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## TOPIC

**Classification of Industries- Manufacturing and Basis of Location and Development of Iron and Steel Industry, Cotton Textile Industry , Chemical Industry, Aluminium Industry, Oil Refining Industry**

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## 1.1 Introduction

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- ❖ In industrial geography locational aspects of an industry is very important.
- ❖ Any type of industry requires some inputs and using them a range different output are generated.
- ❖ All consumer product outputs go to the market while all intermediary product output go to other industry.
- ❖ Transportation of various inputs and outputs entails transportation costs and normally an industry is likely to be located where such costs are low.
- ❖ So, various consideration influences industrial location.

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## 2.1 Objective

- ❖ Here, first we understand a simple classification of industries.
- ❖ Then what are the important factors which in general play important role in deciding where an industry is to be located.
- ❖ Finally a discussion will be presented about locational aspects of some important industries and also an account of the changing pattern in location of these industries, if any, over the time.

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## 3.1 Classification of Industries

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- ❖ There are various kinds and range of goods and services, so industry may be also of various types.
- ❖ Based on the value addition and tangibility broadly we can have three types of industries - primary industries, secondary industries and tertiary industries.

## 3.2 Primary Industries

- ❖ Primary industries are usually very simple industries involving processing of raw materials to give input goods for secondary industries.
- ❖ Here value addition is usually minimal and they are usually material oriented.

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- ❖ Scale of operation may be small or may be very large.
- ❖ Examples are: coal mining and washing, oil-refining, flour milling, metal smelting, stone crushing, etc.

### 3.3 Secondary Industries

- ❖ Secondary industries are very complex and diversified which took input from primary industries and add significant value to it in different processing stages.
- ❖ The value additions are so significant that they may have a locational preference in favour of market.
- ❖ Secondary industries may again divided into heavy industries, light industries, footloose industries, etc.

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## 3.3.1 Heavy Industries

❖ Heavy industries are identified by nature of their bulky product or very high capital inputs or units which may have high capacity to influence environment adversely.

❖ Examples are: heavy chemical, heavy machinery, locomotive, shipbuilding, heavy electrical, etc.

## 3.3.2 Light Industries

❖ Light industries are less capital intensive and more inclined to consumer products.

❖ Products are usually lighter in weight, require less power, less polluting and can be established in small areas.



## 3.3.3 Footloose Industries

- ❖ Footloose industries are those industries which nearly remain indifferent with locational aspects of plant.
- ❖ Their products are having very high value addition and smaller in size and so transportation cost is only a small fraction of total cost.
- ❖ These industries usually requires a very small production space, are usually less polluting and but requires highly skilled workers.
- ❖ Examples are: watch, camera, diamond cutting, precision electronics, etc.

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## 3.4 Tertiary Industries

- ❖ Tertiary industries are not related to production process.
- ❖ They are basically trade and services providing industries.
- ❖ The scale of operation is so large that it is regarded as an industry.
- ❖ Examples are: banking industry, insurance industry, consultancy industry, etc.
- ❖ **NOTE:** Above classification is a broad classification of industries and other classifications and subdivisions are also possible depending upon our criteria of selection.

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## 4.1 Factors Influencing Location of Industries

- ❖ Different industries require different kinds of inputs.
- ❖ Importance of different inputs varies due to their varying cost or they require in various proportions or ease/difficulty in availability of different inputs or various scale of industrial operation or any such reason.
- ❖ These factors are non-ubiquitously distributed around the world, so exert different pull to locate an industry in their favour.
- ❖ These pulls are known as locational factors in industrial location.

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❖ It is important to note that it is usually a combination of factors which also satisfies availability of other factors to a reasonable extent guides the location of an industry.

❖ The importance of different factors may subject to change with time and also same location may reacquire or keep its importance due to emergence of a new factor there.

❖ In all cases, theoretically an ideal industrial location always gives maximum cost advantages or minimum cost disadvantages.

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## 4.2 Some Traditional Locational Factors of Industries

❖ Traditionally raw materials, fuel and power, human resources, transport, market, capital, government policies, industrial inertia, etc., are regarded as important locational factors of industries.

### 4.2.1 Raw Materials

❖ Raw material is one of the most basic inputs to an industry without which no industry can breathe or survive.

❖ An industry can require various kinds of raw materials like crude mineral, semi-processed mineral, semi-finished product or even finished product of an industry.

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❖ Some raw materials required in bulk while others in relatively small fractions; some raw materials are perishable while others are long lasting and some raw materials lose weight in industrial processing while others not.

❖ Usually bulky, difficult and costly to transport, perishable, lose weight on processing and linked to small scale and technologically poor industrial operations exerts greater pull in their favour.

❖ As the proportion of cost of a raw material rises in total input cost, its capacity to exert greater pull, increases.

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❖ Higher the proportion of an input raw material to its output value, higher be its capacity to influence industrial location.

❖ Examples are: iron and steel industry, pulp and paper industry, agro-processing industry, heavy chemicals and oil-refining industry, heavy machinery industry, heavy electrical industry, etc.

## 4.2.2 Fuel and Power

❖ Keeping other conditions constant, normally as the scale of operation increases power requirements of an industry also increases.



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❖ There are various ways by which power can be supplied like human power, wood, charcoal, coal, electricity, petroleum, solar energy, etc.

❖ Use of human power, wood and charcoal are limited these days but was very significant before industrial revolution in running small and cottage industries. They are still significant for such industry of smaller scale.

❖ Industrial revolution had put coal as a prominent source of power supply. Coal itself is very bulky and at that time due to poor technology about twelve times of coal is required to smelt iron and so probably it has exerted one of the strongest pull on industrial location of iron and steel industries. Other industries were followed them.

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❖ Later electricity also becomes an important source of power supply due to its cheapness, easiness to transmit and cleanliness. It can be generated by using variety of sources. It helped in freeing industrial location from the pull of coal.

❖ Petroleum also helped in freeing industry from source of power supply as it can be conveniently transported, can be converted into electricity and their many source area are underdeveloped and desert location.

❖ Solar energy and many other non-conventional energy uses are limited by the lack of efficient and cheap technology and they also easily converted to electricity.

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❖ Thus coal helped mostly in industrial concentration while electricity helped mostly in industrial dispersion.

## 4.2.3 Human Resources

❖ Usually an industrial set up is influenced by highly skilled inventing labour, highly skilled managerial labour, highly skilled technical experts, semi-skilled labour and unskilled labour.

