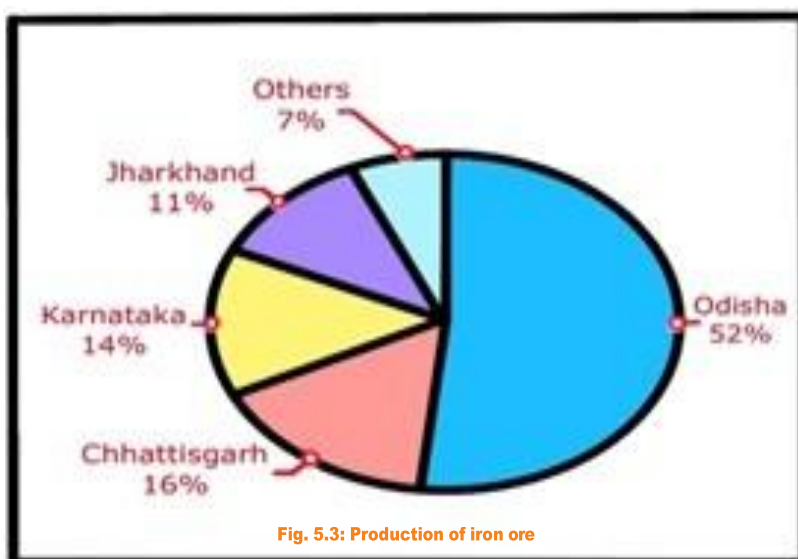
- Its is basic mineral and considered as **backbone of the modern industrial development**.
- India is rich in good quality iron ores.
- **Types of Iron Ore:**
 - **Magnetite:** It is the **finest iron ore** with a very **high content of iron** up to 70 per cent. It has excellent magnetic qualities, especially valuable in the electrical industry.
 - **Hematite:** It is the most important industrial iron ore in terms of the quantity used but has a slightly **lower iron content** than magnetite. (50-60 per cent).

Major Iron Ore Belts in India:

- **Odisha-Jharkhand Belt:** In Odisha high grade **hematite ore** is found in Badampahar mines in the Mayurbhanj and Kendujhar districts. In the adjoining Singhbhum district of Jharkhand haematite iron ore is mined in Gua and Noamundi.
- **Durg-Bastar -Chandrapur belt:** It lies in **Chhattisgarh and Maharashtra**. Very high grade **hematites** are found in the Bailadila range of hills in the Bastar district of Chhattisgarh. The range of hills super high grade hematite iron ore. It has the best physical properties needed for steel making. Iron ore from

these mines is exported to Japan and South Korea via Vishakhapatnam port.

- **Ballari-Chitradurga-ChikkamagaluruTumakuru belt:** It lies in **Karnataka** and has large reserves of iron ore. The **Kudremukh mines** located in the Western Ghats of Karnataka are a 100 per cent **export unit**. Kudremukh deposits are known to be one of the largest. The ore is transported as slurry through a pipeline to a port near Mangaluru.
- **Maharashtra-Goa belt:** it includes the state of Goa and Ratnagiri district of Maharashtra. Though, the ores are not of very high quality, yet they are efficiently exploited. Iron ore is exported through Marmagao port.



Manganese:

- Manganese is mainly used in the manufacturing of **steel** and **ferro-manganese alloy**. Nearly 10 kg of manganese is required to manufacture one tonne of steel.
- It is also used in manufacturing bleaching powder, insecticides and paints.

Non-Ferrous Minerals:

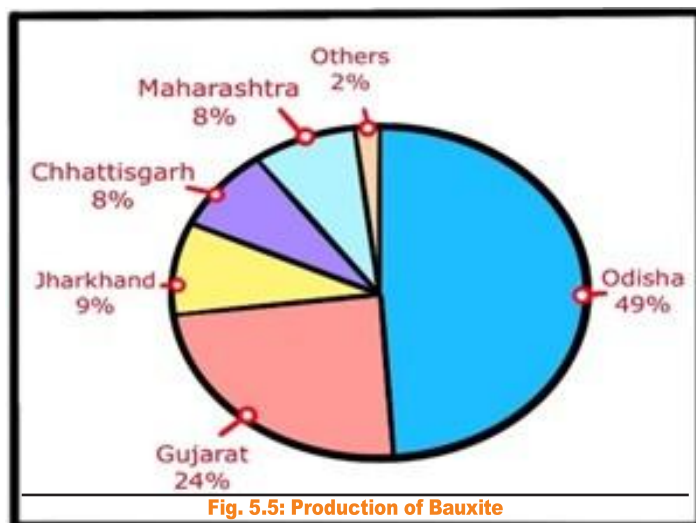
- India's reserves and production of non-ferrous minerals is not very satisfactory.
- These minerals, which include copper, bauxite, lead, zinc and gold play a vital role in a number of metallurgical, engineering and electrical industries.

Copper:

- India is critically deficient in the reserve and production of copper.
- It is mainly used in electrical cables, electronics and chemical industries as copper is malleable, ductile and a good conductor.
- **Leading Producers:** The Balaghat mines in Madhya Pradesh, Khetri mines in Rajasthan and Singhbhum district of Jharkhand.

Bauxite:

- Though, several ores contain aluminium, it is from bauxite, a clay-like substance that alumina and later aluminium is obtained.
- Bauxite deposits are formed by the **decomposition** of a wide variety of **rocks** rich in **aluminium silicates**.
- Aluminium is an important metal because it combines the strength of metals such as iron, with extreme lightness and also with good conductivity and great malleability.
- **Major bauxite Deposits:** They are mainly found in the Amarkantak plateau, Maikal hills and the plateau region of Bilaspur-Katni. Odisha was the largest bauxite producing state where the Panchpatmali deposits in Koraput district are the most important.



Non-Metallic Minerals

Mica:

- Mica is a mineral made up of a **series of plates** or leaves and it splits easily into thin sheets.
- **Properties:** Excellent di-electric strength, low power loss factor, insulating properties and resistance to high voltage.
- Due to such properties mica is one of the most indispensable minerals used in electric and electronic industries.
- **Important Mica Deposits:**
 - They are found in the northern edge of the **Chota Nagpur plateau** and **Koderma Gaya – Hazaribagh belt of Jharkhand** is the leading producer.
 - In Rajasthan, the major mica producing area is around **Ajmer**.
 - **Nellore** mica belt of Andhra Pradesh.

Rock Minerals

Limestone:

- It is found in association with rocks composed of **calcium carbonates** or **calcium and magnesium carbonates**.
- It is found in **sedimentary rocks** of most geological formations.
- It is the basic raw material for the cement industry and essential for smelting iron ore in the blast furnace.

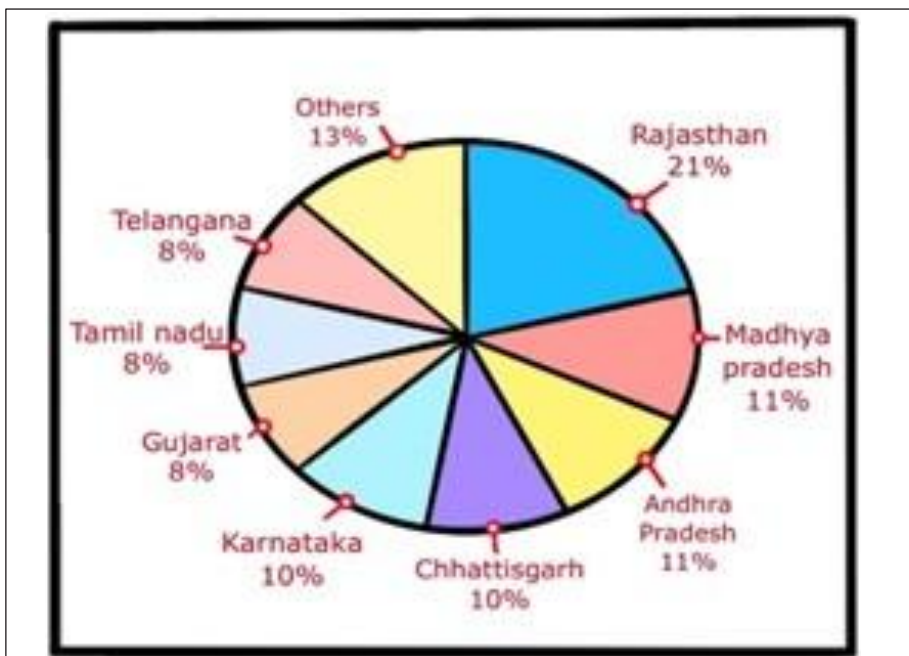


Fig. 5.6: Production of Limestone

Hazards of Mining:

- The dust and noxious fumes inhaled by miners make them vulnerable to pulmonary diseases.
- The risk of collapsing mine roofs, inundation and fires in coalmines are a constant threat to miners.
- The water sources in the region get contaminated due to mining.
- Dumping of waste and slurry leads to degradation of land, soil, and increase in stream and river pollution.

