

PART-A

Section-1

India : Resources and Utilisation

Importance of Resources :

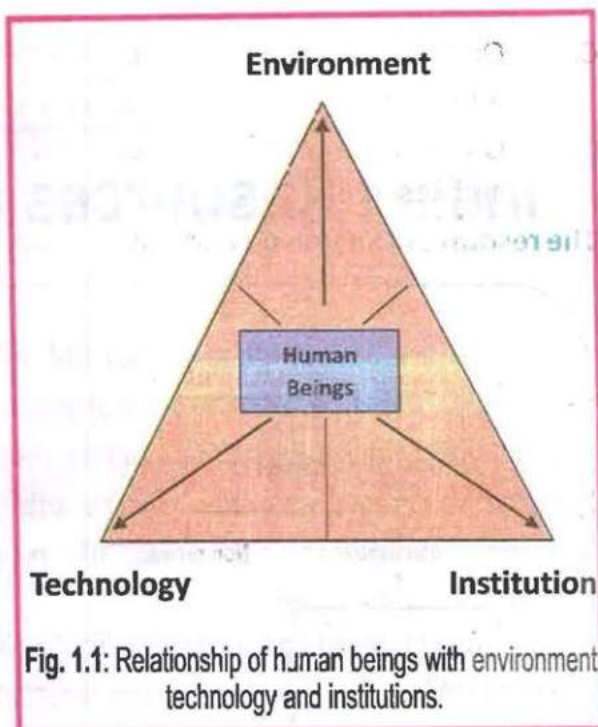
You use many things in your life. All the things that come in use are resources. Resources can be both physical and biological. On the one hand physical materials like land, soil, water, minerals fulfill the human needs and become resources whereas, on the other biological materials , such as, Vegetation, wild - life and aquatic life are not less important in making the human life comfortable.

Both physical and biological, materials become useful with the help of the technology. Since ancient times vegetation and wild life was available in the forests. The aquatic life has been flourishing since lakhs of years in Lake and Oceans. Coal, Petroleum and other minerals were lying in the earth's womb since time immemorial but there was scarcity of technical knowledge in the primitive human beings of that time. Slowly there was increase in the population and necessities and this increase initiated the rate of quick acquisition of knowledge. Not only this, primitive people with this acquired technical knowledge became knowledgeable man. Man became capable of making his life comfortable by utilising available materials in the environment with the help of popular techniques. The civilisation flourishes when popular technique is being used in the environment by human beings. Lastly the customs and ways of human habitation acquire the position of cultural resources.

Thus, the meaning of resource is very broad. Here, the words of **Zimmerman**, the famous Geographer, are worth mentioning "**Resources are not; they become.**"

During present time services are also considered as resources. If a Singer, Poet or Painter through his activity earns wealth and satisfy himself then his activities are also called resources. The poem of a poet, painting of a painter and singing of a singer are also resources. In true sense human being, himself, is a resource because he has knowledge (Technique) through which he can make any material useful. Thus, this concept is doubtful that resources are gift of the nature.

The resources are socio-economic backbone of any country. The countries devoid of resources lag behind in international race but it does not mean that only resource rich nations can develop. Japan is one such nation which has very less resources but its human resource is technically so well equipped that today it stands along with the developed nations of the world by judiciously utilising available materials. Thus, in the development of any nation, along with physical and biotic resources, human resource plays an important role. Amidst various, resources man is positioned as a controller, who establishes interrelationship between materials available in the environment, technology and institutions through which materials available in the environment becomes useful. It can be understood from Fig. 1.1.



CLASSIFICATION OF RESOURCES:

Following are the basis of classification of resources:

- A. On the basis of origin — Biotic and Abiotic

- B. On the basis of Utility — Renewable and Non-Renewable
- C. On the basis of ownership — Individual, Community, National and International
- D. On the basis of status of development — Potential, Developed, Stock and Reserve.

The resources can also be understood with the help of given chart:

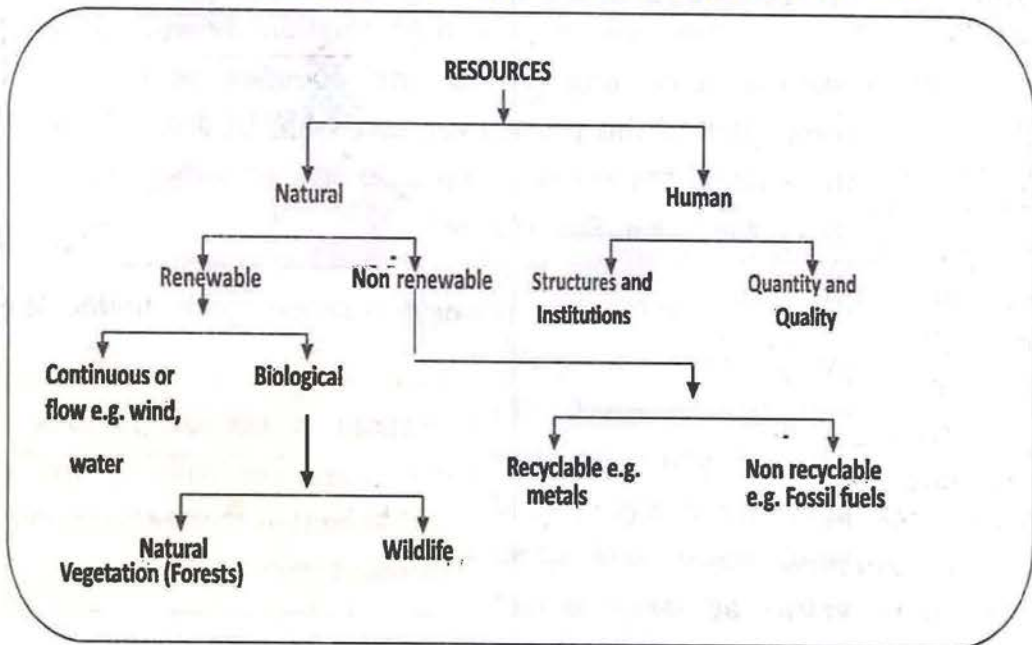


Fig. 1.2 Classification of Resources

TYPES OF RESOURCES

- A. On the basis of origin, resources can be of two types:
 - **Biotic Resources:** These resources are obtained from biosphere and have all the indications of life present in them such as human beings, vegetation, fish, animal and other living community.
 - **Abiotic Resources:** The collections of non-living things are called abiotic resources such as rocks, metals and minerals, etc.

B. On the basis of Utility resources have two classes:

Renewable Resources: Those resources which can be renewed or reproduced by physical, chemical or mechanical processes e.g. - solar energy, wind energy, water, electricity, forest and wildlife are called renewable resources. They can be classified in to continuous or flow and living resources. Fig. 1.2

Non - Renewable Resources: The formation of these resources involves very long period and complex process. The completion of this process can take lakhs of years. Some of these resources are not recyclable and get exhausted once they are used e.g. Fossil fuels.

C. On the basis of ownership resources can be of four types:

Individual Resources: These resources come under the ownership of particular individual for which they pay revenue to the government. e.g. - Plot of land, house and other property over which people have personal ownership. Garden orchard, Ponds, well, etc. are also such resources, over which an individual has personal ownership.

Activity:

Prepare a list of personal resources available in your family and which is owned only by your family.

Community Resources: This type of resource is owned by some particular community which is accessible to all the members of the community such as grazing grounds, burial grounds, Temple or Masjid campuses, community houses, ponds etc. In the urban areas this type of resources can be seen in the form of public parks, picnic spots, playgrounds, Mandir, Masjid, Gurdwara and Churches; these resources are accessible to people related to the community.

- **National Resources:** Legally all the available resources that lie within the country or nation are national resource. The government of the country has statutory rights to acquire private resources for public welfare.

Do you know?

Under some political boundary land, mineral, water resources, forest and wildlife and oceanic life (up to 200 km. oceanic area) are national property.

You might have seen Urban Development Authority boards in your village or in nearby areas. They have been authorised to acquire land by the government; they develop land along with other urban resources.

- **International Resources:** These resources are being controlled by International Institution. After 200 km. from the coastline on the open oceanic resources no country can claim ownership over that resource. These resources can be utilised only for research purposes by a country with the concurrence of international institutions.

Do you know?

The area up to 200 km. from the coastline of a country is known as 'Special/exclusive Economic Zone' (Apbarjak Arthik chetra).

A. On the basis of status of development resources can be of four types:

- **Potential Resources:** Such resources which are found in a particular region and there is possibilities of their utilisation but have not been utilised as yet. For example, minerals of Himalayan region which are very cost effective as its mining is very deep and they lie in very remote areas. Similarly, Rajasthan and Gujarat have huge potential for the development of wind and solar energy but these resources have not been developed properly so far.

- **Developed Resources:** Those resources whose quantity and quality have been determined after survey are known as developed resources. As discussed earlier, the development of resources depends upon technology and level of their feasibility.

Do you know? -

A modern solar energy plant, on a very large scale, is being installed in Bhuj of Gujarat.

- **Stock Resources:** These resources are available in the environment and have the capability to satisfy human needs but due to absence of desired technology for its exploitation these resources are viewed only in the form of stock resources. For example, water is a compound of hydrogen and oxygen which has hidden potential of being a rich source of energy but in the absence of a required technology for their exploitation they are not been exploited as yet.
- **Reserve Resource:** In fact these resources are the part of stock resources which can be utilised with the help of available technical know - how but their use has not started as yet. They are considered as capital for the future. River water can be used for producing hydro electricity in future but presently, it is being utilised only to a limited extent. Thus, these resources are reserved in forests or in Dams in the form of water.

Activity

Survey the area nearby you and prepare a list of reserve and stock resources.

Resource Planning:

- The judicious utilisation of resources is planning of resources. In the present time, the judicious utilisation of resources is a challenge before us. For the judicious exploitation of resources preparation of universally accepted policy is the first priority of resource planning.
- Resource planning is essential for the development of any country. For the country like India it is unavoidable because here along with diversity in the availability of the resources there is concentration of high density of population. Here there is number of regions which are self sufficient in resources and there are also regions which are devoid of resources. Also, there are few regions where abundant reserve of single resource can be found but they are poor in other resources.

Activity

Prepare a list of mining and reserve areas of minerals found in your state.

For example, Jharkhand, Madhya Pradesh and Chhattisgarh etc. are such states which have abundant reserve of minerals and coal. Similarly, Bihar is also rich in minerals like Lime stone and Pyrite. In Arunachal Pradesh water resources are abundantly available but due to some unknown reasons they have not been able to develop. In Rajasthan along with solar energy there is abundance of wind energy but it is a deficient state from the point of view of water resources. In India there are regions like Ladakh, which lies isolated from the rest of the country as cold desert but it has a very rich cultural heritage. Here, there is acute scarcity of water, vital minerals and basic infrastructure of other needs. Thus, on the National, state and local levels, for the management and balance of resources, the planning of resources is mandatory.

The planning of resources is a complex process. For this essential activity is required. These activities act as steps for the resource planning. With the support of these steps, the available resource of the country can be judiciously utilised and path of development can be achieved.

Resource Planning in India:

The steps of the resource planning can be studied by dividing them into following forms:

- (A) Survey of the different regions of the country for the identification of the resources.
- (B) After survey, preparation of map, measurement and estimation of the resources on qualitative and quantitative basis.
- (C) For providing real structure to the development of the resources, appropriate technology, skill and institutional planning structure is to be prepared.
- (D) To establish co-ordination between national development plans and resource development plans.

Find out:

What are the programmes that are being run in your surroundings, for the development of the resources with the help of the community participation in Bihar?

After Independence, efforts have been made to achieve fixed targets of resource planning in our country. In this regard, government of India has made concerted effort right from the launch of the first five year plan. The resources are an essential condition for the development of any unit but in the absence of required changes in the technology and institutions, development is not possible only on the basis of availability of the resources. Even today, there are many states in our country which in spite of having abundance of resources are categorised as economically backward states. Just on the contrary there are some states which are resource deficient but economically they are developed.

Conservation of resources:

Resources play an important role in the development of civilisation and culture but unmindful or over utilisation of resources may lead to social, economic, cultural and environmental problems. For the solution of these problems, resource conservation at various levels is essential. The planned and mindful utilisation of resources is known as conservation of resources.

Activity

Name such regions which are resource rich but economically backward. For this take the help of your teacher.

Since ancient times conservation of resources has remained a topic of concern for great social reformers, leaders, thinkers and environmentalists. In this regard, the view of great philosopher and thinker, Mahatma Gandhi is very apt

“There is enough for everybody's need and not for anybody's greed”

“Narmada Bachao Abhiyan” of Medha Patekar, **“Chipko Andolan”** of Sunder Lal Bahuguna and **“expansion of agricultural land by rain water harvesting”** by Sandeep Pandey are very appreciable steps in the direction of resource conservation.

Many thinkers like Gandhiji are of the view that greedy and selfish tendency of mankind and exploitative nature of modern technology have forced the rapid depletion of the resources. Gandhiji was strictly against production through machines and always supported production of products

by the masses, so that a large population may be protected from social curse like unemployment. He always maintained that through this process the development of working skill of the

laborers will be enhanced and injudicious exploitation of the resources will be checked.

Do you know?

The exploitative tendency of human beings and technology is called Robber's Economy.

Many summits were held for the conservation of the resources at the international level. At first, Club of Rome

advocated resource conservation in 1968.

Related to this, in the book '**Small is Beautiful**' written by Shumacher in 1974, Gandhian Philosophy was published.

For the conservation of resources, the Brundtland Commission Report, 1987

Do you know?

The first world summit for the conservation of the environment was held in Stockholm in 1972. After this summit 5th June is celebrated as **Environment Day** every year.

acted as an eye opener for the whole world. In this report the concept of '**Sustainable Development**' was introduced and along with this emphasis was laid on conservation of the resources. After this report a paper entitled '**Our Common Future**' was published. '**The Earth Summit**' held at Rio de Janeiro (Brazil) in 1992 was also a significant contribution in this regard. Again, the second Earth Summit held at New York in 1997 and third Earth Summit held at Johannesburg in 2002 are appreciable world level steps in the direction of conservation of resources.

The Concept of Sustainable Development:

Resource is the source of livelihood for mankind. The concept of sustainable development of the resources is essential for maintaining the quality of life. Due to the concept of '**Resources are the gift given by nature**' man has blindly exploited it which has led to the development of environmental problems.

The greed of man has led to over exploitation of the resources which has reduced the level of reserves of the resources at a very alarming level. The centralisation of the resources in the hands of select people has divided the society in to visible two (Rich and Poor) classes.

The resources were unmindfully and greedily exploited by the affluent class, which developed serious crisis in the world ecology. Ecological crisis like global warming, depletion of Ozone layer, environmental pollution, soil erosion, land shifting, chemical rainfall, untimely change of season etc. is ready to destroy civilisation and culture that exists on the earth. If these greedy elements or countries continue this uninterrupted exploitation then biotic life on earth may be destroyed.

To get rid of the above conditions and bring back the qualitative life of the biotic world, at first it is mandatory to judiciously distribute the available resources in the society. In other words, planned use of the resources is essential; without harming the environment, keeping the need of the future in mind and maintaining the progress of present developmental work in continuation. This concept is known as '**Sustainable Development**'; through this along with present development the future can also be safe.

Things to Remember:

- **First Earth Summit** was held from 3- 14 June, 1992 at Rio de Janeiro. In this summit about 178 representatives of developed and developing nations participated. An agreement was made on issues like Global warming, Forest - Conservation, Bio - Diversity, Agenda 21 and Rio declaration.
- **Agenda 21**:- In the auspices of United Nation Environment and Development (UNCED), a 800 page declaration approved by the head of the countries, in Rio de Janeiro summit, in which to attain sustainable development 21 agendas were accepted. For the constitution of this Agenda 21 directions was given to each nation and 'World Environment Fund' was established to meet the expected expenditures.

- **The Second Earth Summit** was held from 23- 27 June 1997 at New York for the evaluation of the first earth summit after 5 years. It is also called plus 5 summit.
- **Quito Summit** : A summit was held at Quito of Japan in December 1997 to save the earth from global warming in which 159 nations participated. In this summit agreement was reached on the reduction of utilisation of 6 gasses (Co₂, Methane, N₂O, HFC, CFC, Sulphur Hexa Chloride) mainly responsible for global warming. Where European Union agreed to reduce the emission of these gasses 8 percent, United States of America to 7 percent and Japan to 6 percent. This summit can be considered as the extension of the Montreal agreement held in 1987. This summit is also known as World Environment Summit or Green House Summit.
- **Third Earth Summit** was held from 26th August to 4th September, 2002 at Johannesburg. In this summit world wide agreement on 150 articles related to environment was to be made but this summit failed to produce any result. In this summit 2000 representatives from different countries of the world participated.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

i. Which type of resource is coal?

- (a) Non-renewable
- (b) Renewable
- (b) Biotic
- (d) Abiotic

ii. Which of the Following types of resource is Solar energy?

- (a) Manmade
- (b) Renewable (Punah Purtiyogya)
- (c) Abiotic
- (d) Non-Recyclable

iii. Up to how many km. area away from the coast is called Special/Exclusive Economic Zone?

- (a) 100 N. M.
- (b) 200 N. M.
- (c) 150 N. M.
- (d) 250 N. M.

iv. Robber's Economy is related to —

- (a) Collection of the resources
- (b) Unplanned exploitation of the resources
- (c) Planned exploitation of the resources
- (d) None of these

v. Up to how many km. area of the political boundary in the Ocean area, can be included in national property —

- (a) 10.2 K. M.
- (b) 15.5 K. M.
- (c) 12.2 K. M.
- (d) 19.2 K. M.

SHORT ANSWER TYPE QUESTIONS :

1. Define Resources.
2. Differentiate between Potential and Reserve resources.
3. Write the utility of Resource Conservation.
4. What is the role of technology in the manufacturing of the resources? Clarify.

LONG ANSWER TYPE QUESTIONS :

1. Explain the concept of 'Sustainable Development' in the development of the resources.
2. Describe the different features of the resources on the Basis of ownership.

PROJECT WORK :

1. With the help of your teacher organise a symposium in school in which discussion should be on conservation on those resources which is being utilised.
2. Survey the available possible human resources in your block and present a report based on their development.



(A) NATURAL RESOURCES

(A) LAND RESOURCES

In the previous chapter you have been acquainted with the concept of resources. Here, it has been made clear that the richness of any country depends on the judicious utilisation of the available resources. The concept of resources believes in the support that satisfies human needs and services. For this technical knowledge and institutional support is mandatory.

We live on Land. Our economic activities are performed on land itself. We utilise it in different ways. Therefore, it is a very important resource. It is a natural resource because it has been formed by nature. It is a fundamental resource because economic activities like agriculture, plantation, pastoral, fishery, mining, wild life, transport and communication are performed on land. Though, it has very wide range of use but it is a resource of finite magnitude. Therefore, it is necessary to utilise the available land for different purposes, carefully and in a planned manner.

There are variety of physical features of land resources, such as Mountains, Plateau, Plains, Low Lands and Valleys etc. These different features are affected by climate also. India has sufficient land resources. Here, there is extension of plains on about 43 percent of the total available land which is useful for the development of agriculture and

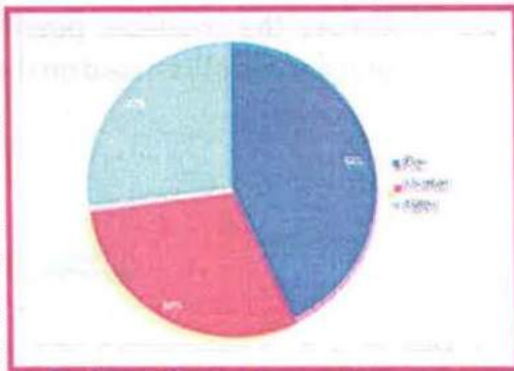


Fig. 1(A). 1 : Physical features of land in India

industries. 30 percent of the total surface area is mountainous region which determines the flow of perennial rivers and creates favorable conditions for the development of tourism. It is also important for ecological balance. The

plateau is spread over 27 percent of the total area, where rich reserves of minerals, fossil fuel and forest wealth are found.

Formation of Soil :

Soil is an important component of ecology. Formed of the unorganised materials, the upper most thin layer of the earth is called soil. Soil is the most important renewable natural resource. It is not only the source of plant growth but it also nourishes different types of living organisms on the earth. The inherent fertility of the soil affects the economic activities of mankind and regulates the future of the country. Its destruction leads to the demolition of property and culture. Thus, soil is a living system.

The formation of soil is a complex process which takes a very long period of time to complete. It takes lakhs of years to form a few centimeter of soil. The soil is formed by the destruction of the rocks accompanied by physical, chemical and organic changes. Geographers consider its formation as a very slow process.

Factors of Soil Formation

- Relief or surface structure
- Parent Rock or Bed Rock
- Climate
- Vegetation
- Organic materials
- Minerals
- Time



Fig. 1(A).2:.....

Change in temperature, running water, wind, glacier and other activities of decomposition are such factors that support the formation of soil. The role of organic and chemical changes is significant in the formation of soil. Conclusively, this can be said that in the formation of the soil both organic (humus) and inorganic materials participate.

On the basis of responsible components of soil formation such as their colour - structure, thickness, age or chemical and physical properties, the soil of India can be studied and classified under following different types:

CLASSIFICATION OF SOIL AND DISTRIBUTION:

There is distinct variation in relief, land structure, climate and vegetation of India. As a result of which six types of soil have mainly developed. They all are the basis of quality of land resource. Their respective descriptions are following:

1. Alluvial Soil:

This soil is spread all over India and is the most important soil. The plains of northern India are completely formed of alluvial soil, which is formed due to the alluvial deposits of



Fig. 1(A). 3 : Alluvial Soil

three important rivers systems of Himalayas namely Sindhu, Ganga and Brahmaputra. This soil is also extended in the form of a narrow corridor in Rajasthan and Gujarat. The Deltas formed by Mahanadi, Godavari, Krishna and Kaveri rivers, situated in the eastern coastal plains are also associated with alluvium. In total alluvial soil is spread over in about 6.4 crore hectare of land in India.

The alluvial soil is constituted by sand, silt and clay in different proportions. Its colour may range from hazy to reddish brown.

The grains of this soil keep on increasing in size from the mouth of the river to upper portion of the valley respectively. This type of soil is generally found in the piedmont plains areas such as Duars, Chos and Terai. Apart from the size of the grains or components the soil can also be recognised from its age. On the basis of age there are two types of alluvial soil: Old and new alluvium. The old alluvium has higher concentration of Kankar nodules. It is called 'Bangar'. The new alluvium mostly contains very fine grains in comparison to Bangar and is called 'Khadar'. In Khadar mixture of sand and clay is found. It is very fertile.

In alluvial soil adequate amount of Potash, Phosphorous and Lime are found, where as it is deficient in Nitrogen and organic materials. This soil is ideal for crops like Sugarcane, Paddy, Wheat, Maize, Pulses etc. Because this soil is very fertile, it is intensively cultivated as a result of which, here, the density of population is very high.

2. Black Soil :

This soil is black in color which is due to the presence of Aluminum and Iron compound. This soil is suitable for Cotton cultivation and that is why it is called 'Black Cotton Soil'. In India this soil is spread over an area of 6.4 crore hectares, which extends particularly in Lava Region - Maharashtra, Gujarat, Karnataka, Andhra Pradesh and Tamil Nadu states of Deccan. The formation of this soil occurred due to the disintegration of the parent rock and volcanic lava Basalt. Locally, this soil is also called 'Regur'.



Fig. 1(A). 4 : Black Soil

The most special quality of this soil is its excess water retaining capacity. This soil is full of nutrients like Calcium Carbonate, Magnesium, Potash and Lime but they are poor in Phosphorous. In hot weather it develops cracks which help in the proper aeration of the soil but it becomes sticky when wet and tilling is not possible. Thus, it is tilled immediately after the first shower. In scanty rainfall areas also this soil is suitable for cultivation without irrigation because the soil is sufficiently oxygenated. Apart from this, the soil is also suitable for the cultivation of Sugarcane, Onion, Wheat and fruits.

3. Red and Yellow Soil :

This type of soil develops in the areas of crystalline igneous rocks of the Eastern and southern parts of peninsular plateau where the rainfall is less than 100 cm. This soil contains iron content and so they look red. After hydration this soil becomes yellow in colour. Originally this soil is formed due to the disintegration and metamorphism of crystalline igneous rocks like granite and gneiss. Its extension, in India, is found on 7.2 crores hectares of the total arable land. Red or Yellow soils are found in Tamil Nadu, Karnataka, Goa, south East Maharashtra, Andhra Pradesh, Odisha, Chotanagpur Plateau and Meghalaya Plateau areas. Because of the lack of organic materials in the soil it is less fertile in comparison to alluvial and black soils. Its fertility can be increased by using fertilizers. Rice, Jawar-Bazra, Maize, Groundnut, Tobacco and fruits can be grown in this soil by making arrangements of irrigation.

4. Laterite Soil :

The word Laterite has been derived from the Greek word LATER which means brick. This type of soil develops in the areas of high temperature and excessive rainfall. In India this soil is found in more than 1.3 crore hectares of land. This soil is found in the high flat eroded lands where seasonal rains are very heavy. This soil is the result of the intense leaching in which the humus content is almost nil. Due to very high temperatures, the Bacterias which

decomposes the organic materials are destroyed. Due to weathering the laterite soil becomes hard. Because of the presence of the oxide of Aluminum and iron it looks red in colour. By utilising fertilizers and other manures in this type of soil, cultivation can be done. Laterite soil is found in Karnataka, Kerala, Tamil Nadu, Madhya Pradesh and hills of Odisha and Assam. In states like Karnataka, Kerala and Tamil Nadu Tea and Coffee is produced with the help of soil conservation techniques. In Tamil Nadu, Andhra Pradesh and Kerala this soil is suitable for growing Cashew nut.



Fig. 1 (A).5 : Laterite Soil

5. Arid Soil :

This type of soil develops in the areas which has long dry season, scanty rainfall and sandy soil which is devoid of humus. In this soil the development of cracks is very less. Chemical weathering is extremely limited. The colour of this soil is red or light brown. This type of soil is found in western Rajasthan,



Fig.1 (A).6 : Arid Soil

Saurashtra, Kutch, western Haryana and southern Punjab. There is scarcity of vegetation and fertile minerals in the soil but by making arrangements of irrigation, crops like cotton, rice, wheat can also be grown.

6. Mountain Soil :

This type of soil is generally seen in mountainous and hilly areas where sufficient rainforest are found. This soil is complex and varied in nature. In river valleys they are found in the form of alluvial soil and in upper parts coarse - grained immature soil is found. Because of the complex and diverse structural, vegetational and humid conditions, here large areas of one type of soil are not found. In snow covered areas these soils experience denudation and they become acidic and devoid of humus. In the lower parts of river valleys, particularly in river terraces and alluvial fans, these soils are fertile. Here, on the slopes, orchards and in the river valleys rice and potatoes are grown all over the area.

The distribution of all the above mentioned soils can be seen in fig no. 1 (A).7.

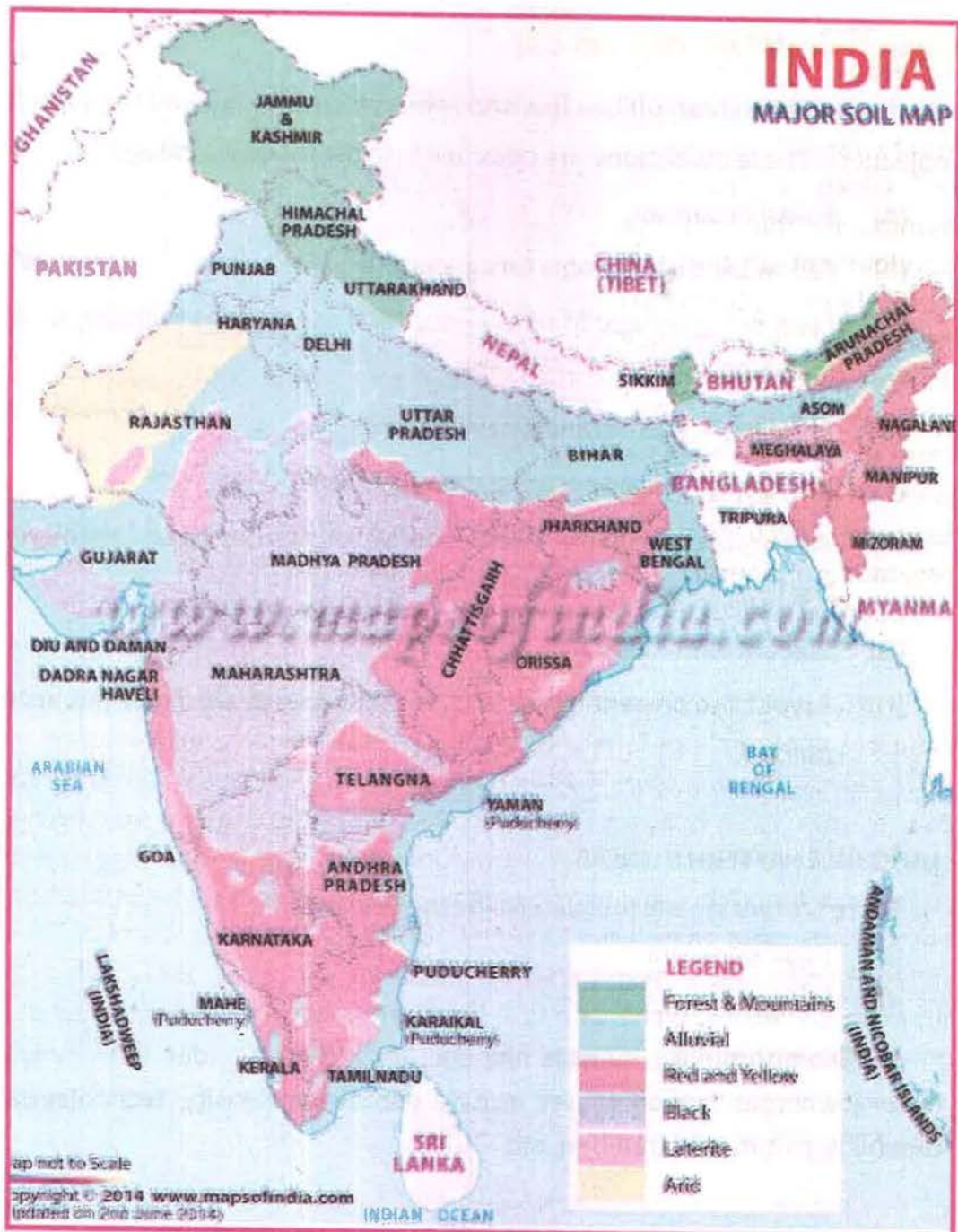


Fig no. 1 (A).7 : India : Map of types of soils

CHANGING PATTERN OF LAND-USE

Land Use : Man utilises the land resource keeping in mind the various objectives. These utilisations are classified in to the following categories :-

- (A) Forest Expansion
- (B) Fallow Land not suitable for agriculture
- (C) Land being utilised in non- agricultural use such as building, road, industries, etc.
- (D) Permanent pasture and grazing ground.
- (E) Land being utilised as Orchards and gardens.
- (F) Agriculturally suitable fallow land which has not been utilised for last five years.
- (G) Present fallow land.
- (H) Apart from present fallow land, the fallow land which has not been utilised

LAND-USE PATTERN IN INDIA

There are two factors that determine the land use :-

- (A) Physical Factor
- (B) Human Factor

Geomorphology, climate and soil are included under the physical factors, whereas human causes include population density, technological capability, culture and tradition, etc.

Out of the total Geographical area of 32.8 lakh square kilometers of India, land use data for only 93 percent part is available. Survey of Pakistan occupied areas of Jammu-Kashmir and Chinese occupied areas has not been done.

The land use pattern of India can be seen in fig.1 (A).8. In this figure, land use pattern for the year 1960-61 and 2002-03 has been shown.

India is bracketed amongst leading nations in terms of cattle population but very

less land is available for the permanent pastures which are not sufficient for the cattle population and it affects adversely in the pastoral activities. Apart from present fallow land and other fallow land are infertile. This type of land can be maximum be sown twice in two to three years. If this type of land is also included in to net sown area even then only 54 percent land, out of the present total available area, is suitable for agriculture.

In the extension of the net sown area there is variation amongst all states. In Punjab and Haryana agriculture is on 80 percent of the total area whereas in Arunachal Pradesh, Mizoram, Manipur and Andaman Nicobar Islands agriculture is practiced on less than 10 percent area.

To maintain the environmental balance of any country, extension of forest is mandatory on 33 percent of its total area. To attain this fixed limit National Policy for Forest 1952 has been made but even today forest

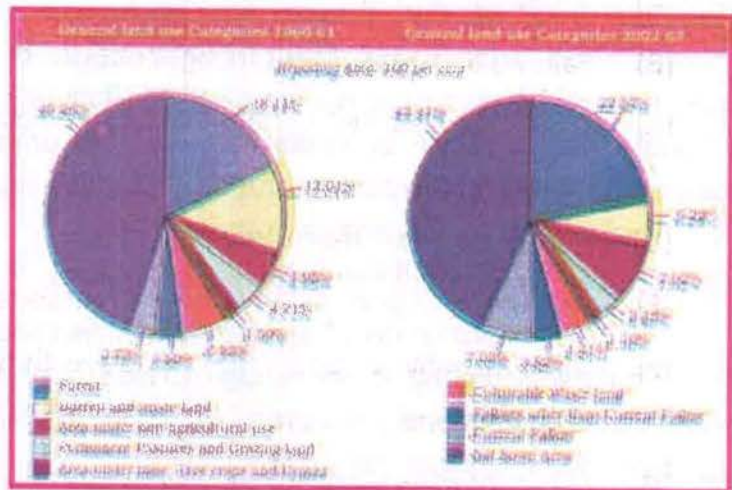


Fig.1 (A).8 : Use of land

expansion has been possible on only 20 percent land which is indicating towards environmental disaster. Along with environmental balance, forests are the source of livelihood for human beings. Fallow land and land used in non agricultural projects are constantly abetting in increasing the problem. Rocky, dry and arid soils are barren lands whereas on this land unplanned developments of the culture are neglecting the standards of land conservation and management. Construction of homes for mankind, development of means of communication (Railways- Roads), establishment of industries, disposal of waste materials are unexpectedly aiding in the degradation of land resources and due to these reasons fear of disaster is looming large on society and environment both.

SOIL EROSION AND SOIL CONSERVATION:

The transportation of soil by various methods is called soil erosion. This is a type of stealing of soil through various natural agents such as running water, wind, glacier and sea waves. The soil on the hilly slopes also falls down by the effect of gravitation force. Environmental problems are giving birth to disastrous situations like climate change, warming of the earth surface which is causing very less or very heavy rainfall. Less rainfall depletes the soil moistures and vanishes the layer composition and slowly the soil dries out and eroded away by the erosional agents. Heavy rainfall also erodes away soil and through Gullies (Abnalika) deposit it in some ditch or valley. In India, about 13 crore hectares of land has been

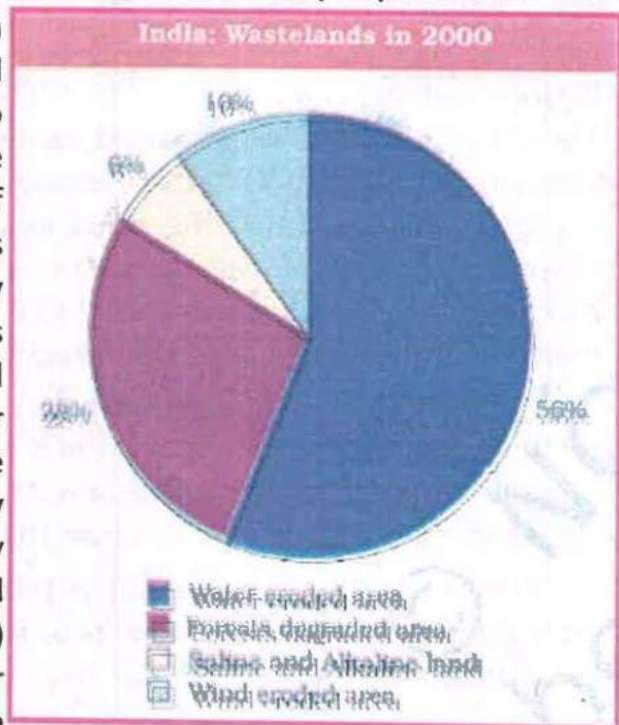


Fig.1 (A).9 : Barren Land Of India 2005

destroyed in this way and the land has been degraded. Of the total degraded land 28 percent is forest and 56 percent is under water. Rest of the area is either in saline and alkaline condition or has been degraded by human activities. Human activities like deforestation, over grazing, mining and excessive use of chemicals play an important role in degradation of the land.

After mining, that area is left open with ditches and debris which has caused land degradation in states like Jharkhand, Chhattisgarh, Madhya Pradesh. Odisha has been a victim of land degradation because of deforestation. Similarly, in states like Gujarat, Rajasthan, Madhya Pradesh and Maharashtra standard of land has been badly affected by over grazing. In Punjab, Haryana, and western Uttar Pradesh; land degradation has occurred due to over irrigation. Over irrigation causes the problem of water logging which increases saline and alkaline properties of the soil; which is responsible for the degradation of the soil. In industries, based on minerals (Cement, earthenware {Mridabartan}, Idol Construction {Murti-Nirman}) lime stone, Chalk, {Selkhari} are grinded to powder which spreads in the atmosphere and slowly settles down on land in the form of layers and effects the water retaining capacity of the soil. The waste material emitted by the industries pollutes both land and water.