❖ Highly skilled inventing labours are usually few in numbers residing in well developed regions where different kinds of technical and financial support are there to run an invention project.

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❖ Highly skilled managerial staff and technical experts coordinate among different factors of production for maximum profitability and different machines for efficient and maximum output respectively. Usually they work in individual capacity and so they are highly mobile to any place with better employment opportunity.

❖ Semi-skilled labours are required relatively in large numbers in contrast to aforesaid labour groups but they have less skill to offer. So, they have limited migration opportunities for better employment.

❖ Unskilled work forces usually required in large numbers and they are least mobile due to lack of any significant skill to offer.

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❖ Thus it is only unskilled labour force and to some extent semi-skilled labour force have some capacity to influence industrial location particularly of labour intensive industries in their favour.

## 4.2.4 Transport

❖ Various mode of transport are used to assemble at a place different factors of productions as well as to distribute the produce to desired locations.

❖ Among different modes of transport, water transport (sea, river, canal, lake, etc.), land transport (road and rail) and air transport are important from industrial location point of view.

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❖ In general as one moves from water and land to air transport the speed and transportation cost both increases.

❖ Transportation cost usually increases with bulk, perishability, special care required and as the objects technologically mature (transportation charges for unfinished, semi-finished and finished product are becoming progressively higher).

❖ Per unit transportation cost for long haul journey are usually less than short haul journey and transportation costs for back haul journey are lesser than onward journey.

❖ Purer the raw material lesser be the transportation cost.

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❖ As the ratio of transportation cost to market value of goods increases, the capacity of transportation cost to influence industrial location also increases.

❖ For examples : heavy machine tool industry favoured nearness to iron and steel plant; watch, camera and other precision instrument industry entails very low transportation cost to output value and not influenced by transport cost; coal exerted significant impact on the location of iron and steel industries in early time, etc.

❖ Keeping in mind the above considerations generally bulky goods are favoured by water route, if available, and by rail on land while perishable and those having very high market value are transported by air routes

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## 4.2.5 Markets

❖ Market is a place where finished or semi-finished product of an industry is normally sold at economically profitable margin.

❖ The sufficient numbers of economically capable buyers, as existing in the West, are necessary for a good market. Thus all industries in general have biasness towards a good market as far as possible.

❖ Specifically, perishable items, fragile products, bulky and low value goods, labour intensive goods, industry involving much personal contacts, require small raw materials, etc. are located close to the market.

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## 4.2.6 Capital

❖ Capital is also a very basic input in any industrial establishment since it facilitates the arrangement of all factors of production.

❖ Capital has probably least influence on industrial location as it is the most mobile factor, if opportunities of profit are present.

## 4.2.7 Government Policies

❖ Government is the ruler of an area whether it is communist or capitalist or any other form of government.

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❖ It has certain ruling goals viz. balance regional development, adequate employment generation, proper utilisation of different physical resources, maintaining healthy living environment, national security concerns, etc.

❖ Thus, through different policy initiatives like, tax concession/higher tax rates, cheap land/putting ceiling on industrial land use, transport concession/green belt policy, facilitating easy concessional loans/restricting disbursement of any loan, licensing policies, etc., it tries to achieve them.

❖ Thus under government policies economic consideration may be just ignored for other reasons.

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## 4.2.8 Industrial Inertia

❖ Industrial inertia is the resistance exerted by an established industry in economic terms to move immediately to new location even when its earlier locational advantages changes to disadvantages.

❖ When an industry established in an area it led into many industry friendly development in this area with its own expansion like transport; highly skilled, semi-skilled and unskilled labour force; ready market; adequate source of power; financial institutions, industrial agglomeration with supportive industries, etc.

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❖ If one or some of earlier advantages change to disadvantages then also industry may not move to newer location since in the meantime it has acquired other advantages which has the capacity to outweigh the so called disadvantage and also cost of establishing a new industry at new location is very-very high.

❖ However industrial inertia has limitation in the form of excessive land and transportation cost, expensive labour, power shortage, discouraging government policies, etc. which after a certain limit strongly started working in favour of industrial shift.

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## 5.1 Location of Some Important Industries

❖ In the light of above generalised knowledge locational aspects of some important industries need to be understand.

### 5.1.1 Iron and Steel Industry

❖ Iron and steel is one of the most basic industry.

❖ In early days demand was low and mostly of local nature. Charcoal obtained from nearby forest were used to locate small plants. This led to dispersion of this industry up to mid-eighteenth century.

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❖ Latter the use of coal in iron smelting began which attracted this industry. Attraction to coalfield regions was governed by then available technology and demand in coalfield areas, forest area were shrinking (about one acre of forest log required to smelt five tone iron), demand for iron increased considerably due to starting of heavy engineering works, required iron ore to coal ratio was 1/8, coal producing regions already had some iron work history, pool of labour required available in many coalfield region, at some places iron ore was found associated with coal and like factors.

❖ Upto the end of nineteenth century coalfield enjoyed this unique position and during this period it has developed sufficient industrial inertia at many places.

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❖ In twentieth century, the technology of iron smelting further improved and now less coke, only half of iron ore, is required.

❖ This has freed establishment of new industries in favour of iron ore regions and in setting of industries also at coastal locations.

❖ In last fifty to hundred years the role of market also become significant. A big market helped in setting large integrated steel plant and in providing scrap iron as raw material to reduce transportation cost.

❖ Location of iron and steel industry effectively responded to the changing nature of different locational factors.

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## 5.1.2 Cotton Textile Industry

❖ Cotton textile industry is one of the oldest industry in the world.

❖ It requires raw cotton (a tropical and sub-tropical crop), cheap and large labour pool (automation has reduced its importance in some areas), power, good transport, humid climate (large plant may maintains it artificially), capital, large market, etc.

❖ Cotton is regarded as nearly pure raw material, so its pressure on industrial location is very low and other locational factors particularly transport, labour, power and market become important.

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❖ Electricity has reduced its dependency on the source of power supply and automation has diluted the need of skilled large labour pool requirement and thus considerations of market to link the industry effectively with the consumer become important.

❖ Thus, initially it was in the form of scattered small and cottage industry but invention of spinning and weaving machinery latter made it a regular industry with United Kingdom and other western country as main producer upto the entire nineteenth century.

❖ In twentieth century these techniques spread to cotton growing areas where cheap large labour pool and local strong market already existed.

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❖ Thus over the period cotton textile sector remain one of the highly dispersed industry in the world.

## 5.1.3 Chemical Industry

❖ The chemical industry presently comprises of very vast sector of modern industries.