Conservation of Minerals:

- **Need for Conservation:**
 - **Slow Rate of Replenishment:** As the geological processes of mineral formation are slow. Mineral resources are **finite** and **non-renewable**.
 - Continued extraction of ores leads to increasing costs as mineral extraction comes from greater depths along with decrease in quality.
- **Steps to Conserve Minerals:**
 - Planned and sustainable use of resources.
 - Improved technologies need to be constantly evolved to allow use of low grade ores at low costs.
 - Recycling of metals and using scrap metals and other substitutes.

Energy Resources:

- Energy can be generated from fuel minerals like coal, petroleum, natural gas, uranium and from electricity.
- **Classification of Energy Resources:**
 - **Conventional Sources:** It includes firewood, cattle dung cake, coal, petroleum, natural gas and electricity (both hydel and thermal).
 - **Non-Conventional Sources:** It includes solar, wind, tidal, geothermal, biogas and atomic energy. Firewood and cattle dung cake are most common in rural India.

Conventional Energy Resources

Coal:

- In India, coal is the **most abundantly** available **fossil fuel**.
- It is used for power generation, fulfil energy needs to industry as well as for domestic needs.
- The coal is a **bulky material** which loses weight on use as it is reduced to ash. Hence, heavy industries and thermal power stations are **located** on or **near the coalfields**.
- In India coal occurs in rock series of two main geological ages:
 - **Gondwana:** They are a little over 200 million years in age. They are metallurgical coal and are located in **Damodar valley** (West Bengal and Jharkhand). The important coalfields are Jharia, Raniganj and Bokaro. The Godavari, Mahanadi, Son and Wardha valleys also contain coal deposits.
 - **Tertiary deposits:** These are only about 55 million years old and occur in the north eastern states of Meghalaya, Assam, Arunachal Pradesh and Nagaland.
- It is formed due the compression of plant material over millions of years and hence it is found in a

variety of forms depending on the degrees of compression and the depth and time of burial.

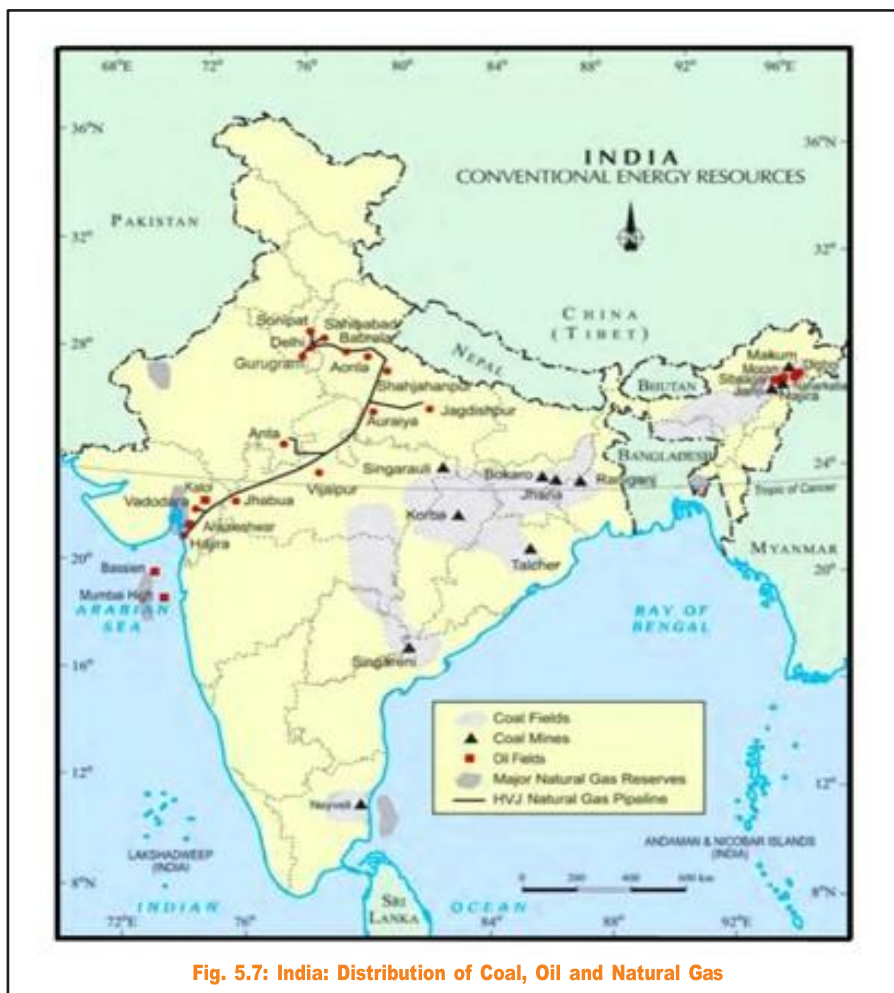
- **Peat:** It is produced by the decaying plants and has a low carbon, high moisture contents and low heating capacity.
- **Lignite:** It is a **low grade brown coal** which is soft with **high moisture content**. The principal lignite reserves are in **Neyveli in Tamil Nadu** and are used for generation of electricity.
- **Bituminous:** This coal has been buried deep and subjected to increased temperatures. It is the most popular coal in **commercial use**. Metallurgical coal is high grade bituminous coal which has a special value for smelting iron in blast furnaces.
- **Anthracite:** It is the **highest quality** hard coal.

Petroleum:

- The Petroleum or **mineral oil** is the next major energy source in India after coal.
- It provides fuel for heat and lighting, lubricants for machinery and raw materials for a number of manufacturing industries.
- Petroleum refineries act as a **“nodal industry”** for synthetic textile, fertiliser and numerous chemical industries.
- **Occurrence of Petroleum:**
 - In India, most of them are associated with **anticlines** and **fault traps** in the rock formations of the **tertiary age**. In regions of folding, anticlines or domes, it occurs where oil is trapped in the crest of the upfold.
 - The oil bearing layer is a porous limestone or sandstone through which oil may flow.
 - The oil is prevented from rising or sinking by intervening non-porous layers.
 - Petroleum is also found in fault traps between porous and non-porous rocks. Gas, being lighter usually occurs above the oil.
- **Major Petroleum Production Areas:** Mumbai High, Gujarat and Assam. Ankeleshwar is the most important field of Gujarat and Assam is the oldest oil producing state of India. Digboi, Naharkatiya and Moran-Hugrija are the important oil fields in the Assam.