It is a hard fact that 95 percent of the human needs are fulfilled by land. The favorable condition for the origin of life and development is provided by soil. Here, our ancestors also utilised this land in this reference and their legacy is benefitting present generation also. Not only this, it will act as foundation stone for the future generation also. Apart from the supply of essential needs like food, cloth, home; human being has increased his greed which has degraded the land. Also, it has given boost to those natural forces which initiate it.

Thus, land degradation is a great problem for the modern human civilisation and its conservation is a big challenge for us but if we are to preserve this land then we must accept this challenge and concentrate on conservation. There could be number of ways of conservation which can be implemented through human activities. The fertility level of the soil can be

maintained by crop rotation. By regular cultivation of wheat, cotton, maize, potato etc. the fertility of the soil is reduced which can be regained by cultivating oilseeds-pulses because it creates Nitrogen binding. In hilly region soil erosion can be checked by contour ploughing. To sustain the qualities of soil, storage of rain water, conservation of surface water and management of recharge of underground water are essential. Both soil and water can be conserved by adopting modern techniques of irrigation. Strip farming is highly suitable in wind erosion areas. This is based upon the development of grass strip between the crops. By adequate use of the chemicals soil can be conserved. The continuous use of the chemicals lowers the nourishing materials of the soil. These nourishing materials can be water, wind, earthworm and other micro-organisms. A chemical called Endrin stops the reproduction of the frog as a result it increases the number of the insects. Therefore, in place of chemicals natural fertilizers should be used. Use of organic fertilizers in place of chemical fertilizers helps in the conservation of the soil. If possible organic insecticide should be used so that along with the preservation of the crop their number is also checked.

Plantation of trees is the greatest source of conservation of the soil; it helps in soil conservation and humus derived from its leaves improves the quality of the soil. By adopting the above mentioned measures soil conservation can be done.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. What is the main cause of land degradation in Punjab?

(a) Deforestation	(b) Intensive cultivation
(c) Over grazing	(d) over irrigation

2. In which state is stair farming prevalent?

(a) Haryana	(b) Punjab
(c) Plains of Bihar	(d) Uttrakhand

3. Where do we find the extension of Arid soil?

(a) Uttar Pradesh	(b) Rajasthan
(c) Karnataka	(d) Maharashtra

4. Which is the chemical that destroys the reproduction of frog?

(a) Benzin	(b) urea
(c) Endrin	(d) Phosphorous

5. What is the other name of Black soil?

(a) Sandy soi	(b) Regur soil
(c) Red soil	(d) Forest soil

SHORT ANSWER TYPE QUESTIONS :

1. Name the states having extension of alluvial soil.
2. What do you understand by contour agriculture?

3. Which method of agriculture is useful in wind erosion areas?
4. In which parts of India are river deltas formed? What is the specialty of soil here?
5. How is crop rotation helpful in the conservation of soil?

LONG ANSWER TYPE QUESTIONS:

1. How water logging is created? What is its role in soil erosion?
2. Write an essay on soil erosion?
3. In spite of having very large cattle population, its contribution in Indian economy is almost nil. Elucidate?

PROJECT WORK :

1. Prepare a project for the use and conservation of soil resource available around your area.
2. Organise a symposium on conservation and management of resources with the help of village representative and Principal of the school.



(B) WATER RESOURCES

You must have seen or heard about river Kosi floods of 2008. Must have seen it on TV, read about it in news papers or heard on Aakashvani. The intensity of that flood was disastrous and it caused immense damage to life and property.

You will be surprised to know that this water brings disaster on the one hand whereas on the other it makes human needs easy and comfortable to create civilisations. This is the reason that almost all the civilisations of the world developed in the river valleys. Even in the modern era water is being used to produce electricity at some places whereas at some other places it is used as coolant for industrial machines.

As you know that the three fourth of the earth's surface is covered with water but most of the water is saline. Fresh water is received from the sources of surface and underground water. These sources of water are renewed and recharged through hydrological cycle. Hydrological cycle remains in motion and that is why the water is renewed on a regular basis. This is the reason why water is also a renewable resource; even then many countries or regions of the world suffer from the scarcity of water.

SOURCES OF WATER:

Because of the presence of water on most of the parts of the earth it is also called 'Blue Planet'. It is an important factor for the evolution of living beings. Here the sources of water are found in various forms. 1. Surface water 2. Underground water 3. Atmospheric (Bayumandaliye) water 4. Ocean water.

If the storage of water is kept in mind then ocean is the largest reservoir of water and that is why it is also called as 'Jaladhi'. In our life surface and

Do You Know?

96.5 percent of the world's total volume of water is found in the Oceans, in which only 2.5 is fresh water.

underground water is mainly used and so these two sources of water are being described:

1. Surface Water: Rainfall is the main source of surface water on the surface of the earth. 20 percent of the total rainfall is evaporated and it goes back to the atmosphere. Some part of it goes below the surface whereas, most of it goes to rivers-canal, lakes-ponds and small water reservoirs. Rest of the water goes to the sea and oceans. The above mentioned water found on the surface of the earth are called surface water.

2. Underground Water: When the rainwater percolates through the pores of the upper surface of the earth and water accumulates on the hard rock surface beneath the uppermost layer of the earth is called underground water. Surface water also contributes to this accumulation of the water. In other words, water accumulates below the upper surface of the earth as underground water in large quantities through these two medium. Water accumulated through these two processes is also called ground water.

DISTRIBUTION OF WATER RESOURCE:

If we look at the distribution of water at world level then we find that majority of the water is found in southern hemisphere. That is why southern hemisphere is also called 'Water hemisphere' and northern hemisphere is called 'Land hemisphere'. Most of the water available on earth contains high quantity of salt but still they are very important for biodiversity, where fish and other sea animals, vegetation and minerals are found.

Do you know?

75 percent of the total fresh water of the world is found in the form of ice sheet or glacier in Antarctica, Greenland and mountainous regions and about 25 percent fresh water is available in the form of underground water.

The distribution of water resources in India is not sufficient because in India 16 percent of world's population is found and for this population world's only 4 percent of fresh water is available. In India every year, out of the total water, about 4000 cubic K. M. water is received from rainfall and

about 1869 cubic K. M from surface water. About 2/3 of the total surface water flows in three large rivers of the country namely Indus, Ganga and Brahmaputra. Today, in India water tanks are being built very rapidly to store

water, with this water storing capacity has reached up to 174 billion cubic meter which was only 18 billion cubic meter at the time of independence.

Because of the structural features and other obstructions only 690 billion cubic meter of water is utilised in India which is only 32 percent of the total available water of India. Ganga basin has the largest usable water storing capacity in India. In spite of having maximum annual flow of water in Brahmaputra river, it has very low usable water storing capacity. If we look at the storing capacity of usable water, from the ratio point of view then river Tapi is at the first position. It has 97 percent water storing capacity. Details of some important rivers are being shown in the following table no. 3.1.

Table 3.1

According to the river basins of India Distribution of surface and underground water (In Billion Cubic Meter)

River Basin	Surface water flow		Underground water	
	Annual Flow	Utilisation	Incomplete	Utilisation
1. Indus	713	46.0	26.5	24.3
2. Ganga	5250	250.0	171.0	157.0
3. Brahmaputra	629.0	24.0	27.0	24.0
4. Godavari	1105	76.3	40.7	37.0
5. Krishna	70.0	58.0	26.4	24.0
6. Kaveri	21.4	19	12.3	11.3
7. Mahanadi	68.9	50.0	16.5	15.0
8. Narmada	45.7	34.5	10.8	9.9
9. Tapi	14.9	14.5	8.3	7.6
Other Rivers	369.4	118.2	74.0	68.2
Total	1952.1	690.3	431.32	395.6

The underground water is unevenly distributed in the country. Its distribution is affected by factors like structure of the rocks, surface condition, source of water supply etc. In water wearing rocks situated in the plain areas huge amount of underground water is present where pregnable rocks are found. In the northern plains of India from Punjab to Brahmaputra valley, which has been formed by the soil brought by the Himalayan rivers; maximum underground water is found. Here about 42 percent of the country's water is found. According to an estimate about 443.9 billion cubic meter of underground water is available in India whose 19 percent is found in Uttar Pradesh alone. There is a greater possibility of underground water resource in larger states like Maharashtra, Madhya Pradesh and Tamil Nadu.

UTILISATION OF WATER RESOURCE:

The population of India is increasing very rapidly. The population has almost tripled after Independence. With the increase in population, the demand for water has also increased very quickly in all the areas. The demand for water

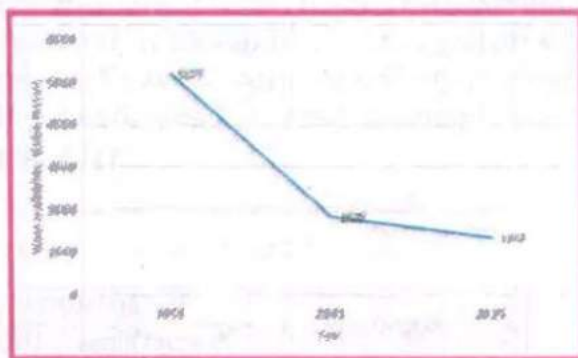


Fig.3.1 Annual rate of decreasing water availability

has increased considerably due to increase in drinking water, irrigation and undertakings like industries. The per person availability of water, in India, was 5177 cubic meters which came down to 1829 cubic meter per person in 2001. It is expected that by 2025 per person availability of water may come down to 1342 cubic meters, which seems to be an indicator for the arrival of water crisis where such crisis stricken nations will be forced to import water.

There is huge usage of Water in human life. Even water is important in life buildup. In animals and plants also water contributes greater part in its constitution. Thus, the

Do You Know?

There is presence of 65 percent and 65-99 water content in animals and plants respectively.

importance of water may very easily be gauged. The list of the use of water is very long. The use of water is unavoidable in activities like drinking water, domestic work, irrigation, industries, public health, cleanliness and human waste disposal etc. It is very difficult to imagine the execution of works like production of hydro-electricity and cooling of nuclear plant, fisheries, water harvesting (Jal Krishi), forestation, water sports, etc. The changing pattern of water utilisation can be seen in the following table:

Table 3.2 India : Changing pattern of water utilization
(Unit : Billion cubic meter)

Utilisation	1990	2000	2010	2025	2050
Domestic	25	33	42	52	60
Irrigation	460	356	653	770	800
Industry	15	30	79	120	130
Power	19	27	44	71	120
Others	30	33	35	37	40
Total	549	659	853	1050	1150

*Estimated

MULTI-PURPOSE PROJECTS:

The ancient epics and other historical records are testimony of the fact that sophisticated structures like Lakes or reservoir embankments were constructed with the support of brick-stone, soil, debris. Thus, this practice is not new, today we have constructed Dams on several rivers.

Planning was made to make the country economically self reliant and improve the standard of living of the countrymen after independence, in which special

Do You Know?

The first prime minister Pandit Jawahar Lal Nehru proudly proclaimed the above mentioned projects which took India on the path of development as "Temples of modern India".

emphasis was given on river valley projects. The development of these projects has multifaceted objectives, such as flood control, control on soil erosion, supply of water for drinking and irrigation, electricity production, supply of water to industries, transportation, entertainment, conservation of wild life, fisheries, water harvesting (Jal Krishi) and tourism etc.



Fig.- 3.2 Hirakud Dam

Capable of attaining these multifaceted objectives, these river valley projects are also known as Multi-purpose projects. In the opinion of the first prime minister, the river valley projects can simultaneously develop agriculture, industries, rural economy and urban economy. In India several river valley projects were developed. Projects like Bhakhra-Nangal, Hirakud, Damodar, Godavari, Krishna, Swarnrekha and Sone are supporting in the all round development of India. Since past few years multipurpose projects and Dams have been the cause of opposition and scrutiny. By constructing Dams in rivers, the natural flow of the rivers is obstructed and it causes rapid sedimentation of the river beds. Due to this deposition of sediments, aquatic animals face the problem of food, reproduction and free movement; with this disaster like floods also occur. Not only this, the vegetation and soil of the flood plain get submerged and are decomposed.

Movements like '**Narmada Bachao Andolan**', Tehri Dam Andolan unveils the shortcomings of the multipurpose projects. Generally, the people get displaced somewhere else from their land, livelihood and sacrifice their control and attachment to the resources. In return to that they neither

Do You Know?

Narmada Bachao Andolan is a Non Government Organisation (NGO) that inspires local people, farmers, environmentalist and human rights activists to oppose Sardar Sarovar Dam being built on the Narmada river in Gujarat.

receive sufficient compensation and nor do they ever get the benefit of the project after displacement; instead the capitalists and *Zamindars* get the benefit of this. It is true that in number of areas, the cropping pattern has been changed due to the availability of the irrigation facilities, where water harvesting (Jal Krishi) and commercial crops have attracted the farmers on one hand then on the other serious problem like salinity of the soil are emerging and because of this reason a social gap seems to be emerging between poor, landless and rich land lords. This type of dispute also emerges on international levels and distribution of profit is causing day to day problem.

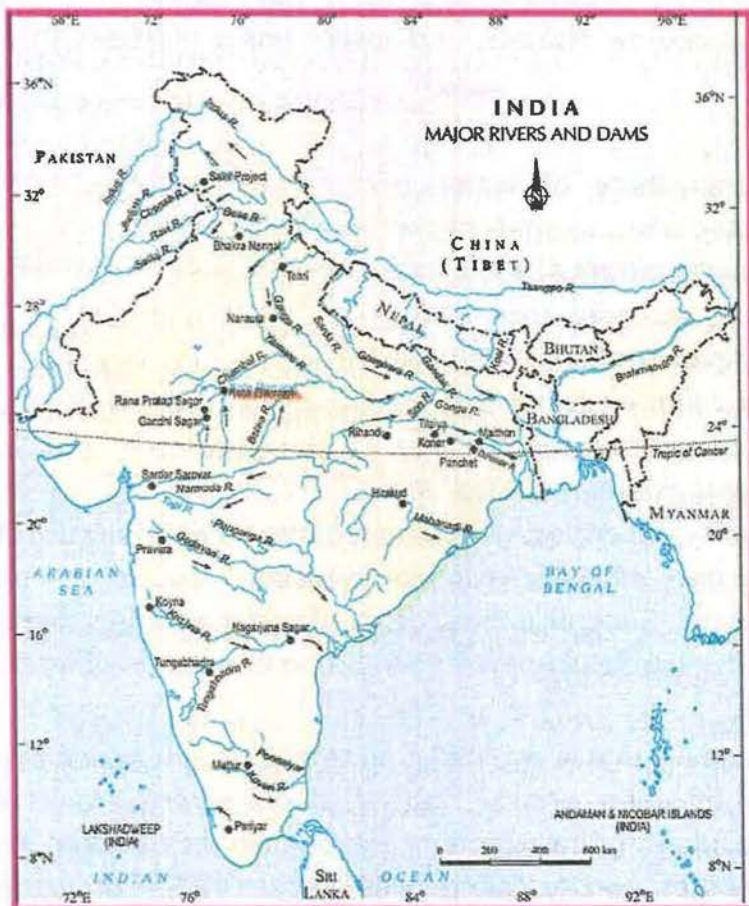


Fig. 1 (B) Major Rivers and Dams

It is generally seen that due to non fulfillment of the expected objectives from the river valley projects opposition and objections are being raised. These Dams are constructed to control floods but due to sedimentation in its reservoirs flood like situation emerges. Accumulation of water due to excessive rains goes beyond the control of the Dam. You have seen and heard about the devastating floods of north Bihar in 2007 which had become very precarious due to the release of water from the barrage situated in Nepal. It has supplemented further in the degradation of land along with the loss to life and property. It is also believed that possibilities of earth quake increases due to the multipurpose projects, not only this from floods water pollution, waterborne diseases and insect borne diseases in crops also spread.

WATER CRISIS :

Non availability of water is known as water crisis. In spite of the presence of huge amount of water and its capability to recharge itself, water crisis is a complex problem. With the expression of water crisis, the picture of drought or scanty rainfall area emerges in our minds. From fig No. 3.4

the situation of water crisis can be assessed. We cannot deny the differences of place and time of water resource availability due to the annual and seasonal changes. Generally, the scarcity of water emerges due to its over exploitation, over use and uneven distribution of water in different sections of the society.

Do you know that in any area in spite of sufficient availability of water, unavailability of water occurs? Several of our towns are its examples. Increasing population, their demand and uneven distribution of water are the cause of water scarcity. Due to availability of excess of water, not only domestic consumption of water increases but also for more production of grains the water resource is over exploited for increasing the area of irrigated

Do You Know?

According to a Swedish expert Falcon Mark, every day every person requires one thousand cubic meter of water. Less availability of water than this is water crisis.

land so that agriculture can be done even in dry season. It is seen more often that farmers are irrigating their land from their own well and tube wells and increasing agriculture productivity but, just think that what would be its result? It can lower the level of underground water which will reduce the water availability and along with creating scarcity of drinking water for living beings; it will also endanger the food security.

Industrialisation and urbanisation grew very rapidly after independence in India. Presently, multinational companies also have their foothold. Due to industrialisation there is increased pressure on fresh water reservoir. Power is required to

Do You Know?

At present, 22 percent of the total electricity produced in India is received from hydro-electricity.

run industries, which is mainly received from hydro - electricity. Due to increase in population in cities and urban life style, there has been rapid increase in the demand for the water and electricity, where water resource is being unmindfully over exploited by supplying water through tube wells and as a result of which water reservoir is exhausting very rapidly.

Till now we have discussed only the quantitative aspect of the water crisis but there are also certain conditions

in our country where in spite of the availability of sufficient amount of water, people remain thirsty. Can you tell why it is so? The main reason for this is the bad quality of water; it is a matter of worry for

Do You Know?

There are 180 leather factories in Kanpur that drains 58 lakh liters of waste materials daily in Ganga.

any state or country. Domestic and industrial waste, chemicals, insecticides and fertilisers used in agriculture get mixed with the water and this affects the quality of water very badly, proving very harmful for the human beings. Due to over exploitation of the water in some parts of Bihar and West Bengal water has been contaminated by Arsenic and in Rajasthan and Maharashtra Fluoride content has increased. Surface water has been contaminated from sewage and human waste, in most of the urban centers of India. Today, most of the rivers of India have become polluted. Many small rivers have become poisonous.

NEED FOR CONSERVATION AND MANAGEMENT OF WATER

You might have experienced that limited supply of water resources, rapid increase of pollution and looking at the need of the time, conservation and management of water resources is unavoidable so that healthy life, food protection, employment practices can be ensured and minimisation of inherent changes can be checked.

For the eradication of scarcity of the water resource or water crisis, government of India enacted a 'National water policy' in September 1987. With the passage of time due to emergence of several problems it was amended and 'National water policy 2002' was presented, under which for the conservation of water, the government kept following principles in mind and planned accordingly—

- (a) To maintain the availability of water
- (b) To save water from getting polluted
- (c) To re-cycle the polluted water and make them clean

In this context following conservation methods can be successful:

(1) Recharge of the underground water : Former President Abdul Kalam stressed on the recharge of underground water by referring it as 'water mission', so that sufficient water can be made available to agricultural fields, villages, cities and industries; for this activities like plantation of trees, use of organic fertilizer, conservation of wetlands, rain water harvesting and purification and recycle of drainage water can be useful.

Do You Know?

Urbanisation, construction of building, railways, construction of mettle roads obstruct recharge of the underground water.

(2) Watershed Management: By utilising running water or water logged area production of orchards, plantation, water harvesting and agricultural productivity can be increased and drinking water can also be supplied through this. The need is to implement this management in smaller units.

(3) **Technical Development:** By technical development we mean such undertakings in which water is least utilised and maximum profit can be earned like drip-irrigation, lift irrigation, irrigation through micro sprinklers, stair farming etc.

RAINWATER HARVESTING AND ITS RECYCLE:

You are well acquainted now that scarcity of water and its marginalisation has become main problem of the modern times. Because of the failure of the multipurpose projects and disputes associated with them, rain water harvesting can be a popular option for water conservation. In ancient India,

Do You Know?

22 percent of the underground water is accumulated when rain water goes below the surface.

there existed sophisticated hydraulic constructions and water- harvesting structures. Indians of that time had deep knowledge of rainfall regimes and soil qualities. They developed several methods of utilisation of rainwater, groundwater, river water and flood water in local ecological conditions. In hilly regions diversion channels like 'Guls' or 'Kuls' (Western Himalayas) were built to change the route of river flow for irrigating agricultural fields. In western India, particularly in Rajasthan, rooftop rain water harvesting was

Do You Know?

Cherapunji and Mausinram situated in Meghalaya receive highest rainfall in the world. Here drinking water crisis is solved (25%) by rooftop rain water harvesting.

done for drinking water. In the flood plains of west Bengal construction of inundation channels was prevalent for irrigation. In arid and semi arid regions ditches were dug to collect rain water, so that soil could be irrigated for agriculture. It is called 'Khadins' in Jaisalmer and 'Johads' in other parts of Rajasthan. In arid regions like Birano Pholadi and Barmer drinking water is stored in underground tanks which is also called 'Tankas'. It is generally located in the courtyard of the house which is connected through pipe with the stored water at the rooftop. In this work a Non Government Organisation 'Tarun Bharat Sangh' is working since last several years. Rooftop rain water harvesting is traditionally popular even today in Shillong of Meghalaya.



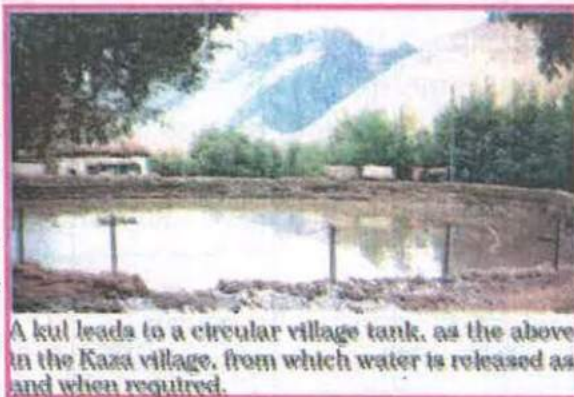
Fig-1 (D) : (A) Recharge through Hand Pump



Fig-1 (D) : (B) Recharge through abandoned dug well (Rooftop rainwater harvesting)

Due to the availability of drinking water all the year round by the development of Indira Gandhi Canal in western Rajasthan, it is sad that rain water harvesting is being neglected but in some houses 'Tankas' is still available.

In Gendathur village, situated in Mysore district of Karnataka, 200 houses have arrangement of rooftop water harvesting which is an example of water conservation. This type of structure can clearly be understood from figure 3.4.



A kul leads to a circular village tank, as the above in the Kasa village, from which water is released as and when required.

Fig.- 3.5- Traditional method of rain water harvesting

Presently, the rain water harvesting and water re-cycle is being done in Maharashtra, Madhya Pradesh, Rajasthan, and Gujarat along with other states.

SON PROJECT — A STUDY:

After Independence, keeping economic, social, trade and other all round development as objective, planning was made to utilise water resources. Because of the many fold utilisation of the river valley water, this project has been named as multipurpose project which has already been discussed before. In Bihar, keeping these objectives in mind several projects

were made in which three are important 1. Son project 2. Gandak project 3. Kosi project.

Son River Valley project is not only the most ancient but also the first project of Bihar. The British government, in order to increase the crop production by increasing the area of irrigated land, developed this project in 1874. In this, canal was constructed in the east and west directions near Dehri. Its total length is 130 Km.; about 3 lakh hectares of land is irrigated through the east canal in Patna, Gaya and Aurangabad districts. From western branch of this canal three sub- branches have been constructed; From the first branch Bhojpur and from the second branch Buxar district is irrigated. The third branch has its effect in Chausa region. Likewise these triple branches serve the three districts of Rohtas, Buxar and Bhojpur. These fully developed canals irrigate 3 lakh hectares of land.

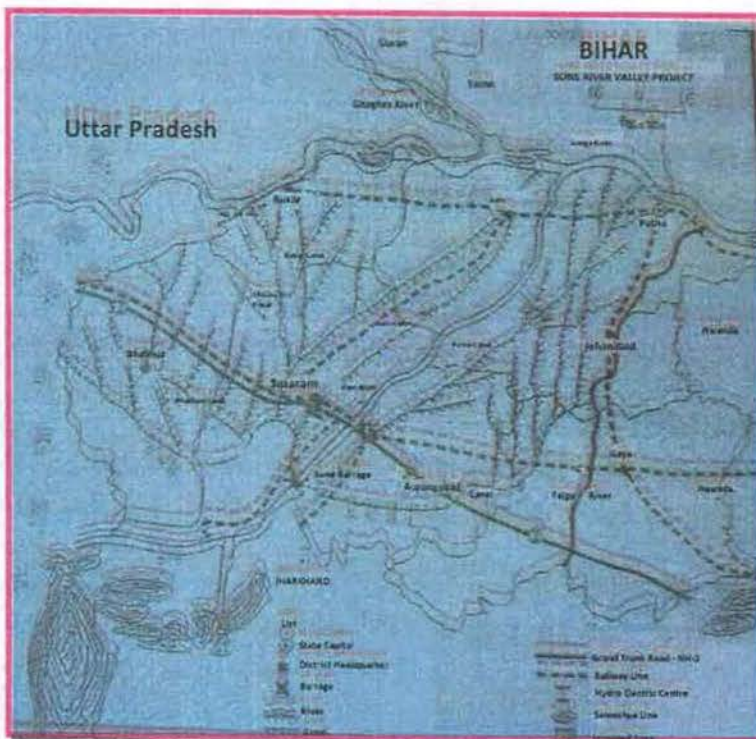


Fig.- 3.6 - Sone River Valley Project

Effort was made in 1968 to give this project a shape of multipurpose project 10 km. away from Dehri at a place known as Indrapuri by constructing a Dam. Through this water has been discharged from the barrage in older canals, canal extension and its re-enforcement has also been done. This is the reason why this drought prone area of Sone is called 'Rice Bowl of Bihar'.

Power stations have also been setup for the production of Hydro-Electricity. On the western canal, near Dehri, power station has been setup which produces 6.6 MW of electricity. By utilising this electricity, Dalmianagar is emerging in the form of a large industrial establishment. Apart from this, on the eastern branch of the canal at a place known as Baruna, power stations have been setup where 3.3 MW of electricity is being produced. The canals of this project are now been rejuvenated. Uttar Pradesh government utilises the water of Rihand river which is a tributary of Son river and this is the reason why river Son faces water scarcity. The Government of Bihar has taken initiative for a positive solution to this problem through dialogue with the government of Uttar Pradesh.

Before the division of Bihar 'Indrapuri Reservoir Project' was known as 'Kadwan Reservoir Project'. For the development of this project construction of a Dam has been proposed. The construction of this Dam will give stability to the irrigation facility of Son project along with the production of 450 MW of electricity. Though, its source lies in the control of three states, in which mutual agreement has been reached between Bihar and Jharkhand but agreement with Uttar Pradesh is still awaited. The Department of Power, Government of Bihar, has given conditional permission to National Hydro Power Corporation (NHPC) for the accomplishment of this project. Under this NHPC will construct this Dam from the point of view of hydro-electric production and Department of water resource will operate the water as per its requirement in the canal system for irrigational purposes. The NHPC is working for the agreement of the concerned states and central water commission is working for the approval of the project. The management work of this project by Bihar Hydro Electric Corporation (BHPC) is in progress.

Apart from this there are many river valley projects which have been proposed in Bihar that need to be developed, among which Durgawati Reservoir Project, Upper Kuil Reservoir Project, Baghmata Project and Barnaar Reservoir Project are significant.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. Because of the presence of water in very large area, the earth is called -
 (A) White Planet (b) Blue Planet
 (a) Red Planet (d) Green Planet
2. What percentage of total water is found in Oceans?
 (a) 9.5% (b) 95.5%
 (c) 96% (d) 96.6%
3. Who called Dams as 'Temple of India'?
 (a) Mahatma Gandhi (b) Dr. Rajendra Prasad
 (c) Pandit Nehru (d) Swami Vivekanand
4. What is the percentage of water present in the body of living beings?
 (a) 55% (b) 60%
 (c) 65% (d) 70%
5. Contamination of which material is increasing due to over exploitation of the water in Bihar?
 (a) Fluoride (b) Chloride
 (c) Arsenic (d) Iron

SHORT ANSWER TYPE QUESTIONS:

1. What do you understand by multipurpose project?
2. What are the uses of water resource? Write.
3. What are the causes of interstate water dispute?
4. What is water crisis?
5. Describe the causes of the pollution of rivers of India?

LONG ANSWER TYPE QUESTIONS:

1. What do you understand by water conservation? What are its solutions?
2. What is the role of rain water in the life of human beings? Mention the methods of its harvesting and recycle.

PROJECT WORK:

1. Prepare a project on the water utilisation of the rivers that flow nearby your school?

ACTIVITY:

1. Search the sources for the increase of level of underground water nearby your area and make a planning for them.
2. Prepare a list of interstate water dispute.



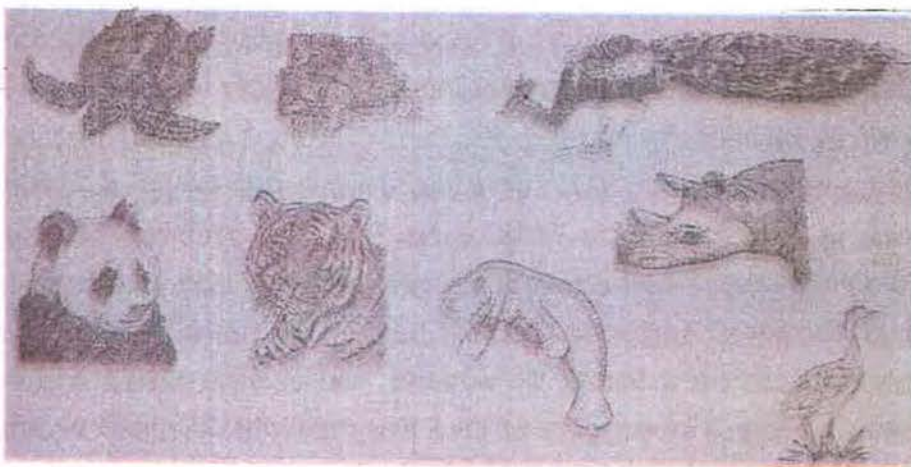
(C) FOREST AND WILDLIFE RESOURCES

"This is true that control on 'Fire' is the greatest invention of the human civilisation, but this great invention triggered the beginning of destruction also and its first victim was forest and wildlife, when cooked meat was tasted and then utilisation of forest timber became common in the form of fuel resource for cooking and roasting of hunted wild animals."

Forest and wildlife are significant partners of the journey of human life. Forest is like a protective shield for the earth. It is not only a resource but an important factor in the making of the ecosystem and we have an undivided relationship with them. In fact, forest is an invaluable gift of the nature. Since the beginning of the universe human being has been nourished by the forest. Forest and wildlife is indispensable resource for human being. It enables all living

Do You Know?

Forest is that part of large piece of land which is covered with trees and bushes. Those forests which are self developed are called natural forest and those forests which are developed by human beings are called man made forest (forestry). Forests are the habitat of bio-diversity.



Pict. 1(c).1 :

beings to live in a state of equilibrium in the biosphere or makes maximum contribution to the making of balanced ecosystem because for all living beings, the initial source of food energy is vegetation.

In India forest resource is a very important resource. Religious scriptures and folk stories are testimony of the fact that people, here, have always loved forest from the very beginning but in the quest for development we have neglected all the great traditions of the past. We now understand the importance of forest and wildlife and exploiting these resources very rapidly. Therefore, we must protect forest and wildlife resources.

TYPES OF FOREST AND WILDLIFE RESOURCES AND THEIR DISTRIBUTION:

India stands tenth in the world from the point of view of extension of forest. Here, forest cover is found on about 68 crore hectares of land. In Russia 809 crore hectares land is forest, which is first in the world, in Brazil 478 crore hectares, in Canada 310 crore hectares, in United States of America 303 crore hectares, in China 197 crore hectares, in Australia 164 crore hectares, in Congo 134 crore hectares, in Indonesia 88 crore hectares and in Peru 69 crore hectares are forest area.

According to a report of Food and Agriculture Organisation (FAO); in 1948 the world had 4 billion hectares of land under forest cover which came down to 3.8 billion hectares in 1963 and in 1990, 3.4 billion hectares of forest area remained but in 2005 some improvement was made and the situation became almost equal to 1948 when the forest area reached up to 3.952 billion hectares. This is about 30 percent of the world's total area. In 2001, in India, the forest spread over 19.27 percent of the total Geographical area; according to Forest Survey of India (FSI) on 20.55 Geographical area forest cover is there. The imagery of I.R.S.P. 6 resource satellite LIS III which is a remote sensing satellite fitted with scanner and camera has been of great

help in assessing the actual situation of Indian forests. According to its tenth report in 2005, the country at present has 67.71 crore hectares land as forest area which is 20.60 percent of the total Geographical area.

The distribution of forest in India is not even. Here, the North-Eastern states and Madhya Pradesh is very rich in forest wealth but Andaman and Nicobar Islands are the richest where forests are found on 90.3 percent of the total Geographical area. On the basis of the density of the trees, the forests can be categorised in five categories:-

1. **Very dense forest** (The density of trees is over 70 percent in total Geographical area)
2. **Dense forest** (Density of trees between 40-70 percent in total Geographical area)
3. **Open forest** (Density of trees between 10-40 percent in total Geographical area)
4. **Bushes and other forest** (Density of trees less than 10 percent in total Geographical area)
5. **Mangrove forest** (Coastal forest)

1. Very dense forest : This type of forest extends on 54.6 lakh hectares of land which is 1.66 percent of the total Geographical area. Except for Assam and Sikkim, all north - eastern states come under this category. In these areas the density of forest is over 75 percent.

2. Dense forest : 73.60 lakh hectares of land falls under this category which is 3 percent of the total Geographical area. The extension of this type of forest is found in the hills of Himachal Pradesh, Sikkim, Madhya Pradesh, Jammu and Kashmir, Maharashtra and Uttarakhand. Here, the density of forest is 62.99 percent.

3. Open forest : The extension of this type of forest is found on 2.59 crore hectare of land which is 7.12 percent of the total Geographical area. This type of forest is found in Karnataka, Tamil Nadu, Kerala, Andhra Pradesh, some districts of Odisha and 16 tribal districts of Assam. In the tribal districts of Assam the density of trees is 23.89 percent.

4. Bushes and other forest : This type of forest is found in Rajasthan and semi arid regions. In the plains of Punjab, Haryana, Bihar, and West Bengal the density of trees is less than 10 percent and that is why this

categorised under this category. This type of forest is found on 2.459 crore hectares of land which is 8.68 percent of the total Geographical area.

5. Mangrove forest (Coastal forest) : Only 5 percent of the world's total Mangrove forests (4,500 K. M.) is found in India, which spreads in the coastal states in which half of them is located in the 'Sunderbans' of West Bengal. After this Gujarat and Andaman and Nicobar Islands are placed. Overall, in 12 states and Union territories Mangrove forests are found in which Andhra Pradesh, Gujarat, Karnatka, Maharashtra, Odisha, Tamil Nadu, West Bengal, Andaman and Nicobar Islands, Pudduchery, Kerala and Daman-Diu are included.

In only 0.14 percent of the total Geographical area of the country (4.4 lakh hectare) Mangrove forests are found. In West Bengal the largest area or 47.6 percent is covered by Mangroves, whereas Gujarat is placed second where Mangroves extends in 21 percent area and the third position is held by Andaman and Nicobar Islands where Mangroves spreads over 14 percent area.

Do You Know?

- Out of the total forest covered area of the country 25.11 percent forest area is found in seven states of North- East.
- In 188 tribal districts of India 60.11 percent of the total forested area is found.
- Madhya Pradesh stands first in terms of forest area in the country where 11.22 percent of total forest area of the country is found. On the second position is Arunachal Pradesh (10.01 percent), The third position is held by Chhattisgarh (8.25 percent), Odisha is placed fourth (7.18 percent) whereas Maharashtra is fifth placed where 7.01 percent area is under forest cover.
- Only 3 billion hectare land in the world is covered by forest, since last 800 years 6 billion hectare forest has been cut.
- In recent years India is placed second after China in terms of forest development.

After the division of Bihar the condition of Bihar in Forest distribution has become pitiable because in the present Bihar most of the land is agricultural land. Only on 6764.14 hectare area forest is found, which is 7.1

percent of the total Geographical area. In 17 of the total 38 districts of Bihar the forest area has totally vanished. The condition of forest in West Champaran, Munger, Banka, Jamui, Nawada, Nalanda, Gaya, Rohtas, Kaimur and Aurangabad is somewhat better whose total area is 3700 square kilometer. In rest of the area overexploited forest is there and in the name of forest only bushes and grass has remained.

Administratively Forests have been Categorised into Following Categories :

(A) Reserved Forest : Those forests which are climatically important are called reserved forests. In these forests neither woods can be cut nor is grazing of animals permitted. These forests are necessary for flood control, stoppage of decertification and maintenance of climate. More than half of the total forest area of the country (54 percent) has been declared as reserved forest area.

(B) Protected Forest : In this type of forest area, under certain rule and regulation grazing of animals and facility of limited cutting of trees is given. To protect the forests from getting destroyed, it is protected. According to the forest department one third of the total forest area (29 percent) are protected forests.