❖ It was invented only by the middle of nineteenth century but by twentieth century it has practically touched each and every corner of our modern life with more than seventy thousand types of industrially significant chemicals.

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❖ It is a capital intensive industry requires specialised labour force, considerable degree of automation, careful handling of products and ample raw materials in the form of chemically significant minerals, industrial byproducts and also natural plants produces. Power and adequate quantity of water are also essentially required.

❖ If other things remain favourable this industry usually located either near to source of raw materials or near to its market.

❖ Capital, automation and skill requirement has restricted them mainly to developed world and to some extent in some areas of developing world.

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❖ If raw material is to be imported or based on byproduct of industries which uses imported inputs or if market is abroad then a coastal location is usually preferred.

❖ In developing countries it is usually found associated with petroleum refining, coal and other mineral producing regions, etc.

❖ Thus due to immature necessary specialisation and capital required, the trend of dispersion has poorly developed in this sector.

## 5.1.4 Aluminium Industry

❖ Aluminium is regarded as metal of twentieth century.

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❖ Aluminium is light in weight, ductile, durable and has good electrical and alloy properties and so quickly become very popular industrially after the invention of Hall-Herault process by the end of nineteenth century.

❖ Aluminium is industrially derived from alumina which is dominant found in tropical and sub-tropical areas. Further, the smelting of aluminium requires large amount of power (18000kWh per tonne aluminium).

❖ Since its raw material is bulky, so if possible, it is concentrated near its source. However in many underdeveloped countries it is exported as raw material due to lack of adequate facility.

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❖ So coastal locations with adequate sources of power are ideal location for it.

❖ In developed countries which themselves have good source of raw material, the plants are usually located near to them.

❖ The cost of power is so significant in this industry that plants are also located near a distant source of raw material with suitable electrical power but if good transportation facility are present. Such plants operate at a very large scale to achieve higher economies of scale.

❖ Thus aluminium industry has localisation tendencies influenced by raw material, power and transport facilities.

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## 5.1.5 Oil Refining Industry

- ❖ Oil refining is a modern industry by which a range of products are obtained from crude petroleum, a combination of various hydrocarbons with some impurities.
- ❖ A variety of refining methods like fractional distillation, catalytic cracking, etc., are used to get refined products.
- ❖ A refinery may be located either near the source of crude oil or near the major market of their produce or at some intermediate location depending upon various circumstances.

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❖ Presently not only crude petroleum but also refined products can be easily transported to distant locations by means of big oil tankers through sea, using truck and train tankers on land and through various pipelines.

❖ Location of oil refinery is most importantly influenced by availability of adequate amount of crude oil and then by other considerations related to availability of people with technical and commercial knowhow, construction and maintenance of plants, distance from market, physical obstacle in oil/product transportation, security and maintenance concerns, etc.

❖ Source of developed regions of the world close to the market area have very large scale of operation.

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❖ They have advantages of minimising transportation cost for both crude oil as well as finished product and also easy availability of other requirements.

❖ Those crude oil source based refineries which are located at a distance from the market have advantage of saving transportation cost of crude oil to the plant and providing higher revenue by the export of finished products instead of crude oil. Such plants usually have large scale of operation to minimise per unit cost.

❖ Intermediate oil refining plants are favoured if due to some obstacle plant establishment not possible or shipment of crude oil/finished product not convenient.

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of  
Distance  
Education  
(DDE)**

**Program:**  
P.G.

**Subject:**  
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**Paper:**  
III  
(Eco. Geo.)

**Lesson:**  
IV



# KURUKSHETRA UNIVERSITY, KURUKSHETRA

*Dr. Sayani Das, Asutosh College*



❖ Such intermediate plants may be near to source area or near to market area. As such plants moves closer to market area usually their scale of operations increases.

❖ In fact it is unique distribution pattern of crude oil sources (mostly found in coastal areas), transportation modes they suits (oil tankers, pipelines, etc.) and marketing areas restricted mostly to developed west and some rapidly developing countries have mostly guided oil refinery location to coastal areas.

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## 6.1 Summary

❖ An industry is usually located only at certain advantageous locations so that its total cost of operation can be minimised, output can be maximised and it become qualitatively better.

❖ There are various factors which govern these concerns and relative importance of these factors may changes with time due to change in innovation, aspiration, etc.

❖ So locational aspect of any industry must be considered taking into account of dynamism involved in different locational factors.

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# MANUFACTURING INDUSTRIES



On the occasion of Diwali, Harish went to a market with his parents. They purchased shoes and clothes for him. His mother purchased utensils, sugar, tea and diyas (earthen lamps). Harish observed that the shops in the market were flooded with items for sale. He wondered how so many items could be made in such large quantities. His father explained that shoes, clothes, sugar etc. are manufactured by machines in large industries, some utensils are manufactured in small industries, while items like **diyas** are made by individual artisans in household industry.

*Do you have some ideas about these industries?*

Production of goods in large quantities after processing from raw materials to more valuable products is called manufacturing. Do you know that paper is manufactured from wood, sugar from sugarcane, iron and steel from iron ore and aluminium from bauxite? Do you also know that some types of clothes are manufactured from yarn which itself is an industrial product?

People employed in the secondary activities manufacture the primary materials into finished goods. The workers employed in steel factories, car, breweries, textile industries, bakeries etc. fall into this category. Some people are employed in providing services. In this chapter, we are mainly concerned with manufacturing industries which fall in the secondary sector.

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 not only help in modernising agriculture, which forms the backbone of our economy, they also 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 our country. This was the main philosophy behind public sector industries and joint sector ventures in India. It was also 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 furnished goods of higher value are prosperous. India's prosperity lies in increasing and diversifying its manufacturing industries as quickly as possible.

Agriculture and industry are not exclusive of each other. They move hand in hand. For instance, the agro-industries in India have given a major boost to agriculture by raising its productivity. They depend on the latter for raw materials and sell their products such as irrigation pumps, fertilisers, insecticides, pesticides, plastic and PVC pipes, machines and tools, etc. to the farmers. Thus, development and competitiveness of manufacturing industry has not only assisted agriculturists in increasing

their production but also made the production processes very efficient.

In the present day world of globalisation, our industry needs to be more efficient and competitive. Self-sufficiency alone is not enough. Our manufactured goods must be at par in quality with those in the international market. Only then, will we be able to compete in the international market.