Natural Gas:

- It is an important clean energy resource found in association with or without petroleum. It is used as industrial raw material in the petrochemical industry.
- **Environment Friendly:** As it has low carbon dioxide emissions.
- Large reserves of natural gas have been discovered in the **Krishna-Godavari basin**.
- Along the west coast the reserves of the Mumbai High and allied fields are supplemented by finds in the Gulf of Cambay. Andaman and Nicobar islands also has large reserves of natural gas.
- The 1700 km long **Hazira-Vijaipur-Jagdishpur cross country gas pipeline** links Mumbai High and Bassien with the fertilizer, power and industrial complexes in Western and Northern India.



Electricity:

- It has such a wide range of applications in today's world that, its per capita consumption is considered as an index of development.
- **Electricity is generated mainly in two ways:**
 - **Hydro Electricity:** It is generated by fast flowing water, which is a renewable resource. India has a number of multi-purpose projects like the Bhakra Nangal, Damodar Valley corporation, the Kopili Hydel Project etc. producing hydroelectric power.
 - **Thermal Electricity:** It is generated by using coal, petroleum and natural gas. The thermal power stations use non-renewable fossil fuels for generating electricity.

Non-Conventional Sources of Energy

Need of Non-Conventional Sources of Energy:

- **Dependence on Fossil Fuels:** As there is growing consumption of energy in the country.
- **Uncertainties about the Security of Energy:** Due to rising prices of oil and gas and their potential

shortages.

- The usage of fossil fuels also causes serious environmental problems.

There is a pressing need to use **renewable energy sources** like solar energy, wind, tide, biomass and energy from waste material. These are called **nonconventional energy sources**.

Nuclear or Atomic Energy:

- It is obtained by **altering the structure of atoms**. When such an alteration is made, much energy is released in the form of heat and this is used to generate electric power.
- Uranium and Thorium are available in **Jharkhand** and the **Aravalli ranges of Rajasthan** and are used for generating atomic or nuclear power. The Monazite sands of Kerala is also rich in Thorium.

Solar Energy:

- **Photovoltaic** technology converts sunlight directly into electricity.
- India is a tropical country and has enormous possibilities of tapping solar energy.
- Some big solar power plants are being established in different parts of India which will minimise the dependence of rural households on firewood and dung cakes, which in turn will contribute to environmental conservation and adequate supply of manure in agriculture.

Wind Power:

- India has great potential of wind power.
- The **largest wind farm cluster** is located in **Tamil Nadu from Nagarcoil to Madurai**. Andhra Pradesh, Karnataka, Gujarat, Kerala, Maharashtra and Lakshadweep have also important wind farms.

Biogas:

- It is produced by shrubs, farm waste, animal and human waste for domestic consumption in rural areas.
- **Decomposition of organic matter** yields gas, which has **higher thermal efficiency** as compared to kerosene, dung cake and charcoal.
- **Gobar Gas Plants:** The plants which use cattle dung in rural India. It provide twin benefits to the farmer in the form of energy and improved quality of manure.
- It prevents the loss of trees and manure due to burning of fuel wood and cow dung cakes.

Tidal Energy:

- **Use of Oceanic Tides:** Floodgate dams are built across inlets. During high tide water flows into the inlet and gets trapped when the gate is closed. After the tide falls outside the flood gate, the water retained by the floodgate flows back to the sea via a pipe that carries it through a power-generating turbine.
- In India the **Gulf of Khambhat**, the **Gulf of Kutch** in Gujarat on the western coast and **Gangetic delta in Sunderban regions** of West Bengal provide ideal conditions for utilising tidal energy.

Geo Thermal Energy:

- It refers to the heat and electricity produced by using the heat from the **interior of the Earth**.
- Where the geothermal gradient is high, high temperatures are found at shallow depths. **Groundwater** in such areas **absorbs heat** from the rocks and becomes hot. It is so hot that when it rises to the earth's surface, it turns into steam. This steam is used to drive turbines and generate electricity.
- **Two Experimental Projects in India:** Parvati valley near Manikarn in Himachal Pradesh and the Puga

Valley, Ladakh.



Fig. 5.8: India: Distribution of Nuclear and Thermal Power Plants

Conservation of Energy Resources:

- There is an urgent need to develop a sustainable path of energy development.
- Promotion of energy conservation and increased use of renewable energy sources are the twin planks of sustainable energy.
- There is a need to adopt a cautious approach for the judicious use of limited energy resources.



Interesting points

- **Abrasive minerals** like silica, limestone, aluminium oxide and various phosphate minerals do the cleaning in toothpaste. The sparkle in some toothpastes comes from mica.
- **Fluoride** is used to reduce cavities comes from a mineral **fluorite**.
- **Titanium Oxide:** It is used to made toothpaste and comes from minerals called **rutile, ilmenite and anatase**.
- The mineral intake represents only about 0.3 per cent of our total intake of nutrients.
- In Meghalaya, there are large deposits of coal, iron ore, limestone and dolomite etc.
- **Rat-Hole Mining:**
 - Coal mining in Jowai and Cherapunjee is done by family member in the form of a long narrow tunnel, known as 'Rat hole' mining.
 - The National Green Tribunal has declared such activities illegal.
- Kudre in Kannada means horse. The highest peak in the western ghats of Karnataka resembles the face of a horse. The **Bailadila hills** look like the **hump of an ox**, and hence its name is Bailadila.

Manufacturing is the Production of goods in large quantities after processing from raw materials to more valuable products. People employed in the **secondary activities** manufacture the primary materials into finished goods such as the workers employed in steel factories, car, breweries, etc. The economic strength of a country is measured by the development of manufacturing industries.

Importance of Manufacturing:

Manufacturing sector is considered the backbone of development in general and economic development in particular mainly because:

- Manufacturing industries help in **modernising agriculture** and reduce the heavy dependence of people on agricultural income by providing them jobs in secondary and tertiary sectors.
- Industrial development is a precondition for **eradication of unemployment and poverty** from India. This was the main philosophy behind public sector industries and joint sector ventures in India. It was aimed at bringing down regional disparities by establishing industries in tribal and backward areas.
- Export of manufactured goods **expands trade** and commerce, and brings in much needed foreign exchange.
- Countries that transform their raw materials into a wide variety of finished goods of higher value are **prosperous**. India's prosperity lies in increasing and diversifying its manufacturing industries as quickly as possible.

Relation between Agriculture and Industry:

- Agriculture and industry are **not exclusive** of each other and move hand in hand. For example - The agro-industries in India have given a major boost to agriculture by raising its productivity.
- The industries depends on agriculture for raw materials and sell their products such as irrigation pumps, fertilisers, insecticides, pesticides, plastic and PVC pipes, tools, etc.
- Development and competitiveness of manufacturing industry has assisted agriculturists in increasing their production and made the production processes very efficient.

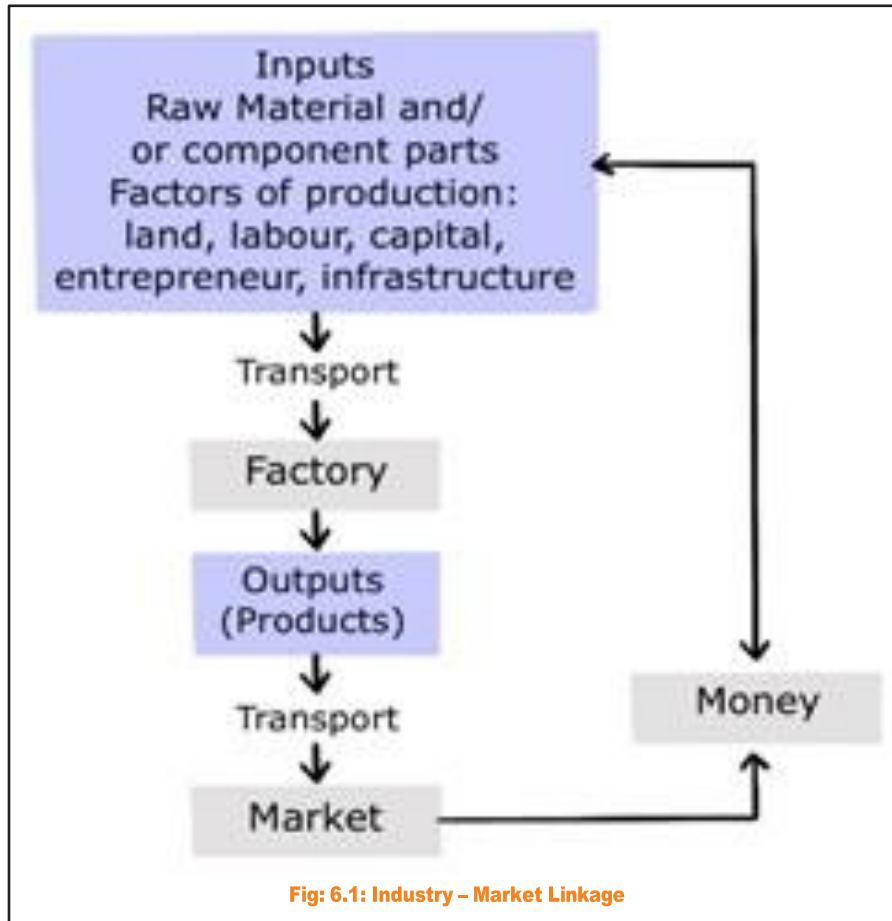
Contribution of Industry to National Economy:

- In last two decades, the share of manufacturing sector has stagnated at 17 per cent of GDP – out of a total of 27 per cent for the industry which includes 10 per cent for mining, quarrying, electricity and gas.
- This is much lower in comparison to some East Asian economies, where it is 25 to 35 per cent.
- Since 2003, manufacturing is growing at the rate of 9 to 10 per cent per annum.

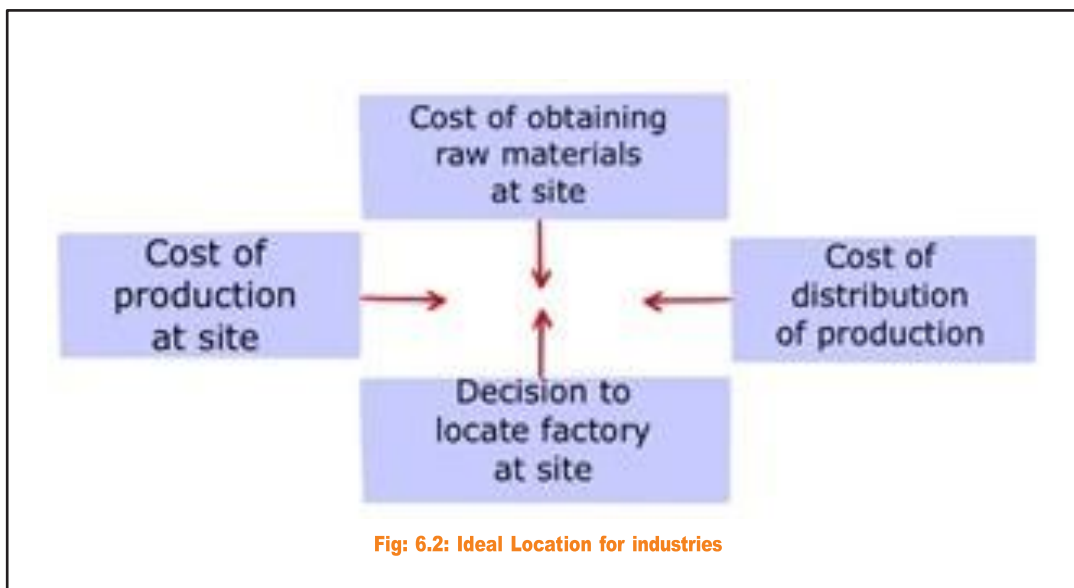
Industrial Location:

- Industrial locations are complex in nature and are influenced by availability of raw material, labour,

capital, power and market, etc.



- It is rarely possible to find all these factors available at one place. Consequently, manufacturing activity tends to locate at the most appropriate place where all the factors of industrial location are either available or can be arranged at lower cost.
- The industrialisation and urbanisation go hand in hand. Cities provide markets and also provide services such as banking, insurance, transport, labour, consultants and financial advice, etc to the industry.
- Many industries tend to come together to make use of the advantages offered by the urban centres known as **agglomeration economies**. Gradually, a large industrial agglomeration takes place.
- The key to decision of the factory location is the **least cost**. Government policies and specialised labour also influence the location of industry.



- In the **Pre-Independence period**, most manufacturing units were located in places from the point of view of overseas trade such as Mumbai, Kolkata, Chennai, etc. Consequently, there emerged certain pockets of industrially developed urban centres surrounded by a huge agricultural rural hinterland.

Classification of Industries

On the Basis of Source of Raw Materials Used:

- **Agro Based:** Cotton, woollen, jute, silk textile, rubber and sugar, tea, coffee, edible oil.
- **Mineral Based:** Iron and steel, cement, aluminium, machine tools, petrochemicals.

According to their main role:

- **Basic or key Industries:** These are those which supply **their products as raw materials** to manufacture other goods e.g. iron and steel and copper smelting, aluminum smelting.
- **Consumer Industries:** They produce goods for **direct use** by consumers – sugar, toothpaste, paper, sewing machines, fans etc.

On the Basis of Capital Investment:

- **A Small Scale industry:** It is defined with reference to the **maximum investment** allowed on the assets of a unit. At present the maximum investment allowed is rupees one crore.

On the Basis of Ownership:

- **Public Sector:** They are owned and operated by government agencies such as BHEL, SAIL etc.
- **Private Sector Industries:** They are owned and operated by individuals or a group of individuals such as TISCO, Bajaj Auto Ltd., Dabur Industries.
- **Joint Sector Industries:** They are **jointly** run by the **state and individuals** or a group of individuals such

as Oil India Ltd. (OIL).

- **Cooperative Sector industries:** They are owned and operated by the producers or suppliers of raw materials, workers or both. They pool in the resources and share the profits or losses proportionately. For example - The sugar industry in Maharashtra, the coir industry in Kerala.

Based on the Bulk and Weight of Raw Material and Finished Goods:

- **Heavy industries** such as iron and steel.
- **Light industries** that use light raw materials and produce light goods such as electrical goods industries.

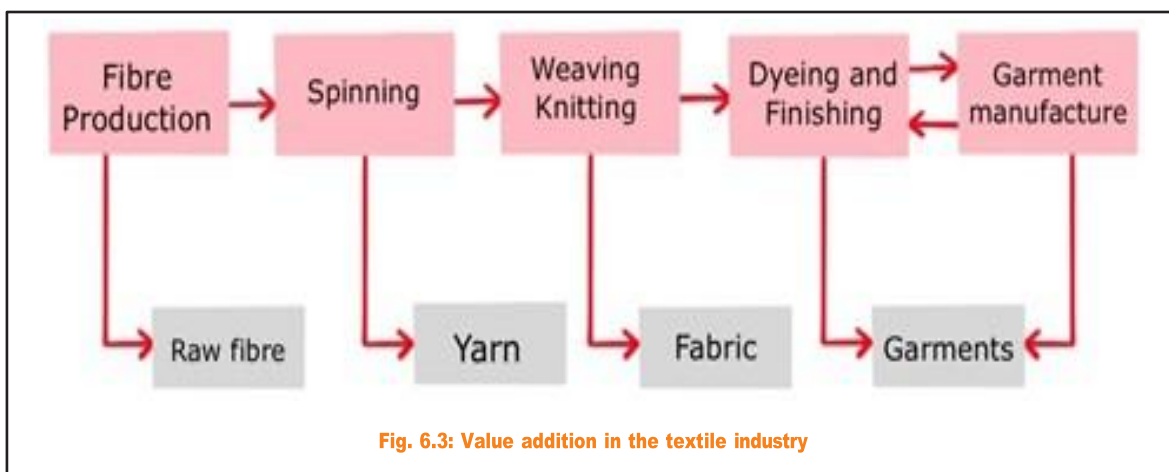
Agro-Based

Industries:

Cotton, jute, silk, woollen textiles, sugar and edible oil, etc. industries are based on agricultural raw materials.