(C) Unclassified Forest : Rest all types of forests and barren land which is in the ownership of Government, individuals, communities are categorised under independent and unclassified forest. In these types of forests, the government has not imposed any prohibition on cutting of wood and grazing of the animals. The government charges tax for this. 17 percent of the total forest area is unclassified forest area.

The maximum extensions of reserved and protected forests are found in Madhya Pradesh where 75 percent of the total forest area is located. Apart from this a large proportion of total forest in Jammu and Kashmir, Andhra Pradesh, Uttarakhand, Kerala, Tamil Nadu, West Bengal and Maharashtra are of reserved forests whereas in Bihar, Haryana, Punjab, Himachal Pradesh, Odisha and Rajasthan, in all forests a large proportion of protected forest is protected. In all the states of North-East and in Gujarat most of the forest area is unclassified and under in the management of local communities.

The Destruction and Conservation of Forest Wealth and Wildlife:

The destruction of forest wealth began in the colonial era because English developed railways and roadways for administrative and trade purposes and it started the exploitation of the forest but after independence forest and wild life was regularly attacked. In fact, in the name of development destruction of forests began. Till the mid of the twentieth century, the forests occupied 24 percent area which shrank to 19 percent in the beginning of the twenty first century. The main cause for this was human interference, uncontrolled grazing of the domestic animals and exploitation of the forests through different ways. According to a report of the Indian Forest Survey, the annual production of Indian forests is 0.5 cubic meters, whereas from the extension point of view it is 2.1 cubic meter.

One of the main causes of the destruction of the forests in India is the extension of agricultural land. According to one survey, between 1951 and 1980, about 26,200 square kilometer forest area turned in to agricultural land. Particularly, in the tribal areas of the North-East and central India, due to shifting (Jhum) cultivation or 'Slash and Burn' cultivation, forests have been destroyed.

The forests have also been badly destroyed by the implementation of the mega developmental projects. Due to the development of the river valley projects since 1952, over 5000 square kilometers forest area has been destroyed. Similar projects are still under construction which is causing continuous destruction to the forest. Due to rapid mining activity also the destruction of forest has occurred. The Dolomai Tiger reserve of West Bengal is in extreme danger due to mining activities. The natural habitat of several species has suffered damage because of the mining activity.

Grazing and use of wood as fuel has also played a major role, in the destruction of forest and wildlife. The construction of railways, roadways, industrialisation and rapid urbanisation has brought large scale destruction to the forests.

According to few environment experts, in many parts of India, for enriched plantation or from the commercial point of view, the plantation of

single variety of trees led to the extinction of the other species of trees. For example due to exclusive plantation of Teak, the other natural forest in south India has been destroyed and due to the plantation of Chir Pine in Himalayas, the forests of Himalayan Oak and Rhododendron have been damaged.

The Himalayan Yew In Danger-

The Himalayan Yew (Evergreen tree like chir) is a medicinal plant which is found in various parts of Himachal Pradesh and Arunachal Pradesh. A chemical called 'Taxol' is extracted from the bark, leaves, branches and roots of Chir trees and is used for the treatment of cancer. The medicine made from it is largest selling cancer medicine in the world. The existence of this vegetation species is under threat due to over extraction. Thousands of Yew trees have been lost in various parts of Himachal Pradesh and Arunachal Pradesh in the last one decade.

As the area of forest shrank, the natural habitat of wildlife also reduced continuously. For food security as well as hunting of wildlife for enjoyment is one of the major causes of destruction of wildlife. In present times the situation is

Do You Know?

In our country 81,000 species of fauna and 47,000 species of flora are found. About 15,000 flora species is of Indian origin.

Activity:

Describe prevalent folk stories and songs of your village and Mohalla related to harmonious relationship between human being and nature.

this that a number of wildlife are extinct or on the verge of becoming extinct. Cheetah and Vulture are its examples in India. If we analyse carefully then we will

find that it is our non-sensitivity towards environment that is threatening the forest and wildlife since decades.

Today, in India 744 species have become extinct and 22,531 species are on the verge of becoming extinct. From table No. 1.1 we get the details of those species which have become extinct or on the verge of becoming extinct.

Table -- 1.1
Number of species on the verge of becoming extinct in India

Species	Extinct	Endangered species
1. Plants	384	19079
2. Pisces	21	343
3. Amphibious	02	50
4. Reptiles	21	170
5. Invertebrates	98	1355
6. Birds	133	1037
7. Mammals	83	497
	Total 742	2,2531

Some major species which are in danger of becoming extinct are Black Buck, Chinkara, Wolf, Swamp Deer, Nilgai, Indian Gazelle, Antelope, Panther, Thinos, Gir Lion, Crocodile, Flamingo, Pelican, Bustard, White Crane, Gray Heron, Mountain Quil, Peacock, Green Sea Turtle, Tortoise, Dugong, Red Panda etc.

Following are the three major causes of adverse effect of human beings on the habitat of wildlife:

(I) **Encroachment of natural habitat:** The natural habitat of wild animals are forests, plains, rivers, ponds, wetlands, hills and Tarai etc. but their habitat is being encroached due to uncontrolled growth in population, industrial development, urbanisation, large Dams or other projects. Due to increase in the facilities of the communication the natural habitat of the wildlife has been encroached. As the natural habitat of wild life is being threatened by increasing encroachment, under this pressure the normal growth of the wildlife and their reproductive capability has lessened.

Do You Know?

Low lying water logged areas are called wetlands. Locally they are also called Chauras, Bhagar Maan, Tal.

(II) **Pollution associated problems:** The increasing pollution has given birth to several problems. The main factors responsible for the reduction in the number of wildlife are ultra violet rays, acidic rainfall and greenhouse effect. Apart from these, due to air, water and soil pollutions the life cycle of forest and wild life is being seriously being affected. Without the completion of the life cycle, the birth of new plant or organism cannot take place. As a result of which in spite of having the availability of their natural habitat, the wild life is slowly diminishing.

(III) **Economic Gain :** Right from colorful Butterflies to Frogs, birds and wild animals, Tortoise, Parrots and other local birds are hunted and sold. These are black marketed on national and international level. China is the main center for the black marketing of such wildlife.

Due to planned exploitation of the particular species of plants-trees and animals on local, regional or state level, number of species are endangered.

Continuous hunting of the wildlife is also a big challenge. In present times, it has emerged as an issue of world level, as a matter great concern.

Now it has been accepted at social, cultural, moral, economic and religious level. Not only this, men of literature, poets and artists, for awareness, have given particular mention about it in their creations. In India, the significance of forest and wildlife has been accepted since ancient times.



In every religious writings and different ancient scriptures a significant mention has been made of forest and wildlife. People living in rural areas, utilises more than 100 species of plants in their religious rituals and they also grow these plants in their agricultural fields. The rulers of India also emphasised on the conservation of nature. Emperor Ashoka had also concentrated on this in the third century BC. Perhaps this is the first historical proof that Ashoka, while accepting the significance of nature registered on his inscriptions, the prohibition on killing of animals and the related conservation laws. In medieval India, in the writings of the founder of Mughal empire, Zahir Uddin Babur and Jahangir. A special mention regarding conservation of nature is found. The Mughal art and creations also reflect love towards forest and wildlife.



Do You Know about Amrita Devi Vanya Sanrakchan Prasar?

Amrita Devi lived in Vishnoi village (Jodhpur District) of Rajasthan. She refused to obey the orders of the king and protested against the cutting of wood from the forest in 1731. Wood was to be cut for the construction of new palace of the king. The villagers also joined hands with Amrita Devi and protested against king's men. When the king came to know about this he repented over this and prohibited the cutting of trees in his kingdom.

In the present times for the conservation of the forest and wildlife a number of programmes are going on at national and international levels. The preparation of list of the endangered species of plants was jointly done by Botanical Survey of India (BSI) and Forest Research Institute (FRI), Dehradun. The list prepared by them was named as 'Red Data Book'. In this series 'Green Book' was prepared for rare plants.

What is Red Data Book?

In this information is given about the danger of extinction of normal species.

The endangered species are universally marked.

It warns towards a comparative situation of endangered species at world level.

On Local level endangered species are identified and programmes related to their conservation are promoted.

International Union for the Conservation of Nature and Natural Resources (IUCN) is an important international organisation which is working for the conservation of endangered species and its propagation.

International Union for the Conservation of Nature and Natural Resources (IUCN) is now also called **World Conservation Union**.

This organisation has identified various species of plants and animals and divided them in to following categories:

(A) Normal Species : These are those species whose population is considered to be normal for survival such as cattle, Sal, Pine and Rodents etc.

(B) Endangered Species : These are those species which are in danger of extinction. If the negative situation in which their population has declined, continues then their survival is difficult. Black Buck, Crocodile, Indian wild Ass, Rhino, Lion Tailed Macaque, Sangai (Manipur Deer) etc. are examples of this type of species.

(C) Vulnerable Species : Under this category are those species whose population is on decline and if their proper care is not taken of then they can move into endangered category. Blue Sheep, Asiatic Elephant, Gangetic Dolphin etc. are examples of this type of species.

(D) Rare Species : The population of this type of species is very less or vulnerable. If the negative factors affecting them does not change then they can move into endangered category.

(E) Endemic Species : This type of species are found in particular areas which are isolated by natural and Geographical boundaries. Andaman Teal, Nicobar Pigeon, Andaman wild pig, Mithun of Arunachal Pradesh are examples of this category.

(F) Extinct Species : These are those species which could not be found in their habitat where they lived. These species may be extinct from local area, region, country, continent or the entire earth. Asiatic Cheetah, Pink head Duck and Dodo bird are its good examples.

Several other International and National organisations are also running programmes for the conservation of endangered forest and wildlife, environment and natural resources, in which World Wild Fund for Nature (WWF) is particularly significant.

In India, several programmes are being run by Ministry of Forest and Environment for the conservation of forest and wildlife.

Effort to conserve wildlife in their habitat is becoming successful. It is called In Situ effort. In this a large piece of land is declared as reserve area. Similarly, to save them from crisis artificial habitat is developed; it is called Ex-Situ. Through the effort of Ex- Situ, those species which are in danger of extinction are collected.

For the conservation of wildlife; in reserve areas (i) National Park (ii) Sanctuary (iii) Biosphere Reserves are included.

(i) **National Park :** The main objective of this type of parks is to develop ideal conditions for growth and reproduction for the wildlife in their natural habitat. In this park external interferences are prohibited such as agriculture, gathering of forest products, grazing and construction. In our country there are 85 such national parks. Important National Parks and Sanctuaries have been shown in Table No. 2.



Picture-7

(ii) **Sanctuary:** It is such a protected area where wildlife can live in a protected manner. It can be a private property. In this area limited permission is granted for agriculture, gathering of forest products, fishing etc. On imposition of restrictions over natural biological activities of wildlife such as building of nests, mating, hatching of eggs or bringing up of the young ones, the ownership rights can be put under limitation. In India there are 448 such sanctuaries. In Bihar Kanwar lake of Begusarai and Kusheshwar of Darbhanga have been identified for this.

(iii) **Biosphere Reserves:** It is that area where programmes for the conservation of Bio- diversity are being run on priority basis. In these areas reserved programmes are being run on Bio- Diversity in the form of genetic-diversity. In 65 nations of the world 243 such Biosphere reserves are there. There are 14 such reserves in India.

Table No. 2**Statewise Important National Parks and Sanctuaries**

State	National Parks and Sanctuaries
Madhya Pradesh	Bandhavgarh National Park (Umaria) Fasil National Park (Mandla) Kanha National Park (Mandla and Balaghat) Madhav National Park (Shivpuri) Panna National Park (Panna/Chattarpur) Pench National Park (Hoshangabad) Satpura National Park (Bhopal) Sanjay Dubri National Park (Sidhi)
Karnataka	Gandhi Sagar Sanctuary (Mandsaur) Bandipur National Park Bhadra Sanctuary (Chikmagalur) Dandeli Wildlife Sanctuary (South kannad) Sharavati wildlife Sanctuary (Shivamogga)
Rajasthan	Ranthambhaur National Park (Sawai Madhopur) Ghna Bird sanctuary (Bharatpur) Drrat Sanctuary (Kota) Sariska wildlife Sanctuary (Alwar) Deserj Sanctuary (Jaisalmer, Badmer)
Andhra Pradesh	Kabla wildlife sanctuáry (Aadilabad) Kinnarsani wildlife sanctuary Malapatti Bird Sanctuary (Nellore)
Kerala	Prmbikulam wildlife sanctuary (Palghat) Periyar National Park Vinayad wildlife sanctuary

State	National Parks and Sanctuaries
Uttarakhand	Corbett National Park (Nainital) Nanda Devi National Park (Chamoli) Kedarnath Sanctuary (Chamoli) Chila Sanctuary (Gadhwal)
Uttar Pradesh	Dudhwa National park (Lakhimpur Khiri) Chandraprabha Sanctuary (Varanasi)
Assam	Kaziranga National Park (Shivsagar, Naugaon) Manas wildlife sanctuary (Gwalpada) Sonairupa wildlife sanctuary (Darang)
Jharkhand	Hazaribagh wildlife sanctuary Palamu wildlife sanctuary (Palamu) Dalmia wildlife sanctuary
Tamil Nadu	Mudumalai wildlife sanctuary Annamalai Tiger sanctuary Gundi National Park (Chennai)
Maharashtra	Borivali National Park (Mumbai) Tadoba National Park (Chandrapur) Dakna Sanctuary (Amravati)
Gujarat	Gir National Park (Junagarh) Balwadar National Park (Bhavnagar)
Himachal Pradesh	Rohila National Park (Kullu) Shikari Devi wildlife sanctuary (Mandi)
West Bengal	Jaldapara wildlife Sanctuary (Jalpaigudi) Sunderban Tiger Sanctuary (24 Pargana)
Arunachal Pradesh	Arunachal Pradesh Wildlife Sanctuary (Kamenga) Jandfa Wildlife Sanctuary (Tirp)
Odisha	Similipal National Park (Mayur Bhanj) Chilka Sanctuary (Puri)

State	National Parks and Sanctuaries
Chhattisgarh	Indravati National Park (Bastar) Kanker National Park (Kanker) Kutru Park (Bastar) Udyanti Sanctuary (Raipur) Tmor Pingla National Park (Sarguja)
Jammu & Kashmir	Dingaon National Park (Srinagar)
Sikkim	Kanchanjunga National park
Mizoram	Dampa wildlife sanctuary (Aizol)
Nagaland	Etengi wildlife sanctuary (Kohima)



The list of important National Parks, Sanctuaries and Biosphere Reserves mentioned in Table No. 2 is in accordance with the Government of India, Ministry of Environment and Forest annual report of 2004-05.

Breeding Centers: In adverse conditions there is decline in the reproductive rate of the animals. There are a number of species which are included in the endangered species list, because of the low reproductive rate. Therefore, facility of breeding centers should be developed for the animals. In our country, in Madhya Pradesh, due to environment change the population of Crocodiles has declined considerably, therefore, for its conservation a Crocodile breeding center has been established in Muraina (Madhya Pradesh). Similarly, In Nandankanan of Odisha, breeding center for white tiger has been established.

Prohibition on Hunting: One of the main causes for the decline in the population of wildlife is their reckless hunting and trapping for various purposes. Because of their economic importance, they are being exploited. Though their trapping, hunting and trade are legally prohibited but on local, state and international levels they are being black marketed and smuggled. Because of this wildlife is rapidly being exploited. The government is taking strict legal action against such acts. Non Government Organisations are being encouraged to come forward and there is need for the sensitisation of the local population. Kusheshwar Asthan Sanctuary (Bird sanctuary area) of Darbhanga in Bihar is a good example for this, where people awareness programmes have been started with the help of local population against the hunting and trade of the migratory birds. With the help of district administration, the local UNESCO club has prohibited the hunting of the birds which has yielded good results. For this a watch tower has been constructed here by the district administration.

Bio Piracy Problem: It is an output of Genetic - Engineering and Bio technology. It is not only a serious problem for wildlife but also becoming a big problem for the whole human society.

What is Bio Piracy?

The alterations made in the genetic character which are Nature associated and established in the development activity of crores of years is called Bio Piracy.

By investigating the Genetic- characters of different animals and plant, through transplantation it is transplanted into another animal and plant, by doing so a new type of animal and plant is developed. Bio Piracy is done in a different countries in other words alteration of Genetic characters is done.

Several examples of Bio Piracy adopted by the developed countries of the Bio- Wealth of developing nations can be seen. It can be made possible by identifying Germ Plasma and bringing necessary changes and transplantation. Germ Plasma of one species of rice, grown in America is similar to Germ Plasma of Basmati rice of India.

Pendiplandra Brazzeane Brazzein plant found in West Africa has come under its effect. A type of protein found in this plant is 200C times sweeter than sugar and has less calories. The Gene that produces sweetness has been identified by America. Research is on to extract organic product having more sweetness than sugar with fewer calories by transplanting its Gene into Maize plant. You can understand that Bio Piracy has become a type of challenge for the countries which produces sugar from sugarcane and exports them. For this many countries are taking stern steps and by identifying Hot Spots Bio-Wealth are being protected.

Hot Spots : Normen Mayers, in 1988 had emphasised on identifying Hot Spots for the conservation of in Situ on priority basis.

"The Hot Spots are the richest and the most threatened reservoir of plant and animal life on the earth"

There are few conditions for the determination of Hot Spots-

- (i) Determination of the number of the local species- Those species which are not found anywhere else.
- (ii) To determine the limitation of encroachment on habitat.

Project Tiger:

In the wildlife structure, Tiger is one of the important wild species. In 1973, the authorities observed that the number of Tigers from the estimated 5500 in the beginning of the 20th century has dwindled to 1827. Poaching of Tigers for trade, shrinking of the habitat, depletion of the necessary wild sub-species and growing human population are the main causes of the dwindling number of tigers. Because of the Trade of Tiger skin and the use of their bones

Do You Know?

The people of Cameroon and Bororo tribes, instead of hunting the lions themselves they attack the animals hunted by the Lions. It reduces the number of Lions. This type of hunting is called 'Claptoparacitism'.

in traditional medicines in Asian countries, this species is on the verge of extinction. As India and Nepal provide habitat to two third of the world's tigers, therefore these countries are the main target of hunters, poachers and illegal traders.

Project Tiger is one of the best wildlife projects of the world which was launched in 1973. Much success was achieved in the beginning because the Tiger population went up to 4002 in 1985 and reached 4334 in 1989 but in 1993 its population dropped to 3600. There are 27 Tiger reserves spread over an area of 37,761 square kilometers in India. Tiger conservation is not only an effort to save an endangered species but an aim to preserve biotypes of sizeable magnitude. Corbett National Park in Utranchal, Sunderbans National Park in west Bengal, Bandhavgarh National Park in Madhya Pradesh, Sariska wildlife sanctuary, Manas Tiger Reserve in Assam and Periyar Tiger Reserve in Kerala are some of the examples of Tiger conservation projects in India.

Community and Forest Conservation:

In some regions of India local communities are working together with the government officials to conserve wildlife habitats because since time immemorial, their needs are being satisfied by these forests and vegetation. In Sariska Tiger Reserve the villagers of Rajasthan, by citing the wildlife Protection Act, are fighting to stop mining activities. The inhabitants of 5 villages of Alwar district of Rajasthan have declared 1200 hectare forest land as "Bhairodev Dakav" Vihar chori, having their own rules and regulations that prohibit hunting and protect wildlife from outside encroachments.

The tribal population depends on their surroundings for their need. They hunt the wild animals, catch fish and collect wild fruits, roots and seeds. They also meet their needs of food by doing limited agriculture. But the tribal people have sentimental relationship with trees and wild life which are found in their areas. They are very active and alert for the conservation of resources found in their locality. They do not enter the forest in the germination season of seeds of wild plants and don't even allow their domestic animals to enter the forest. During mating season they do not hunt female wild animals. They utilise the forest resources in a cyclic manner. They keep the particular areas of the forest protected and never enter in those areas. From time to time, as per their need, they do plantation and protect them. Therefore, the forests located in tribal areas get natural protection.

The famous 'Chipko Andolan' in Himalayas was not successful in checking cutting of forests in many areas but it exhibited that by utilising indigenous species of plants community afforestation movement can be made successful. Through traditional conservation methods, the farmers have learnt to practice agriculture in accordance with the ecosystem. For example, in Tehri, 'Bhoomi Bachao Andolan' amongst farmers have shown that different crops can be grown without the use of chemical fertilizer which can be economically profitable.

Chipko Movement

In the mountainous district of Tehri-Garhwal of Uttar Pradesh in the leadership of Sunder Lal Bahuguna, a movement started by the illiterate tribal population. In this movement, the local people saw the cutting of green trees by the Axe of contractors. To save these trees from cutting the local people surrounded these trees in their laps and protected them. Several countries have also accepted it.



Pict. : A scene of Chipko Movement

In India joint forest management exhibits the importance of the role of local community in management and restoration of degraded forest. Officially the programme started in 1988 when the state of Odisha passed the first resolution for the joint management of forest. Under forest department the joint forest management undertakes protection activities of degraded forest and forms institutions at village level in which villagers and officials of forest department work together.

The followers of Jain and Baudh religion believe in non violence (Ahimsa) and this religion is based on 'Ahimsa Parmo Dharma.' Amongst Jain community killing of even micro organisms is prohibited. Therefore, their contribution in the protection of forest and wildlife is significant.

Mahatma Budha had said in 480 BC "A Tree is special, limitless, kind and liberal living being which never demands for its self nourishment and gifts liberally the activities of its life. It protects everybody and even keeps the person who is cutting it with his axe under its shed."

Legal Provision for Conservation of Wild Life:

Rules and legal provisions made for the Protection of wild Life can be categorised in to two classes. They are-

(A) International Laws: For the protection of wild life rules and legal provisions have been made by a collection of two or more than two countries (Under international agreement). Through international rules on the conservation of natural resources made under African Convention in 1968, Wetlands Convention of international importance (Ramsar Convention) 1971 and World Natural and Cultural Heritage Conservation and Protection Act 1972, efforts are being made to protect wild life. By following it strictly, the wild life can be protected.

(B) National Laws: India is among those nations of the world where provisions have been made in the constitution for the protection of the environment and wild life. In sections 47, 48, and 51 A (G) under article 21 of the constitution rules for the protection of the wild life and natural resources have been laid down.

After the formation of Indian Wild Life Board in 1952 the government became serious towards the protection of the wild life. Wild Life Boards were also constituted on provincial level.

Hunting of birds and animals has been banned under the wild life protection Act 1972, Regulation 1973 and amended Act 1991.

The legal provisions in the Forest conservation Act 1980 and Regulation 1981 made for the conservation of the forest are very effective. Under Bio- Diversity Act 2002, for the protection of the Bio Diversity, provision was made for the constitution of the committees on local/sub-Division/ District and state level. Keeping conservation of the wild life in mind, all states were told to declare state animal and bird. On National level Tiger has been declared as national animal and peacock as national bird.

Utility of Wild Life and Bio-Diversity:

Plants and animals developed in the atmosphere of natural habitat are called wild life. Therefore, Flora and Fauna are two components of wild life and are integral part of the Biosphere. It is an invaluable asset on our earth. Wild life has played an important role since hundreds of years in our cultural and economic fields. We get food, fiber for clothes, Leather, building material for our home etc. from them. Their brightness and fragrance provides energy in our life and they are assets to ecology. In India they have always been respected and worshiped. They have been the source of inspiration for Saints on the one hand whereas on the other they are a subject of attraction for tourists.

Flora:

The climate of our country is extreme. Almost all the climate of the world is found here and that is why a wide range of vegetation is found in our country. Roughly we can divide India in to eight Botanical Regions.

1. West Himalayan Vegetation Region: This region extends from Kashmir to Kumayun. Here Pine, Deodar and coniferous trees are spread all over. With the height the change in the species of trees is visibly seen. At a greater height (4750 Meters) there is extension of Alpine forests.

2. **Eastern Himalayan Vegetation Region:** In this region Oak, Dwarf Cane and flowering evergreen trees are found.

3. **Assam Vegetation Region:** This area lies between Brahmaputra and Surma Valley, here mainly evergreen forests are found. In evergreen forest dense Bamboo and bushes of tall grass is found.

4. **Indus Plain vegetation Region:** Punjab, West Rajasthan and plains of North Gujarat is included in this region. Babul, Nagfani, Khejri, Aak etc. are important plants here.

5. **Ganga Plain vegetation Region:** The region between Aravalis and Bengal and Odisha falls in this region. This region is known for its agriculture and so extension of forest is very less here. Scattered trees of Bamboo, Sal, Khair, Tendu can be found here.



Pic. - 8

6. **Southern Plateau Vegetation Region:** Whole southern plateau region falls in it. Here deciduous trees are found; apart from this different wild bushes are seen here.

7. **Malabar Vegetation Region:** In this category western coastal region is included. Here apart from Hot Spices, Supari, Coconut, Rubber; Cashew nut, Tea and Coffee trees are found.

8. **Andaman Vegetation Region:** Here mainly evergreen, semi-evergreen and coastal forests are found.

According to Botanical Survey of India (BSI) there are 47,000 species of plants and trees found here, in which 15,000 species are included in Vascular plants. In this 35 percent of the species are endemic which are not found anywhere in the world.

Fauna: According to a survey conducted by the Zoological Survey of India (ZSI), 89,451 species of fauna are found here which are categorised into following classes:

Protista	2,577 species
Arthropoda	68,389 species
Mollusca	5,000 species
Other Invertebrates	8,329 species
Protochordata	119 species
Pisces	2,546 species
Amphibious	209 species
Reptiles	456 species
Birds	1,232 species
Mammals	390 species

Many of them are on the verge of extinction. The government of India has taken various steps for their conservation. For them development of 89 parks and 400 wildlife sanctuaries which has a combined area of 1.56 lakh kilometers is significant.

Before learning about the utility of Bio-Diversity, you must learn what is Bio-Diversity?

You must have visited Sanjay Gandhi Biological Park situated in Patna. There you might have seen different varieties of small medicinal plants in Dhanvantari Park on the one hand, then on the other different varieties of very tall trees, habitat of Monkeys jumping here and there in this forest, then there are Lions, Rhinoceros and Crocodiles which must have amused you. The chirping of small and large birds must have overwhelmed you. Then you might have seen crawling snake lying somewhere. In fact this biological park acts as a representative of Bio-Diversity on local basis. This earth is home for all of us, From Micro- organisms and Bacteria to Banyan tree, Elephant and Blue Whale. It provides habitat for crores of living beings. In real sense Earth the is a store house of Bio-Diversity.

For the last 250 years, Biologists are trying to identify and name **Flora and Fauna**. Our scientist have been researching on animals and plants for thousands of years and have prepared a list, named them and identified their species. In the first century, Charak the founder of 'Ayurved' in his creation, 'Charak Sanhita' mentioned the names of 200 types of animals and 340 types of plants.

In the eighteenth century, Swedish scientist **Karols Linains** identified about 5900 types of plants and 4200 types of animals. Till date about 17 lakhs of species have been named in which over ten lakhs are animals and 7 lakhs are the plant species. According to one estimate there are more than 50 lakhs of species in the world. More than half of the species are found in unknown tropical rain forests when the rain forests extend on less than 8 percent of the total land surface area.

Our country is one of the richest countries of the world so far as the **Bio-Diversity** is concerned; it is counted among top 12 nations of the world who are having largest Bio-Diversity. Here eight percent of the total sub-species of the world (About 16 Lakhs) is found.

Do You Know?

- 60 thousand of the one lakh species of the insects of the world are found in India.
- Out of 41 hundred fish species, 1693 species are found in India.
- 12 hundred out of 9 thousand bird species of the world are found in India. Similarly, 10 percent of the world's 4 thousand mammal varieties are found in India.
- India is placed tenth amongst Flora abundant nations.
- India is an important Vavilavion Centre of Diversity, where 167 important cultivated plant species are found.
- Rice, Sugarcane, Jute, Mango, Lemon, Banana, Bajra, Jawar crops originated in India.

Even today our knowledge about Bio-Diversity is very less. There are possibilities that number of species of animals and plants may exceed from the known number of species and sub-species. You will be surprised to know that every year new 10,000 (Roughly) species are evolving.

Do You Know?

- We do not have correct information about the species living on Earth.
- According to an estimate the number of species can reach from four to hundred million.
- The maximum number of species is of insects and micro- organisms which cannot be seen by naked eyes.

Our country is rich in Bio-Diversity. The richest Bio-Diversity region is Western Ghats and North-Eastern India. They have 4% and 5.2% of the Geographical area of India respectively and they are included in the world's

Do You Know?

- At least 136 crop species and 320 forest related species are of Indian origin.
- We have indigenous species in large numbers; the best example for this is rice whose 50,000 to 60,000 varieties are found in India.

25 Hot Spots. In this lakhs of Bio -clusters are found. In India 33% flowering plants are of Indian origin.

Similarly, 53% fresh water fish, 60% Amphibians, 30% Reptiles and 10% mammal species are endemic. In North-East India, Western Ghats, North-West Himalaya and

Andaman Nicobar Islands are mainly famous as endemic region. Few Amphibians in Western Ghats are of Indian origin.

With the help of UNESCO 14 Biosphere Reserve Regions have been established, which are given in the following table:-

Table 3

Sl. No.	Name of the Biosphere Reserve Region	Total Geographical area (In Sq. K.M.)	Location (State)
1	Nilgiri	5520	Vaynad, Nagarhole, Bandipur, Mudumalai, Nilmbur, Silent Valley and Siruvalli hills (Tamil Nadu, Kerala and Karnataka)
2	Nanda Devi	236.74	Parts of Chamoli, Pithoragarh and Almora districts (Uttarakhand)
3	Nokrek	820	Part of Garo Hills (Meghalaya)
4	Manas	2837	Parts of Kokrajhar, Bongaigaon, Barpeta, Nalbadi, Kamrup and Darang districts (Assam)
5	Sunder bans	9630	Ganga- Brahmaputra Delta and its parts (West Bengal)
6	Gulf of Mannar	10500	Indian Part of Gulf of Mannar situated in between India and Sri Lanka (Tamil Nadu)
7	Great Nicobar	885	Extreme southern Island of Andaman Nicobar (Andaman and Nicobar Islands)
8	Simlipal	4374	Parts of Mayurbhanj districts (Odisha)
9	Dibru Saikoba	765	Parts of Dibrugarh and Tinsukia districts (Assam)
10	Dihang-Debang	51115	Parts of Siyang and Debang districts in Arunachal Pradesh
11	Kanchenjunga	2619.92	Parts of North and West Sikkim

Source: Annual Report 2004-05 Ministry of Environment and Forest, Govt. of India



Picture-7

For Nation's health, Biosphere and Bio Industries a rich Bio- Diversity is mandatory. We are directly or indirectly benefitted by Bio- Diversity. For us Bio-Diversity is a source of food, medicine, pharmaceutical medicines (BHAISAJYA Medicine), fibers, rubber, and wood. Many micro organisms are used for the production of valuable products in the industries. It provides us ecological services free of cost. Following are the Important uses of Bio-Diversity:-

- (i) There are three types of uses of Bio- Diversity in Modern agriculture
 - (A) In the form of source of new crop.

(B) In the form of material for better quality breed.

(C) In the form of troubleshooter of new bio destruction.

Food for human being is derived from the living world. Several thousand species are of edible plants but about 85 percent of the world's food is produced through agriculture from less than 20 species of plants. Rest 15 percent is produced from animals. Discovery of the new species (plants and animals) will be helpful for arranging food for increasing population.

Developed plants and better breed of domestic animals is the backbone of modern agriculture. Several developed types of crops and other useful plants have been developed through planned reproductive- activity. The use of Genes of wild species is done for new qualities like disease resistance or for the production of developed endemic species. For example protection of rice cultivation from four major diseases in Asia is done through a single wild Bharti rice species *Oryza nivara*.

Bio-Diversity is utilised in various medicinal uses. From several materials disease curing qualities are derived from the plants such as Morphine used as pain killer and is derived from *Papaver Soniferum*. Quinine is useful for Malaria and is derived from *Chinchona Ledgeriana*. Taxol is a Cancer resistant medicine and is derived from the bark of a type of evergreen trees *Taxus Baccata* and *T. Brevifolia*. Most of the traditional medicines are prepared from plants. About 25% are prepared from 120 plant species.

Do you know about a true story of December, 1987? A team of Tropical Botanical Garden and Research Institute (TBGRI) was on a Biological expedition in Western Ghats of Kerala, they had taken few members of Kani

Do You Know?

- Ayurvedic and Yunnani medicines are prepared from flora, fauna and minerals.
- The founder of Ayurved, Charak used flora, fauna and minerals for the treatment of diseases thousand years ago.
- Ayurved is Indian method of treatment and is one of the ancient methods of treating diseases.

tribe as guide with them. Scientists saw that these people were eating a fruit which made them fresh and full of energy in spite of walking on such a difficult terrain. When scientist also ate them they too experienced sudden rush of energy and strength in them.

With increased curiosity towards the fruit, the scientists wanted to know more about the fruit

from the guides but they refused and continued to say that it is sacred and mysterious fruit and it is only for them and not for outsiders. When the scientists pressed several requests then the guides showed them the plant of the fruit and named it as 'Arogyapacha'.

When the scientists got sufficient knowledge about it, they researched on it and their finding was that it is tension resistant and have other active, useful and qualitative substance in them. Arogyapacha was mixed with three more medicinal plants and a medicine was prepared from this mixture and was named as 'Jivani'. TBGRI handed it over to a private company Aryavaid Pharmacy (AVP) to make medicine and for this they charged Rs.10, 00,000/- as registration fee and two percent royalty was also agreed upon. Like this the Kani tribe received half of the royalty, and for the welfare of the tribe they established a trust.

Did you see what wonder a plant can do?

Activity

- Go near a Pipal or Banyan tree along with your friends and discuss about its qualities, benefits and utility.
- Organise a symposium in your school on the subject related to conservation of forest and wild life.
- Sensitise the people about the economic benefits and medicinal qualities of Shisham trees planted around you and also tell them that for which diseases its dust and leaves are useful.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. What was the percent of forest cover out of the total Geographical area of India in 2001?
(a) 25 (b) 19.27
(b) 20 (d) 20.60
2. According to the forest status report, the total extension of forest in India is
(a) 20.60 percent of Geographical area
(b) 20.55 percent of Geographical area
(c) 20 percent of Geographical area
(d) None of these
3. What is the percent of forest cover out of the total Geographical area in Bihar?
(a) 15 (b) 20
(c) 20 (d) 7
4. On how many percent of the country's total area forest is there, in 188 tribal districts of North-Eastern states?
(a) 75 (b) 80.05
(b) 90.03 (d) 60.11
5. Which state has maximum extension of coverage of forest?
(a) Kerala (b) Karnataka
(c) Madhya Pradesh (d) Uttar Pradesh
6. Forests have been categorised from the point of view of forest conservation and management, into-
(a) 4 categories (b) 3 categories
(c) 5 categories (d) None of these

7. How many square kilometer of forest area has been converted into agricultural land from 1951 to 1980.
 (A) 30,000 (B) 26,200
 (C) 25,200 (D) 35,500
8. Article 21 of the constitution is related to-
 (A) Conservation of Wildlife and natural resources
 (B) Soil Conservation
 (C) Water Resources Conservation
 (D) Mineral resource conservation
9. According to a Botanical report of a NGO, on how many hectares of land of the world extension of forest existed in 1948?
 (A) 6 billion hectares (B) 4 billion hectares
 (C) 8 billion hectares (D) 5 billion hectares
10. Which convention was held for the conservation of natural resources in 1968?
 (A) African Convention (B) Wetlands Convention
 (C) World disaster Convention (D) None of these
11. Which among the following creatures is found only in India?
 (A) Crocodile (B) Dolphins
 (C) Whale (D) Tortoise
12. Is the national bird of India-
 (A) Pigeon (B) Swan
 (C) Peacock (D) Parrot
13. Has maximum extension of Mangroves
 (A) In costal Parts of Andaman Nicobar islands
 (B) In Sunder bans
 (C) In western coastal region
 (D) In North- Eastern states

14. Taxol is utilised-

- (A) In Malaria
- (C) In Cancer

- (B) In AIDS
- (D) For T.B.

15. 'chrak' was related to which country?

- (A) Myanmar
- (C) India

- (B) Sri Lanka
- (D) Nepal

SHORT ANSWER TYPE QUESTIONS :

1. Describe the present status of forest wealth in Bihar.
2. Write few factors of forest destruction.
3. Describe the environmental importance of forests.
4. Mention four important factors of wildlife destruction.
5. Describe favorable customs and traditions for the conservation of forest and wildlife.
6. What is Chipko movement.
7. What is the contribution of forest in the treatment of Cancer?
8. Write the name of ten endangered animal- birds.
9. Express your thoughts on the pollution associated problems in the destruction of wildlife?
10. Write the names of two important Biosphere regions of India, their area and name of the states?

LONG ANSWER TYPE QUESTIONS:

1. Describe in detail the importance of forest and wildlife?
2. On the basis of density of trees classify forests and describe each category in detail?
3. What is Bio-Diversity? Why is it important for human beings? Give a detailed account.
4. Describe in detail how human activities are responsible for the destruction of natural vegetation and animals.
5. Describe in detail the Biosphere regions of India.



(D) MINERAL RESOURCES

Mineral resources are the foundation stones of modern civilisations and culture. More than 100 types of minerals are found in India and is one of the leading nations of the world in the production and reserves of few of the minerals. Much attention has been paid towards survey and production of the minerals after independence. Geological Survey of India (GSI), Oil and Natural Gas Commission and private companies are doing important work in this direction.