### Contribution of Industry to National Economy

Over the 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. The trend of growth rate in manufacturing over the last decade has been around 7 per cent per annum. The desired growth rate over the next decade is 12 per cent. Since 2003, manufacturing is once again growing at the rate of 9 to 10 per cent per annum. With appropriate policy interventions by the government and renewed efforts by the industry to improve productivity, economists predict that manufacturing can achieve its target over the next decade. The National Manufacturing Competitiveness Council (NMCC) has been set up with this objective.

### Industrial Location

Industrial locations are complex in nature. These 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. After an industrial activity starts, urbanisation follows. Sometimes, industries are located in or near the cities. Thus, 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.

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.

### Industry – Market Linkage

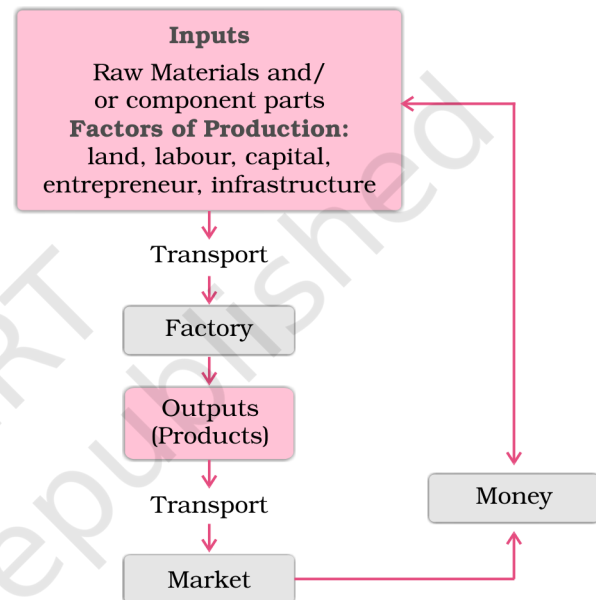


Fig. 6.1

The key to decision of the factory location is the least cost. Government policies and specialised labour also influence the location of industry.

### Ideal Location of an Industry

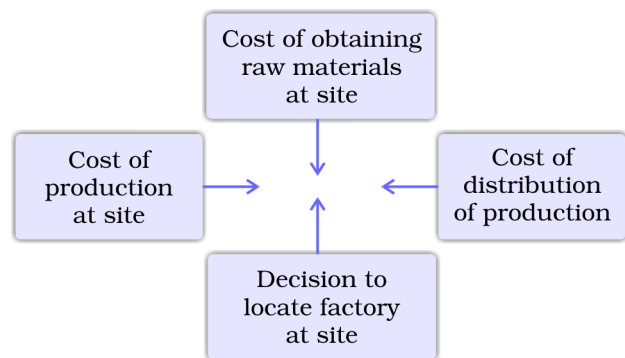


Fig. 6.2



### Classification of Industries

List the various manufactured products you use in your daily life such as – transistors, electric bulbs, vegetable oil, cement, glassware, petrol, matches, scooters, automobiles, medicines and so on. If we classify the various industries based on a particular criterion then we would be able to understand their manufacturing better. Industries may be classified as follows:

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 which supply their products or raw materials to manufacture other goods e.g. iron and steel and copper smelting, aluminum smelting.
- Consumer industries that produce goods for direct use by consumers – sugar, toothpaste, paper, sewing machines, fans etc.

On the basis of capital investment:

- A small scale industry is defined with reference to the maximum investment allowed on the assets of a unit. This limit has changed over a period of time. At present the maximum investment allowed is rupees one crore.

On the basis of ownership:

- Public sector, owned and operated by government agencies – BHEL, SAIL etc.
- Private sector industries owned and operated by individuals or a group of individuals – TISCO, Bajaj Auto Ltd., Dabur Industries.
- Joint sector industries which are jointly run

by the state and individuals or a group of individuals. Oil India Ltd. (OIL) is jointly owned by public and private sector.

- Cooperative sector industries 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 such as 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 industries.

#### Activity

Classify the following into two groups on the basis of bulk and weight of raw material and finished goods.

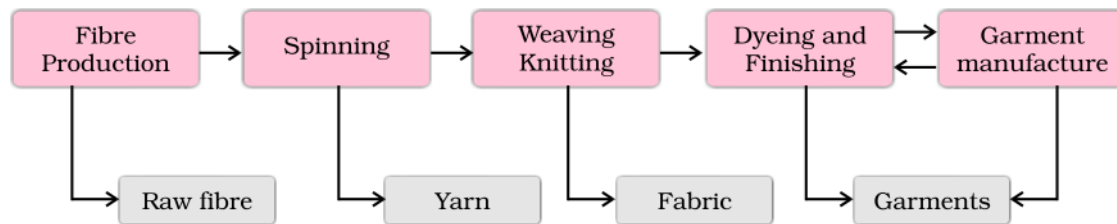
- |                       |                       |
|-----------------------|-----------------------|
| (i) Oil               | (vi) Sewing Machines  |
| (ii) Knitting needles | (vii) Shipbuilding    |
| (iii) Brassware       | (viii) Electric Bulbs |
| (iv) Fuse wires       | (ix) Paint brushes    |
| (v) Watches           | (x) Automobiles       |

### Agro Based Industries

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

**Textile Industry:** The textile industry occupies unique position in the Indian economy, because it contributes significantly to industrial production (14 per cent), employment generation (35 million persons directly – the second largest after agriculture) and foreign exchange earnings (about 24.6 per cent). It contributes 4 per cent towards GDP. It is the only industry in the country, which is self-reliant and complete in the value chain i.e., from raw material to the highest value added products.





**Fig. 6.3:** Value addition in the textile industry

**Cotton Textiles:** In ancient India, cotton textiles were produced with hand spinning and handloom weaving techniques. After the 18<sup>th</sup> century, power-looms came into use. Our traditional industries suffered a setback during the colonial period because they could not compete with the mill-made cloth from England.

- The first successful textile mill was established in Mumbai in 1854.
- The two world wars were fought in Europe, India was a British colony. There was a demand for cloth in U.K. hence, they gave a boost to the development of the cotton textile industry.

As on 30 November 2011, there were 1946 cotton and human-made fibre textile mills in the country. About 80 per cent of these are in the private sector and the rest in the public and cooperative sectors. Apart from these, there are several thousand small factories with four to ten looms.

In the early years, the cotton textile industry was concentrated in the cotton growing belt of Maharashtra and Gujarat. Availability of raw cotton, market, transport including accessible port facilities, labour, moist climate, etc. contributed towards its localisation. 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, mill stores, packaging materials and engineering works.