Textile Industry:

- It contributes significantly to industrial production, employment generation and foreign exchange earnings.
- It is the only industry in India which is **self-reliant** and **complete in the value chain** i.e., from raw material to the highest value added products.



Cotton Textiles:

- In ancient India, cotton textiles were produced with hand spinning and handloom weaving techniques.
- After the 18th century, power-looms came into use and our traditional industries suffered a setback during the colonial period because they could not compete with the mill-made cloth from England.
- In the early years, the cotton textile industry was concentrated in the **cotton growing belt of Maharashtra and Gujarat** due to availability of raw cotton, market, transport including accessible port facilities, labour, moist climate, etc.
- This industry has close links with agriculture and provides a living to farmers, cotton boll pluckers and

workers engaged in ginning, spinning, weaving, dyeing, designing, packaging, tailoring and sewing.

- The industry by creating demands supports many other industries, such as, chemicals and dyes, packaging materials and engineering works.
- **Exporting areas:** India exports yarn to Japan and other cotton goods to U.S.A., U.K., Russia, etc.

Issues with Cotton Textile Industry:

- **Mismatch between demand and supply:** Most of the production is in fragmented small units which cater to the local market. As a result, many of spinners export cotton yarn while apparel/garment manufactures have to import fabric.
- Power supply is erratic and machinery is outdated in the weaving and processing sectors.
- There is low output of labour.
- It has stiff competition with the synthetic fibre industry.



Fig. 6.4: Distribution of cotton, woollen and silk industries in India

Jute Textiles:

- India is the **largest producer of raw jute** and jute goods and stands at second place as an exporter after Bangladesh.
- Most of the mills are located in West Bengal mainly along the banks of the Hugli river in a narrow belt. The main **factors responsible for their location** in the Hugli basin are:
 - **Availability of Inputs:** Proximity of the jute producing areas and abundant water for processing raw jute.
 - **Transportation:** There is inexpensive water transport which is supported by a good network of railways, roadways and waterways to facilitate movement of raw material to the mills.
 - **Availability of Labour:** There is cheap labour from West Bengal and adjoining states of Bihar, Odisha and Uttar Pradesh.
 - **Infrastructure:** Kolkata as a large urban centre provides banking, insurance and port facilities for export of jute goods.

Challenges faced by the Industry: It includes stiff competition in the international market from synthetic substitutes and from other competitors like Bangladesh, Brazil, Philippines, Egypt and Thailand. To stimulate demand, the products need to be diversified.

Opportunities: The growing global concern for environment friendly, biodegradable materials, has opened the opportunity for jute products.

The internal demand has been on the increase due to the Government policy of mandatory use of jute packaging.

Sugar Industry:

- India is the **second largest producer of sugar** and occupies the **first place** in the production of **gur** and **khandsari**.
- The **raw material** used in this industry is **bulky** and its sucrose content reduces in haulage.
- This industry is **seasonal** in nature and it is ideally suited to the **cooperative sector**.
- In recent years, there is a tendency for the mills to **shift and concentrate in the southern and western states**, especially in Maharashtra because:
 - The cane produced has a higher sucrose content.
 - The cooler climate ensures a longer crushing season.
 - The cooperatives are more successful in these states.
- **Location of Mills:** Uttar Pradesh, Bihar, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Gujarat, Punjab, Haryana and Madhya Pradesh. **Sixty per cent mills** are located in **Uttar Pradesh and Bihar**.
- **Major Challenges:** The challenges include: the seasonal nature of the industry, old and inefficient methods of production, transport delay in reaching cane to factories and the need to maximise the use of baggase.

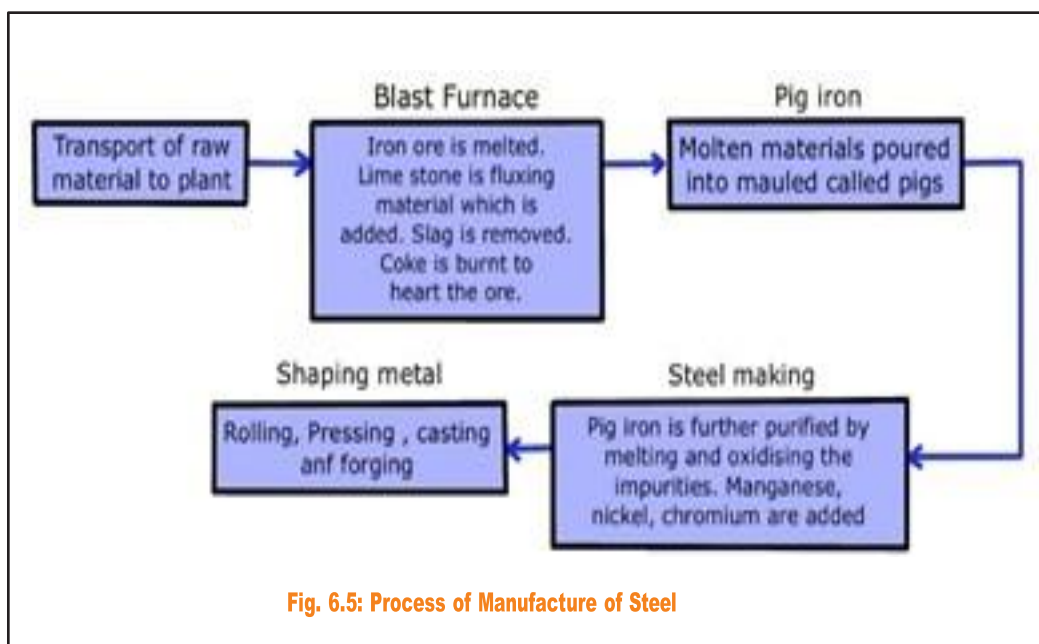
Mineral-based

Industries:

These are the industries that use minerals and metals as raw materials.

Iron and Steel Industry:

- The iron and steel industry is the **basic industry** since all the other industries (heavy, medium and light) depend on it for their machinery.
- It is a **heavy industry** because all the raw materials as well as finished goods are heavy and bulky entailing heavy transportation costs.
- Production and consumption of **steel** is often regarded as the **index** of a **country's development**.



- Iron ore, coking coal and lime stone are required in the ratio of approximately 4 : 2 : 1 to manufacture steel. Some quantities of manganese, are also required to harden the steel.
- Steel is needed to manufacture a variety of engineering goods, construction material, defence, medical, telephonic, scientific equipment and a variety of consumer goods.
- The per capita consumption of steel is low in India as compared to the world.
- In 2018, India ranked **2nd** among the world **crude steel producers** and is the **largest** producer of **sponge iron**.
- China is the largest producer as well as largest consumer of steel.
- **Maximum concentration of Iron and Steel industries:** It is found in **Chhotanagpur plateau** because low cost of iron ore, high grade raw materials in proximity, cheap labour and vast growth potential in the home market.