Mineral is a natural substance formed in fixed proportion of chemical and physical properties. In other words, mineral is a solid natural substance having certain chemical combination and particular internal atomic structure. Our lithosphere is made up of rocks and rocks are made of combination of minerals. Till date over 2000 minerals have been identified but only 30 minerals are significance from the economic perspective.

TYPES OF MINERALS:

Minerals are generally of two types:-

1. **Metallic Minerals:** These minerals contain metals in them such as Iron ore, Copper, Nickel, Manganese etc. Again they can be divided into two categories:-

(A) Ferrous Minerals: Are those minerals in which greater content of iron ore is found in them, such as Iron ore, Manganese, Nickel, Tungsten etc.

(B) Non-Ferrous Minerals: Are those metallic minerals in which the iron content is very less or they have no iron content in them, such as Gold, Silver, Lead, Bauxite, Tin, Copper etc.

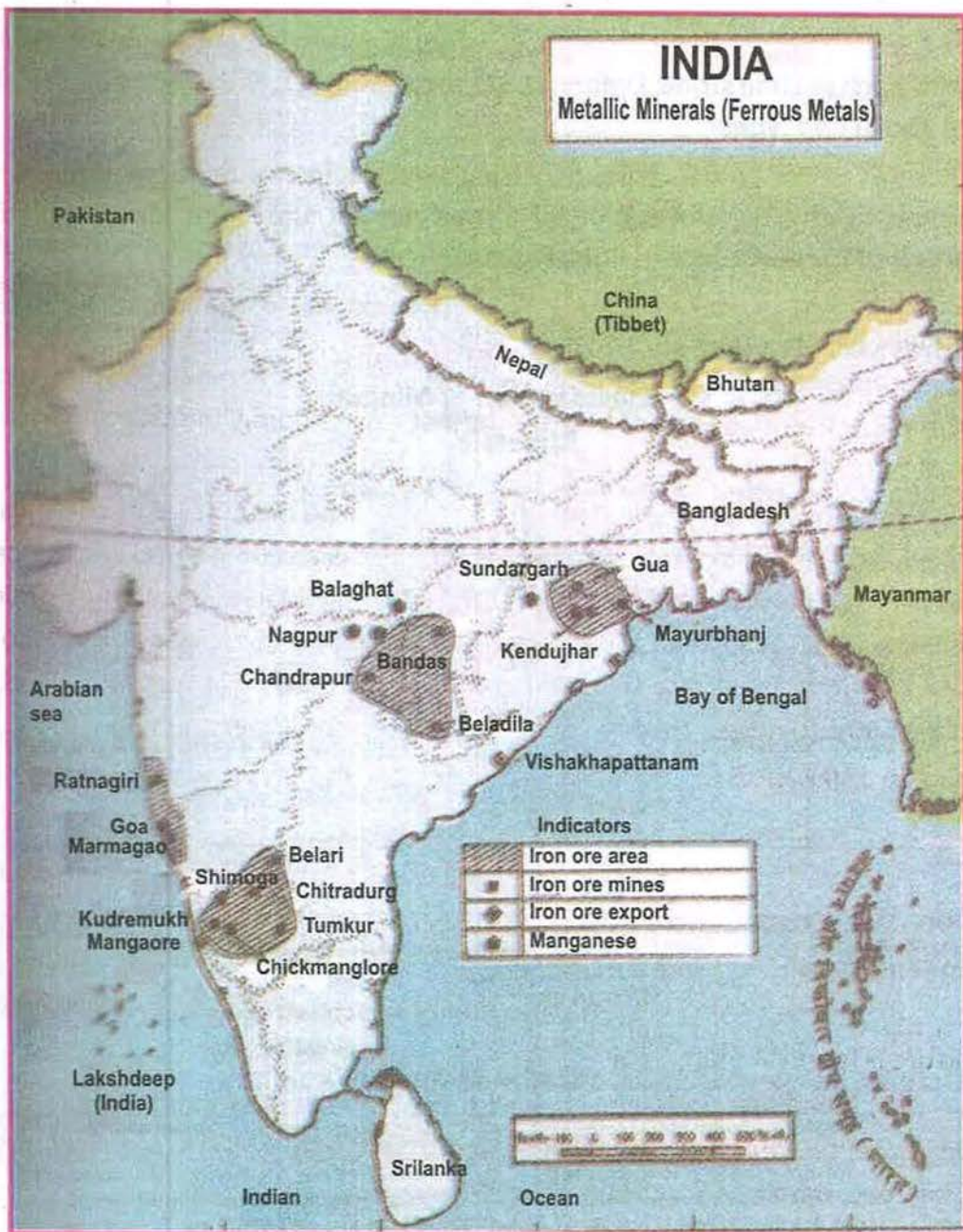


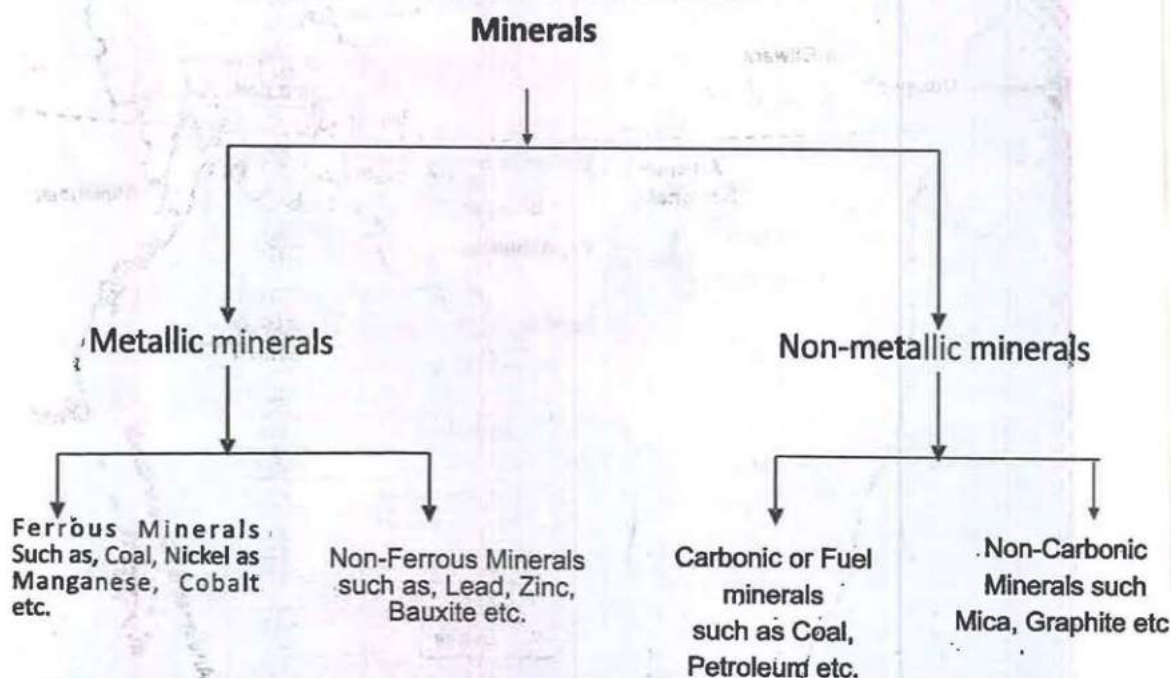
Fig.1 (D). 1 : Metallic Minerals (Ferrous Metals)

2. Non-Metallic Minerals: These minerals contain no metal in them, such as Lime stone, Dolomite, Mica, Gypsum etc. Non-Ferrous minerals are also of two types-

(A) Carbonic Minerals: They contain fossils in them. They are formed by the transformation of buried animal and plant life under the surface of the earth such as Coal, Petroleum, etc.

(B) Non-Carbonic Minerals: They do not contain fossil in them such as Mica, Graphite etc.

Classification of Minerals



Difference between Metallic and Non-Metallic Minerals:

Metallic Minerals	Non-Metallic Minerals
1. On melting, metal is extracted from the metallic mineral.	1. On melting, metal is not extracted from the Non-metallic minerals.
2. They are hard and shining.	2. They are self shining.
3. They are generally found in igneous rocks.	3. They are generally found in sedimentary rocks.
4. They can be turned into wire when hammered (Ductility) and do not break when hammered.	4. Wire cannot be made out of them by hammering. They break in to pieces when hammered.



Fig. 1 (D). 2 :Non- Metallic minerals (Non- Ferrous Metals)

Difference between Ferrous and Non-Ferrous Minerals:

Ferrous Minerals	Non- Ferrous Minerals
1. Those minerals that contain iron content in them and are used in making Iron and Steel are called ferrous minerals such as Iron ore, Nickel, Tungsten, Manganese etc.	1. The minerals in which the iron content is very less or they have no iron content in them are called Non-Ferrous minerals such as Gold, Lead, Mica etc.
2. They are of Grey, Dull, Dusty color.	2. They are found in many colors.
3. They are found in crystalline rocks.	3. They can be found in all types of rocks

Specialties of minerals:

The distribution of minerals is uneven. Minerals of better qualities are found in less quantity but minerals of lesser qualities are found in large amount. Minerals are exhaustible resource. Once it is utilised then it cannot be used again, therefore its conservation is very essential.

Distribution of Minerals:

In different parts of India various types of Geological structures are found. As a result of which, the distribution of minerals is very uneven. Most of the minerals are found in the ancient rocks formations, such as iron ore and Manganese reserves of India are found in the Pre Cambrian rocks of Dharwad system. On the other hand Copper, Lead and Gypsum are found in the Aravali range. Lime- Stone, Dolomite, Gypsum and Calcium Sulphate are confined to Cuddapah system and upper Vindhyan system. Most of the mineral bearing rocks are found in south India. The base rocks of the northern plains of India have totally been covered by a thick layer of sediments, so there is scarcity of minerals there. Most of the minerals of the country are found in the following three belts:

1. North-Eastern Plateau: This is the richest mineral belt of India in which Chotanagpur Plateau, Odisha Plateau, Chhattisgarh Plateau and eastern Andhra Pradesh Plateau are situated. In this belt large reserves of Iron-ore, Manganese, Mica, Bauxite, Dolomite, Copper, Thorium, Uranium, Chromium, Siliminite and Phosphate are situated.

2. South-West Plateau: This belt spreads over the Karnataka plateau and adjacent Tamil Nadu plateau. Here, Iron-ore, Manganese, Bauxite etc. are found in large quantities. All three Gold mines of the country are situated in this belt.

It is for the information that detailed discussion of power resources is given in separate chapter; therefore it has not been discussed in this chapter.

3. North-West Region: This belt extends from Gulf of Cambay to Aravali ranges. Here number of different Non-Ferrous metals, Lead, Zinc, Copper etc. are found. Also sufficient reserves of Sand-Stone, Granite, Marble, Gypsum, Multani Mitti, Dolomite, Lime stone, Salt etc. are situated.

Himalaya is another mineral belt, where Copper, Lead, Zinc, Cobalt etc. are found.

IRON-ORE:

Iron is backbone of modern civilisation. It is the mother of Industries. Pure Iron is not found from the mines but it is extracted in the form of Iron-Ore from the mines. On the basis of pure iron content, the Iron Ore found in India are of three types- Hematite, Magnetite and Limonite. One fourth of the total iron reserve of the world is situated in India.



Fig.1 (D).3 Distribution of Iron-Ore in India

Important Facts about Iron-Ore of India

Types	Iron Content in %	Sub- Name	Reserve (In Crore Tonne)
1. Hematite	68	Red Ore	1231.7
2. Magnetite	60	Black Ore	54.0
3. Limonite	40	Yellow Ore	Under Survey (Not certain as yet)

Production of Iron-Ore in India

Year	Production in Thousand Tonne
2005 - 06	165230
2006 - 07	180917
2007 - 08	206939

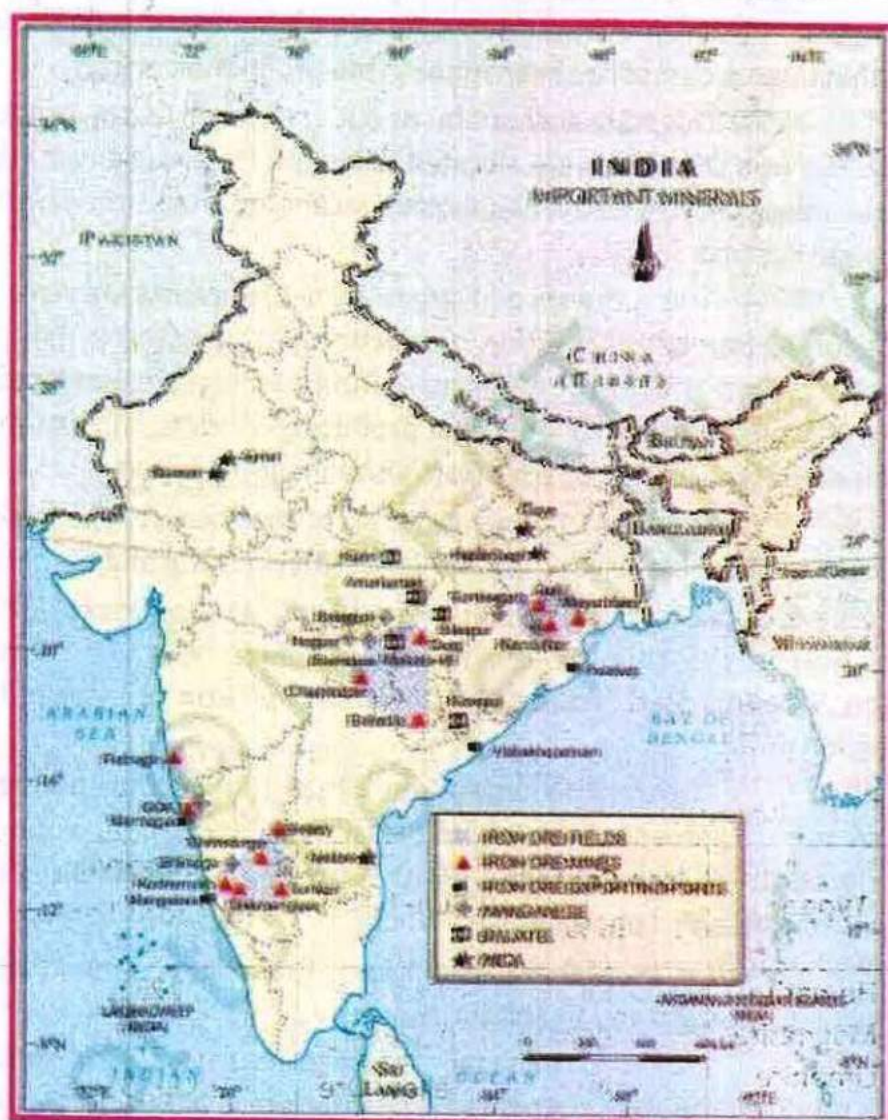


Fig.1 (D). 4: Distribution of important minerals
Geography :: 87

DISTRIBUTION:

The Iron-Ore is found in almost every state of India but 96 percent of the total reserve is confined in the states of Karnataka, Chhattisgarh, Odisha, Goa, and Jharkhand. Rest reserve is situated in Tamil Nadu, Andhra Pradesh, Maharashtra and other states. 42 Lakh Tonne of Iron Ore was produced in India in 1950 -51 which increased to 1427.1 Lakh Tonne in 2004-05, which means that huge progress has been made in the production of iron.

Karnataka: This state account for about one fourth of iron production of India. The Iron Ore mines are situated in Bellari, Hospet, Sandur regions. Many Iron mines are situated in Babubadan, Kalahandi and Kemangudi hills in Chikmanglur district.

Chhattisgarh: It is the second largest Iron- Ore producing state which account for 20 percent of the iron production of the country. Bailadila of Dantewada district and Dalli and Rajahra of Durg district are major producers. Raigarh, Bilaspur and Sarguja are other producing districts. Most of the Iron Ore of this area is exported to Japan from Vishakhapatnam port.

Odisha: It produces 19 percent of Iron of the country. The important mines here are Guru Mahishani, Badam Pahar (Mayur Ganj) and Kiriburu.

Goa: It is the fourth largest Iron producing state and account for 16 percent Iron of the country. The important mines here are Sahqualim, Sangyum, Qupem, Stari, Ponda and Viyolim. The Iron is exported from Marmagaon port.

Jharkhand: It is the fifth largest Iron Ore producing state and account for more than 15 percent of the Iron of the country. Here important Iron-ore producing districts are East and West Singhbhum, Saraikela, Palamu, Dhanbad, Hazaribagh, Lohardaga and Ranchi.

Maharashtra: In Maharashtra Iron Ore mines are situated in Chandrapura, Ratnagiri and Bhandara districts.

Andhra Pradesh: Karimnagar, Warangal, Kurnool, Cuddapah etc. districts produce Iron Ore in Andhra Pradesh whereas in Tamil Nadu, hills of Tirthamalai, (Salem) and Yadpalli (Nilgiri) has Iron Ore reserves.

MANGANESE ORE

India stands third in the world after Russia and the South Africa in the production of Manganese. It is mainly used in the manufacturing of rust

Do You Know?

In the production of 1 tonne of steel 10 Kilogram of Manganese is used.

resistant steel and Ferro Manganese alloy. It is also used in the manufacturing of dry cells, Photography, leather and matchbox industries. Also it is used in the manufacturing of paints and insecticides. Out of the total production of the Manganese in India, 85 percent is used in the manufacturing of alloy.

Distribution:

The total reserve of Manganese in India is 1670 Lakh tonne. After Zimbabwe, India has the largest reserve of Manganese in the world which is 20 percent of the total reserves of the world.

The main Manganese producing regions in India are Odisha, Madhya Pradesh, Maharashtra, Karnataka and Andhra Pradesh. About 78 percent of Manganese - Ore deposits are found in a belt from Nagpur and Bhandara districts of Maharashtra to Balaghat and Chindwara districts of Madhya Pradesh.

Manganese Production

Year	In thousand tone
2005 – 06	1906.35
2006 – 07	2143
2007 - 08	2512

Odisha: It stands first in the production of Manganese in India. It accounts for 37 percent of Manganese production out of the total production of the country. The important mines of manganese here are in Sundargarh, Kalahandi, Raigarh, Bolangir, Keonjhar, Jajpur and Mayurbhanj districts.

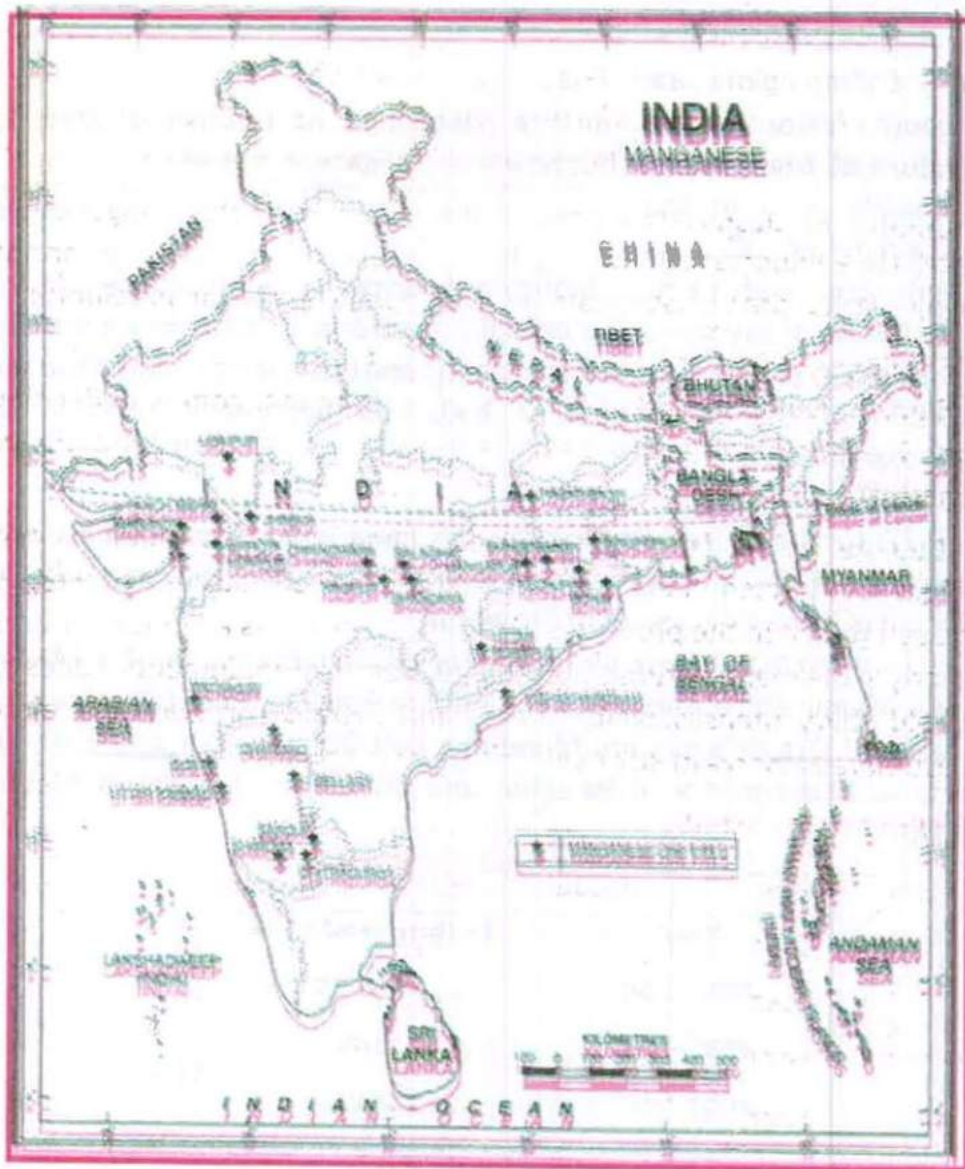


Fig 1 (D): 5 Distribution of Manganese Ore in India

Madhya Pradesh: This state is placed third by producing 21 percent of Manganese in the country. Manganese is produced in Balaghat and Chhindawara districts.

Karnataka: Shimoga, Chitrapur, Tumkur, Bellary, North Kanara, Dharwar, Chikmanglore and Bijapur districts are main producers of manganese. Previously, one fourth of the country's total production of Manganese was produced here but now less manganese is produced here.

Andhra Pradesh: Here 6 percent of the country's total manganese is produced. Here important producing district is Srikakulam. Other important producing districts are Vishakhapatnam, Cuddapah, Vijaynagar and Guntur.

Metallic Minerals (Non Ferrous)

Bauxite, Gold, Silver, Copper, Tin, Lead, Zinc etc. comes under this category. These minerals are of great use in daily life but there is scarcity of these minerals in India.

Bauxite: It is a Non-Ferrous deposit from which a metal named Aluminium is extracted. India has sufficient reserve of Bauxite and we can become self reliant in the production of Aluminium. It has a number of uses particularly in the manufacture of Aeroplane, Electrical equipments, goods of house hold utility, utensils, white cement and chemical products etc. India has an estimated reserve of 3037 Million tonnes of Bauxite.

Bauxite Production in India

Year	Production in thousand tones
1951	68.4
1961	475.9
1971	1517.1
1981	1954.6
1991	4977.0
2004 -05	11598.9
2005 - 06	12596
2006 - 07	15661
2007 - 08	24678 (Estimated)



Fig 1 (D).6: Distribution of Bauxite in India

Distribution:

Bauxite is found in many parts of India but its reserves are mainly found in Odisha, Gujarat, Jharkhand, Maharashtra, Chhattisgarh, Karnataka, Tamil Nadu and Uttar Pradesh. More than half of the country's Bauxite reserve is situated in Odisha. Odisha produces 42 percent of the total Bauxite production of India. Kalahandi, Bolangir, Koraput, Sundargarh and Sambhalpur are important producing districts.

Gujarat is placed second with a percent share of 17.35 of the total Bauxite production of India. Jamnagar, Kaira, Sabarkanth, Kuchchh and Surat are producing districts.

Jharkhand is placed third with 14 percent share in the total Bauxite production of India. Here Lohardaga, Ranchi, Latehar and Palamu are important producing districts.

Maharashtra here Bauxite is mined in Kolaba, Ratnagiri and Kolhapur districts and shares 12 percent in the total production of India.

Chhattisgarh produces more than 6 percent Bauxite of India. Plateau region of Sarguja, Raigarh and Bilaspur districts are famous for its production.

Among other Bauxite producing states, in **Karnataka** main deposits of Bauxite is found in Belgaum district. Nilgiri, Salem, Madurai and Coimbatore districts of **Tamil Nadu**, Banda district of **Uttar Pradesh** produces less amount of Bauxite, In Poonch and Udhampur districts of **Jammu and Kashmir** high grade of Bauxite is found. India exports Bauxite to several countries. The important importing countries are Italy, United Kingdom, Germany and Japan.

Copper:

Copper is a very useful Non Ferrous metal. It is a very good conductor of electricity and that is why it is mostly used in the manufacture of the electrical equipments. Utensils and coins are also made from it. Several metal wares are made by mixing Copper with other metals. India is deficient in Copper and total reserve of

Copper in the country is 125 crore tonne. Only 3.75 lakh tonne of Copper was produced in 1951 which increased to 52.49 lakh tonne but its production has dwindled to 30.85 lakh tonne in 2000 -01. Hindustan Copper Limited is engaged in mining activities of Copper. East and West Singhbhum districts of Jharkhand are the largest producer of Copper. Apart from this some Copper in low quantity is found in Hazaribagh, Palamu and other districts of

Copper Production

Year	In Thousand tonnes
2005 – 06	125
2006 – 07	150
2007 – 08	175

Jharkhand. In Khetri Singhana belt of Rajasthan, extension of large area of Copper can be seen. Copper mines are situated in Balaghat district of Madhya Pradesh and Durg district of Chhattisgarh. With this some Copper is mined from Khamman, Guntur and Kurnool districts in Andhra Pradesh, Chitrdurg and Hasan districts in Karnataka and Chandrapur district of Maharashtra.

Non Metallic Minerals

Apart from Metallic minerals there are reserves of several types of Non Metallic minerals in India. These minerals contribute immensely in the industrial development. In 2000 -01 more than 40 Non-Metallic minerals have been produced on commercial scale. Economically Mica, Lime stone, Dolomite, Phosphate, Graphite, Gypsum, Magnecite etc. are important.

MICA

India is a leading producer of sheet mica in the world. Till date it has been used in electronics industries but with the arrival of some artificial alternatives, the production and export of mica has been badly affected. Since ancient times Mica has been used for Ayurvedic medicines but it has particular use in the manufacture of electrical equipments as owing to its di - electric strength it can resist high voltage of electricity.

From the production point of view, there are three belts of Mica deposits in India, which lie in Bihar, Jharkhand, Andhra Pradesh and Rajasthan. The total reserve of mica in India is 59065 tonnes. In 2002 - 03 its production was 1217 tonnes. High quality ruby mica is produced in Bihar and Jharkhand. From Gaya district to Hazaribagh in the west it crosses Munger and extends up to Bhagalpur in the east. Apart from this mica reserves are also found in Dhanbad, Palamu, Ranchi and Singhbhum districts. Bihar and Jharkhand collectively produce 80 percent of India's mica. In Nellore district of Andhra Pradesh mica is produced. Rajasthan is the third largest mica producer of the country; here mica belt is spread up to Jaipur, Udaipur, Bhilwara, Ajmer and other districts. United States of America is an important importer of Indian mica.

Limestone:

In India 76 percent Limestone is used in Cement, 16 percent in Iron and Steel and 4 percent is used in Chemical industries. Rest 4 percent is used in fertilizer, paper and sugar industries. 35 percent of the country's Limestone is found in Madhya Pradesh. Other producing states are Chhattisgarh, Andhra Pradesh, Gujarat, Rajasthan, Karnataka, Maharashtra, Odisha, Bihar, Jharkhand, Uttar Pradesh etc.

Economic Importance of Minerals:

As water and surface of the earth are very significant assets on earth, similarly mineral resources are also of equal importance. In absence of mineral resources industrial development of the country cannot be given proper motion and direction. As a result economic development of the country can be obstructed. In many countries of the world, mineral wealth continues to be an important source of national income. The biggest quality of the minerals is that they are almost finished once they are utilised. They are related to our present and future welfare. Minerals are such eroding resources which cannot be renewed. Therefore, conservation of minerals is of utmost importance.

Conservation of Minerals:

Minerals are eroding, finite and non-renewable resource. Its replenishment is almost impossible. Minerals are the foundations of the industries, but their excess exploitation and utilisation in industrial development is endangering their existence. Therefore, conservation and management of minerals is essential. Judicious utilisation of minerals depends upon three factors restriction on continuous exploitation of minerals, their sustainable use and search for the cheaper alternatives in the form of raw materials. Apart from putting restrictions on minerals, its alternatives should be searched; intelligent utilisation of by-products of the minerals, control over ill effects on ecosystem, adoption of cyclic method for the manufacture of the minerals is called management. If along with the conservation of minerals attention on its management is also given then mineral crisis can be tackled.

QUESTIONS

OBJECTIVE TYPE QUESTIONS:

1. About how many types of minerals are found in India?
(a) 50 (b) 100
(b) 150 (d) 200
2. Which out of the following is an example of ferrous mineral?
(a) Manganese (b) Mica
(c) Bauxite (d) Lime-stone
3. Which out of the following is an example of Non Metallic mineral?
(a) Gold (b) Copper
(c) Mica (d) Graphite
4. Which mineral is called mother of industries?
(a) Gold (b) Copper
(b) Iron (d) Manganese
5. Which is type of iron-ore?
(a) Lignite (b) Hematite
(c) Bituminous (d) All of the above
6. Which of the following states is the largest producer of iron?
(a) Karnataka (b) Goa
(c) Odisha (d) Jharkhand
7. What percentage of iron ore of India is being produced by Chhattisgarh?
(a) 10 (b) 20
(c) 30 (d) 40

8. What is the position of India in the production of Manganese in the world?
(a) First (b) Second
(c) Third (d) Fourth
9. For the production of one tonne of steel how much Manganese is needed?
(a) 5 K.G. (b) 10 K.G.
(c) 15 K.G. (d) 20 K.G.
10. Odisha is the largest producer of which mineral?
(a) Iron - Ore (b) Manganese
(c) Tin (d) Copper
11. Which mineral is required for the manufacture of Aluminium?
(a) Manganese (b) Tin
(c) Iron (d) Bauxite
12. What is the total reserve of Copper in the country?
(a) 100 crore tonnes (b) 125 crore tonnes
(c) 150 crore tonnes (d) 175 crore tonnes
13. What percentage of Mica of the country is being produced in Bihar - Jharkhand?
(a) 60 (b) 70
(c) 80 (d) 90
14. Which is the most important raw material for Cement industry?
(a) Lime - Ston (b) Bauxite
(c) Granite (d) Iron

SHORT ANSWER TYPE QUESTIONS:

1. What is Mineral?
2. What are the two identifications of metallic minerals?
3. Describe the characteristics of minerals.
4. Write the names of types of Iron Ore.
5. Write the names of important iron producing states.
6. Write the names of important iron producing districts of Jharkhand.
7. Describe the uses of Manganese.
8. Describe the uses of Aluminium.
9. What are the uses of Mica?
10. What are the uses of Lime-stone?
11. Describe the important characteristics of minerals.
12. What do you understand by conservation and management of minerals?

LONG ANSWER TYPE QUESTIONS:

1. How many types of minerals are there? Describe each one of them with example?
2. What is the difference between metallic and non metallic minerals? Compare them?
3. Write the name of mineral belts of India and describe any two.
4. Classify iron ore and write their characteristics.
5. Describe the distribution of iron ore in India.
6. Describe the uses of Manganese or Bauxite and their distribution in the country.
7. Describe the uses and distribution of Mica.
8. Suggest measures about the conservation of minerals.

MAP WORK:

1. Show the distribution of important minerals on the map of India.
2. Locate the important iron ore producing centers on the map of India.
3. Make a map of India on full page and locate the following:- Manganese, Bauxite and Copper producing regions.
4. Make available pieces of different rocks and minerals and collect it in Geography Practical Laboratory.

PRACTICAL WORK:

- (a) Make a map of India on plywood or hardboard and fix bulbs of different colors on the producing centers of different minerals and fix a separate switch for each mineral. Now as soon as the switch of a particular mineral will be pressed the particular bulb will glow and we will be able to understand which mineral is found at which place.
- (b) Discuss with your teacher the importance, availability, and conservation of minerals.
- (c) Take permission from your teacher parent and make a trip to mineral rich neighbouring state, see them and collect samples of minerals.



(E) ENERGY (POWER) RESOURCES

Energy or power resources are the key to development. For centuries, human being has been utilising living and non-living forms of energy for different activities. Man in his early stages of progress, utilised his physical strength, then used animals as means of transportation. With the increase in economic activities new sources of energy or power were discovered. Windmills were used to run the machineries. The actual development of the means of energy began along with the industrial revolution in the 18th century. Coal was used to develop steam energy in England. Soon it spread in other countries of Europe. As the time passed, development of new sources of energy took place. Coal was replaced by petroleum. With the passage of time nuclear energy was developed. Today, the source of energy or power is the foundation of development and industrialisation. This is the reason why Coal, Petroleum, Natural gas, Hydro electricity and nuclear energy sources are called "**Commercial Source of Energy**".

Types of Energy Resources:

There could be different ways of classification of energy resources. **On the basis of utilisation level**, energy is of two types : Sustainable energy and Exhaustible energy. Sun rays, Geo thermal energy, wind, running water etc. are sustainable sources whereas Coal, Petroleum, Natural gas and disintegrating substances are examples of exhaustible source of energy.

On the **Basis of Levels of Utilisation** energy can be divided in to two parts. First is primary energy e.g. Coal, Petroleum, Natural gas and

Radioactive minerals etc. and the second is hidden energy e.g.- Electricity, because it is received from the primary source of energy.

On the **Basis of situation of the sources** the energy resources can be classified in to two parts : The first is depleting energy resources such as Coal, Petroleum, Natural gas and Atomic minerals etc. and the second non-depleting resources such as water, wind, currents, Solar energy etc. On the **Basis of structural qualities** there are two sources of energy Living Energy Sources and Non-living source of energy. Human beings and animals are classified as living and hydro - power, wind power, solar energy and fuel energy (mineral energy) etc. are classified under Non-living source of energy. The sources of energy are also classified **on the basis of time** into Conventional and Non- Conventional forms of energy resources. Coal, Petroleum and Natural gas are conventional and Sun, Wind, Tide, Nuclear energy and hot water springs etc. are the examples of Non- Conventional forms of energy resources.

Conventional Sources of Energy:

Fuel minerals like Coal, Petroleum, Natural gas which are also known as fossil fuel are conventional resources of energy and are exhaustible resources.

Coal:

Coal is an important source of energy and power. The total estimated reserves of coal, up to 1st January, 2008 found up to the depth of 1200 meters, is 26, 454 crore tonnes. The total production of coal in 2007-08 was 456.373 tonnes.

Geologically, the total reserve of coal in India can be divided in to two major parts:-

1. Gondwana System: In this system lies 96 percent of coal reserves of India and 99 percent of the total coal production of India is received from this system. The coal found in this system was formed about 20 crore years before. The Gondwana coal region are mainly found in four river valleys- 1. Damodar valley 2. Son valley 3. Mahanadi valley and 4. Wardha-Godavari valley.

2. Tertiary system: The tertiary coal was formed after the Gondwana coal and is 5.5 crore years old. The tertiary coal is mainly found in Assam, Arunachal Pradesh, Meghalaya and Nagaland.

Classification of Coal:

On the basis of Carbon content, the coal has been divided in to four categories:-

1. Anthracite: It is the highest quality coal which has more than 90 percent of carbon content in them. It does not emit smoke on burning and gives very high heat for very long time and is also called as coking coal and is used in smelting metals.

2. Bituminous: It contains 70 to 90 percent of carbon content in them and is refined to make coking coal. Most of the coal of India belongs to this category.

3. Lignite: It is considered to be a low grade coal which contains 30 to 70 percent of carbon content in them. It generates less heat and more smoke. It is also called brown coal.

Year	Production in million tonnes
2005-06	407
2006-07	431
2007-08	456

Gondwana Coal Fields:

Jharkhand: Jharkhand stands first in reserves and production of coal in the country. It has more than 30 percent of coal reserves of the country and more than 23 percent of production. Jharia, Bokaro, Giridih, Karpura, Ramgarh are the main producing regions of this state. Some parts of Raniganj coal fields lies in this state.

The coal used in metal industries is found in Damodar valley coal fields. Most of the coking coal for Iron and Steel industries is found in this region. This coal region has become less important now. In 1970, 47 percent coal of the country was produced from this region where as it dwindled to only 23 percent in 2004-05.