While spinning continues to be centralised in Maharashtra, Gujarat and Tamil Nadu, weaving is highly decentralised to provide scope for incorporating traditional skills and designs of weaving in cotton, silk, zari, embroidery, etc. India has world class production in spinning, but weaving supplies low quality of fabric as it cannot use much of the high quality yarn produced in the country. Weaving is done by handloom, powerloom and in mills.

The handspun khadi provides large scale employment to weavers in their homes as a cottage industry.

**Why did Mahatma Gandhi lay emphasis on spinning yarn and weaving khadi?**

**Table 4.2: India: Production of Fabrics in India**

Sector	2009-10	2010-11* (Provisional)
Mill Sector	3.3	3.5
Powerlooms (in Hosiery)	84.1	84.1
Handlooms	11.3	11.1
Others	1.3	1.3
<b>Total</b>	<b>100%</b>	<b>100%</b>

**Source:** Office of Textile Commissioner, Mumbai, Economic Survey, 2011-12.

**Note:** 90 per cent of the weaving, cutting and processing is in decentralised sector.

Study the figures above and note the share of mills in the production of fabric.

**Why is it important for our country to keep the mill sector loomage lower than power loom and handloom?**

India exports yarn to Japan. Other importers of cotton goods from India are U.S.A., U.K., Russia, France, East European countries, Nepal, Singapore, Sri Lanka, and African countries.







**India:** Distribution of cotton, woollen and silk industries

India has the second largest installed capacity of spindles in the world, with 43.13 million spindles (2011-12) after China. Since the mid-eighties, the spinning sector has received a lot of attention.

We have a large share in the world trade of cotton yarn, accounting for one fourth of the total trade. However, our trade in garments is only 4 per cent of the world's total. Our spinning mills are competitive at the global level and capable of using all the fibres we produce. The weaving, knitting and processing units cannot use much of the high quality yarn that is produced in the country. There are some large and modern factories in these segments, but most of the production is in fragmented small units, which cater to the local market. This mismatch is a major drawback for the industry. As a result, many of our spinners export cotton yarn while apparel/garment manufactures have to import fabric.

Yarn is sold at Rs. 85 per kg. If it is sold as a trouser it fetches Rs 800 per kg. Value is added at every stage from fibre to yarn to fabric and to garment.

**Why is it important for us to improve our weaving sector instead of exporting yarn in large quantities?**

Although, we have made significant increase in the production of good quality long staple cotton (356 lakh bales of 170 kgs each during 2011-12), the need to import is still felt. Power supply is erratic and machinery needs to be upgraded in the weaving and processing sectors in particular. Other problems are the low output of labour and stiff competition with the synthetic fibre industry.

### Jute Textiles

India is the largest producer of raw jute and jute goods and stands at second place as an exporter after Bangladesh. There were about 80 jute mills in India in 2010-11. Most of these are located in West Bengal, mainly along the

banks of the Hugli river, in a narrow belt (98 km long and 3 km wide).

The first jute mill was set up near Kolkata in 1859 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).

Factors responsible for their location in the Hugli basin are: proximity of the jute producing areas, inexpensive water transport, supported by a good network of railways, roadways and waterways to facilitate movement of raw material to the mills, abundant water for processing raw jute, cheap labour from West Bengal and adjoining states of Bihar, Orissa and Uttar Pradesh. Kolkata as a large urban centre provides banking, insurance and port facilities for export of jute goods.

In 2010-11 the jute industry was supporting 3.7 lakh workers directly and another 40 lakhs small and marginal farmers who were engaged in cultivation of jute and mesta. Many more people were associated indirectly.

Challenges faced by the industry include stiff competition in the international market from synthetic substitutes and from other competitors like Bangladesh, Brazil, Philippines, Egypt and Thailand. However, the internal demand has been on the increase due to the Government policy of mandatory use of jute packaging. To stimulate demand, the products need to be diversified. In 2005, National Jute Policy was formulated with the objective of increasing productivity, improving quality, ensuring good prices to the jute farmers and enhancing the yield per hectare. The main markets are U.S.A., Canada, Russia, United Arab Republic, U.K. and Australia. The growing global concern for environment friendly, biodegradable materials, has once again opened the opportunity for jute products.

### Sugar Industry

India stands second as a world producer of sugar but occupies the first place in the



production of *gur* and *khandsari*. The raw material used in this industry is bulky, and in haulage its sucrose content reduces. Where should the mills be ideally located? In 2010-11 there were over 662 sugar mills in the country spread over Uttar Pradesh, Bihar, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh and Gujarat along with Punjab, Haryana and Madhya Pradesh. Sixty per cent mills are in Uttar Pradesh and Bihar. This industry is seasonal in nature so, it is ideally suited to the cooperative sector. Can you explain why this is so?

In recent years, there is a tendency for the mills to shift and concentrate in the southern and western states, especially in Maharashtra. This is because the cane produced here has a higher sucrose content. The cooler climate also ensures a longer crushing season. Moreover, the cooperatives are more successful in these states.

Major 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 baggage.

### Mineral based Industries

Industries that use minerals and metals as raw materials are called mineral based industries. Can you name some industries that would fall in this category?

### 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. Steel is needed to manufacture a variety of engineering goods, construction material, defence, medical, telephonic, scientific equipment and a variety of consumer goods.

#### Activity

Make a list of all such goods made of steel that you can think of.

Production and consumption of steel is often regarded as the index of a country's development. Iron and steel is a heavy industry because all the raw materials as well as finished goods are heavy and bulky entailing heavy transportation costs. Iron ore, coking coal and lime stone are required in the ratio of approximately 4 : 2 : 1. Some quantities of manganese, are also required to harden the steel. Where should the steel plants be ideally located? Remember that the finished products also need an efficient transport network for their distribution to the markets and consumers.

In 2010-11 with 72.2 million tonnes of steel production, India ranked 4th among the world crude steel producers. It is the largest producer of sponge iron. In 2010-11 per capita consumption of steel in the country was only around 49 kg per annum against the world average of 182 kg.