Fig. 6.6: Iron and Steel Plants in India

Unrealised Potential of India:

India is not able to perform to its full potential due to:

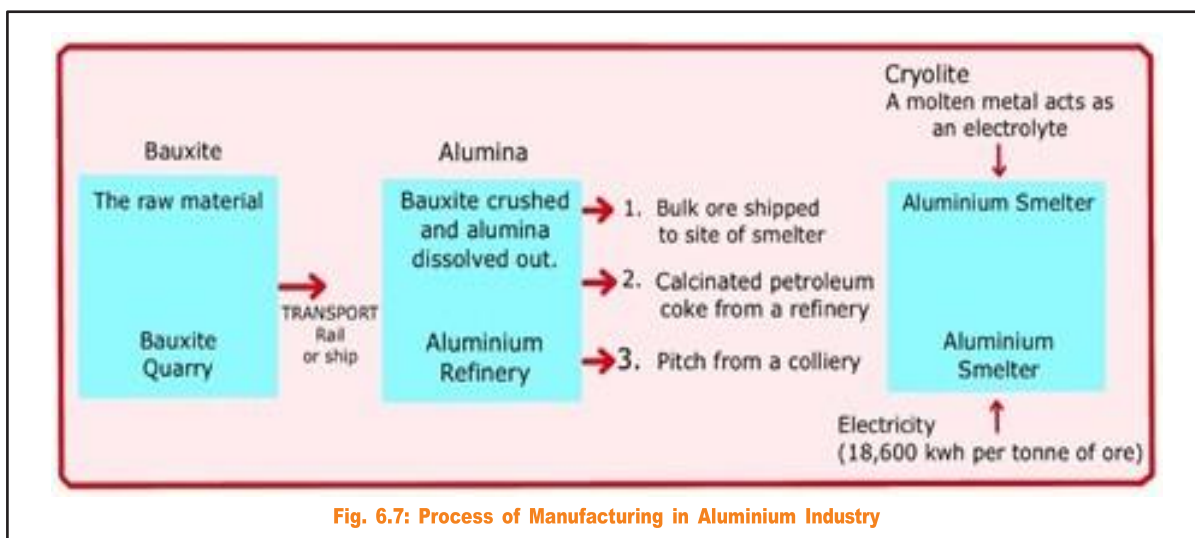
- High costs and limited availability of coking coal.
- Lower productivity of labour.
- Irregular supply of energy.
- Poor infrastructure.

Aluminium Smelting:

- Aluminium smelting is the second most important metallurgical industry in India.
- **Properties:** It is light, resistant to corrosion, a good conductor of heat, malleable and becomes strong

when it is mixed with other metals.

- Regular supply of electricity and an assured source of raw material at minimum cost are the two prime factors for location of the industry.
- Bauxite, the raw material used in the smelters is a very bulky, dark reddish coloured rock.



- It is used to manufacture aircraft, utensils and wires.
- It has gained popularity as a substitute of steel, copper, zinc and lead in a number of industries.
- **Location of Aluminium Smelting Plants:** Odisha, West Bengal, Kerala, Uttar Pradesh, Chhattisgarh, Maharashtra and Tamil Nadu.

Chemical Industries:

- The Chemical industry in India is fast growing and diversifying. It comprises both large and small scale manufacturing units.
- The chemical industry is its own largest consumer. Basic chemicals undergo processing to further produce other chemicals that are used for industrial application, agriculture or directly for consumer markets.
- **Classification of Chemicals:**
 - **Inorganic Chemicals:** It includes sulphuric acid (used to manufacture fertilizers, synthetic fibres, plastics, adhesives, paints, dyes stuffs), nitric acid, alkalies, soda ash (used to make glass, soaps and detergents, paper) and caustic soda. These industries are widely spread over the country.
 - **Organic Chemicals:** It includes petrochemicals, which are used for manufacturing of synthetic fibers, synthetic rubber, plastics, dye-stuffs, drugs and pharmaceuticals. Organic chemical plants are located near oil refineries or petrochemical plants.

Fertilizer Industry:

- The fertilizer industry is centred around the production of nitrogenous fertilizers (mainly urea), phosphatic fertilizers and ammonium phosphate (DAP) and complex fertilizers which have a combination of nitrogen (N), phosphate (P), and potash (K).
- The **potash** is **entirely imported** as India does not have any reserves of commercially usable potash or potassium compounds in any form.
- **Fertilizer Producing States:** Gujarat, Tamil Nadu, Uttar Pradesh, Punjab and Kerala contribute half of India's fertilizer production.

Cement Industry:

- Cement is essential for construction activity such as building houses, factories, bridges, roads, airports, dams and for other commercial establishments.
- This industry **requires bulky and heavy raw materials** like limestone, silica and gypsum.
- Coal, electric power and rail transportation are crucial for cement industry.
- The cement industry has **strategically located plants in Gujarat** that have suitable access to the market in the **Gulf countries**.

Automobile Industry:

- Automobiles provide vehicle for quick transport of good services and passengers.
- Trucks, buses, cars, motor cycles, scooters, three-wheelers and multi-utility vehicles are manufactured in India at various centres.
- The liberalisation has led to the healthy growth of the industry.
- **Location of Industries:** Delhi, Gurugram, Mumbai, Pune, Chennai, Kolkata, Lucknow, Indore, Hyderabad, Jamshedpur and Bengaluru.

Information Technology and Electronics Industry:

- The electronics industry covers a wide range of products such as transistor sets, television, cellular telecom, telephone exchange, radars, computers etc.
- Bengaluru has emerged as the electronic capital of India.
- **Important Centres for Electronic Goods:** Mumbai, Delhi, Hyderabad, Pune, Chennai, Kolkata, Lucknow and Coimbatore.
- A major impact of this industry has been on employment generation. The continuing growth in the hardware and software is the key to the success of IT industry in India.

Industrial Pollution and Environmental Degradation

Air Pollution:

-
- It is caused by the presence of high proportion of undesirable gases and unwanted particles such as sulphur dioxide and carbon monoxide.
 - Airborne particulate materials contain both solid and liquid particles like dust, sprays mist and smoke.
 - Toxic gas leaks can be very hazardous with long-term effects.

Water Pollution:

- It is caused by organic and inorganic industrial wastes and effluents discharged into rivers.
- **Major Polluting Industries:** Paper, pulp, chemical, textile and dyeing, petroleum refineries, tanneries and electroplating industries.
- The polluting industries let out dyes, detergents, acids, salts and heavy metals like lead and mercury pesticides, fertilisers, synthetic chemicals with carbon, plastics and rubber, etc. into the water bodies.
- Fly ash, phospo- gypsum and iron and steel slags are the major solid wastes in India.

Thermal Pollution:

Thermal pollution of water occurs when hot water from factories and thermal plants is drained into rivers and ponds before cooling.

Noise Pollution:

- It causes irritation, anger, hearing impairment, increased heart rate and blood pressure among other physiological effects.
- Unwanted sound is an irritant and a source of stress.
- It is also created by the Industrial and construction activities, machinery, generators, etc.

Control of Environmental Degradation

Ways to Reduce the Industrial Pollution of Fresh Water:

- Minimising use of water for processing by reusing and recycling it in two or more successive stages.
- Harvesting of rainwater to meet water requirements.
- Treating hot water and effluents before releasing them in rivers and ponds. Treatment of industrial effluents can be done in three phases:
 - **Primary Treatment:** It is done by mechanical means and involves screening, grinding, flocculation and sedimentation.
 - **Secondary Treatment:** It is done by biological process.
 - **Tertiary Treatment:** It is done by biological, chemical and physical processes and involves recycling of wastewater.
- There is a need to regulate overdraw of ground water reserves by industry.

Other ways of Reducing Pollution:

- **To reduce Air Pollution:**

- Particulate matter in the air can be reduced by fitting **smoke stacks** to factories with electrostatic precipitators, fabric filters, scrubbers and inertial separators.
- Smoke can be reduced by using oil or gas instead of coal in factories.

- **To reduce Noise Pollution:**

- Machinery and equipment can be used and generators should be fitted with silencers. Almost all machinery can be redesigned to increase energy efficiency and reduce noise.
- Noise absorbing material may be used.