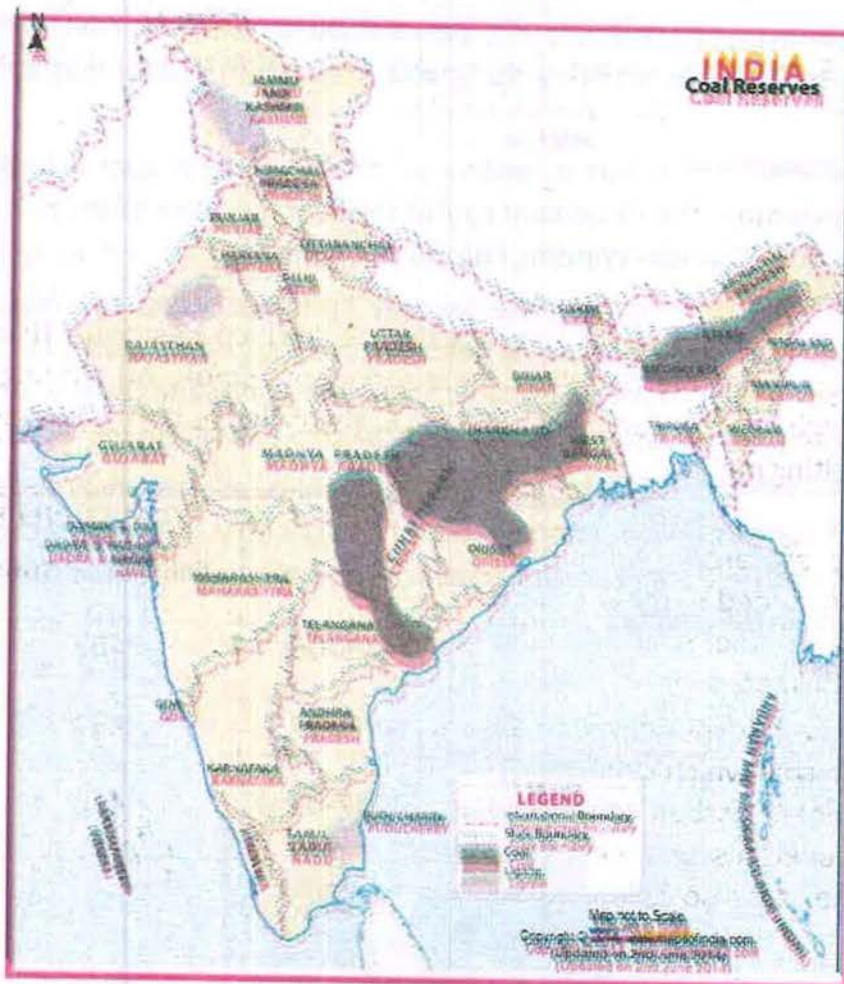


Fig.1 (D).1 Major coal fields of India

Chhattisgarh: In reserves it is placed third but from the production point of view it stands second in India. Here 15 percent of the coal reserves of the country is found but it produces 16 percent of the coal. The major coal fields of north Chhattisgarh are Chirmiri, Kursia, Bishrampur, Jhilmili, Sonhat, Lahanpur etc. Hasdo Arand, Korba and Mand - Raigarh are coal fields of the south Chhattisgarh.

Odisha: One fourth reserves of the country's coal is found in Odisha but the production here is only 14.6 percent. Huge reserve of coal is found in Talcher but as they are not of highest grade, it is mainly used for making steam and gas.

Maharashtra: It has a reserve of only 3 percent coal of India but production is more than 9 percent coal of the country. Most of the coal of the state is found in Chanda- Wardha, Kampti and Bander.

Madhya Pradesh: The state has only 7 percent of coal reserves of the country because most of the coal fields are now in Chhattisgarh. The major coal producing regions are in Singrauli, Sohagpur, Johilla and Umaria. Another coal producing region is Pench Kanaha, Pathkhera and Mohpani.

West Bengal: This state has the fourth largest coal reserves and stands seventh in terms of production of coal of the country. Raniganj is the most important coal field some portion of which has gone to Jharkhand. Some coal is also found in Darjeeling.



Fig-1(D).2: Major coal fields of India.

Tertiary Coal Fields:

The coal formed in tertiary period is of recent origin and of low grade. This coal is mined from Dargiri, Cherapunji, Letringyu, Maolaung and Langrin fields in Meghalaya. Makum, Jaipur, Najira etc. coal fields in upper Assam. Namchik and Namruk coal fields in Arunachal Pradesh and from Kalakot coal field this coal is mined in Jammu and Kashmir.

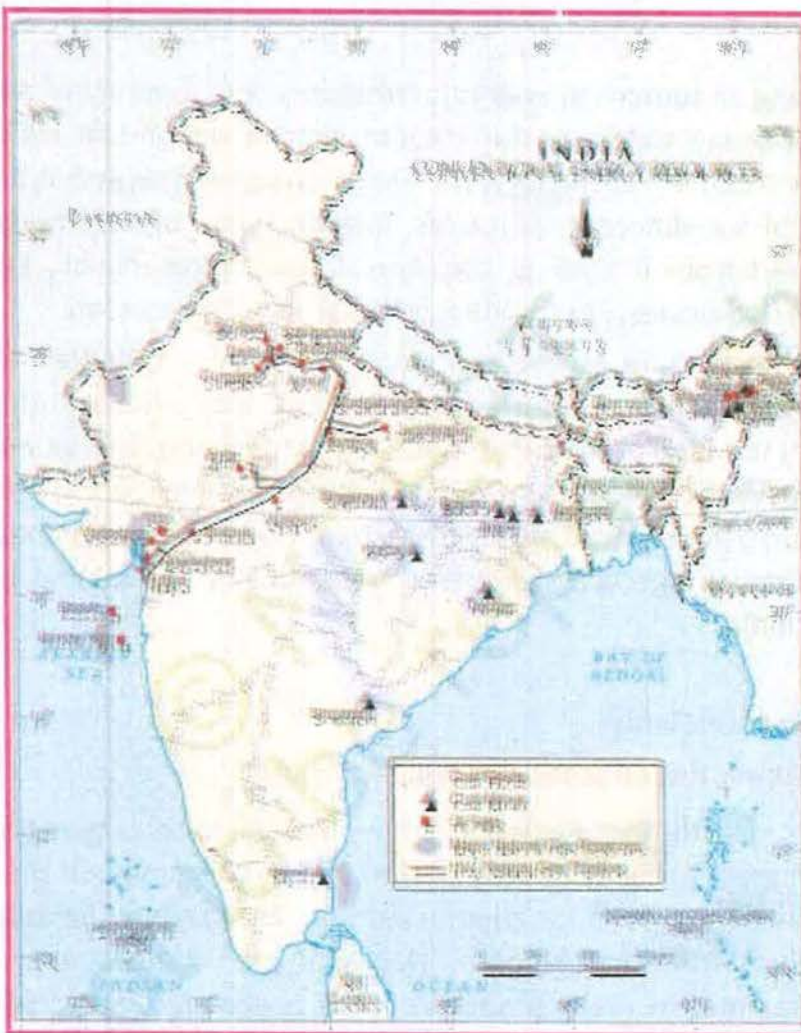


Fig.1(D).3:Conventional Source of Energy

Lignite Coal Fields:

It is a low grade coal having high moisture content and less carbon and so it emits more smoke. Lignite coal reserve is mainly found in Lignite basin of Tamil Nadu. Here 94 percent of total Lignite coal reserves of the country are found. Here, coal is mined by Neyveli Lignite Corporation Limited. This coal is found in Rajasthan, Gujarat and Jammu and Kashmir.

Petroleum:

Among all sources of energy, petroleum is the most significant and a resource of broad utility. In the modern era, no nation can maintain its existence without it. Petroleum is not only a source of energy but it is also a raw material for different industries. Several types of commodities are manufactured from it such as Gasoline, Diesel, Kerosene oil, Lubricant, Insecticides, Medicines, Petrol, Soap, Artificial fibers, plastics, etc.

According to an estimate of Geological Survey of Indian, the total reserve of Petroleum and Natural gas is 17 billion tonnes. India produces only 1 percent of the total petroleum production of the world. The oil wells were dug in India for the first time in 1866 in upper Assam valley. In 1890 oil was discovered in Digboi region. In 1959 the oil was discovered in Cambay region. In 1975 Mumbai high was discovered. After this oil production began to increase in India.

Distribution of Oil Fields:

There are mainly five oil producing regions in India:

1. **North-East Region:** It is the oldest oil producing region of the country, where digging of oil well started in 1866. It remained the only oil producing region of India for about a century. The large oil fields of upper Assam valley, Arunachal Pradesh, Nagaland etc. comes under this oil producing region. The major producers of this region are Digboi, Naharkatia, Moran, Rudrasagar etc. The Nigru oil field of Arunachal Pradesh and Borholla oil field of Nagaland are also important.

2. **Gujarat Region:** This region extends in Cambay basin and plains of Gujarat. Here, at first, oil was discovered in 1958. Its major producers are Ankleshwar, Kalol, Naugaon, Kosamba, Mehsana etc.

2. **Mumbai High Region:** This region is situated in Arabian Sea, 176 Kilometer North-West of Mumbai coast. Here the search for oil started in 1975. Here, a platform named 'Sagar Samrat' has been built which is a ship

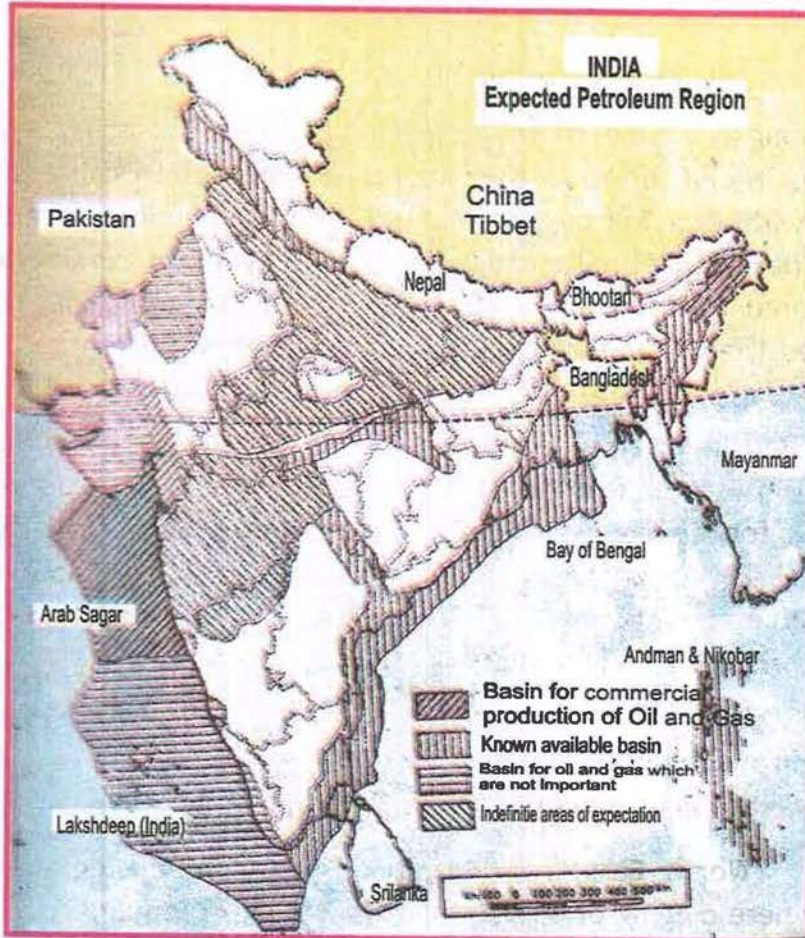


Fig-1 (D).4: India: Expected Petroleum Region

and works as a rig to dig oil wells. 80 crore tonne of oil reserve is estimated here. Here, crude oil is transported to the mainland through pipe-line and then refined. 22,424 thousand tonnes of oil was produced from this region in 2004-05 which is 66 percent of the total production of India.

South of this region one more oil field has been discovered which has greater reserve than the Mumbai high.



Fig-1(D).5: Petroleum producing region of India.

4. Eastern Coastal Region: This region extends in the Krishna-Godavari and Kaveri river basins and ocean area of their mouth. Narimanam and Koviltpal are major oil fields of Kaveri region. Some time before oil has also been discovered in Godavari-Krishna region.

5. Barmer Basin: From September, 2009 oil production has started from the Mangla oil field of this basin. Here, 56000 barrels of oil is produced daily. By 2012 this region will produce 22 percent of oil of India.

Oil Refinery:

The crude oil which is extracted from the oil well is not refined and is impure; so, before being utilised it is essential that they are refined in oil refineries. After that only products like Diesel, Petrol, Kerosene oil, Lubricating materials and several other products are received. The first oil refinery of India was established in Digboi of Assam in 1901. The second oil refinery was established in Mumbai in 1954. After this India made considerable progress in oil refinement. Presently, there are 18 oil refineries functioning in the country.

Natural Gas:

Natural gas is rapidly becoming an important fuel in our present day to day life. It is being utilised to run machines in different industries, in production of electricity, in cooking and in running of motor cars.

According to one estimate the total reserve of Natural gas in India is 700 billion cubic meters. The total production of natural gas in 1984 -85 was 723 crore billion cubic meters which increased to 3082 crore cubic meters in 2004 -05.

Generally, Natural gas is found in the petroleum producing regions. In 1984, the Gas Authority was established for the transportation, distribution and marketing of natural gas which meets the demand of the consumers through 5340 kilometer long pipe line throughout the country.

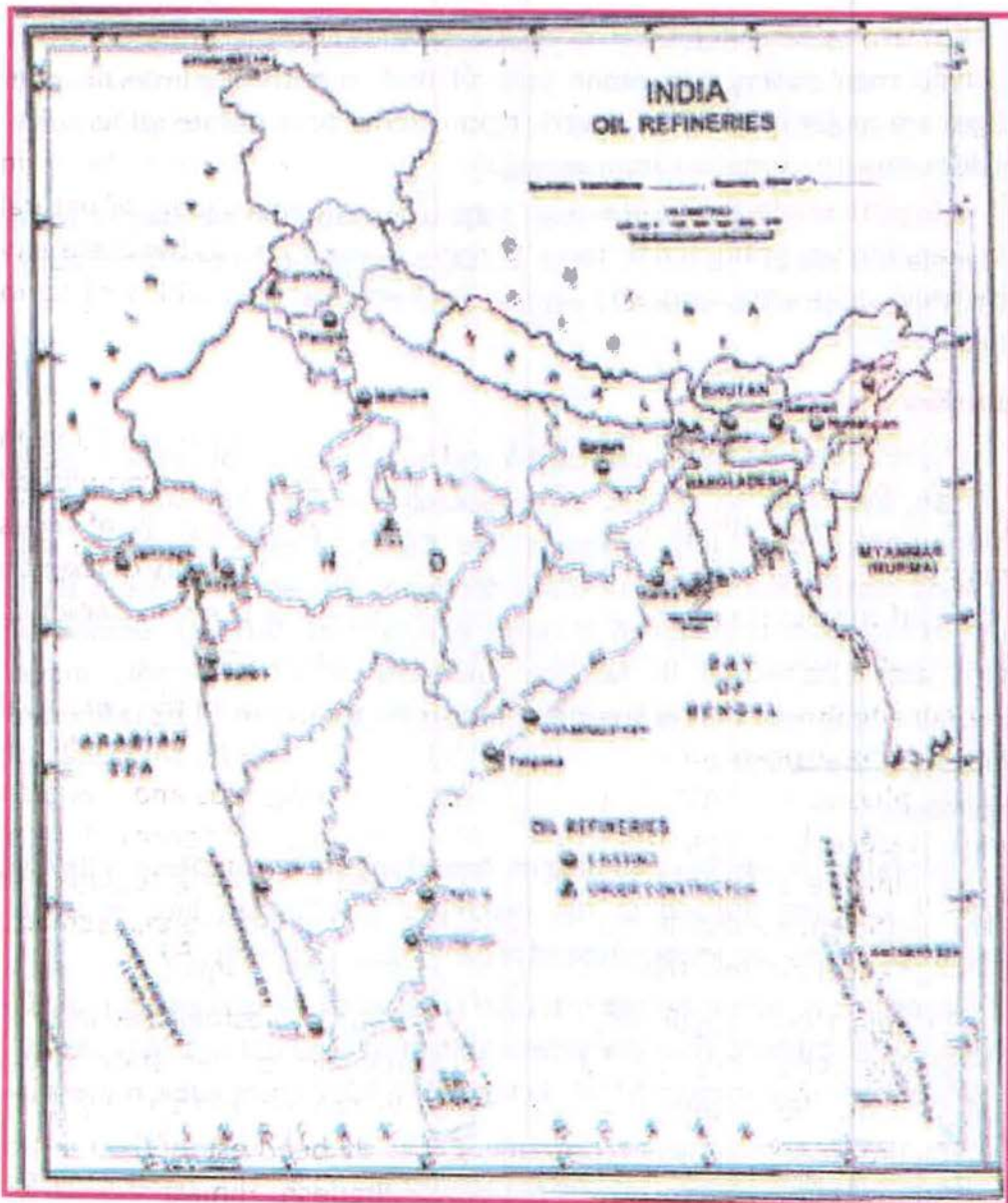


Fig-1(D).6: Oil Refineries of India

Electrical Energy:

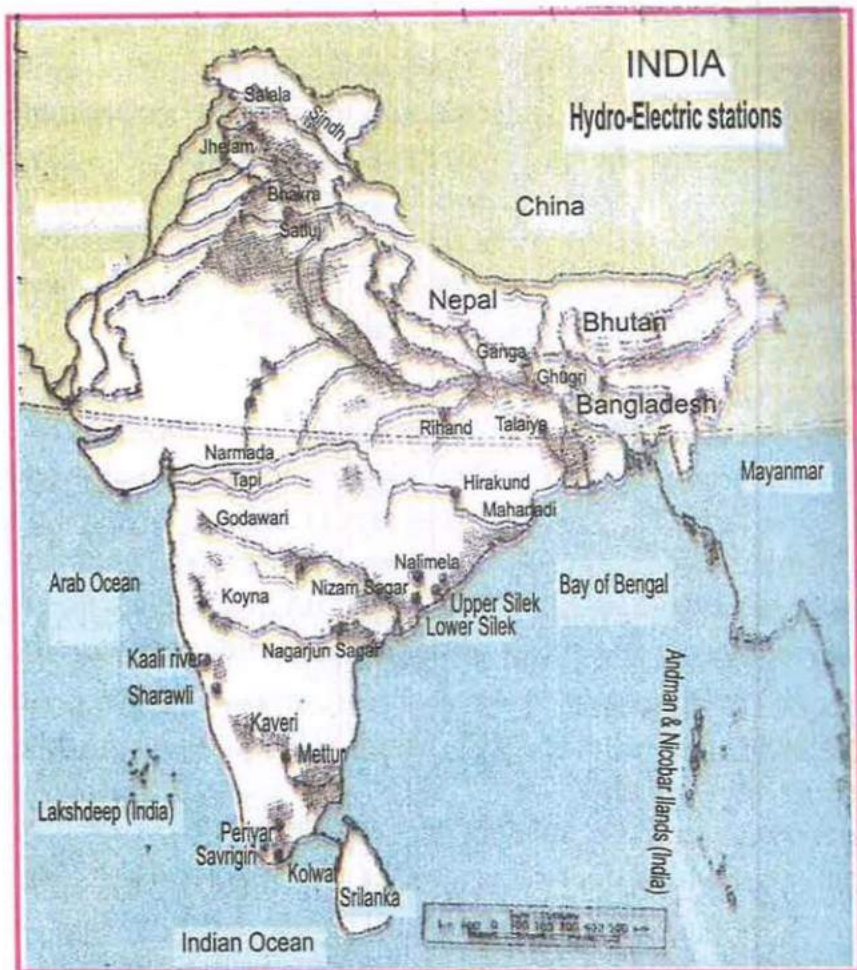
Electrical energy is an important source of power. In the present world the per capita consumption of electricity is an indicator of development. The energy produced from the running water is called hydro- electricity. When in the production of electricity heat produced from coal, petroleum or natural gas is used then it is called thermal electricity. Apart from this the electricity is also produced by the disintegration of the atomic minerals which is known as nuclear electricity. It is also a form of thermal electricity.

Hydro- Electricity:

The water has been used in the form of power resource by tradition. In the beginning, the process of getting energy from water was accomplished through wind mills but with the invention of process of taming of rivers through cement, Dynamo and Portland cement in the 20th century quickened the pace of the development of hydro electricity. Water is a non-depleting and renewable resource which produces pollution-free energy.

For the production of hydro-electricity ample water in the perennial rivers, sloping river course, swift water current, natural waterfall are favorable physical conditions which is found in mountainous and glaciated regions. The economic conditions for its production, such as dense industrial development, development of commerce, settled flourishing regions like market, sufficient capital investment, means of transportation, technical knowledge and deficient other sources of power are important.

In India, the first hydro-electric power station was established in 1897 in Darjeeling. After this, the second hydro-electric power station was established on the waterfall of river Kaveri in Shivasamudram. By 1930 several hydro- electric power stations had already been established in the mountainous region of Western Ghats, Uttar Pradesh, Himachal Pradesh, Tamil Nadu and Karnataka etc. By 1947-50, eight Megawatts of electricity was produced in India. After this serious efforts were made in this direction in successive five year plans in the Independent India. Several multipurpose projects were initiated so that the complete and quick development of electrical energy may take place.



Map of India: Hydro- Electric Stations

Distribution and Important Hydro-Electric Projects:

By constructing barrage on the river, that electricity is also produced along with control floods, to stop soil erosion

Electricity production in 2003-04 (In Billion Units)	
Thermal Power	467
Hydro-Electricity	64
Nuclear Power	17
Total	558

transport by constructing canals and construction of attractive places to develop tourism industry etc. when many such benefits are attained at a time then such projects are called multifaceted, multi profession or multipurpose projects. Let's study such important projects and distribution of hydro-electricity in India.

Do You Know?

The difference always remains between installed capacity and actual production of electricity. Electricity production and utilisation can also be expressed in units. The meaning of one unit is the use of 1000 watts of electricity for one hour.

1. Bhakra-Nangal Project: Built on river Sutlej in Himalayan region, one of the premier Dams of the world, Bhakra Dam is 225 meters high. It is the largest project of India where four power stations have been built. One is in Bhakra, two in Ganguwal and one in Kotla where 7 lakh Kilowatts of electricity is produced and this has brought revolutionary changes in agriculture and industries in the states of Punjab, Haryana, Delhi, Uttrakhand, Uttar Pradesh, Himachal Pradesh, Rajasthan and Jammu and Kashmir.

2. Damodar Valley Project: This project not only prevents Jharkhand and West Bengal from disastrous floods of Damodar river but it also helps in producing 1300 Megawatts of electricity by constructing Dams at Telaiya, Maithan, Konnar and Panchet hills. The states of Bihar, Jharkhand and West Bengal are benefitted by this project. Through the corporation of this project thermal electricity is also being produced.

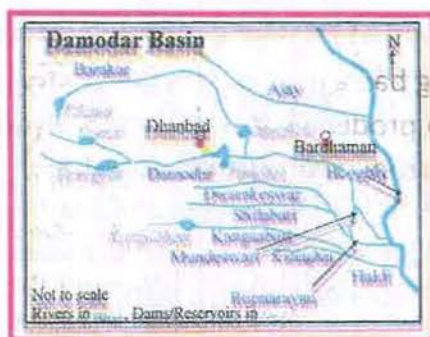


Fig-1 (D).8: Damodar Valley Project
Geography :: 113

3. **Kosi Project:** On river Kosi, which is a curse for North Bihar, by constructing a Dam at Hanuman Nagar (Nepal) 20000 Kilowatts of electricity is being produced. Half of the electricity goes to Nepal and the rest is received by Bihar.

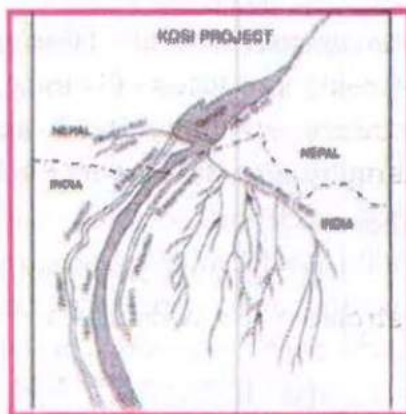


Fig- 1(D).9: Kosi Project

4. **Rihand Project:** On Rihand river which is a tributary of river Son, by constructing 934 meter long Dam and creating an artificial lake 'Govind Ballabh Pant Sagar' electricity is being produced. The project has the capacity of producing 30 lakh Kilowatts of electricity. The electricity produced here is being utilised by Aluminium industry of Renukut, Cement industry of Churk, electrification of railways of central India and thousands of tube wells.

5. **Hirakud Project:** Built on river Mahanadi in Odisha, it is the longest Dam of the world (4801 meters) and 2.7 lakh kilowatts of electricity is being produced here. It is used by Odisha and nearby regions in agriculture and industries.



Fig- 1(D).10: Hirakud Project

6. **Chambal Valley Project:** By constructing three Dams on river Chambal Gandhi Sagar, Ranapratap Sagar and in Kota; by constructing three power stations 2 lakh Kilowatts of electricity is being produced. Rajasthan and Madhya Pradesh are benefitted by it.

7. **Tungbhadra Project:** It is the largest river valley project of south India situated in Karnataka on river Tungbhadra, the tributary of river Krishna. It has been built with the help of Karnataka and Andhra Pradesh. Its electricity production capacity is 1 lakh Kilowatts which supplies electricity to hundreds of small and large industries along with irrigation.

8. River Sharvati Project: By constructing 2160 long and 62 meters high Dam on river Sharvati of Western Ghats near Jog falls in Karnataka, electricity is being produced. Planning has been made to increase its electricity producing capacity to 13 lakh Kilowatts. The states benefitted by it are Karnataka, Kerala, Andhra Pradesh, Tamil Nadu and Maharashtra.

Thermal Power:

In thermal power plants for the production of thermal electricity Coal, Petroleum and Natural Gas are used. These are also called fossil fuel and

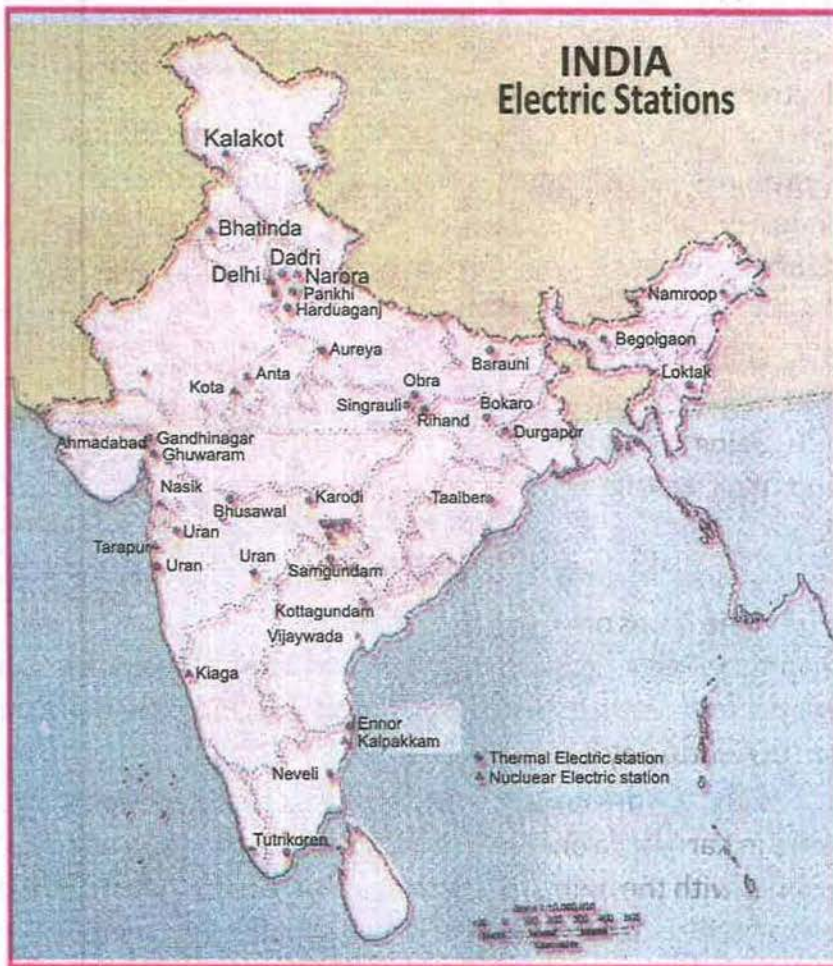


Fig-1(D).11 India: Important Electric Stations

are exhaustible resources. They are not pollution-less like hydro-electricity. Up to 1997-98 the production of thermal electricity reached upto 64 thousand Megawatt which was equal to 33.6 billion units. It again increased to 784921 Megawatts which is equal to 467 billion units. Most of the thermal electricity/energy of the country is produced by National Thermal Power Corporation (NTPC).

Nuclear Energy:

When the atom of higher molecular weight disintegrates then energy is released. Ilmenite, Vanadium, Antimony, Uranium, Monazite etc. are



Fig. 1 (D). 12: India- Important Power Plants

nuclear minerals. In India, Monazite is abundantly found in Kerala. Apart from this, Monazite is also found in the coastal areas of Tamil Nadu, Andhra Pradesh, Odisha etc. Uranium is the raw material for nuclear energy which is found from the ancient rocks of various types. In this Pitch blend is important in which 50 to 80 percent of Uranium is found.

In India, large reserve of Uranium is found in Jadugoda of Jharkhand where it is spread in 97 kilometer long belt. Its sufficient reserves are found also in the Jaintia Mountains of Meghalaya. Uranium is also found in Andhra Pradesh. Reserves of Ilmenite are also situated in Kerala, Tamil Nadu, Andhra Pradesh, Odisha and Maharashtra. This mineral is also found in coastal sand. Vanadium is found in Jharkhand and Odisha.

The first Nuclear reactor was established in India near Mumbai at Tarapur in 1955 with an objective to supply electricity to industries and agriculture. Till now six nuclear power stations have been established in the country.

1. Tarapur Nuclear Power Plant: This is the largest nuclear power station of Asia. It has two boilers, each capable of generating more than 200 Megawatts of electricity. For generating electricity, Plutonium is made from Thorium these days in place of Uranium because India is having Thorium reserves in abundance.

2. Rana Pratap Sagar Nuclear Power Plant: It is situated at Kota in Rajasthan, on the bank of river Chambal from where it gets its supply of water. This power station has been built in collaboration with Canada. Its power generating capacity is 100 Megawatts. Recently two units of 235 Megawatts each have also been started.

3. Kalpakkam Nuclear Power Plant: This power plant is situated in Tamil Nadu and has been built with indigenous technology. Here two reactors of the capacity of 335 Megawatts each have started functioning from 1983 and 1985 respectively.

4. Narora Nuclear Power Plant: It is situated near Bulandshahar of Uttar Pradesh. It also has two reactors of the capacity of 235 Megawatts each.

5. Kakrapar Nuclear Power Plant: It is situated near sea in Gujarat. This Nuclear power station is having two reactors of the capacity of 235 Megawatts each.

6. Kaiga Nuclear Power Plant: It is situated in Jagwar district of Karanataka.

7. Kudankulam Nuclear Power Plant: The construction of this Nuclear power plant is in progress in collaboration with Russia near Tuticorin port in Tamil Nadu. It is under construction and it is expected that by mid 2010 generation from the plant may begin.

Non Conventional Sources of Energy

We cannot depend upon conventional sources of energy because they are exhaustible resources. Therefore, development of energy from the non-conventional sources of energy is necessary. Among non-conventional sources of energy Bio-Gas, Solar Energy, Wind Energy, Tidal and Current Energy, Geo-Thermal Energy and Bio Mass energy are important. India is one such country of the world which has developed technology for the renewable energy and use of non-conventional sources. The non-conventional sources of energy are always pollution-free.

Solar Energy: When the Sun rays, present in the Photovoltaic cells are converted into energy then solar energy is produced. Because it requires less expenditure, is environment friendly and easy to produce, so it is more useful than other sources of energy. Generally it has been used more frequently in equipments like heaters, coolers, lamps etc. In the western parts of India, particularly in Gujarat and Rajasthan, the possibilities of tapping solar energy is greater.

Wind Energy: The wind energy is received by the support of wind mills. The wind mill runs with the speed of the wind and they run the turbine and like this the energy produced by the speed is converted in to electrical energy. India is the largest producer of wind energy in the world. Here Monsoon and westerly winds are used as source of energy. Apart from this, local winds, land and sea breeze can also be used for the production of electricity.



Flg-1(D).13:Wind Mill

A very ambitious plan has been made for the development of wind energy in India under which 300 wind driven turbines will be stationed particularly in 12 favorable locations of coastal areas. The expected production capability of the country is 50,000 Megawatts. By 2006, 5340 Megawatts of electricity has already been produced. Favorable conditions for the production of wind energy are present in Tamil Nadu, Rajasthan, Gujarat, Maharashtra and Karnataka. The Lamba wind energy plant in Kuchchh of Gujarat is the largest plant of Asia. The second large plant is situated in Tuticorin of Tamil Nadu.

Tidal and Current Energy: In tides and currents of the Ocean the water remains in motion. Therefore they have immense power in them. It has been estimated that India has the capability of producing 8,000 - 9,000 Megawatts of Tidal and Current energy. Gulf of Khambhat has most favorable conditions where 7,000 Megawatts of power can be produced, after this Gulf of Kuchchh (1000 Megawatts) and Sunderban (100 Megawatts) are placed.

Geo Thermal Energy: This energy is received from the high heat of the earth. When the magma comes out from the interior of the earth then energy is released on the upper surface. Energy can also be received from the hot

water coming out from the Geyser wells and Hot springs. At Manikarn of Himachal Pradesh Geo Thermal Energy plant is situated and the second one is situated in Durga (Should be Puga please check) valley of Laddakh.

Bio Gas and Bio Energy: Agricultural waste in the rural areas, animal and human wastes are used to produce biogas for domestic consumption. In fact, the decomposition of organic materials produces biogas. The plant that which produces gas using cattle dung is called **Gobar Gas Plant** In India. It provides energy and manure to the farmers. The energy produced by the organic materials is called bio energy. Agricultural



Fig. 1(D). 14: Biogas Plant

waste, Municipality, industrial and other wastes are examples of organic materials. This can be converted in to electric energy, thermal energy or gas energy for cooking food. Through this solid wastes are cleaned and problems like environmental pollution can be solved. A project to convert solid wastes in to energy has been started in Delhi at Okhla.

Conservation of Energy Resources:

The energy crisis is a global problem. Several efforts are being made to find solution for this problem in the existing condition.

1. Judicious Use of Energy: To prevent energy crisis, at first rule of judicious use of the energy should be adopted. For this development of technology is essential. Such motor cars should be manufactured which are fuel efficient. By checking unnecessary use of electricity, we can save huge amount of energy.

2. Search for new areas of energy: To find solution for the energy crisis, researches should be conducted to search new areas of conventional sources of energy. On this issue India has stepped up its efforts after 1970 and new reserves of petroleum and natural gas has already been found. New sources of petroleum and natural gas have been found in Arabian Sea, Krishna-Godavari basin, Rajasthan etc. For this Remote Sensing Information system is being used.

3. Use of New Alternative sources of Energy: In alternative source of energy, both conventional and non-conventional sources of energy are included. Few of them are renewable and few of them are exhaustible sources of energy. Presently, it will be an important step in the direction of conservation of sources of energy, to develop and then use alternative sources of energy like Hydro-Electricity, Wind- Energy, Tidal-Energy, Bio-Energy, Geo Thermal-Energy, Solar-Energy etc. Excessive use of fossil fuel creates various types of pollutions, health problems and doubts of climatic change become more probable. Therefore, in its place use of alternative sources of energy has become unavoidable.

4. International Support: International support is essential to prevent ourselves from energy crisis. All nations of the world should forget their personal differences and to solve the problem of energy crisis policy should be made as per the general agreement, otherwise in times to come it may prove disastrous. In reference to this, international organisations such as United Nations Organisation (UNO), Organisation of Petroleum Exporting Countries (OPEC), World Trade Organisation (WTO), 8 nation organisation of South Asia (G 8) can play an important role.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. In which state large reserve of crude oil is situated?
(a) Assam (b) Rajasthan
(b) Biha (d) Tamil Nadu
2. At which place of India the first nuclear power station was established?
(a) Kalpakkam (b) Narora
(c) Rana Pratap Saga (d) Tarapur
3. Which source of energy is non-renewable?
(a) Water (b) Solar
(c) Coal (d) Wind
4. Is not an example of primary energy?
(a) Coa (b) Electricity
(b) Petroleum (d) Natural gas
5. Is a non-conventional source of energy?
(a) Coal (b) Electricity
(c) Petroleum (d) Solar-Energy
6. Gondawana system of coal was formed?
(a) Before 20 crore years (b) Before 20 lakh years
(c) Before 20 thousand years (d) Non of the above

7. Is the most important coal producing state of India?
(a) West Bengal (b) Jharkhand
(c) Odisha (d) Chhattisgarh
8. Which is the best quality of coal?
(a) Anthracite (b) Peat
(c) Lignite (d) Bituminous
9. Why Mumbai high is famous?
(a) For the export of coal (b) For oil refinery
(c) For crude oil (d) For nuclear power
10. Where does the first oil refinery of India situated?
(a) Mathura (b) Barauni
(c) Digboi (d) Guwahati
11. With which mineral does natural gas is found?
(a) Uranium (b) Petroleum
(c) Limestone (d) Coal
12. On which river does Bhakra-Nangal project is situated?
(a) Narmada (b) Jhelum
(c) Satluj (d) Beas
13. Is the largest river valley project of south India?
(a) Tungabhadra (b) Sharvati
(c) Chambal (d) Hirakud

14. Is an example of thermal power station:
- (a) Gaya (b) Barauni
(c) Samastipur (d) Katihar
15. Is an important Uranium producing center:
- (a) Digboi (b) Jharia
(c) Ghatshila (d) Jadugodal
16. Is the largest nuclear power station of Asia?
- (a) Tarapur (b) Kalpakkam
(c) Narora (d) Kaiga
17. Which state of India has maximum possibilities for the development of Solar energy?
- (a) Assam (b) Arunachal Pradesh
(c) Rajasthan (d) Meghalaya
18. Where do we find most favorable condition for the production of Tidal and Current energy in India?
- (a) Gulf of Mannar (b) Gulf of Kambhat
(c) River Ganga (d) River Kosi

SHORT ANSWER TYPE QUESTIONS:

1. Write three examples each of conventional and non-conventional sources of energy?
2. Write the names of the Gondwana coal producing regions?
3. Write the names of important coal producing regions of Jharkhand?
4. Write the names of different types of Coal?