### Processes of Manufacture of Steel

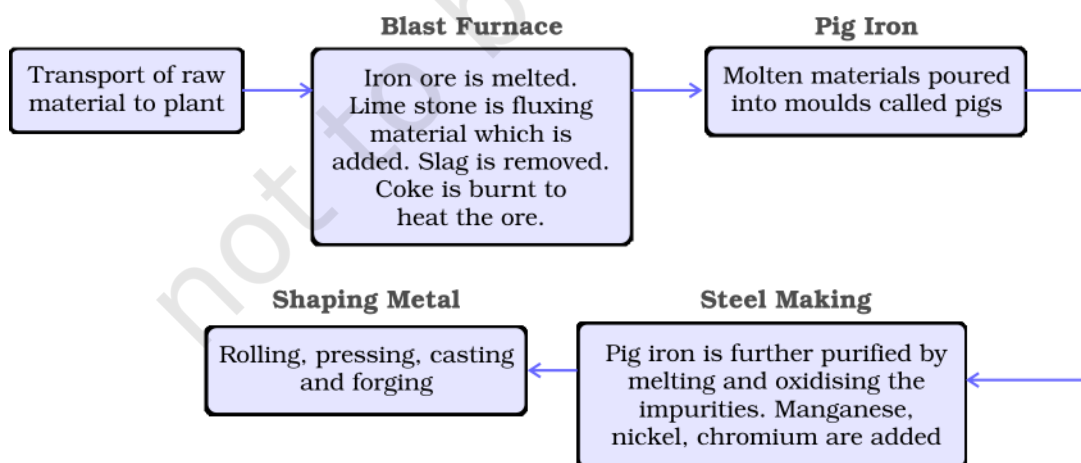


Fig. 6.4



India: Iron and Steel Plants





## Activity

**Table 5.2: Total finished steel production in India**

Year	Production (In million tonnes per annum)
2005	45.7
2006	49.4
2007	53.0
2008	57.8
2009	56.6
2010	68.3
2011	72.2

**Source:** Ministry of Steel, Government of India

**Why is the per capita consumption of steel so low in India?**

## Activity

Collect information about steel plants located in your own State and show them on the map of India.

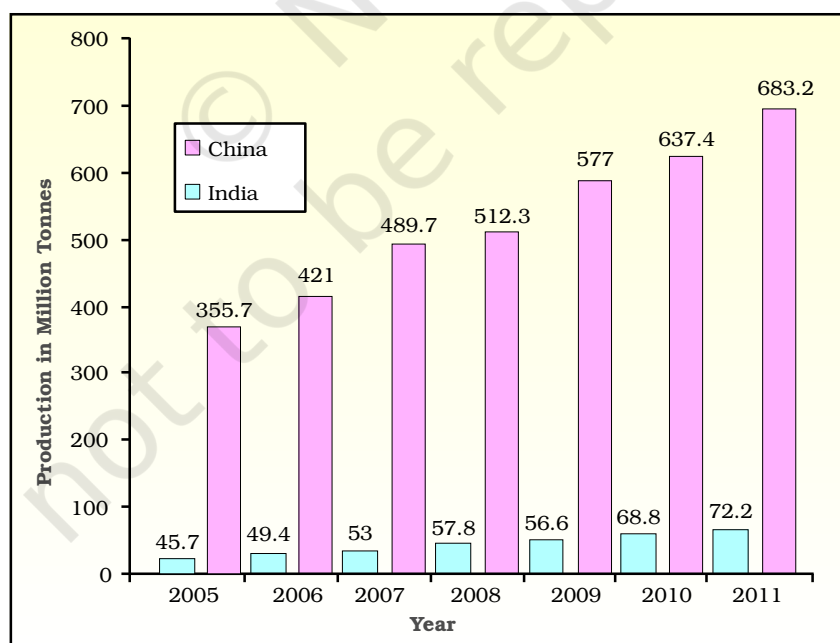
Mini steel plants are smaller, have electric furnaces, use steel scrap and sponge iron. They have re-rollers that use steel ingots as well. They produce mild and alloy steel of given specifications.

An integrated steel plant is large, handles everything in one complex – from putting together raw material to steel making, rolling and shaping.

Most of the public sector undertakings market their steel through Steel Authority of India Ltd. (SAIL).

In the 1950s China and India produced almost the same quantity of steel. Today, China is the largest producer of steel. China is also the world's largest consumer of steel. In 2004, India was the largest exporter of steel which accounted for 2.25 per cent of the global steel trade. Chotanagpur plateau region has the maximum concentration of iron and steel industries. It is largely, because of the relative advantages this region has for the development of this industry.

These include, low cost of iron ore, high grade raw materials in proximity, cheap labour and vast growth potential in the home market. Though, India is an important iron and steel producing country in the world yet, we are not able to perform to our full potential largely due to: (a) High costs and limited availability of coking



**Fig. 6.5: Steel Production in India and China**

**Source :** World Steel Association, website : [www.worldsteel.org](http://www.worldsteel.org)

coal (b) Lower productivity of labour (c) Irregular supply of energy and (d) Poor infrastructure.

We also import good quality steel from other countries. However, the overall production of steel is sufficient to meet our domestic demand.

Liberalisation and Foreign Direct Investment have given a boost to the industry with the efforts of private entrepreneurs. There is a need to allocate resources for research and development to produce steel more computatively.

### Activity

Have you read about the Kalinganagar controversy? Collect information from different sources and discuss.

### Aluminium Smelting

Aluminium smelting is the second most important metallurgical industry in India. It is light, resistant to corrosion, a good conductor of heat, malleable and becomes strong when it is mixed with other metals. 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.

Aluminium smelting plants in the country are located in Odisha, West Bengal, Kerala, Uttar Pradesh, Chhattisgarh, Maharashtra and Tamil



Fig. 6.6: Strip casting mill at smelter of NALCO

Nadu. In 2008-09 India produced over 15.29 lakh million tonnes of aluminium.

Bauxite, the raw material used in the smelters is a very bulky, dark reddish coloured rock. The flow chart given below shows the process of manufacturing aluminium. Regular supply of electricity and an assured source of raw material at minimum cost are the two prime factors for location of the industry.