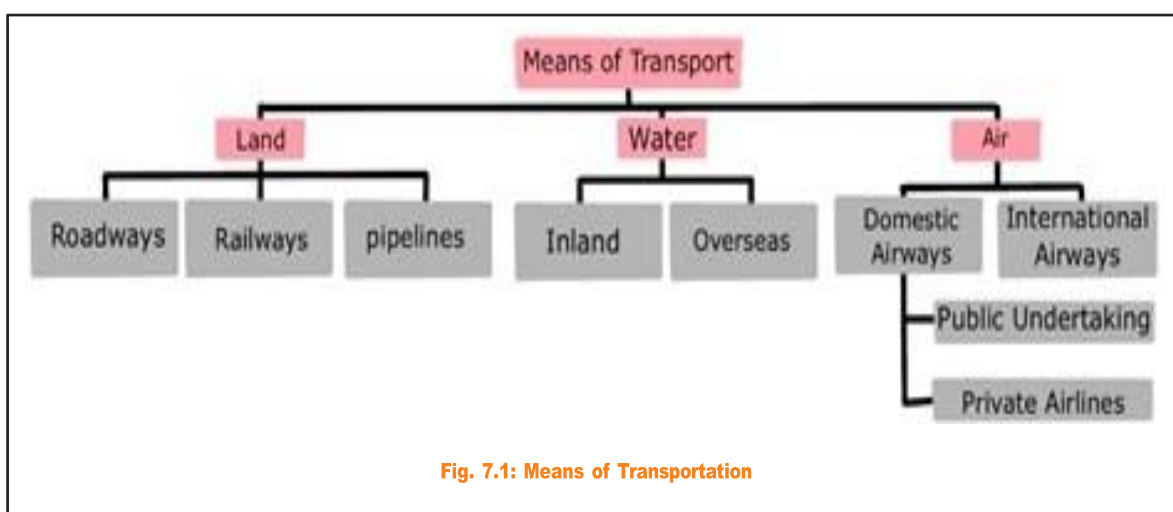
Interesting points

- The **first successful textile mill** was established in Mumbai in **1854**.
- The **first jute mill** was set up near Kolkata in **1855** at Rishra. After Partition in 1947, the jute mills remained in India but three-fourth of the jute producing area went to Bangladesh (erstwhile East Pakistan).
- The **first cement plant** was set up in Chennai in **1904**.
- **Mini Steel Plants:** They are smaller, have electric furnaces, use steel scrap and sponge iron. They have re-rollers that use steel ingots as well. They produce mild and alloy steel of given specifications.
- An **integrated steel plant** is large, handles everything in one complex – from putting together raw material to steel making, rolling and shaping.
- Every litre of waste water discharged by our industry pollutes eight times the quantity of freshwater.
- NTPC is a major power providing corporation in India. It has ISO certification for EMS (Environment Management System) 14001.
- The challenge of sustainable development requires integration of economic development with environmental concerns.

The pace of development of a country depends upon the production of goods and services as well as their movement over space. Therefore, efficient means of transport are prerequisites for fast development.

Means of Transport:

Movement of goods and services can be over three important domains of earth i.e. land, water and air. Based on these, transport can also be classified into land, water and air transport.



Relation between Transport and Trade:

- Transport has been able to connect global village with the help of equally developed communication system. Therefore, transport, communication and trade are complementary to each other.
- A dense and efficient network of transport and communication is a prerequisite for local, national and global trade.

The modern means of transport and communication serve as lifelines of India.

Roadways:

India has one of the largest road networks in the world, aggregating to about **56 lakh km**. In India, roadways have preceded railways.

Importance of Road transport vis-à-vis Rail transport:

- **Low Construction cost:** The Construction cost of roads is much lower than that of railway lines.
- **Ease of Movement:**
 - Roads can traverse comparatively more dissected and undulating topography.
 - Roads can negotiate higher gradients of slopes and can traverse mountains such as the Himalayas.
- **Economical for short distance:** Road transport is economical in transportation of few persons and relatively smaller amount of goods over short distances.

- **Low Handling Cost:** It provides door-to-door service, thus the cost of loading and unloading is much lower.
- **Feeder to other modes of Transport:** Road transport provides a link between railway stations, air and sea ports.

Classification of Roads according to their Capacity:

In India, roads are classified in the following six classes.

Golden Quadrilateral Super Highways:

- The government has launched a major road development project linking Delhi-Kolkata-Chennai-Mumbai and Delhi by **six-lane Super Highways**.
- It includes:
 - The **North-South corridors** linking Srinagar (Jammu & Kashmir) and Kanniyakumari (Tamil Nadu).
 - The **East-West Corridor** connecting Silchar (Assam) and Porbander (Gujarat).
- **Major Objective:** To reduce the time and distance between the mega cities of India.
- **Implementing Agency:** The National Highway Authority of India (NHAI).



Fig. 7.2: National Highways

National Highways:

- It links extreme parts of India and are the primary road systems.
- These are laid and maintained by the **Central Public Works Department (CPWD)**.
- A number of major National Highways run in North-South and East-West directions.
- The historical Sher-Shah Suri Marg is called **National Highway No.1, between Delhi and Amritsar**.

State Highways:

- These are roads linking a state capital with different district headquarters.
- These roads are constructed and maintained by the **State Public Works Department (PWD)** in State and Union Territories.

District Roads:

- These roads connect the **district headquarters** with **other places** of the district.
- These roads are **maintained** by the **Zila Parishad**.

Other Roads:

- These includes rural roads, which link rural areas and villages with towns.
- These roads received special impetus under the **Pradhan Mantri Grameen Sadak Yojana**.
 - Under this scheme special provisions are made so that every village in the country is linked to a major town in the country by an all season motorable road.

Border Roads:

- The **Border Roads Organisation** (Government of India undertaking) constructs and maintains roads in the bordering areas of India.
 - This organisation was established in **1960** for the development of the roads of strategic importance in the Northern and North-Eastern border areas.
- These roads have **improved accessibility** in areas of difficult terrain and have helped in the economic development of these area.

Railways:

- Railways are the **principal mode of transportation** for freight and passengers in India.
- It make it possible for people to conduct multifarious activities like business, sightseeing, pilgrimage along with transportation of goods over longer distances.
- Railway has been considered great integrating force for more than 150 years.
- Railways in India bind the economic life of India as well as accelerate the development of the industry and agriculture.
- The Indian Railway is now reorganised into 16 zones. (According to NCERT).

Distribution Pattern of the Railway Network in India:

It has been largely influenced by physiographic, economic and administrative factors.

- **The Northern Plains:** It has vast level land, high population density and rich agricultural resources which provides the most **favourable condition** for their growth. However, a large number of rivers requiring construction of bridges across their wide beds posed some obstacles.
- **The Hilly Terrains of the Peninsular Region:** The railway tracts are laid through low hills, gaps or

tunnels.

- **The Himalayan Mountainous Regions:** It is unfavourable for the construction of railway lines due to high relief, sparse population and lack of economic opportunities.
- **Konkan Railway:** It lies along the west coast and has facilitated the movement of passengers and goods in this most important economic region of India. It has also faced a number of problem such as **sinking of track** in some stretches and landslides.
- **Other areas with difficulty to lay Railway Lines:** On the sandy plain of western Rajasthan, swamps of Gujarat, forested tracks of Madhya Pradesh, Chhattisgarh, Odisha and Jharkhand.

Challenges for Railways:

- Many passengers travel without tickets.
- Thefts and damaging of railway property.
- People stop the trains and pull the chain unnecessarily which cause heavy damage to the railway.

Pipelines:

- Pipeline transport network is a new arrival on the transportation map of India.
- Apart from water transportation it has been now used for transporting crude oil, petroleum products and natural gas from oil and natural gas fields to refineries, fertilizer factories and big thermal power plants.
- Solids can also be transported through a pipeline when converted into slurry.
- The far inland locations of refineries like Barauni, Mathura, Panipat and gas based fertilizer plants could be thought of only because of pipelines.
- **Initial cost** of laying pipelines is very **high** but subsequent **running costs are minimal**. It rules out trans-shipment losses or delays.