5. Write the names of the commodities that are produced from petroleum?
6. What is Sagar Samrat?
7. Write the names of any four oil refineries?
8. What are the factors responsible for the production of hydro-electricity?
9. Why river valley projects are called multipurpose?
10. In which states do the following river valley projects are situated- Hirakud, Tungabhadra and Rihand.
11. Why thermal energy is exhaustible resource?
12. Name the different minerals from which nuclear energy is received?
13. Where do we find Monazite in India?
14. How the solar energy is produced?
15. Name the areas of India which has favorable condition for the production of wind energy?

LONG ANSWER TYPE QUESTIONS:

1. Classify power resources on the basis of different factors and clarify with examples?
2. Describe different sources of conventional energy in India?
3. Describe the distribution of Gondwana coal in India?
4. Classify coal and write their characteristics?
5. Describe the distribution of crude oil in India?
6. Discuss the favorable Geographical and economic factors for the production of hydro-electricity?
7. Write short Geographical Notes
Bhakra-Nangal project, Damodar Valley Project, Kosi project, Hirakud project, Rihand project and Tungabhadra project.

8. Write the names of four nuclear power stations of India and write their characteristics?
9. What steps can be taken for the conservation of energy (power) resources? How can you help in this effort?

MAP WORK:

Locate the following on the given map of India and write their names:

1. Coal Mines: Jharia, Bokaro, Raniganj, Korba, Talcher, Singreni and Naively.
2. Oil Fields: Digboi, Kalol, Ankleshwar, Mumbai high.
3. Oil Refineries: Bhatinda, Panipat, Mathura, Jamnagar, Manglore, Haldia, Guwahati, Barauni.
4. Nuclear Power Station: Kaiga, Kalpakkam, Rawat Bhata, Narora, Kakrapara, Tarapur.



Section-2

Agriculture

India is a self sufficient nation in agriculture. Different types of fertile soil are found here. Because of the availability of adequate temperature all the year round, the crops get longer time for their proper growth and maturity. The perennial rivers that flow down the Himalayas always have adequate water all the year round due to melting of glaciers in their source areas. The Monsoon rainfall also recharges the underground water and the surface water. It is a unique gift of the nature to the Indian agriculture.

Due to nature of Monsoon the rainfall controls the pattern of agriculture. Most of the parts receive rainfall for 3 4 months in a year and that too uneven and irregular. That is why in most of the areas only one crop is grown in a year. Only in 15 percent area where facility of irrigation is available, two or more crops are grown. Thus, in most of the areas of India dry agriculture is prevalent. The agriculture system developed with the support of rainfall is known as dry agriculture.

IMPORTANCE:

Agriculture is Important in India due to following different factors

1. It is the life line of the economic life of the country. About 2/3 of the total population rely on agriculture for their living in India.
2. The large population of the country gets their food from agriculture.
3. Agriculture provides raw material to industries such as Cotton Cotton Textile Industries, Sugarcane Sugar industry, Jute industry and other agriculture produce provides raw materials to agriculture processing

industries such as Juicy fruits provide base for the production of Jelly, Jam, Squash. Similarly, silk worms provide raw materials to silk industries. Thus, agriculture also strengthens the industries.

4. Due to availability of diversified type of climate, soil and land surface; diversification in crop production is also seen. In the production of many crops, India is significantly placed in the world. India is one of the leading nations in the production of Tea, Sugarcane, Coarse grains, some oilseeds etc. In the production of Rice, Jute, Tobacco, Wheat, Cotton etc. it holds second to fourth position.

3. Indian agriculture contributes significantly in the national income. 24 percent of the country's income comes from agriculture.

Agriculture plays an important role in internal and international trade. Through internal trade railways income and through foreign trade port income increases.

In short, the main objective of agriculture is to provide food, raw materials to the industries and through export of the agriculture produce it earns foreign exchange.

Land use of Agricultural Land in India: Land is a very significant resource for those who are dependent on agriculture because it is totally based on land resources. That is why in rural areas landless are always poor. In the production of crops the quality of land plays a major role where as in other economic activities such as in industries, transport, housing it is not that important. These can be even constructed on barren and fallow land. Because it is an immovable property so land is a matter of social dignity also. It enhances the social status. It can be mortgaged for loan. Landless are deprived of these benefits. In cultivable land category four types of land are included (1) Net sown area (2) Current fallow land (3) Other fallow land (4) cultivable waste land.

There is immense pressure on cultivable land due to rise in population and its non - agricultural use is on the rise. In such situation the agriculture production can be increased in two forms only -

1. Increase in per hectare yield.

2. Increasing total productivity by growing more than one crop from the same land within a year. It is called agricultural intensity. It can be understood by this example. For example you have 2 hectares of land. In one agriculture year you sow and grow paddy crop. After this during rabbi season you sow wheat on the same 2 hectares of land and reap wheat crop. Then quick yielding variety of Moong is sown and harvested. In real sense you have only 2 hectares of land but in one agriculture year you grow 3 crops from the same land, so you got the benefit of growing crop in $2 \times 3 = 6$ hectares of land.

This agriculture intensity is exhibited through an index and represented in percentage.

$$\text{Agriculture Intensity} = \frac{\text{Total sown area}}{\text{Net sown area}} \times 100$$

$$= \frac{6 \text{ Bigha}}{2 \text{ Bigha}} \times 100 = \frac{600}{2} = 300$$

becomes 300%. Punjab is ahead of the other states in India in agriculture intensity. The factors affecting agriculture intensity can be achieved by capital investment. Therefore, there is close relationship between agriculture intensity and capital utilisation. Students now it must be clear to you that why agriculture intensity is less in Bihar in comparison to Punjab?

There is very less chance of increase in net sown area in India but agriculture intensity is that alternative through which agriculture produce can be increased.

Factors affecting Agriculture Intensity

1. Irrigation
2. Fertilizer
3. High yielding variety of seeds
4. Machanisation
5. Insecticides
6. Appropriate cost of the agricultural produce

Capital Utilisation: Utilisation of irrigation, fertilizer, high yielding variety of seeds, machines etc. by investment of capital

Due to the presence of tropical climate in most of the parts in India, sufficient temperature and light is available here. Because the distribution of rainfall is not even in all places, therefore, there is variation in humidity percentage from place to place and it becomes an important factor in regulating the agriculture pattern, types of crops and its productivity. When crops are grown only on the basis of moisture received through rainfall then it is called rain fed agriculture. This agriculture is of two types Dry land agriculture and Humid land agriculture.

The agriculture in the area of less than 75 C.M. of rainfall is 'Dry Land' and areas having more than 75 C.M. of rainfall is called 'Humid Land' agriculture.

On 38.67% agricultural land of India, agriculture is dependent on rainfall. Coarse grains, Pulses, Oilseeds, Cotton etc. are examples of rain fed agriculture.

Characteristics of Dry Land Agriculture:

1. Methods of conservation of rainwater are used here so that the stored water can be used during dry season.
2. Water excess of their necessity is conserved for the recharge of the underground water.
3. Due to dryness the amount of humus is very less in the soil.
4. Due to dryness the upper layer of the soil is eroded away by the wind.
5. Dry land agriculture is mostly done by poor farmers who have scarcity of capital and necessary resources to do developed agriculture.
6. There is less income through agriculture here and so it is compensated by pastoral farming. Now due to increasing population pressure the grazing grounds are turning in to agricultural fields.

Though poor farmers and dry land agriculture, both are closely related to each other. Therefore, for the upliftment of poor farmers government has made several programmes such as

1. Integrated Rural Development Programme, Drought Prone Area Development Programme, Grains in return of work and employment programme, MNREGA etc.
2. Seeds of quick yielding variety are being prepared.
3. New technique of agriculture is being developed.
4. Technique to control water loss and its storage to be advertised.
5. Pastoral farming and poultry farming are being developed as supplement to agriculture.
6. Cottage and small scale industry is also being developed.
7. For semi - dry tropical areas International Crop Research Institute (Hyderabad) and Central Dry Area Research Institute (Jodhpur) is working for the remedy of dry land and other agriculture related problems.

Types of Agriculture:

Agriculture is an ancient economic activity. The different Geographical and cultural settings of India has also affected the agriculture as per the situation of time. Thus, several type of agriculture is being done here -

- 1. Primitive Subsistence Farming**
- 2. Intensive Subsistence Farming**
- 3. Commercial Farming**

Primitive Subsistence Farming: It is a type of agriculture which is being practiced here since ancient time. This type of agriculture is done as per the prevailing tradition. The tools used for agriculture are traditional such as wooden plough, hoe and Dao. With these tools fields cannot be ploughed deeply. Somehow the seeds are sown and crop is harvested once it is ready. There is deficiency of investment of modern techniques and that is why the yield is less and due to less fertility of the soil, the per unit productivity of the crops is also less. The example for this type of agriculture is Slash and Burn

Agriculture. In this the farmers clear the piece of land by cutting the wild vegetation that had grown and burn them and then sow the crops. In this the crop is grown for the subsistence. When the fertility of the field decreases then the farmers shift and repeat the same process on a fresh piece of land.

This type of agriculture is known by different names in different parts of the country.

In the North Eastern states Assam, Meghalaya, Mizoram and Nagaland it is known as '*Jhumming*', '*Pamlou*' in Manipur, '*Dipa*' in Bastar districts of Chhattisgarh and in Andaman and Nicobar Islands.

Intensive Subsistence Farming:

This type of agriculture is done in most parts of the country. This method of agriculture is adopted in those areas where the pressure of population is more on land. In this method of agriculture involvement of labor is more and methods of traditional agriculture are greatly adopted. Traditional knowledge is adopted to maintain the fertility of the agricultural land; safe keeping of the seeds and climate related knowledge is also being used. With the increase of the population the size of the agricultural fields has shrunk and in absence of alternative employment opportunities, more than the required number of population is involved in this type of agriculture practices. Thus, it also presents the form of hidden unemployment.

In this type of agriculture mainly food grain (Rice) is grown. Because of very large population, even greater production becomes less for such a large population size and that is why it is called as subsistence agriculture.

Commercial Farming:

True to its name, in this form of agriculture the crops are grown for commercial motives. Today in this type of agriculture more capital input and modern agricultural techniques are being adopted. The farmers try to earn greater profit from their capital investment. In the modern agriculture technique, high yielding variety of processed seeds, chemical fertilizer, irrigation, chemical insecticides etc. are being used. In India this method of

agriculture was the outcome of 'Green Revolution' and was widely adopted in Punjab and Haryana. In this mainly Wheat is cultivated. In Punjab and Haryana 'Basmati Rice' is also grown under this method of agriculture.

Plantation agriculture is also a type of commercial farming. Similar to industries, in this form of agriculture there is provision of manager and labor and the farmer is similar to a mill owner. The total production of this method of agriculture is used as raw material for the industries.

Tea, Coffee, Rubber, Sugarcane, Banana etc. are plantation crops in India. Tea in Assam and Darjeeling, Coffee in Karnataka, Rubber in Kerala, are some of the important plantation crops mainly grown in these states. As the crops are mainly grown for commercial purposes, therefore a well developed network of transport and communication is very essential.

Cropping Pattern:

The physical diversities give birth to cultural diversity in India. This diversity is also reflected on different crops that are grown here, in their pattern and methods of cultivation adopted. Here, various types of food crops, pulses, oilseeds, beverage crops, fiber crops, fruits, vegetables etc. are cultivated. These different varieties of crops are grown according to the different type of seasons. Here three types of season related crop groups are cultivated

- (1) **Rabi crops**
- (2) **Kharif crops**
- (3) **Zaid crops (Garma Crops)**

Rabi crops are sown in winter months in between October to December and harvested in summer season in between April to June. Major crops are Wheat, Barley, Gram, Peas, Red Lentil (Maasoor) and Mustard etc. Though, Rabi crops are cultivated in large parts of the country but states of North West India such as Punjab, Haryana, Western Uttar Pradesh, are important. It is that area where as a result of Green Revolution we became self reliant in food grains. Green Revolution has its essentials conditions (1) Developed through latest technique, High Yielding Variety (HYV) Seeds which

gives high per hectare productivity, (2) Means of irrigation, (3) Chemical fertilizer, (4) Chemical insecticides etc.

As a result of the Green Revolution, several environmental problems are now emerging in these areas. Do you know anything about it?

Kharif : Kharif crops are sown during rainy season in India and harvested in September October. Paddy is the important crop grown in this season. Other crops which are also grown in this season are Maize, Jowar, Bajra, Arhar, moong, Urad, Groundnut, Soyabean, Cotton, Jute etc. Rice is mainly grown in Assam, West Bengal, Bihar, Odisha, Andhra Pradesh, Tamil Nadu, Kerala, Konkan coast of Maharashtra. Since last few years good quality of Basmati rice is grown in Haryana and Punjab. In the areas where the rainfall is more than the normal there three crops of paddy is grown and are named as Aus, Aman and Boro.

Zaid: Crop sown in summer season between Kharif and Rabi crops is called Zaid or Garma crop. In this mainly Paddy, Maize and vegetables are grown. In the vegetables mainly cucumber, kakri, pumpkin, Nenua; ladiesfinger, muskmelon, watermelon etc. are important.

Important Crops of India

Crops	Duration of Time	Season	Important crops
Kharif	Up to June-July to October-November	Rainy season	Rice, Maize, Jowar, Bajra, Arhar, Moong, Urad, Cotton, sesame Jute, Groundnut.
Rabi	Up to October-November to March-April	Winter season	Wheat, Barley, Gram, Masoor, Peas, Linseed, Mustard.
Zaid	Up to March-April to May-June	Summer season	Vegetable – Pumpkin, Kakri, Cucumber, muskmelon, watermelon, paddy, maize, moong, urad.

The special feature of crops grown in India is that 100 cm Isohyet divides the country into two large agricultural regions. Rice is grown in the areas that receive more than 100 cm of rainfall whereas wheat is grown in those areas where rainfall is less than 100 cm.

There is an area of transition in between these two important agricultural regions. There is a special crop feature of dry areas where the main crops are jowar, Bajra, groundnut, oilseeds and pulses.

Major Crops The major factors that affect diversity of Indian agriculture are amount of rainfall, types of soil, diversified agricultural methods etc. As a result of which different crops are grown in India, important among them are paddy, wheat, maize, jowar-bajra, pulses-oilseeds, beverage crops, fiber crops etc.

Rice:

It is a staple food crop of our country over which majority of population rely. 22% of the world's rice area is in India and this is 23% of the total agricultural area. Following are the favorable Geographical conditions which are suitable for Rice cultivation:-

(i) **Temperature:** It is a tropical crop; therefore high temperature is required for its growth. At least 24° C of temperature is required for its cultivation. At the time of sowing the ideal temperature is 21° C, during growing period 24° C and at the time of harvest it should be 27° C.

(ii) **Rainfall:** For rice cultivation rainfall between 125 cm - 200 cm is required. Any region having lesser rainfall than this, the crop is grown with the help of irrigation.

(iii) **Soil:** For its cultivation very fertile alluvial soil is required. Its soil should be clay-loams so that the roots of the plant may develop properly.

(iv) **Labor:** Human labor in large number is required for its cultivation. The whole process of sowing to harvesting is accomplished by human labor. The cheap labor of India creates favorable human environment for its cultivation.

Production and Distribution:

Most of the rice of India is grown in the areas of alluvial soil, deltaic and coastal parts. Apart from these it is also cultivated in the stair shaped fields of lower valleys of Himalayas and in valleys of southern plateau.

In the Satluj-Ganga plains, the cultivation of rice has made commendable progress with the help of irrigation. Its important producing



Fig 2.1 India: Distribution of Rice

are West Bengal, Bihar, Uttar Pradesh, Andhra Pradesh, Odisha, Chhattisgarh, Assam, Kerala, Tamil Nadu etc. All three varieties of rice are grown in West Bengal.

Wheat:

Wheat is the second most important cereal crop after rice. Our country is the second largest producer of wheat and produces about 10 percent of the total wheat production of the world. It is grown in winter season and at the time of ripening it requires bright sunshine. It requires

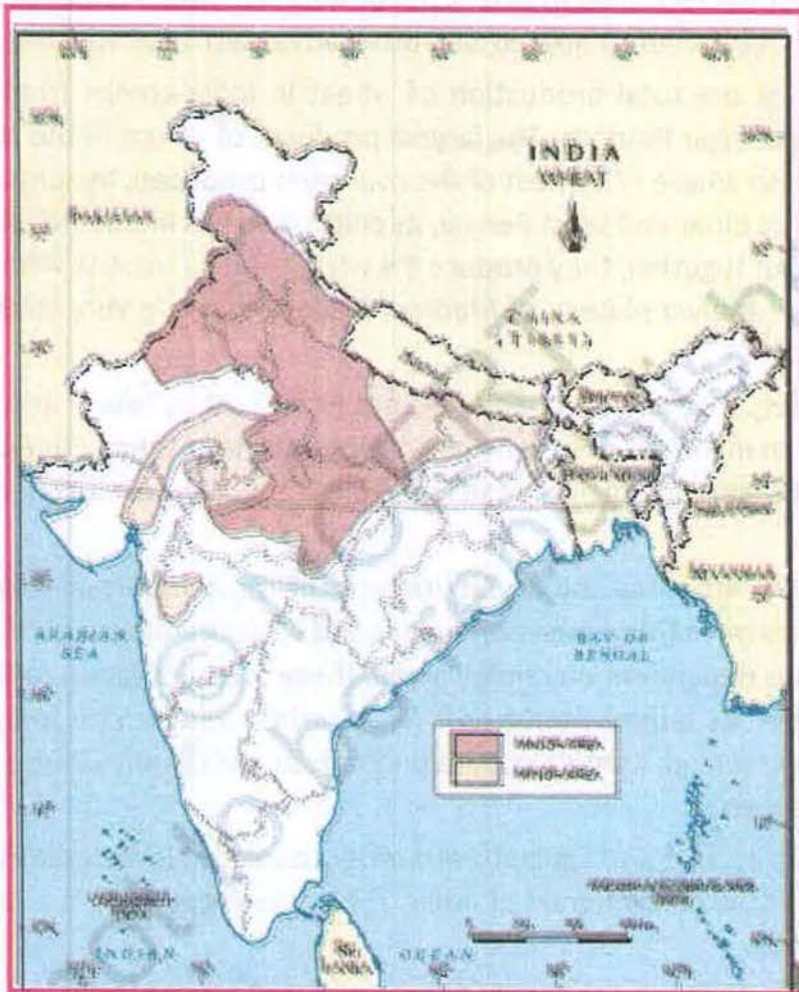


Fig 2.2 India: Distribution of wheat

evenly distributed annual rainfall of 50-75 cm during growing season. It cannot be cultivated in the areas where annual rainfall is more than 100 cm. 100 cm annual rainfall Isohyet divides wheat and rice producing areas. With the help of irrigation, wheat can be grown in those areas also which receives 20 cm of annual rainfall.

In 1967 Green Revolution started in our country and its maximum impact was on wheat cultivation. In 1970-71 the production of wheat doubled in comparison to 1960-61. There was about 1.5 times increase in the area and per hectare yield of wheat but per hectare productivity of wheat in India is very less when compared with other advanced nations of the world.

2/3 of the total production of wheat in India comes from Punjab, Haryana and Uttar Pradesh. The largest producer of wheat in the country is Uttar Pradesh where 1/3 wheat of the country is produced. In nontraditional areas such as Bihar and West Bengal, its cultivation has increased and if both states are put together, they produce 8% wheat of the country. Wheat is also cultivated in Malwa plateau of Madhya Pradesh and in a very large area in Maharashtra.

Millets : Jowar, Bajra and Ragi are important millets of the country. They contain materials of very high nutritional value in them. For example in Ragi, ample amount of iron, calcium, micro nutrients and roughage are found.

Jowar: After rice and wheat, Jowar is the most important food crop in India. It is grown in those areas where rice and wheat cannot be cultivated. Its cultivation is dependent on rainfall and in those areas irrigation facilities are not available. Its largest producer is Maharashtra where 51% Jowar of the country is produced. Karnataka, Andhra Pradesh and Madhya Pradesh are its other producers.

Roughly, 16.5% of agricultural land is occupied in Jowar cultivation and it produces 10% of food grain of India. 75% of Jowar of India is produced in plateau areas.

Bajra: It is grown on 7% of the total cultivable land of India. It is a staple food for poor and animals. It is mainly grown on sandy and shallow black soil.

The largest producing states are Gujarat (24%), Rajasthan (20%), Uttar Pradesh (13%) and Maharashtra (10%).

Ragi: It is a crop of dry region. It comfortably grows on red, black, sandy, loamy and shallow black soil. Karnataka is its largest producing state, followed by Tamil Nadu which is the second largest producer. Ragi is also grown in Himachal Pradesh, Uttarakhand, Sikkim, Jharkhand and Arunachal Pradesh as important crop.

Maize: It is another very important coarse grain and used as food by human beings and given to animals as fodder. It is a good source of glucose and Mand (**Please check and translate Mand of Hindi**) and that is why it is given to animals to make them fat. As its per hectare yield is more, so it is an important food crop for the poor.

It is a Kharif crop and it requires temperature in between 21°C 27°C and rainfall of 75 cm. This crop grows well in the alluvial soil brought by rivers. It is mainly grown in plain areas. Introduction of modern inputs such as High Yielding Variety (HYV) seeds, fertilizers and irrigation facilities has increased the production of maize.

Pulses:

Majority of population of India are vegetarian and pulses are the source of protein in our food. Tur (Arhar), Urad, Moong, Masur, Peas and Gram are important pulses that are grown in India. The production of pulses has not increased in the same proportion as the proportional growth in food grain production. In fact, in total agricultural land, the percentage of pulse cultivation has decreased. The pulses require very less moisture so it can be grown even in dry conditions and 90% of its cultivation is done in accordance with the dry agriculture technique. All pulse crops except Tur (Arhar) makes the soil fertile by fixing Nitrogen from the air. Thus, generally they are grown in rotation with other crops. Pulses are grown in both Kharif and Rabi seasons Arhar, Moong, Urad, etc. are Kharif crops whereas Gram, Peas, Masur etc. are Rabi crop. National Pulse Development Programme has been started in 1986-87 for increasing pulse production but its results are not satisfactory. Important pulse producing states in India are Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra and Karnataka.

Food Crops Other Than Grains:

Sugarcane: It is plant of Bamboo species. Sweet juice is extracted from it and Gur (Jaggery) and Sugar is made from it. Sugarcane is said to have originated from India. It is a tropical as well as sub-tropical crop. It is cultivated in the areas where the temperature is between 21°C to 27°C and rainfall ranges in between 75 cm to 100 cm. In the areas where the rainfall is less irrigation is required. It is grown in variety of soils but well drained deep loamy soil is ideal for its cultivation. This crop spoils the fertility of the soil very quickly and so large amount of fertilizer is required for its cultivation.

This crop is grown in India from Kanyakumari in the south to Gurdaspur of Punjab in the North but its major producing area lies south of 25° North latitude. In comparison to North India, South India has more favorable conditions for its cultivation.

Oilseeds: India is the largest oilseed producing country of the world. On 12% of the total cropped area of the country various variety of oilseeds are grown. The oil extracted out of them is an important part of our food and some of them are used as raw materials for the industries.

Groundnut, Mustard, Coconut, sesame (Til), Soyabean, Castor seed, Cotton Seed, Linseed and Sunflower etc. are important oilseeds which is grown in India. Some of these oilseeds are used in the manufacture of soap, cosmetics and ointments (Ubtan).

Groundnut: It is a Kharif crop. India is second largest producer of groundnut in the world. It is cultivated on 3.6% of the total cropped area of the country. It accounts for half of the total oilseeds produced in India. Gujarat is the largest producer of Groundnut in the country. Other important Groundnut producing states are Andhra Pradesh, Karnataka and Maharashtra.

Mustard: In this Rai, Mustard, Toriya, Taramira and various other oilseeds are included. It is sub-tropical Rabi crop and it is cultivated in central and North-Western parts of India during Rabi season. Very cold weather is harmful for this crop and badly affects its production. To increase its production new technique is being adopted which includes the use of high

yielding variety of seeds and adequate arrangement of irrigation has also been made. 1/3 of the total production comes from Rajasthan. Other producing states are Uttar Pradesh, Haryana, West Bengal and Madhya Pradesh. Its per hectare production is very high in Haryana and Punjab.

Linseed: It is another Rabi oilseed crop. It has many industrial uses. Linseed is a Kharif crop in North India and in South India it is a Rabi crop. Castor seed is both Kharif and Rabi crop.

Soyabean and Sunflower are other very important oilseeds of India. Soyabean is mainly grown in Madhya Pradesh and Maharashtra and both put together accounts for 90% of the total production of India. Sunflower is mainly grown in Karnataka, Andhra Pradesh, Maharashtra states of South India. It is not very important crop in North India but still it is cultivated in irrigated areas.

Tea:

It is an evergreen bush whose leaves are dried to make tea. It contains a substance known as thein which gives us slight freshness when we drink tea. It is an important beverage crop of India. India is the second largest producer but largest consumer of the tea in the world. It comes under plantation agriculture. At first, its cultivation was started by English in Brahmaputra valley in 1840. This region is still the most important tea producing region of the country.

Tea plant blooms in tropical and sub-tropical areas. It requires an ideal temperature that ranges between 25°C to 30°C and rainfall between 200 to 250 cm is essential. For tea plantation land should have sufficient slope so that there is no water logging near the roots of the plant. The humidity should be evenly distributed throughout the year for the proper and regular growth of the leaves. Morning fog and daily shower is highly helpful for the growth of the leaves. Its soil should be well drained and fertile. The soil should contain sufficient amount of phosphorous, potash and humus.

For the cleaning and cutting of the tea bushes large number of human labor is required. To maintain the freshness of the tea leaves, it is processed in the garden itself. In India Tea is produced in some major as well as in some less

important areas. The major tea producing areas are Brahmaputra and Surma valley of Assam, Hills of Darjeeling and Jalpaigudi in West Bengal and in the hills of Nilgiri in Tamil Nadu. In the less important areas, Himachal Pradesh, Uttarakhand, Meghalaya, Tripura, Andhra Pradesh etc. states are there. India is leading tea producer and exporter of the world.

Coffee: Like tea it is also a beverage crop. Coffee seeds are taken out from the fruits of Coffee bushes.

Like tea it also grows in soil containing limestone but soil must contain humus for its proper growth. For plucking of its fruit, then roasting and grinding of the seeds to make coffee powder, large human labor is required. Most of the coffee in India is produced in south India. Karnataka is the largest producer of coffee of India and produces 70% of the total coffee production of India. It is also grown in the Nilgiri hills of Tamil Nadu. In North Eastern India, Tripura is an important producing state.

There are Three Major Varieties of Coffee

1. Arabica 2. Liberica 3. Robusta.

In India best quality of Arabica coffee is grown which is in great demand all over the world. It was brought in India from Yemen and planted in the hills of Baba Budan.

Horticulture Crops:

Due to diversified climatic conditions in India several varieties of horticulture crops are grown in India such as different varieties of fruits, Vegetables, roots and aromatic plants and spices etc. India is a producer of tropical as well as temperate fruits.

India is a leading producer of Mangoes. Countless varieties of Mangoes are produced here. Uttar Pradesh, Andhra Pradesh, Maharashtra, West Bengal, Bihar are famous for Mangoes, Bihar and Uttar Pradesh for Litchi, Meghalaya for Pineapple, Andhra Pradesh and Maharashtra for Grapes and Himachal Pradesh and Jammu and Kashmir are famous for Apples, Pears, Apricots and Walnuts production. Name of few places are associated with particular fruits such as Nagpur and Cherrapunjee with Oranges, Muzaffarpur with Litchi and Bananas of Jalgaon are significant. In states such as Kerala, Tamil Nadu, Maharashtra and Mizoram large scale cultivation of Banana is done.

In horticulture crops Cashew nuts, Black Pepper and Coconuts are also important. India is the largest exporter of Cashew nuts in the world. It is mainly grown in Kerala and Andhra Pradesh.

Black Pepper is grown in the Western Ghats of Kerala and Coconut is grown in the coastal areas of Kerala, Tamil Nadu, Andhra Pradesh and Karnataka.

Non-Food Crops:

Rubber: Rubber plantation was starts in India in 1880 at Travancore and Malabar but its commercial production could start only in 1902. Rubber is a crop of equatorial climate and it requires high temperature and high humidity for its growth. Rubber is grown in Kerala, Tamil Nadu, Karnataka, Andaman and Nicobar Islands and Garo hills of Meghalaya.

Fibre Crops:

Cotton, Jute, Hemp and Natural silk are four important fibre crops grown in India. Natural silk is obtained from the Cocoons of the silkworms which grows by eating Mulberry leaves but first three fibre crops are grown in soil.

Cotton:

India is considered to be the home of Cotton. It supplies raw material for the cotton textile industries. It is a tropical as well as sub-tropical plant and it requires a climate of 210 frost free days. Black soil formed of Lava is highly suitable for its cultivation in India because it maintains moisture for longer period of time.

Bright sun shine helps in the proper growth of the cotton plants. At the time of ripening it requires dry climate. It is a Kharif crop and requires 6 to 8 months to mature. The major cotton producing states are Maharashtra, Gujarat, Madhya Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu, Punjab, Haryana and Uttar Pradesh.

Jute:

Jute is the second important fibre crop of India after cotton. It is also called 'Golden Fibre'. Very good jute crop is received, when new fertile soil is

deposited in the flood plains every year. It requires loamy soil for its growth. Its other requisites are hot and humid climate and after maturity of the fibres sufficient amount of water is required for its processing. The flowing river creates ideal conditions for its cultivation. The river deltas and lower Ganga plains presents favorable conditions for its cultivation. Traditionally ropes, Chat, Gunny Bags etc. are made from the Jute which is used in packing. These days dresses and other artifacts are made from it which is in great demand in and outside the country.

Technological and Institutional Reforms:

Agriculture has been practiced in India since thousands of years but since no changes has been brought in traditional methods and institutional structures with the span of the time; we find that we are lagging far behind in agriculture. Because of the rapid increase in population agricultural fields has been fragmented and as a result of which agriculture has not remained economically profitable. Most of the agriculture of India still relies on Monsoon and very limited irrigation facility has been developed. It is a major challenge to make agriculture a developed part of the economic system for the increasing population. For this, it is highly essential to bring about technological and institutional reforms because without this it is very difficult to improve agriculture. After independence efforts has been made for the consolidation of holdings, abolition of zamindari systems and to develop cooperatives.

In the first five year plan emphasis was laid down on land reforms but land reform act was not implemented properly. In the decade of 1960-70 special package for agriculture was also introduced.

It was from this package that green revolution in wheat cultivation was started. In this, wide ranging use of High Yielding Variety (HYV) of seeds, chemical fertilizer, irrigation, insecticides etc. was introduced and as a result of which there was an unexpected rise in the production of food grains and it proved to be a mile stone in food protection. During this period White Revolution (Operation Flood) was also introduced which also resulted in unexpected rise in milk production. To take this revolution further ahead, the Indian government paid particular attention on cooperative department.

In the decades of 1980s and 1990s a comprehensive land development programme was initiated, in which special attention was paid on institutional and technological development programmes. In this, efforts were made to develop agriculture in the rain fed areas. To protect the farmers from loss due to natural disasters, crop insurance programme was introduced. Grameen Banks, cooperative Societies and other Banks were established for providing loan facilities to the farmers at lower rates of interest. The government of India also introduced Kisan Credit Card (KCC), Personal Accident Insurance Scheme (PAIS). Apart from these, special agriculture related programmes for farmers were broadcasted on television and Akashwani. To check the exploitation of farmers from the middlemen, the government announces minimum support price and profitable procurement price for important crops.

In the 1980s Agro-Climatic Planning was started and regional equilibrium was emphasised in agricultural development. In this decade particular emphasis was laid on agricultural diversity, for example cultivation of costly medicinal plants etc. Apart from crop cultivation in agriculture, development of domestication of milching animals, poultry, pastoral farming, fishery etc. was greatly encouraged.

Contribution of Agriculture to the National Economy, Employment and Output:

Because India is an agricultural country, so agriculture remains to be the main stay of our economy. In 2001, about 63% of the total Indian population got employment from agriculture but ever since the attainment of Independence till today its share in the Gross Domestic Product has registered a continuous declining trend which is a matter of concern. Any decline in agriculture will bring decline in other spheres of the society and will encourage regional disparity. It is not in the interest of those people who are totally dependent on agriculture.

Understanding the importance of agriculture, the government of India is making concerted efforts to modernise agriculture for its development. Establishment of Indian Council of Agricultural Research, Agricultural

Universities, Veterinary services and animal breeding centers, Horticulture development, research and development in the field of meteorology and weather forecast etc. were given priority.

Growth in Gross Domestic Product

	1980 – 91	1992 - 2001
Agriculture	3.6	3.3
Industry	7.1	6.5
Services	6.7	8.2

It is clear from the above table that there has been increase in the Gross Domestic Product but it is not generating sufficient employment in the country. The growth rate is on decline in agriculture and it is an alarming situation.

Globalisation is affecting the agriculture of India. The meaning of Globalisation is - combining the economy of the country with the economy of the world. It has opened the Indian market for the world's market. The control of government machinery over the international trade has lessened now. Now the foreign products which includes agricultural produce also, can easily be sold in India. Due to this international competition, the Indian farmers are up against a very stiff challenge. Indian

Major Factors of Low Productivity

- (i) Increasing population pressure on agricultural land.
- (ii) Decreasing area of agricultural land.
- (iii) Small size of agricultural fields.
- (iv) Land-ownership system
- (v) Less and uncertain facility of irrigation.
- (vi) Uncertainty of Monsoon rainfall.
- (vii) Maginalisation of agricultural land.
- (viii) Less capital investment.
- (ix) Limited use of modern agricultural techniques (HYV Seeds, Insecticides, Chemical Fertilizers and Modern Equipments).
- (x) The propagation system of agricultural research is not in good condition.
- (xi) No proper cost of agricultural products.
- (xii) Lack of work all the year round.
- (xiii) Lack of commercialisation in agriculture.

agriculture is fighting against several problems and greatest of them all is less per hectare yield. On every unit of land in India, the production of crops is $\frac{1}{3}$ of Japan and $\frac{1}{4}$ of United States of America.

To stand before the global competition, India will have to use its agriculture related potential in a planned manner. Apart from utilisation of bio-technology, unification of national market can be an important step in this direction. It is highly essential to make available roads, electrical, irrigational and loan facilities for it. Without this, it will not be possible to save agriculture from the ill effects of globalisation.

Food Security: Food is our basic need and we must have access to food, cloth and shelter. For every citizen, it is highly essential to have access to food with nutrition. In those areas of the country where poverty is widespread, problem of death due to hunger is there. To counter this problem, our government has designed a National Food Security System. It consists of two important components (i) Buffer Stock and (ii) Public Distribution System (PDS).

In the Public Distribution System food grains and other essential commodities are supplied to the inhabitants of rural and urban areas at subsidised prices. It has enabled the poor to have access to food. Food Corporation of India (FCI) is active in maintaining the buffer stock. Food grains are purchased by FCI at the minimum support price and then it is stored by them.

The consumers are divided in to two categories 1. Below Poverty Line (BPL) and Above Poverty Line (APL). The people who are categorised under these categories have different issue prices for the commodities for each category. However, this classification is not perfect in itself. Many deserving poor people has not been included in BPL category and those people who are on the margin of the APL category slip back to BPL category after the destruction of a single crop but they are not counted in BPL category. As per the administrative point of view, there are many general problems in accurate classification.

Food Grain Production (In Million Tonnes)

Year	Rice	Wheat	Coarse Grains	Pulses	Total
2000-2001	85.0	70.0	31.0	11.0	197.0
2001-2002	93.0	73.0	33.0	13.0	213.0
2002-2003	72.0	66.0	26.0	11.0	175.0
2003-2004	88.0	72.0	38.0	15.0	213.0
2004-2005	85.0	72.0	34.0	13.0	205.0
2005-2006	92.0	69.0	35.0	13.0	209.0
2006-2007	93.0	76.0	34.0	14.0	217.0
2007-2008	96.0	77.0	40.0	15.0	228.0

Source : India 2008, Publication Department.

Essential reforms in the basic infrastructures such as electricity, irrigation, rural roads etc. in the agriculture sector are urgently required for the development of agriculture. Instead of wheat and rice, the cultivation of local food crops should be encouraged in which increased productions are expected. Increasing food grain production which should be on a sustainable basis is very essential because the increasing population of India needs food security. There has been increase in net sown area under fruits, vegetables, oilseeds and industrial crops where as on the other hand, there has been reduction in the net sown area under cereals and pulses. Due to increase in population, there has been increase in percentage of land engaged in non-agricultural uses. Due to the technology introduced in green revolution (Insecticides, pesticides and chemical fertilizers) the quality of the soil has been degraded which is a huge problem. Due to irrigation and incompetent water management, problem of Water logging and Salinity has emerged. Because the farmers are given free electricity, the underground water is being exploited unmindfully from the different means of irrigation. As a result of

this unsustainable pumping, the water storage in the aquifers has been reduced which has resulted in the drying of many tube wells. This has compelled the small and marginal farmers to leave agriculture. Though, the big farmers with deeper tube wells still have water. Inadequate facility of storage and lack of marketing facilities affects the productivity of the farmers. Thus, the farmers had to endure double loss as they are compelled to invest high capital

Defined words:

Growing Period: It is the period of favorable climate for sowing, growing and ripening of the crops.