### Activity

A factory produces aluminium saucepans with plastic handles. It obtains aluminium from a smelter and a plastic component from

4 to 6 tonnes of bauxite → 2 tonnes of alumina → 1 tonne of aluminium

Fig. 6.7

### Process of Manufacturing in Aluminium Industry

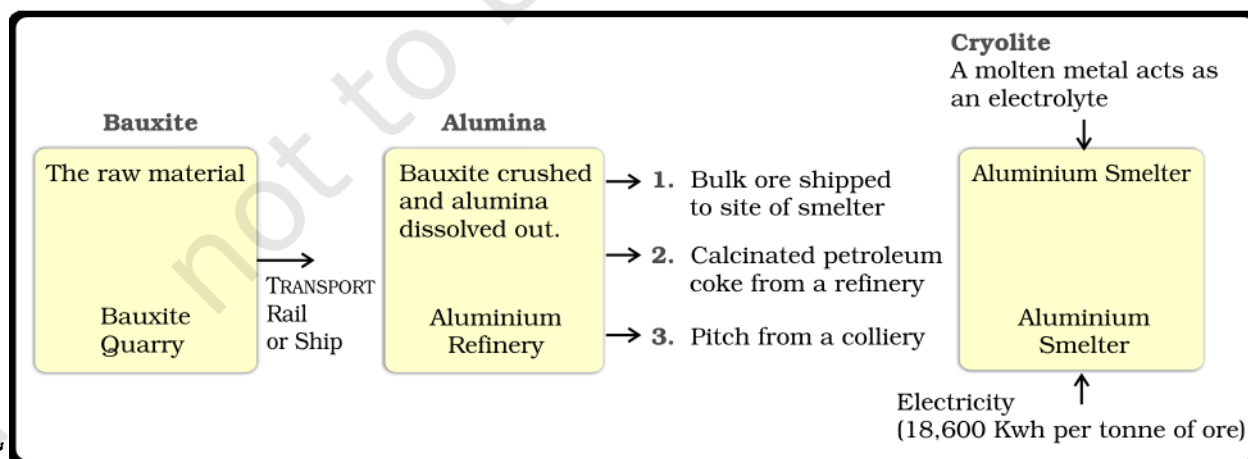


Fig. 6.8



another factory. All the manufactured saucepans are sent to a warehouse:

1. (a) Which raw material is likely to be most expensive to transport and why?  
(b) Which raw material is likely to be the cheapest to transport and why?
2. Do you think the cost of transporting the finished products after packaging is likely to be cheaper or more expensive than the cost of transporting aluminium and plastic? Why?

### Chemical Industries

The Chemical industry in India is fast growing and diversifying. It contributes approximately 3 per cent of the GDP. It is the third largest in Asia and occupies the twelfth place in the world in term of its size. It comprises both large and small scale manufacturing units. Rapid growth has been recorded in both inorganic and organic sectors. Inorganic chemicals include sulphuric acid (used to manufacture fertilisers, 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.

#### Why do you think it is so?

Organic chemicals include 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.

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. Make a list of the products you are aware of.

### Fertiliser Industry

The fertiliser industry is centred around the production of nitrogenous fertilisers (mainly urea), phosphatic fertilisers and ammonium phosphate (DAP) and complex fertilisers which have a combination of nitrogen (N), phosphate (P), and potash (K). The third, i.e. potash is

entirely imported as the country does not have any reserves of commercially usable potash or potassium compounds in any form. India is the third largest producer of nitrogenous fertilisers. There are 57 fertiliser units manufacturing nitrogenous and complex nitrogenous fertilisers, 29 for urea and 9 for producing ammonium sulphate as a by-product and 68 other small units produce single superphosphate. At present, there are 10 public sector undertakings and one in cooperative sector at Hazira in Gujarat under the Fertiliser Corporation of India.

After the Green Revolution the industry expanded to several other parts of the country. Gujarat, Tamil Nadu, Uttar Pradesh, Punjab and Kerala contribute towards half the fertiliser production. Other significant producers are Andhra Pradesh, Odisha, Rajasthan, Bihar, Maharashtra, Assam, West Bengal, Goa, Delhi, Madhya Pradesh and Karnataka.

### 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, alumina and gypsum. Coal and electric power are needed apart from rail transportation.

#### Activity

Where would it be economically viable to set up the cement manufacturing units?

The industry has strategically located plants in Gujarat that have suitable access to the market in the Gulf countries.

#### Activity

Find out where the plants are located in other States of India. Find their names.

The first cement plant was set up in Chennai in 1904. After Independence the industry expanded. Decontrol of price and distribution since 1989 and other policy reforms led the cement industry to make rapid strides in capacity, process, technology and production. There are 128 large plants and

332 mini cement plants in the country. India produces a variety of cement.

Improvement in the quality has found the produce a readily available market in East Asia, Middle East, Africa and South Asia apart from a large demand within the country. This industry is doing well in terms of production as well as export. Efforts are being made to generate adequate domestic demand and supply in order to sustain this industry.

### **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. After the liberalisation, the coming in of new and contemporary models stimulated the demand for vehicles in the market, which led to the healthy growth of the industry including passenger cars, two and three-wheelers. This industry had experienced a quantum jump in less than 15 years. Foreign Direct Investment brought in new technology and aligned the industry with global developments. At present, there are 15 manufacturers of passenger cars and multi-utility vehicles, 9 of commercial vehicles, 14 of the two and three-wheelers. The industry is located around Delhi, Gurgaon, Mumbai, Pune, Chennai, Kolkata, Lucknow, Indore, Hyderabad, Jamshedpur and Bengaluru.

### **Information Technology and Electronics Industry**

The electronics industry covers a wide range of products from transistor sets to television, telephones, cellular telecom, pagers, telephone exchange, radars, computers and many other equipments required by the telecommunication industry. Bangalore has emerged as the electronic capital of India. Other important centres for electronic goods are Mumbai, Delhi, Hyderabad, Pune, Chennai, Kolkata, Lucknow and Coimbatore. By 2010-11 (STPI) Software Technology Parks of India have come up across 46 locations at different centres of India. However, the major industry concentration is at Bangalore, Noida, Mumbai, Chennai, Hyderabad and Pune. A major impact of this industry has been on

employment generation. It is encouraging to know that 30 per cent of the people employed in this sector are *women*. This industry has been a major foreign exchange earner in the last two or three years because of its fast growing Business Processes Outsourcing (BPO) sector. The continuing growth in the hardware and software is the key to the success of IT industry in India.



**Fig. 6.9:** Cable manufacturing facilities at HCL, Rupnarainpur (West Bengal)



**Fig. 6.10:** Gas turbine rotor an assembly bed at BHEL, Hyderabad

### **Industrial Pollution and Environmental Degradation**

Although industries contribute significantly to India's economic growth and development, the increase in pollution of land, water, air, noise and resulting degradation of environment that they have caused, cannot be overlooked. Industries are responsible for four types of





**India:** Some Software Technology Parks



pollution: (a) Air (b) Water (c) Land (d) Noise. The polluting industries also include thermal power plants.