Three important Networks of Pipeline Transportation in India:

- **From oil field in Upper Assam to Kanpur (Uttar Pradesh):** It passes through Guwahati, Barauni and Allahabad. It has branches from Barauni to Haldia, via Rajbandh, Rajbandh to Maurigram and Guwahati to Siliguri.
- **From Salaya in Gujarat to Jalandhar in Punjab:** It passes through Viramgam, Mathura, Delhi and Sonapat. It has branches to connect Koyali (near Vadodara, Gujarat) Chakshu and other places.
- **Gas pipeline from Hazira in Gujarat connects Jagdishpur in Uttar Pradesh:** It passes through Vijaipur in Madhya Pradesh. It has branches to Kota in Rajasthan, Shahajahanpur, Babrala and other places in Uttar Pradesh.

Waterways:

- **Advantages:**
 - Waterways are the **cheapest** means of transport.
 - They are most suitable for **carrying heavy and bulky goods**.
 - It is a **fuel-efficient** and **environment friendly** mode of transport.
- India has inland navigation waterways of 14,500 km in length. Out of these only **5685 km** are

navigable by mechanised vessels.

National Waterways (NW) of India:

- **NW No 1:** The **Ganga** river between Allahabad and Haldia (1620 km).
- **NW No 2:** The **Brahmaputra** river between Sadiya and Dhubri (891 km).
- **NW No 3:** The **West-Coast Canal** in Kerala (Kottapurma-Kollam, Udyogamandal and Champakkara canals-205 km).
- **NW No 4:** Specified stretches of **Godavari and Krishna** rivers along with Kakinada Puducherry stretch of canals (1078 km).
- **NW No 5:** Specified stretches of river **Brahmani** along with Matai river, delta channels of Mahanadi and Brahmani rivers and East Coast Canal (588 km).
- Some other inland water ways on which substantial transportation takes place are Mandavi, Zuari and Cumberjua, Sunderbans, Barak and backwaters of Kerala.

Major Ports:

- With a long **coastline** of **7,516.6 km**, India is dotted with 13 major and 200 notified non-majors (minor/intermediate) ports.
- These major ports handle 95 per cent of India's foreign trade.

Ports on Western Coast:

- **Kandla in Kuchchh:**
 - It was the **first port** developed soon **after Independence** to ease the volume of trade on the Mumbai port, in the wake of loss of Karachi port to Pakistan after the Partition.
 - It is also known as the **Deendayal Port** and is a **tidal port**.
 - It caters to the convenient handling of exports and imports of highly productive granary and industrial belt stretching across the states of Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Rajasthan and Gujarat.
- **Mumbai:** It is the biggest port with a spacious **natural** and well-sheltered harbour.
- **The Jawaharlal Nehru Port:** It was planned with a view to decongest the Mumbai port and serve as a hub port for this region.
- **Marmagao Port (Goa):** It is the premier iron ore exporting port of India and accounts for about **fifty per cent** of India's **iron ore export**.
- **New Mangalore Port (Karnataka):** It caters to the export of iron ore concentrates from Kudremukh mines.
- **Kochchi:** It is the **extreme south-western port**, located at the entrance of a lagoon with a **natural harbour**.

Ports on Eastern Coast:

- **Tuticorin (Tamil Nadu):**
 - It is **extreme south-eastern port** and has a **natural harbour** and rich hinterland.
 - It has a flourishing trade handling of a large variety of cargoes to even neighbouring countries like Sri Lanka, Maldives, etc. and the coastal regions of India.
- **Chennai:** It is one of the oldest artificial ports of India and is ranked next to Mumbai in terms of the

volume of trade and cargo.

- **Vishakhapatnam:** It is the **deepest landlocked** and well-protected port. It was originally conceived as an outlet for iron ore exports.
- **Paradwip Port (Odisha):** It specialises in the export of iron ore.
- **Kolkata:** It is an **inland riverine** port and serves a very large and rich hinterland of Ganga-Brahmaputra basin. It is a **tidal port** and requires constant dredging of Hoogly.
- **Haldia Port:** It was developed as a subsidiary port in order to relieve growing pressure on the Kolkata port.

Airways:

- The air travel is the **fastest**, most comfortable and prestigious mode of transport.
- It can **cover** very **difficult terrains** like high mountains, dreary deserts, dense forests and also long oceanic stretches with great ease.
- The air transport was **nationalised in 1953**.
- **Air India:** It provides domestic and international air services.
- **Pawanhans Helicopters Ltd:** It provides helicopter services to Oil and Natural Gas Corporation in its off-shore operations, to inaccessible areas and difficult terrains like the north-eastern states and the interior parts of Jammu and Kashmir, Himachal Pradesh and Uttarakhand.
- **Issues:** Air travel is not within the reach of the common people.

Communication:

- There are different means of communication and the pace of change has been rapid in modern times.
- Long distance communication is far easier without physical movement of the communicator or receiver.
- Personal communication and mass communication including television, radio, press, films, etc. are the major means of communication in the country.
- The **Indian postal network** is the **largest in the world**.
 - It handles parcels as well as personal written communications.
 - **First-class Mail:** These are cards and envelopes and are airlifted between stations covering both land and air.
 - **Second-class Mail:** It includes book packets, registered newspapers and periodicals. They are carried by surface mail, covering land and water transport.
 - To facilitate quick delivery of mails in large towns and cities, **six mail channels** have been introduced recently. They are called Rajdhani Channel, Metro Channel, Green Channel, Business Channel, Bulk Mail Channel and Periodical Channel.

Telecom:

- India has one of the largest telecom networks in Asia. Excluding urban places more than **two-thirds** of the **villages** in India have already been covered with **Subscriber Trunk Dialling (STD) telephone** facility.

- The government has made special provision to extend twenty-four hours STD facility to every village in the country to strengthen flow of information from grassroot level to higher level.
- There is a **uniform rate of STD** facilities all over India.
- It has been made possible by integrating the development in space technology with communication technology.

Mass Communication:

- It provides entertainment and creates awareness among people about various national programmes and policies.
- It includes radio, television, newspapers, magazines, books and films.
- **All India Radio (Akashwani)**: It broadcasts a variety of programmes in national, regional and local languages for various categories of people.
- **Doordarshan**, the **national television channel** of India, is one of the largest terrestrial networks in the world.
- India publishes a large number of newspapers and periodicals annually. Newspapers are published in about 100 languages and dialects.
- India is the largest producer of feature films in the world. The **Central Board of Film Certification** is the authority to **certify** both Indian and foreign films.

International Trade:

- **International Trade**: It is the exchange of goods between two countries which may take place through sea, air or land routes.
- Advancement of international trade of a country is an index to its economic prosperity. It is, therefore, considered the **economic barometer for a country**.
- Export and import are the components of trade.
 - **Balance of Trade of a country**: It is the **difference between its export and import**.
 - **Favourable Balance of Trade**: When the value of export exceeds the value of imports.
 - **Unfavourable Balance of Trade**: If the value of imports exceeds the value of exports.
- **Commodities exported from India**: Gems and jewellery, chemicals and related products, agriculture and allied products, etc.
- **Commodities imported to India**: Petroleum crude and products, gems and jewellery, chemicals and related products, base metals, electronic items, machinery, agriculture and allied products.

Tourism as a Trade:

- More than 15 million people are directly engaged in the tourism industry.
- Tourism promotes national integration, provides support to local handicrafts and cultural pursuits.
- Foreign tourists visit India for heritage tourism, eco tourism, adventure tourism, cultural tourism, medical tourism and business tourism.



Interesting points

- The Indian Railways is the largest public sector undertaking in the country.
- The **first train** steamed off from **Mumbai to Thane** in 1853, covering a distance of 34 km.
- **Digital India Programme:**
 - It is an umbrella programme to prepare India for a knowledge based transformation.
 - Its focus is on being transformative to realise – **IT (Indian Talent) + IT (Information Technology)=IT (India Tomorrow)** and is on making technology central to enabling change.