Green Revolution: It is a revolutionary development in the agriculture of our country. In this, by using new seeds, fertilizers and by making arrangement of irrigation facility, production of few food grains was increased immensely.

Plantation Agriculture: It is a method of planting one or more variety of plants for commercial production in large economic units.

for good productivity in their fields on one hand and on the other they do not get right support price or wear the loss of their crops due to some natural disaster. Thus the farmers are compelled to sell their crop production. Therefore, there can be no food security without the security of small farmers.

Pastoral farming and development of milk production are highly helpful in the development of small and marginal farmers in Indian agriculture. Through this their income is being increased and their living standard is being uplifted. Through this there is possibility of increasing income of people living in semi-urban areas, tribal population dominated areas and drought prone areas.

India has the largest cattle population in the world; 57% of Buffalos and 14% of cows (2003) of the world lives here. Through 'Operation Flood' substantial increase in milk production has been brought in the country and by strengthening cooperative system, white revolution has been executed. In Bihar, Sudha Milk Cooperative Society is working for the farmers of this area.

Alternative of horticulture agriculture can be seen shining on the horizon of Indian agriculture. Self help groups and non - government organisations are working in this field. Cultivation of vegetables, fruits, flowers, medicinal plants etc. are gaining momentum.

QUESTIONS

1. Answer the following Questions:

- (A) Name the two most important food grains of India.
- (B) Which are the three important coarse grains are grown in India?
- (C) Name three cash crops of India.
- (D) Which is the most important plantation crop of India?

2. Differentiate between the two:

- (A) Cash crop and Plantation crop.
- (B) Commercial agriculture and Subsistence agriculture.

3. Write one word for each one of the following:

- (A) Crop sown in the beginning of Monsoon and harvested in winter.
- (B) Crops sown in winter after rainy season and harvested in spring season.
- (C) Land left after cultivation to regain its fertility and start cultivation once again.
- (D) One cropped cultivation being practiced by implementing scientific and commercial methods which is similar to industrial produce.

SHORT ANSWER TYPE QUESTION:

- 1. Write the name of two food, cash and fibre crops which is grown in India?
- 2. Write the name of two important states which produces above mentioned crops?
- 3. Write the names of rain fed crops grown in India?
- 4. Discuss the contribution of agriculture in Net National Product?

5. Write in brief the main causes of low productivity of Indian agriculture?
6. What do you understand by Green Revolution?
7. Write five important characteristics of Indian agriculture?
8. Write the name of important food and commercial crops which is grown in India?

Give reason for the following:

1. Cotton is mostly grown in the black soil of Deccan region.
2. Production of Sugarcane is more in south India in comparison to North India.
3. India imports and exports cotton.
4. India is leading Tea exporter of the world.

MAP WORK:

Locate Rice, Wheat, Tea and Cotton producing regions in the outline map of India.



Section-3

MANUFACTURING INDUSTRIES

In the present era manufacturing industries are the indicators of development and prosperity of any country. Production of goods which are useful in life from raw materials is called manufacturing industries such as cloth from cotton, sugar from sugarcane, iron and steel from iron ore, aluminium from bauxite etc. are few examples of the commodities that are manufactured. The history of manufacturing industries is very old in our country. Here it developed in the form of cottage industries and took a large shape in mid of the nineteenth century. Today numerous large manufacturing industries have been established in the whole country; important among them are iron steel industries, textile industries, sugar industries, information and technology industries.

The industrial development on modern lines started in India with the establishment of cotton textile industry at Mumbai in 1854. The first Jute factory was established near Kolkata at a place called Rishra in 1855 but planned development of industries in India started from 1951 after independence.

The establishment of any industry is influenced by several factors. These factors can be divided in two categories physical and human. Raw material, power resources, availability of water and suitable climate are physical factors where as labor, market, transport, capital, banking facility and government policies are human factors.

Classification of Industries: - The industries can be classified on different basis.

1. On the asis of Labour

(i) **Large scale Industries:** - when in industries, large number of laborers and huge capital is being utilised and production is on large scale then they

are called large scale industries. Cotton textile industries and Jute industry comes in this category.

(ii) Medium scale Industries: In this category of industry neither large number of labor nor large scale production is involved. Industries such as Cycle, Radio and Television can be kept in this category.

(iii) Small scale Industries: Small rural industry and cottage industries are small scale Industries which is confined to family members. In this family members combine together and produce products using simple methods. Ornament manufacturing and handicraft industries are its good examples.

2. On the basis of raw materials:

(i) Heavy Industries: In these industries heavy raw materials are used and so the manufactured products are also heavy. Iron and Steel industry is a very good example for this.

(ii) Light Industries: In this category of industry lighter raw materials are used and as a result lighter products are produced. Electronic equipments and Sewing machine industry are its best examples.

3. On the basis of ownership:

(i) Public Sector Industry: In this category heavy and grass root level industries are included. These industries are run by government itself. Iron and Steel Industries of Durgapur, Bhilai and Raurkela are examples of public sector industries.

Do You Know?

BHEL Bharat Heavy Electric Limited and

SAIL - Steel Authority of India are public sector industries.

(ii) Joint or Cooperative Industry: When contribution of two or more persons or cooperative societies are there then it is called joint or cooperative industry. Oil India Limited (OIL), Sugar industry in Maharashtra, Amul (Gujarat) is its best examples.

4. On the basis of source of raw materials:

(i) Agro based industries: Cotton textiles, Jute, Silk, Woolen and edible oil industries are based on raw materials which are received from agriculture.

Cotton Textile Industry:

India is maintaining its monopoly over the manufacture of cotton textile since ancient times but the first cotton mill on modern lines was established at Fort Gloster near Kolkata in 1818. However, it was closed after some time and first successful mill in real sense was established by Kaba ji Nanabhai Dabur at Mumbai in 1854. After this development of modern textile industries began in India.

Cotton textile industry is the largest industry of India. It is the second largest employment providing sector after agriculture in which more than 20 percent of the total industrial work force is found. Presently, it has 14% share in total industrial production and has 4.0 percent share in gross domestic product and earns 17 percent of the total income from abroad (2006-07). There are about 1600 cotton and synthetic textile mills in the country, out of which 80 percent are in private sector and rest are in public and cooperative sector. Presently, 93 percent cotton textiles are produced in decentralised areas of the country in other words textiles are manufactured in other centers apart from mills. In the early years, the cotton textiles industry was established in Maharashtra and Gujarat. Availability of cotton, market, transport and humid climate, contributed immensely in the establishment of cotton mills in these states but today most of the mills of the country are centralised in Gujarat, West Bengal, Uttar Pradesh and Tamil Nadu. Sholapur, Pune, Wardha, Nagpur, Aurangabad and Jalgaon are important cotton textile industry centers in Maharashtra. In Gujarat, Ahmadabad, Vadodara, Surat, Rajkot and Porbandar are important cotton textile industry centres.

Howrah, Murshidabad, Hoogly and Shrirampur are important cotton textile centres of West Bengal. In Uttar Pradesh, Kanpur, Muradabad, Agra and Modi Nagar are important centres. Gwalior, Ujjain, Indore and Dewas are important cotton textile industry centres of Madhya Pradesh. Coimbatore, Chennai and Madurai are important centres of Tamil Nadu. Extended market, transport, bank and facility of electricity has played an important role in the decentralisation of cotton textile industries. Because of the available market of cotton textile and in spite of being not a weight loosing industry, this industry experienced nationwide decentralisation.

Do You Know?

Mumbai is called the Cotton polis because in Mumbai metro region alone one fourth of the total cotton textile of India is produced.



Fig 3.1 India: Textile Industry

Today cotton textile industries are surrounded by several problems. Main problems are scarcity of good quality cotton, greater number of traditional machines giving low output, irregular power supply, low output and stiff competition with clothes manufactured from synthetic fibre.

Know it also!

The first Apparel Park in the country - To increase export of the readymade garments an apparel park has been established in Ettivaramplayam village of Tirupur in Tamil Nadu.

Cotton textiles are mainly exported in the form of readymade garments from India. The important importers of Indian cotton textiles are United States of America, United Kingdom, Russia, France, countries situated in the eastern side of Europe, Nepal, Singapore; Sri Lanka and African countries. India exports cotton textiles to Japan also. In the year 2006 -07, 36.10 crore square meter of cloth was produced in India.

Jute Textiles:

Jute industries are the second most important textile industry after cotton textiles. India is placed first in the production of raw jute and goods made from jute in the world. India stands second after Bangladesh in the export of Jute goods in the world. There are 77 factories of Jute in India (2006-07) among which 69 mills are in West Bengal. More than 80 percent of the total Jute goods are produced in West Bengal. Andhra Pradesh manufactures 10 percent of the Jute goods. Rest Jute goods are manufactured in Bihar, Uttar Pradesh, Odisha, Assam and Tripura.

Most of the mills in West Bengal are situated along the banks of river Hooghly, in a 98 kilometer long and 3 kilometer narrow belt. Following are the factors responsible for the location of mills here. Proximity of jute producing areas, cheap water transport, availability of abundant water for the processing of raw jute etc. Apart from these cheap labour, banking and insurance facilities and port facility for export has played an important role in the concentration of jute industry here. Presently this industry provides direct employment to about 2.61 lakh people. In the year (2006 -07) the total production of raw jute was 90 lakh bales (Each bale equal to 180 kilograms).

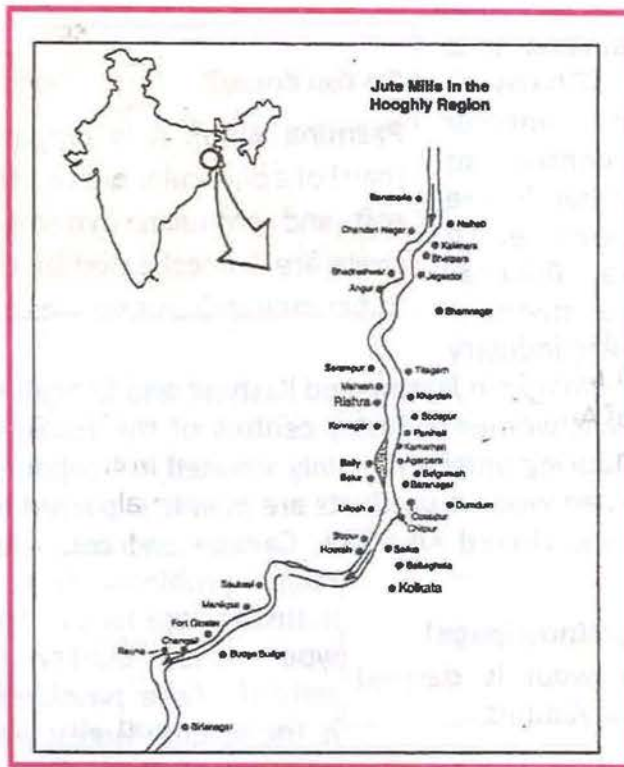


Fig-3.2: Concentration of jute industry in Hooghly region

Good amount of foreign exchange is being earned by India by jute export before and after independence also. Presently, jute industry, is facing several challenges such as high production cost, goods made from synthetic fibres in the international market. Countries such as Bangladesh, Brazil, Philippines, Egypt and Thailand are putting up stiff competition. The Indian Jute products are mainly imported by United States of America, Canada, Russia, Arab Republics, United Kingdom and Australia.

Woolen Industry:

It is one of the oldest textile industries of the country. The woolen industries are mainly concentrated in Punjab, Maharashtra, Uttar Pradesh,

Gujarat, Haryana and Rajasthan. Dhariwal, Ludhiana and Amritsar are major centres of Punjab. Mumbai is the largest centre in Maharashtra. Bikaner and Jaipur are important centre of woollen industry

Do You Know?

Pashmina Wool: It is prepared from the fur (hair) of a particular breed of goat which is very soft and produces extreme warmth. These goats are domesticated by the Gurjars in the upper mountainous regions of Kashmir.

Increase your Knowledge!

The Angora wool is derived from the fur of Rabbits.

in Rajasthan. Srinagar in Jammu and Kashmir and Bangaluru in Karnataka are other important woollen industry centres of the country. The readymade garments producing units are mainly situated in Punjab, Haryana and Tamil Nadu. The Indian woollen products are mainly exported to United States of America, Russia, United Kingdom, Canada and countries of Europe. The major problems faced by the woollen industries are lack of local market of raw wool and low quality of its products. In spite of these problems, presently, India is the seventh largest wool producer of the world. It shares 1.8 percent of the total wool production of the world. 55, 00 million kilograms of wool was produced in India in 2005-06.

Silk Industry:

India is known for its silk products all over the world since ancient times. Four types of silk such as Mulberry, Tasar, Ere, and Moonga are produced in the country. There are about 90 silk mills in India. Apart from these, there are several small and medium units which are engaged in the production of silk cloth. India produces about 8.5 lakh kilograms of silk yarn. More than 90 percent of silk is produced in the states of Karnataka, Tamil Nadu, West Bengal and Jammu and Kashmir. Bangaluru, Kolar, Mysore and Belgaum are major silk producing centers in Karnataka. Murshidabad and Bankura in West Bengal, Anantnag, Baramula and Srinagar in and in Jammu and Kashmir are major silk producing centers.

There is great demand for Indian Silk in Europe and Asian countries. The major importers of Silk cloth are United States of America, United Kingdom, Russia, Saudi Arab, Kuwait and Singapore. The Indian Silk industry faces stiff challenge from China, Thailand and Italy.

Synthetic textiles:

In Synthetic textiles industry, synthetic yarn is used. These clothes occupy an important place in textile industry. They are strong and durable. It is easy to re-dye and weave these clothes. It has revolutionised the textile industries. The manmade fibres are derived from the pulp, coal and petroleum through a chemical process. To add greater quality to it, they are generally mixed with natural fibres such as cotton, silk and wool. These industries are more developed in the states such as Kerala, Tamil Nadu, Karnataka, Maharashtra, Gujarat, Rajasthan and Madhya Pradesh. The important synthetic textile industry centres are Mumbai, Ahamdabad, Surat, Delhi, Amritsar, Gwalior and Kolkata.

Do You Know?

The synthetic yarn is the by-product of petro chemicals such as Nylon, Polyester, Rayon, Acrylic and Polymer.

Sugar Industry:

India is the largest producer of sugarcane in the world. Including the production of Gur and Khandsari it occupies first place in the production of sugar as well. Presently, this industry provides direct employment to over 4 lakh persons and indirect employment to large number of farmers. Because its raw material is seasonal, so sugar industry is a seasonal industry.

The industry started developing on modern lines from 1903 when a sugar industry was established at Marhaura in Saran district of Bihar. We know that sugar industry depends on sugarcane. The sugarcane begins to lose weight immediately after cutting and they perish very quickly as well. Keeping these specialties of sugarcane in mind, the sugar industries are established in sugarcane producing areas. In 2008 there were 615 working sugar mills in the country, among which more than 134 mills were situated in Maharashtra alone. Apart from this, sugar mills are spread over Uttar Pradesh, Bihar, Karnataka, Tamil Nadu, Andhra Pradesh, Gujarat, Punjab, Haryana and Madhya Pradesh. In last few years, the number of these industries has increased in southern and western states, particularly in Maharashtra. This is because the sugarcane produced here has higher sucrose content. The cooler climate found here is also beneficial and apart from this, the cooperative societies are more successful in these states.

Do You Know?

Consumer: Consumer is that industry that produces for the direct consumption of the consumer and they are called consumer industry. In this industry mainly goods of house hold consumption are produced such as paper, tooth paste, fan, cement industry are is perfect examples.



Geography: 160

Iron and Steel Industry:

Iron and Steel industry is the basic industry because other heavy, light and medium industries depend upon it for their machinery manufactured by them. It is also called the creator of other industries. The art of making iron was known to Indians, thousands of years before Christ. The iron pillar standing near Qutub Minar in Delhi is a perfect example of quality of iron manufactured in the country. The famous swords of Damascus were manufactured from the iron produced in India. The first Iron and Steel industry was established at Porto Novo in Tamil Nadu but due to the lack of favorable factors responsible for the location of Iron and Steel industry, it was closed.

In true sense, the beginning of Iron and Steel industry, on modern lines, started with the establishment of its unit at Kulti in 1864 in West Bengal and large scale production of steel started in 1907 with the establishment of Tata Iron and Steel Company at Sakchi (Jamshedpur Situated in Jharkhand). After this, factories were established at Burnpur in West Bengal and at Bhadravati also in Karnataka before independence. After independence many plants of Iron and Steel were established with foreign collaboration. At present, there are 10 integrated Iron and Steel plants and about 200 mini steel plants in India.

Major Iron - Steel Industry of India

Sl. No.	Company	Foreign Collaboration	State	Place
1	Tata Iron and Steel (TISCO)		Jharkhand	Jamshedpur
2	Indian Iron and Steel (IISCO)		West Bengal	Burnpur
3	Vishvesvaraya Iron and Steel (VISL)		Karnataka	Bhadravati
4	Bhilai Iron and Steel Plant	Russia	Chhattisgarh	Bhilai
5	Raurkela Steel Plant	Germany	Odisha	Raurkela
6	Durgapur Steel Plant	Britain	West Bengal	Durgapur
7	Bokaro Steel Plant	Russia	Jharkhand	Bokaro
8	Salem Steel Plant		Tamil Nadu	Salem
9	Visakhapatnam Steel Plant		Andhra Pradesh	Visakhapatnam
10	Vijay Nagar Steel Plant		Karnataka	Vijay Nagar

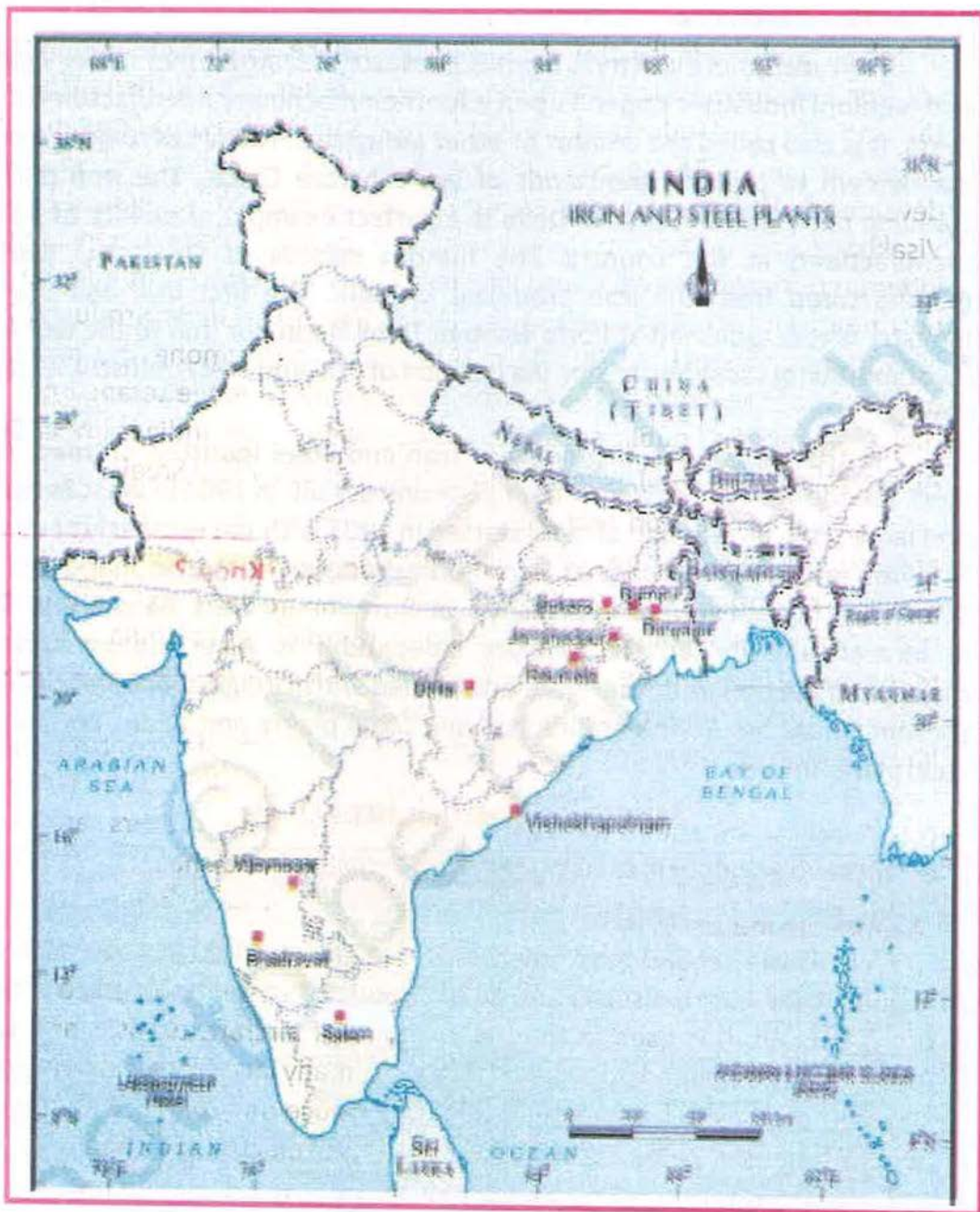


Fig-3.4 Iron and Steel Plants

Iron and Steel industry is a heavy industry because it utilises raw materials which is bulky and occupies larger space. Important among them are iron ore, coking coal, limestone, manganese ore. This is the reason why the iron and steel industries are highly localised in relation to raw material producing areas. The production made by them is bulky and so a well developed network of transport system is very essential for their distribution. Visakhapatnam is the only plant which has a coastal location whereas other integrated iron and steel plants of the country are located in mineral rich north-east and southern part of the Indian Peninsula. India produced 76.9 lakh tonnes of steel in 2007-08 and is placed fifth among the raw steel producers of the world. It is the largest producer of sponge scrape iron. The management of all public sector iron and steel plants of India is under Steel Authority of India (SAIL), whereas TISCO is managed by Tata Steel.

Most of the Iron and Steel plants are established in the Chottanagpur plateau of India because reserves of important minerals like iron ore, coal, manganese, limestone, dolomite are found here. Presently policy of liberalisation, privatisation and globalisation and efforts of the entrepreneurs have given impetus to the development of this industry. With the collaboration of the multinational companies new centers are being established at Raipur in Chhattisgarh and Gopalpur in Odisha.

Do You Know?

Jamshedpur is called the Birmingham of India.

Aluminium Industry:

It is the second most important metallurgical industry of India. It is flexible, light, rust resistant, and good conductor of heat and electricity. Its ore is Bauxite. It is used in the manufacture of aircraft, utensils and wire. Presently, it has gained popularity because in many industries it is being used as substitute of steel, copper and zinc. To produce one tonne of aluminium, about 6 tonnes of Bauxite and 18,600 Kilowatts of electricity is required.

In the total cost of the aluminium about 30 to 40 percent is the cost of electricity. Therefore, it becomes clear that for the establishment of the aluminium industry, availability of Bauxite and cheap electricity are very important factors.

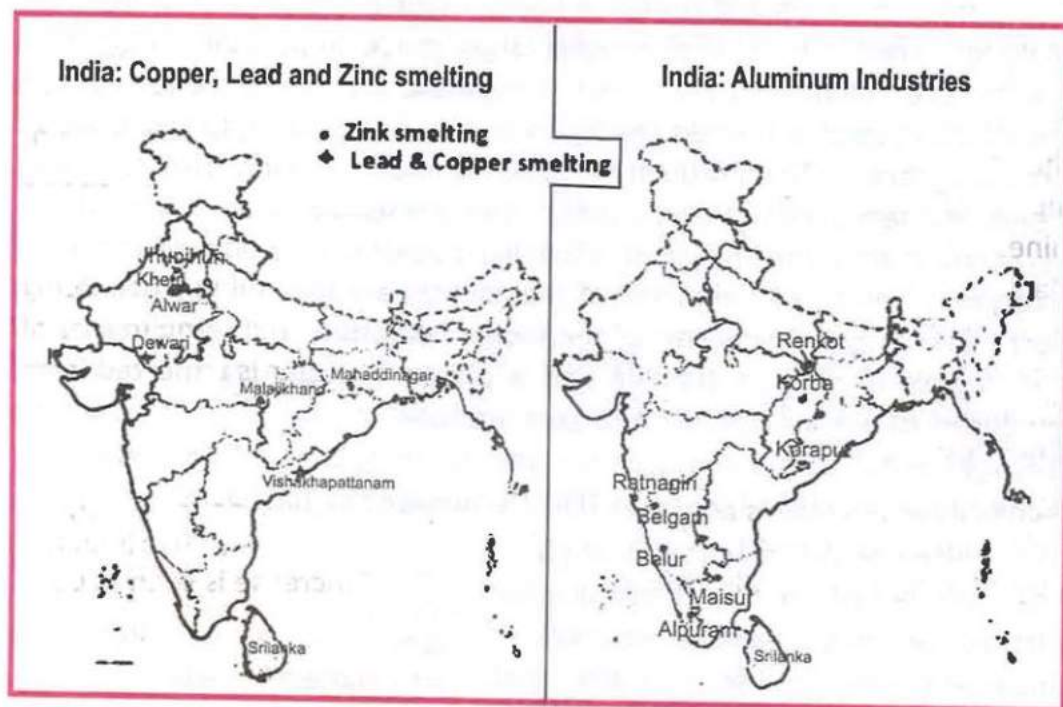


Fig-3.5(A): India: Copper, Lead and Zinc smelting

Fig- 3.5 (B): India : Aluminum

There are 8 aluminium plants in the country which is situated in Odisha (NALCO and BALCO), West Bengal, Kerala, Uttar Pradesh, Chhattisgarh, Maharashtra and Tamil Nadu. The total production of aluminium of all plants put together in 2007-08 was 6.2 lakh tonnes.

Copper Smelting (Please Check) Industry:

The first copper smelting plant was established at Ghatshila in Jharkhand by Copper Corporation of India. In 1972, the Copper Corporation of India was amalgamated with the Hindustan Copper Limited which is the only copper producing organisation in India. It has two centres, one is at Maubhandar near Ghatshila in East-Singbhum district of Jharkhand and

Do You Know?

The oldest copper mine of India is situated at Khetri in Rajasthan.

the second is at Khetri in Jhunjhunu district of Rajasthan. The copper smelting plants have been established near the copper mines situated in these districts. The Khetri copper smelting plant also gets supply of copper ore from Mlanjkhand mines situated in Balaghat districts of Madhya Pradesh. Based on imported copper ore, a new copper plant is being established at Tuticorin of Tamil Nadu. India produces 43 thousand tonnes of copper blisters (Partially refined). Rest 50 percent copper is imported from Zambia, Chilly, United States of America and Canada.

Know it also:

The alloy like Brass, Bronze, German Silver, Roldgold, Ashtdhatu etc. are made from copper.

Chemical Industry:

Chemical industry plays an important role in the economic development of the country. It is placed 12th in the world and third in Asia in size. This industry is developing very rapidly in the country. This rapid increase is seen in both

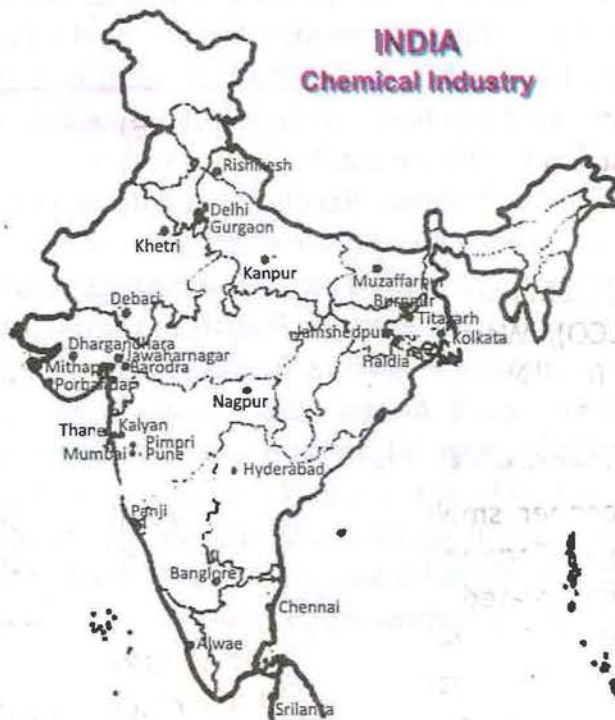


Fig- 3.6 India: Chemical Industry

non-carbonic and carbonic types of industries. The Indian non-carbonic chemicals include Sulphuric acid (it is used in the manufacture of fertilizer, synthetic fibres, plastic, gum, color, dye etc.) Nitric acid, Charit materials, Soda ash (Used in the manufacture of glass, paper, soap and washing powder) and Caustic Soda. In the heavy carbonic chemical industries, petroleum is important. It is used in the manufacture of synthetic fibres, synthetic rubber, plastic goods, colour and medicines. The non-carbonic chemical industries are spread in different parts of the country whereas carbonic chemical industries are situated near oil refineries and petroleum plants. The production of insecticides has contributed immensely in the development of agriculture by controlling harmful insects and weeds. India is a leading medicine producer among the developing nations. It produces 14 percent of the total industrial produce and contributes 14 percent in export also. It shares 3 percent in the gross domestic product.

Fertiliser Industry:

India is an agriculturally important country and to maintain the fertility of the soil utilisation of fertiliser is essential. India is the third largest producer of nitrogenous fertilisers in the world. The first fertiliser plant of India was established at Ranipet (Tamil Nadu) in 1906 but actual development of this industry began in 1951 with the establishment of Sindri plant by Fertiliser Corporation of India. Due to Green Revolution the demand for fertilisers has increased which has opened way for the establishment of fertiliser plants in different parts of India. More than 50 percent of the total fertiliser production is by Gujarat, Tamil Nadu, Uttar Pradesh, Punjab and Kerala. Other important fertiliser producing states are Andhra Pradesh, Odisha, Rajasthan, Bihar, Maharashtra, Assam, West Bengal, Goa, Delhi, Madhya Pradesh and Karnataka. The establishment of fertiliser plants in different parts of the country has been possible due to easily available natural gas. In 2006-07 about 150 lakh tonnes of Nitrogenous, 50 lakh tonnes of phosphates and 20 lakh tonnes of potash fertilisers was produced by India. To manufacture potash fertiliser, potassium is imported by India.

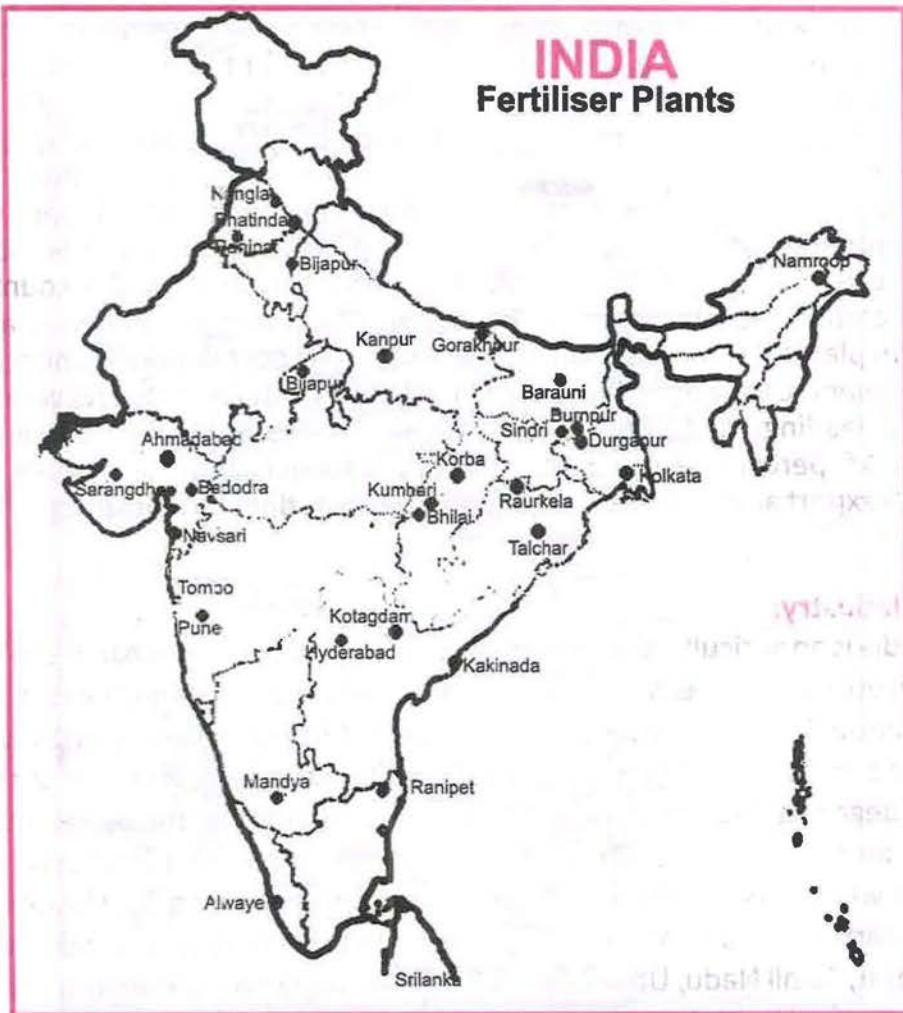


Fig-3.7 India : Fertiliser Plants

Cement Industry:

It plays an important role in the construction of houses and structural field of the country. India is the second largest cement producing country of the world. Different varieties of cement are produced in India such as simple Portland cement, Portland pojolana, Portland blast funace, slag cement, oil well and white cement etc. Raw materials such as limestone, coal, silica, aluminium and gypsum are required for cement industry. That is why this industry is established near the source of raw materials.

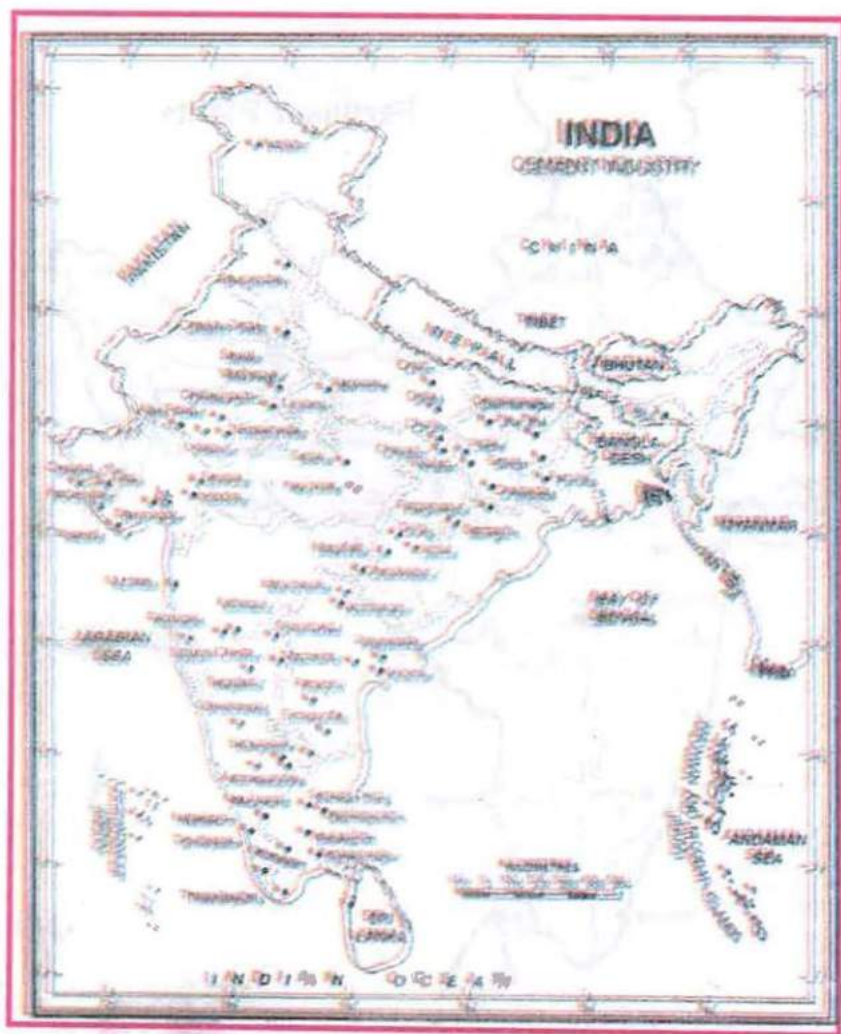


Fig-7 : Cement Industry

The first cement plant was set up in Chennai in 1904. This industry mainly expanded after independence. Presently there are 159 large and more than 332 mini cement plants in the country (2008). Their total production capacity is 1683 lakh tones per year (2007-08). Because of the better quality of Indian cement, it is in great demand in the south and eastern Asian countries. Presently more than 20 crore tonnes of cement is produced in India every year.