**Air pollution** is caused by the presence of high proportion of undesirable gases, such as sulphur dioxide and carbon monoxide. Air-borne particulate materials contain both solid and liquid particles like dust, sprays mist and smoke. Smoke is emitted by chemical and paper factories, brick kilns, refineries and smelting plants, and burning of fossil fuels in big and small factories that ignore pollution norms. Toxic gas leaks can be very hazardous with long-term effects. Are you aware of the Bhopal Gas tragedy that occurred? Air pollution adversely affects human health, animals, plants, buildings and the atmosphere as a whole.

**Water pollution** is caused by organic and inorganic industrial wastes and effluents discharged into rivers. The main culprits in this regard are paper, pulp, chemical, textile and dyeing, petroleum refineries, tanneries and electroplating industries that 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** of water occurs when hot water from factories and thermal plants is drained into rivers and ponds before cooling. What would be the effect on aquatic life?

Wastes from nuclear power plants, nuclear and weapon production facilities cause cancers, birth defects and miscarriages. Soil and water pollution are closely related. Dumping of wastes specially glass, harmful chemicals, industrial effluents, packaging, salts and garbage renders the soil useless. Rain water percolates to the soil carrying the pollutants to the ground and the ground water also gets contaminated.

**Noise pollution** not only results in irritation and anger, it can also cause hearing impairment, increased heart rate and blood pressure among other physiological effects.

Unwanted sound is an irritant and a source of stress. Industrial and construction activities,

machinery, factory equipment, generators, saws and pneumatic and electric drills also make a lot of noise.

### Control of Environmental Degradation

Every litre of waste water discharged by our industry pollutes eight times the quantity of freshwater. How can the industrial pollution of fresh water be reduced? Some suggestions are-

- (i) minimising use water for processing by reusing and recycling it in two or more successive stages
- (ii) harvesting of rainwater to meet water requirements
- (iii) treating hot water and effluents before releasing them in rivers and ponds. Treatment of industrial effluents can be done in three phases
  - (a) Primary treatment by mechanical means. This involves screening, grinding, flocculation and sedimentation.
  - (b) Secondary treatment by biological process
  - (c) Tertiary treatment by biological, chemical and physical processes. This involves recycling of wastewater.

Overdrawing of ground water reserves by industry where there is a threat to ground water resources also needs to be regulated legally. 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. 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 apart from personal use of earplugs and earphones.



**Fig. 6.11:** Sewage Treatment plant under Yamuna action plan at Faridabad



The challenge of sustainable development requires integration of economic development with environmental concerns.

### **NTPC shows the way**

NTPC is a major power providing corporation in India. It has ISO certification for EMS (Environment Management System) 14001. The corporation has a pro-active approach for preserving the natural environment and resources like water, oil and gas and fuels in places where it is setting up power plants. This has been possible through-

- (a) Optimum utilisation of equipment adopting latest techniques and upgrading existing equipment.
- (b) Minimising waste generation by maximising ash utilisation.
- (c) Providing green belts for nurturing ecological balance and addressing the question of special purpose vehicles for afforestation.

- (d) Reducing environmental pollution through ash pond management, ash water recycling system and liquid waste management.
- (e) Ecological monitoring, reviews and on-line database management for all its power stations.



**Fig. 6.12:** Ramagundam plant

### **EXERCISES EXERCISES EXERCISES EXERCISES EXERCISES**

#### **1. Multiple choice questions.**

- (i) Which one of the following industries uses limestone as a raw material.  
(a) Aluminium (b) Cement (c) Sugar (d) Jute
- (ii) Which one of the following agencies markets steel for the public sector plants?  
(a) HAIL (b) SAIL (c) TATA Steel (d) MNCC
- (iii) Which one of the following industries uses bauxite as a raw material?  
(a) Aluminium (b) Cement (c) Jute (d) Steel
- (iv) Which one of the following industries manufactures telephones, computer, etc.  
(a) Steel (c) Aluminium  
(b) Electronic (d) Information Technology

#### **2. Answer the following briefly in not more than 30 words.**

- (i) What is manufacturing?
- (ii) Name any three physical factors for the location of the industry.
- (iii) Name any three human factors for the location of an industry.
- (iv) What are basic industries? Give an example.
- (v) Name the important raw materials used in the manufacturing of cement?

#### **3. Write the answers of the following questions in 120 words.**

- (i) How are integrated steel plants different from mini steel plants? What problems does the industry face? What recent developments have led to a rise in the production capacity?
- (ii) How do industries pollute the environment?
- (iii) Discuss the steps to be taken to minimise environmental degradation by industry?





**ACTIVITY**

Give one word for each of the following with regard to industry. The number of letters in each word are hinted in brackets.

- |                                    |             |
|------------------------------------|-------------|
| (i) Used to drive machinery        | (5) P.....  |
| (ii) People who work in a factory  | (6) W.....  |
| (iii) Where the product is sold    | (6) M.....  |
| (iv) A person who sells goods      | (8) R.....  |
| (v) Thing produced                 | (7) P.....  |
| (vi) To make or produce            | (11) M..... |
| (vii) Land, Water and Air degraded | (9) P.....  |

**PROJECT WORK**

Select one agro-based and one mineral based industry in your area.

- What are the raw materials they use?
- What are the other inputs in the process of manufacturing that involve transportation cost?
- Are these factories following environmental norms?

**ACTIVITY**

Solve the puzzle by following your search horizontally and vertically to find the hidden answers.

G	G	G	P	V	A	R	A	N	A	S	I
U	O	J	I	P	G	X	K	M	Q	W	V
K	S	U	G	A	R	C	A	N	E	E	N
O	T	T	O	N	O	Z	V	O	P	T	R
A	U	E	L	U	B	H	I	L	A	I	U
T	K	O	C	R	A	Q	N	T	R	L	N
E	I	R	O	N	S	T	E	E	L	S	J
E	N	A	N	O	E	P	I	T	L	R	Y
G	A	N	U	J	D	R	A	G	D	T	A
N	T	A	R	P	O	A	P	U	E	P	Y
A	S	N	A	E	N	J	D	I	Y	S	K
S	M	H	V	L	I	A	J	H	S	K	G

- Textiles, sugar, vegetable oil and plantation industries deriving raw materials from agriculture are called...
- The basic raw material for sugar industry.
- This fibre is also known as the 'Golden Fibre'.
- Iron-ore, coking coal, and limestone are the chief raw materials of this industry.
- A public sector steel plant located in Chhattisgarh.
- Railway diesel engines are manufactured in Uttar Pradesh at this place.