(ii) Manufactured Goods Based- Structural and Equipment Industry

(i) Transportation Equipment Industry:

(i) Railway:

There is a network of railways in India and so there is great demand of wagon and coaches of goods and passenger trains and railway engines. Therefore, there is large scale development of railway engine, passenger coaches and goods train wagon industries. Today we also export heavy railway wagons on large scale. Broad gauge electric engines are manufactured in locomotive works of Chitranjan in West Bengal. Diesel operated rail engine manufacturing factory is at Varanasi. Passenger coaches are manufactured at Pairambur, Bengaluru, Kapurthala and Kolkata. The goods train wagons are manufactured in private sector and rail factories. Bharat Wagon and Engineering Company Limited manufactures wagons for railways at Mokama in Patna district of Bihar. Railway work shop is located at Jamalpur in Munger district which is the oldest railway workshop of Asia. Railway wheel manufacturing factory at Chapra in Saran district and passenger train coach manufacturing factory at Harnaut in Nalanda district are under construction.

(ii) Automobile Industry:

Road transportation is more extensive than railways. Presently motor vehicles such as Truck, Bus, Car, Motorcycle, Scooter etc. are being manufactured in large numbers. India is the largest manufacturer of three wheelers in the world. Tractor and cycles are also manufactured in large number. Motor cycles are manufactured at Lucknow, Satara, Panki (Kanpur), Akurdi near Ahmadabad and at Pimpri. Maruti Udyog Limited is situated near Delhi at Gurgaon in Haryana. Tata Engineering and Locomotive Company Limited (TELCO) is an important manufacturer of medium and heavy commercial vehicles in India. Mahindra and Mahindra manufactures Scorpio and Bolero at Nasik. Tata Nano Car Company manufactures low cost cars in Gujarat. Apart from this, these industries have also developed in Chennai, Pune, Indore, Hyderabad and Bengaluru.

(iii) Ship Building Industry:

Ship building is a large industry in the present era. Large capital is required for this industry. Presently, there are five important ship building centres in the country-Vishakhapatnam, Kolkata, Kochi, Mumbai and Majhgaon (All in Public sector). Large ships are manufactured at Kochi and Vishakhapatnam. In this ships of 1,00,000 tonne (D.W.T.) and 50,000 tonne (D.W.T.) are built (Weight of vacant ship is called D.W.T.). Majhgaon Doc yard has been built to manufacture ships for Indian Navy. Near Kolkata Dodger boats, goods boats, pulling boats, coastal boats, diesel engines used by ships are manufactured.

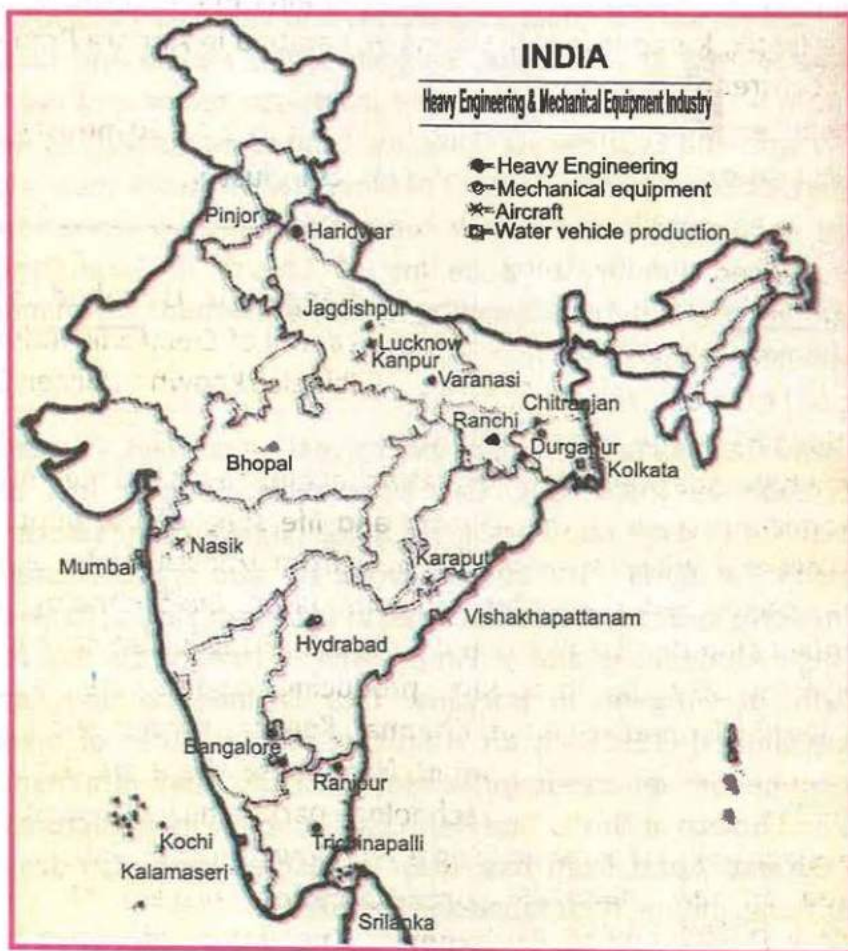


Fig-3.8 : Heavy Engineering and mechanical Equipment Industry

(iv) Aircraft Industry:

It is a recent industry and completely in control of the government. The first factory, Hindustan Aircraft Limited, of this industry was established at Bengaluru (1940). This factory was tied to Aeronautics India Limited in 1964 with a new name Hindustan Aeronautics India Limited at Bengaluru which is popularly known as HAL. India now manufactures different type of small and large aircrafts. The Indian aircrafts are utilised by Indian Airlines and Indian Air Force. Indian aircrafts are used by Indian Airlines in domestic circuit, Air India for foreign circuits and for defense purposes. At present we are manufacturing Krishak, Pushpak, Jet MIG, Supersonic Jet, Interceptors, Attack Helicopters, MIG and Ecto 746 type of aircrafts. Bengaluru, Kanpur, Ojhar near Nasik, Koraput in Odisha and Hyderabad in Andhra Pradesh are important centres of this industry.

(v) Foot Loose or Technology and Labour Proficiency based Industries**(i) Information Technology and Electronics Industry:**

This industry is also known as knowledge based industry because for production in this industry specialised recent knowledge, classified technology and continuous research and investigation is required. It is this industry

Do You Know?

Bengaluru is called as the capital of Electronic Industries. It is also known as Silicon City.

which is mainly associated with information technology. It has revolutionised the economic structure of the country and life style of the people. This industry covers a wide range of products from transistors to television, telephone, pager, radar, cellular, telecom, laser, bio-technology, space equipments, computer hardware and software etc. It is also called as high technology industry. Its important producing centers are Bengaluru, Mumbai, Delhi, Hyderabad, Pune, Chennai, Kolkata, Kanpur and Lucknow.

Do You Know?

Because electronic industry is not based on raw materials therefore it is also known as 'Foot Loose' industry.

Apart from these there are 20 software technology parks which provide facility of single window service and high data communication system to software experts. The main objective of this industry is to create jobs. Of the total work

force involved in this industry 30 percent are females. This industry has been an important source of foreign currency earning for the last two or three years. The main cause for this is Business Process outsourcing (BPO). The economy associated with this is also known as knowledge economy.

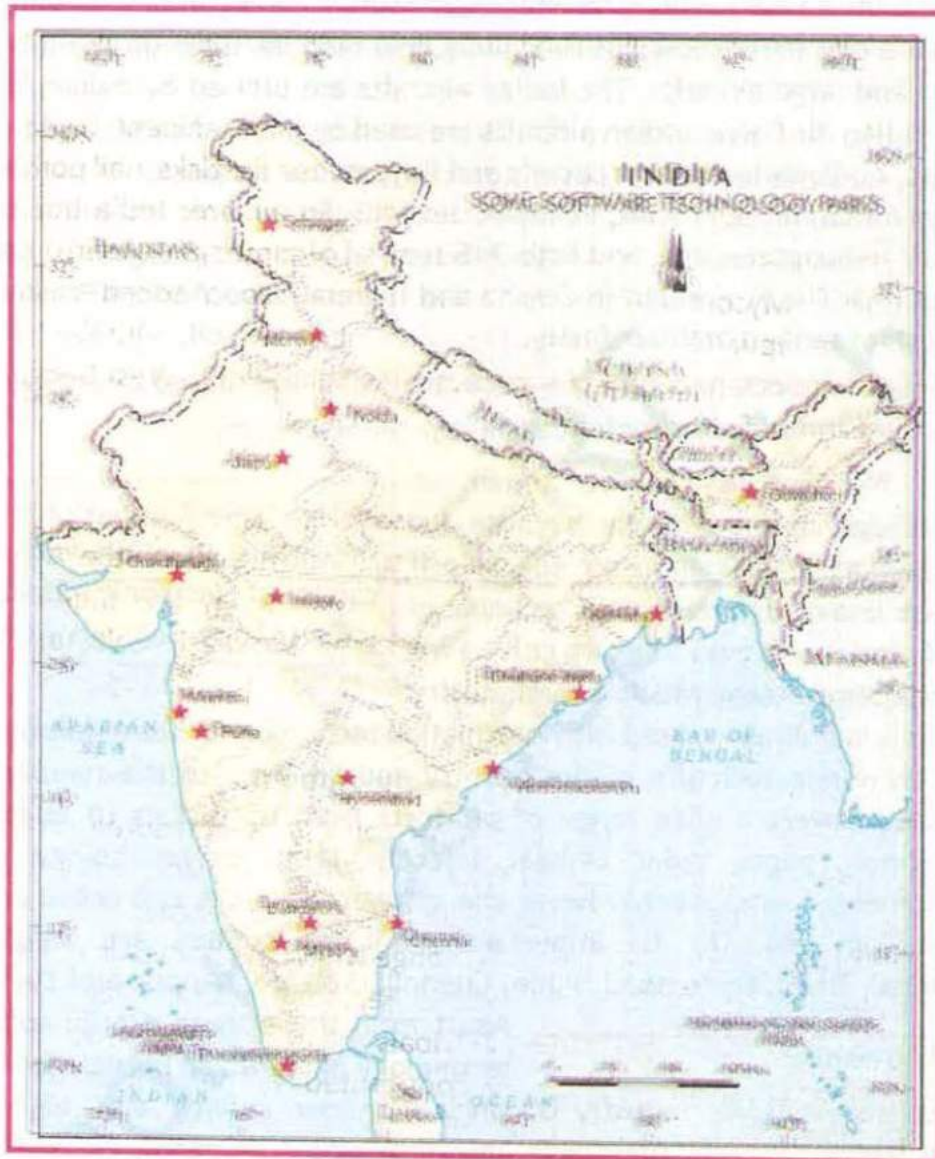


Fig- 3.9 : Software Technology Parks

(ii) Readymade Garments Industry:

This industry is spread all over India in the form of light industry but Lucknow, Ludhiana, Kolkata, Jaipur, Srinagar, Chandigarh, Surat, Shahadra, Mau etc. are its important large centres. Meerut, Muradabad, Agra, Mathura, Bulandshahar are famous for hosiery and readymade garments.

(iii) Cosmetics Industry:

India has been known for its cosmetics since ancient times. The industry includes the production of soap, oil, powder, lipsticks, nail polish and artificial jewelry etc. This industry is also spread all over India but some particular centres are famous for the production of some specialised product. For example, Mysore is famous for its Sandal wood based cosmetics industries, Jaunpur for perfume, Kanauj for fragrant oil, Mumbai, Pune, Kolkata are important centers for good quality soap. Delhi, West Bengal and Jaipur are famous for artificial Jewelry.

(iv) Toys Industry:

Toys manufacturing industry provides job to large number of people but there has been considerable decline in this industry due to the import of electronic toys from China and Japan. But even today this industry has developed in many cities of India. Shivkashi, Varanasi, Kolkata, Delhi, Chennai, Hyderabad, Madurai, Bhopal etc. are famous for this industry.

Contribution of Industries in the National Economy

The economic prosperity of any country is measured from the development of its manufacturing industries. These industries have reduced dependency over agriculture by providing jobs to the people. The export of manufactured goods earns foreign exchange which has helped in controlling the problem of poverty to great extent. Regional disparity has also been reduced by industrial development in tribal areas. For the past two decades, the manufacturing industries have contributed 17 percent in the gross domestic product.

In comparison to India, the contribution of manufacturing industries in East Asian nations in gross domestic product is 25 to 35 percent but in the

past one decade the Indian manufacturing industries have shown 7 percent growth rate which is expected to rise to 12 percent in the next decade. Since 2007-08 the manufacturing industries have grown the rate of 9 to 10 percent. The economists have speculated that due to the government policies and by fresh efforts to increase Industrial productions, the manufacturing industries may achieve its target in next one decade. To achieve this objective, National Manufacturing Competition Council has been established.

Effect of Globalisation on Indian Economy:

The meaning of Globalisation is to connect country's economy with the world's economy. In other words one country changing capital, technology and trade with other countries without any prohibiting is globalisation. The new economic policy of government of India is engaged in defining globalisation. Our objective is to make Indian economy compatible to other economies of the world.

Do You Know?

Liberalisation: In this, the industry and trade are made free from the unnecessary prohibition of Red Tapism and effort is made to make them more competitive.

In Globalisation there is freedom of import of all the commodities, reduction in custom duty, permission of open flow of foreign capital, relaxation of capital investment in service sector particularly in banking, insurance and shipping sectors and making rupee fully convertible. To

What do you Understand by Privatisation?

Handing over of the ownership, control and management of most of the industries of the country to private sector reduces or ends government monopoly on its results, health and economy.

achieve these targets, there is rapid globalisation of Indian economy. Economic reforms are being implemented through liberalisation and privatisation, as a result of which the achievements in some sectors are very encouraging. The foreign exchange reserve has increased considerably. It reached 200 billion dollars in 2007-08 but recently there has been some hindrances in the rate of export and agriculture. Despite worldwide economic recession the rate of gross domestic product of India was more in

comparison to other developing nations excluding China but its progress is not satisfactory in social fields. Creation of job opportunities has been less and poverty eradication programme has also been affected. In spite of having huge reserve of food grain, large population of India is victim of malnutrition. Lack of purchasing capacity is major cause for this.

Do You Know?

Multinational companies are those companies that control production and services in various countries from its headquarter situated in anyone country.

Globalisation is affecting indigenous industries, particularly the small and cottage industries are adversely affected. It is very clear that, there will be adverse affect of globalisation on our economy and industrial development.

Effect of Industrial Pollution:

The manufacturing industry has contributed significantly in the economic development of the country. But still the industries have increased pollution and have degraded the environment. The industries are responsible for four types of pollutions — air, water, land and noise.

(1) **Air Pollution:** The smoke and gases, emitted by industries have badly polluted the air. Carbon mono oxide (Co) is also called as the strangulating gas and excess

of unwanted gases in the air such as Sulphur dioxide (So₂) causes air pollution. The Carbon mono oxide (Co) gas enters the body through breathing and reduces the oxygen carrying capacity of

Do You Know?

A human being breathes 23000 times per day. Through breathing human beings utilises 35 gallons or 16 kilograms of oxygen mixed air per day.

haemoglobin present in the blood which can even cause death. The So₂ causes health problem such as burning of eyes, Asthma, cough, lung diseases, headache and giddiness. Apart from these there are liquid and solid pollutants that pollute air. In dust, Spray, fog, smoke and mist both type of materials are mixed and they affect animals, trees, plants and the environment.

(2) Water Pollution:

There are many sources of water pollution. The most significant among them is industrial effluent which is discharged in to the rivers. They are both organic and inorganic. Coal, dyes, detergents, insecticides, fertilisers, plastics materials and rubber etc. are water polluters. Paper pulp, chemicals, petroleum, oil refineries, leather industries and electroplating are major water polluting industries. The poisonous metallic effluent discharged from the industries pollutes land and soil, reduces oxygen content from the water that affects living organisms adversely. Diseases such as Cholera, diarrhea, typhoid and jaundice are caused by drinking polluted water.

Do You Know?

There are five major polluting industries:

- (1) Leather industry
- (2) Oil refineries
- (3) Industries based on diesel-coal
- (4) Metal industries
- (5) Paper industries

(3) Noise Pollution:

Unwanted noise is also pollution. Generally it is created by industries and means of transport. The unbearable noise produced by mechanical saw mills, generators, faulty machines is a cause of causes discomfort. Excess noise causes deafness, increased heart rate, irritation, insomnia and other associated problems.

(4) Thermal Pollution:

Hot water from industries and thermal plants is drained in to rivers and ponds without cooling and it causes thermal pollution of water which destroys planktons and aquatic vegetation.

The Bhopal gas tragedy was an incident that occurred on 3rd December, 1984 at Bhopal (M.P.) when Methyl isocyanate (MK) gas leaked from the Union Carbide fertiliser and insecticide manufacturing factory killing 500 people.

Oily effluent discharged in to river Ganga from oil refinery situated at Barauni is causing water pollution.

Wastes from nuclear power plants and nuclear surgical production facilities causes skin diseases, cancer (Blood and Bone cancer) birth defects and miscarriages.

Do You Know?

Bata Shoe factory and distillery situated at Mokama drains 250000 gallons of toxic waste water every day in to river Ganga.

Measures to Control Pollution:

The pollution can be controlled through proper planning. By establishing industries in prescribed locations, maintaining the quality of equipments and by their proper operation, the pollution can be reduced. Choosing alternative fuel and their correct utilisation is the major source of controlling the air pollution. Smoke can be reduced by using oil instead of coal in industries. There are number of such equipments through which emission of pollutants in to the air can be reduced. Important among them are separator filters, fabric filters and scrubbers.

Water pollution can be checked by treating polluted water from industries before releasing them in to rivers. Treatment of industrial effluents can be done in three stages. Primary treatment by mechanical process, secondary treatment by biological process and tertiary treatment by biological, chemical and physical processes. In the primary treatment screening, grinding, flocculation and sedimentation is involved. In the secondary treatment biological process are involved and the tertiary treatment involves the recycling of waste water. For reducing soil and land pollution, three processes are involved.

- (A) Collection of waste materials from different places.
- (B) The disposal of waste materials by filling of land.
- (C) Recycling of the waste materials and making them useful.
- (D) In addition to refinement and minimisation of industrial effluents which affect qualities of soil, its proper management is essential for soil pollution.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

- Which of the following is not a factor of industrial location?
(a) Market (b) Population
(b) Capital (d) Energy
- Which of the following is the first Iron and Steel industry established in India?
(a) Indian Iron and Steel Company of India (IISCO)
(b) Tata Iron and Steel Company (TISCO)
(c) Bokaro Steel City
(d) Vishvesvaraya Iron and Steel Industry
- The first modern cotton textile industry was established in Mumbai, Why?
(a) Mumbai is a Port.
(b) Is situated near cotton producing region.
(c) Capital is available in Mumbai.
(d) All of the above.
- Which of the following industries is not based agriculture?
(a) Cotton textiles (b) Cement
(b) Sugar (d) Jute textiles
- Is the centre of Hoogly industrial region?
(a) Kolkata- Risra (b) Kolkata- Konnagri
(c) Kolkata- Modinipur (d) Kolkata- Howrah
- Which of the following industries comes under public sector?
(a) J.K. Cement Industry (b) Tata Iron and Steel Industry
(c) Bokaro Iron and Steel Industry (d) Raymond Textile Industry

7. Which of the following is consumer industry?
- | | |
|--------------------|---------------------------|
| (a) Petro-Chemical | (b) Iron-Steel |
| (c) Sugar Industry | (d) Chitranjan Locomotive |
8. Which of the following is small scale industry?
- | | |
|--------------------|-----------------------------------|
| (a) Sugar Industry | (b) Paper Industry |
| (a) Toy Industry | (d) Electrical equipment Industry |
9. Bhopal Gas disaster was caused by which gas?
- | | |
|------------------------|---------------------|
| (a) Carbon Dioxide | (b) Carbon Monoxide |
| (c) Methyl Iso cyanate | (d) Sulphur Dioxide |

SHORT ANSWER TYPE QUESTIONS:

1. What do you understand by manufacturing?
2. Differentiate between public and private industry.
3. Mention three factors responsible for industrial location.
4. Differentiate between mineral based and agro based industries.
5. Classify industries with examples on the basis of ownership.

LONG ANSWER TYPE QUESTIONS:

1. What do you understand by liberalisation, privatisation and globalisation? Discuss the effect of globalisation on Indian economy?
2. Describe Information Technology industry in India.
3. Describe distribution of cotton textile industries in India.

PROJECT WORK:

Question: With the help of appropriate symbols locate and name the following on the outline map of India?

- (i) A famous iron and steel centre established in private sector.
- (ii) Software Technology Park of Madhya Pradesh.
- (iii) Software Technology Park of Bihar.
- (iv) Iron-Steel plant of Chhattisgarh.
- (v) Leading state of sugar industry.
- (vi) Major centers of cotton textile industry Mumbai, Coimbatore, Ahmadabad and Kanpur.

With the help of your teacher prepare a table of 10 multinational companies working in India and in front of every name write the name of those industries in which they have made considerable invested.



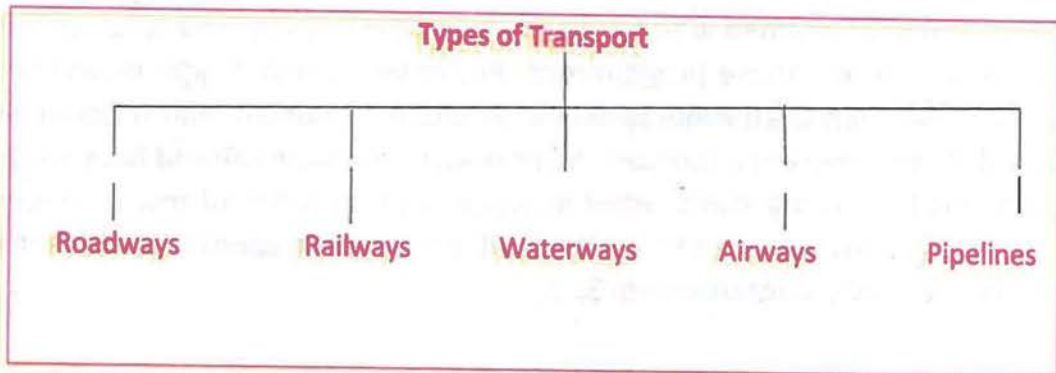
Section-4

TRANSPORT, COMMUNICATION AND TRADE

Have you ever given a thought as to how and from where all essential commodities of life come to your village/town? How does wheat grown in Punjab, rice grown in West Bengal, coal mined in Dhanbad, cotton grown in Maharashtra and letters and messages written by you reach to other places and persons? All this is possible due to means of transport and communication. Means of transport and communication acts as base in the all round development of any region or country. A relationship between production and consumption or demand and supply is being established by these means. That is why they are called lifeline of national economy.

Types of Transport:

Means of transportation is required to travel between two places. At present means of transport and communication are the arteries of socio-economic setup which give shape to the world, affects it and also get affected by them. For transportation in India there is facility of roadway, railway, waterway, airway and pipe line. In hilly regions, especially for tourism, development of ropeway can be seen as a means of transportation.



1. Roadways:

Roadways are the most common, easy and convenient means of transportation. It is used by every person during his life time. You also use roadways for going to school from your home every day. India has one of the largest road networks in the world with about 33 lakh kilometers long road network. Grand Trunk Road is the oldest road of the country. This road was built by Sher-shah Suri and its stretch from Kolkata to Amritsar lies in India. At present it is known as National Highway No. - 1 (NH - 1) from Amritsar to Delhi and National Highway No. - 2 (NH - 2) from Delhi to Kolkata. Road going to Leh via Kargil from Amritsar is known as National Highway No. 1A (NH 1A).

Development of Roadways in India:

The earliest proof of development of roads in India is found in the Harappa and Mohenjodaro civilisation. The rulers during Budha era also constructed roads. In 1857 after first war of Independence, the English rulers developed roads as a supplement to the railways. Not only this, before independence under 'Nagpur Road Plan' considerable efforts were made in the country for the development of roads. As a result, at the time of independence 2.42 lakh kilometer long kuchchi and 1.46 lakh kilometer long pukki roads was there in the country.

After independence adequate attention was given on the development of roads. In 1950-51 the total length of roads in the country was 4 lakh kilometers which increased to 24 lakh in 2000-01 and it further increased to 33 lakh kilometers in 2006-07. During this, several programmes were also implemented which enhanced the development and construction of roads. Among these programmes, Rashtriya Gramin Rojgar Guarantee Yojana, Swarnim Chaturbhuj Sadak Pariyojana and Pradhan Mantri Grameen Sadak Yojana are very important. Apart from these, from MP and MLA quota also small roads are constructed in village and mohallas of towns. Under Pradhan Mantri Grameen Sadak Yojana it is planned to connect settlements which are having a population of 500.

Regional Distribution:

So far as the length of pakka roads are concerned, Maharashtra stands first in the country. 2.70 lakh kilometer long roads exist here. Uttar Pradesh and Odisha are placed second and third respectively. The length of the roads here is 2.47 lakh and 2.36 lakh kilometers respectively. The least length of the pukka roads is found in Lakshadweep, here length of the pakka road is only 01 kilometer long. The density of the roads is maximum in Kerala. Here on every 100 square kilometer area the length of the road is 387 kilometer. Goa and Odisha are placed second and third with total length of roads being 258 and 152 kilometers respectively.

In North India the maximum density of roads is in Punjab with a density of 122 kilometers on every 100 square kilometers. After this, Uttar Pradesh and West Bengal are placed with a density of 103 and 102 kilometers per 100 square kilometers respectively. In the North- East states, Tripura is the first and Nagaland is the second in terms of density of roadways with a density of 134 and 127 kilometers respectively on every 100 square kilometer area. Among Union territories with a density of 1176 kilometer per 100 square kilometers Chandigarh is placed first. With a density of 17381 kilometer per 100 square kilometer Delhi stands first in the whole country.

Types of Roads:

Through Nagpur plan roads were divided in to four different types-

- | | |
|-----------------------|--------------------|
| (1) National Highways | (2) State Highways |
| (3) District Roads | (4) Rural Roads |

(1) National Highways:

National Highways acts as a link in connecting different parts and states of the country. They are spread over from one corner to another corner of the country. The National Highway No 7 is worth mentioning in this regard. It is the longest National Highway of the country. Crossing through Varanasi, Jabalpur, Nagpur, Hyderabad, Bengaluru and Madurai up to Kanayakumari,

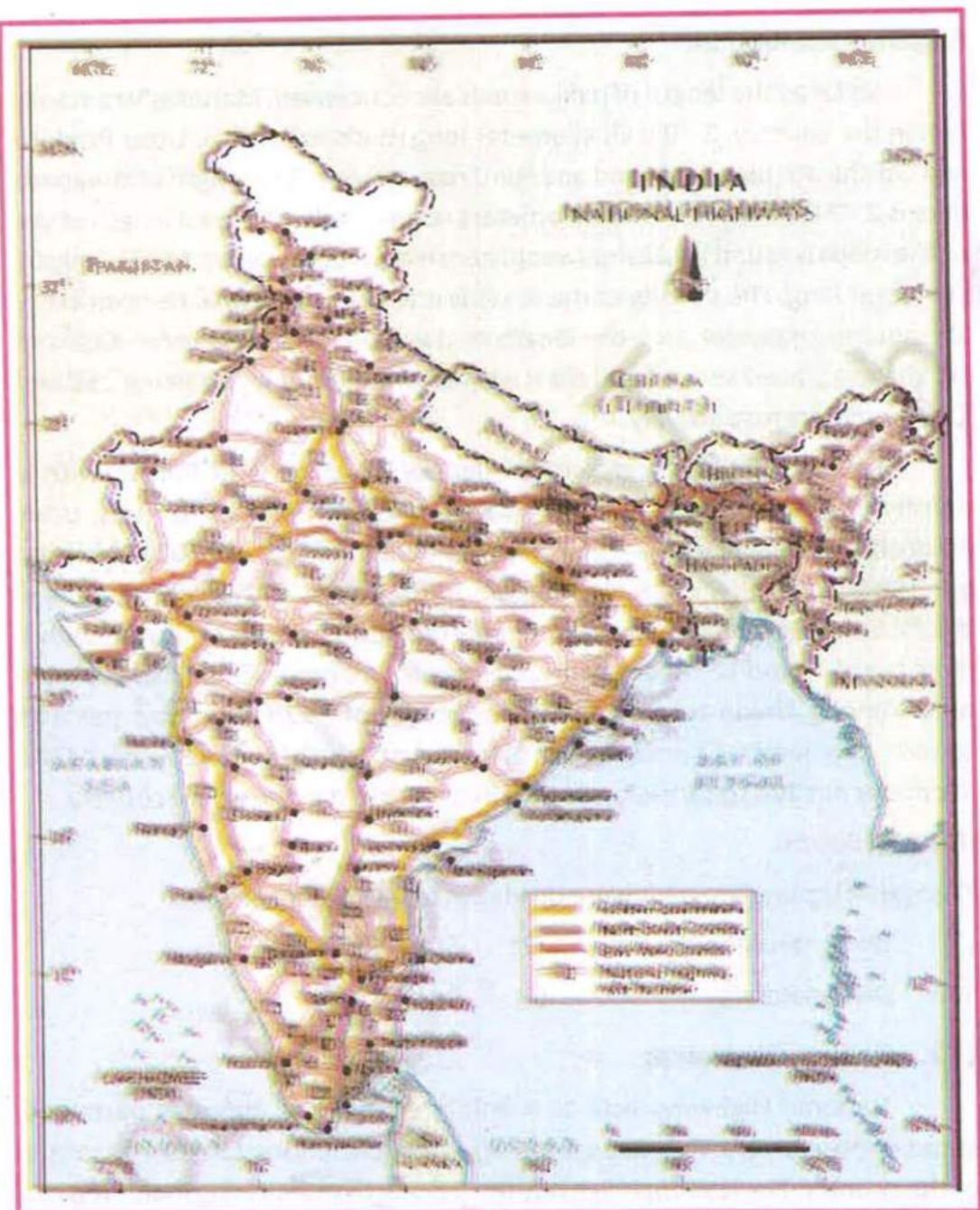


Fig 4.1 India : National Highways

the total length of this Highway is 2369 kilometers. The central government is responsible for the construction and maintenance of these highways. There are 228 National Highways in the country having a total length of 66590 kilometers.

National Highways

Single Lane	- 32%
Double Lane	- 56%
Four/Six/Eight Lane	- 12%

This only 2% of the total length roads of the roads in India. These roads share 40% of the total transportation of the country. All National Highways are having Pakka roads. The traffic on the National Highways ply at a very faster speed due to which unfortunate incidents occur. Therefore, for safety and first aid emergency boxes are also kept at places on these highways.

To encourage economic development in the country, the government has launched extensive National Highways development project. This is the largest National Highways project of the country till date. Following are the activities of phase- I and phase- II of the National Highways development project.

(i) **Golden Quadrilateral Highways:** Launched by central government to link four major cities - Delhi, Mumbai, Chennai and Kolkata by six lane highways with about 5846 kilometer long road. The construction work of these highways is going on.

(ii) **East-West and North-South Corridors:** The construction work on roads linking Silchar in the east and Porbander in the west and Srinagar in the North and Kanayakumari in the south is going on. The total length of East-West corridor is 3640 kilometers and the total length of North-South corridor is 4016 kilometers is proposed.

(iii) **Express Way:** These roads are constructed with an aim to cover distances in short time. The vehicle plying on these roads run at a very fast speed and have to pay additional Toll-Tax. These modern four lane roads include Kolkata-Dumdum express way, Ahmadabad express way, Mumbai West Coast express way. The Mumbai Pune super express way is first international standard highway of the country. It has been proposed to convert 380 kilometer long National highway connecting 10 major ports of the country in to four lane express ways.

(2) State Highways:

The state highways connect state capital with headquarters of different districts. The responsibility of construction and maintenance of these roads is on the state government and this work is executed by the Public Works Department (PWD) of the states. The total length of these roads is only 4% of the total lengths of the roads in the country. These roads are also connected to National highways.

(3) District Roads:

The district roads connect different district head quarters and towns. The total share of these roads is 14% in the total roads of the country. These roads have a very significant role in the regional development. The responsibility of maintenance of all these roads is on state governments.

(4) Rural Roads:

These roads connect villages with each other. These roads include 80% of the total road area of the country. The development of these roads is being done under Pradhan Mantri Sadak Yojana.

(5) Border Roads:

From Political and strategic point of view it is essential to construct roads in border areas. The Border Road Organisation constructs and maintains these roads in India which was established in 1960. In the situation of war the comparative importance of these roads increases. It is through these roads that the essential supplies to the soldiers are sent to the border areas.



Fig-4.2 Transportation on North-East Roadways.

The roads are the most convenient and cheapest means of transportation. Its development is totally dependent on the relief of the area. Its development is easy in plain areas but it is very difficult to construct roads in mountainous and plateau areas. Due to relief features the stair shaped winding roads can be seen in mountainous regions.

It is useless to imagine human life without roads. The development of roads can be seen in all places whether it is village or cities or metropolitan cities but there is adequate variation in their standard. The development of road is directly related to the economic development.

When you go to market to purchase vegetables or other items with your mother father then you take the help of roadways. The transfer of goods and services are done through roadways only. It is such a means of transportation which can be constructed at any place according to the need of the people. Not only this, it acts as a supplement to the other means of transportation. Without its development the railways, waterways, and airways services will remain incomplete. The cost of its construction is less and is the best means of transportation for goods for comparative lesser distances. The most special feature of this means of transportation is that it provides door to door service and acts as a chain for the other means of transportation.

In the total transportation of the country, the total goods transport through roads increased to 600 billion tonnes kilometer in 2003-04 from 6 billion tonnes in 1950- 51. Similarly, during this period the transportation of passengers increased to 3135 billion traveler kilometer from 23 billion traveler kilometer.

1. Railways:

The development of railways started in India from 16th April, 1853 when the first train travelled a distance of 34 kilometers between Mumbai and Thane. After this the East India Company emphasised on the development of railway network for its benefits. Slowly the length of the rail

route in the country began to increase. Government of India also paid adequate attention on the development of railways after Independence. As a result, the length of the railways increased to about 63 thousand 327 kilometers in 2006-07 from 54 thousand kilometers in 1947-48. For administrative convenience the Indian railways has been divided into 16 zones. The Northern railway is the largest railway zone in the country and the smallest is North-East frontier railways.

Railway Zone	Headquarter
1. Northern Railways	New Delhi
2. Eastern Railways	Kolkata
3. Western Railways	Churchgate, Mumbai
4. Southern Railways	Chennai
5. Central Railways	Mumbai central
6. North-East Railways	Gorakhpur
7. East-Central Railways	Hajipur
8. North- East frontier Railways	Maligaon (Guwahati)
9. South-Central Railways	Sikanderabad
10. South-Eastern Railways	Kolkata
11. East Coastal Railways	Bhubaneswar
12. North-Central Railways	Allahabad
13. North-Western Railways	Jaipur
14. South-Eastern Central Railways	Bilaspur
15. South-Western Railways	Hubly
16. West-Central Railways	Jabalpur

Indian Railways:

Particular emphasis has been laid down on the development of railway after independence. During different five year plans, along with the extension of rail routes adequate facilities have also been increased. Following are the special qualities of the Indian railways:

- (i) High speed Rajdhani express and Shatabdi express trains are being operated between two large cities and metropolitan cities.
- (ii) The Janshatabadi express trains are being run to connect small towns with metropolitan cities and large cities.
- (iii) For transportation of goods private container and wagons are being attached to the goods trains.
- (iv) Till 31st March 2006, in Indian railways 44 steam engines, 4793 diesel engines and 3188 electric engines were working.
- (v) The protection guard (A C D) has been arranged in engines to prevent accidents of trains.
- (vi) From 1st August, 1947 the ministry of railways has started rail passenger insurance scheme.
- (vii) In Between Maharashtra, Goa, Karnataka and Kerala the trains are being run under Konkan Rail Project in a stretch of 760 kilometers. In this Rail route between Apta to Mangalore there are 92 tunnels, 1819 small bridges, 179 large bridges and 56 railway stations. On this rail route 6.5 kilometer long tunnel is situated near Ratnagiri. At present, it is the longest railway tunnel in the country.
- (viii) In Kolkata and Delhi Metro Rail is providing underground rail service.

Do You Know?

In large cities, commuters **DMU**, **EMU** and **MEMU** train services are available for the transportation.

- (ix) In Rajasthan Royal train "Palace on wheels" and in Maharashtra "Deccan Odyssey" trains are being operated.
- (x) For joyful journey up to tourist destinations situated in the hills narrow gauge and special gauge trains are being operated. This includes Shimla, Ooty, Mount Abu, Darjeeling etc rail services.
- (xi) For the protection of Railway property and rail passengers, arrangement of G.R.P. and R.P.F. has been made.
- (xii) Till 31st March 2007, 6909 stations, 8153 rail engines, 45360 passenger trains and 1905 other passenger trains were available to Indian railways.
- (xiii) In the North- Eastern states, Meghalaya is the only state where rail route is not available.
- (xiv) The Indian Railways Network is the largest in Asia and the third largest in the world.
- (xv) After Russia, India has the most electric operated trains in the world.
- (xvi) The most unique specialty of Indian railways is the operation of 'Jivan Rekha'. After becoming operational on 16th July 1991, this train is the first mobile hospital of the world.

Major Gauge of Indian Railways

Railway Line (Gauge)	Gauge Length	Length of total Route (K.M.)	Percentage
Broad Gauge	1.676 Meter	49820	74%
Meter Gauge	1.000 Meter	10621	21%
Narrow Gauge	0.762 Meter and 0.610 Meter	2886	5%
Total		63327	100%

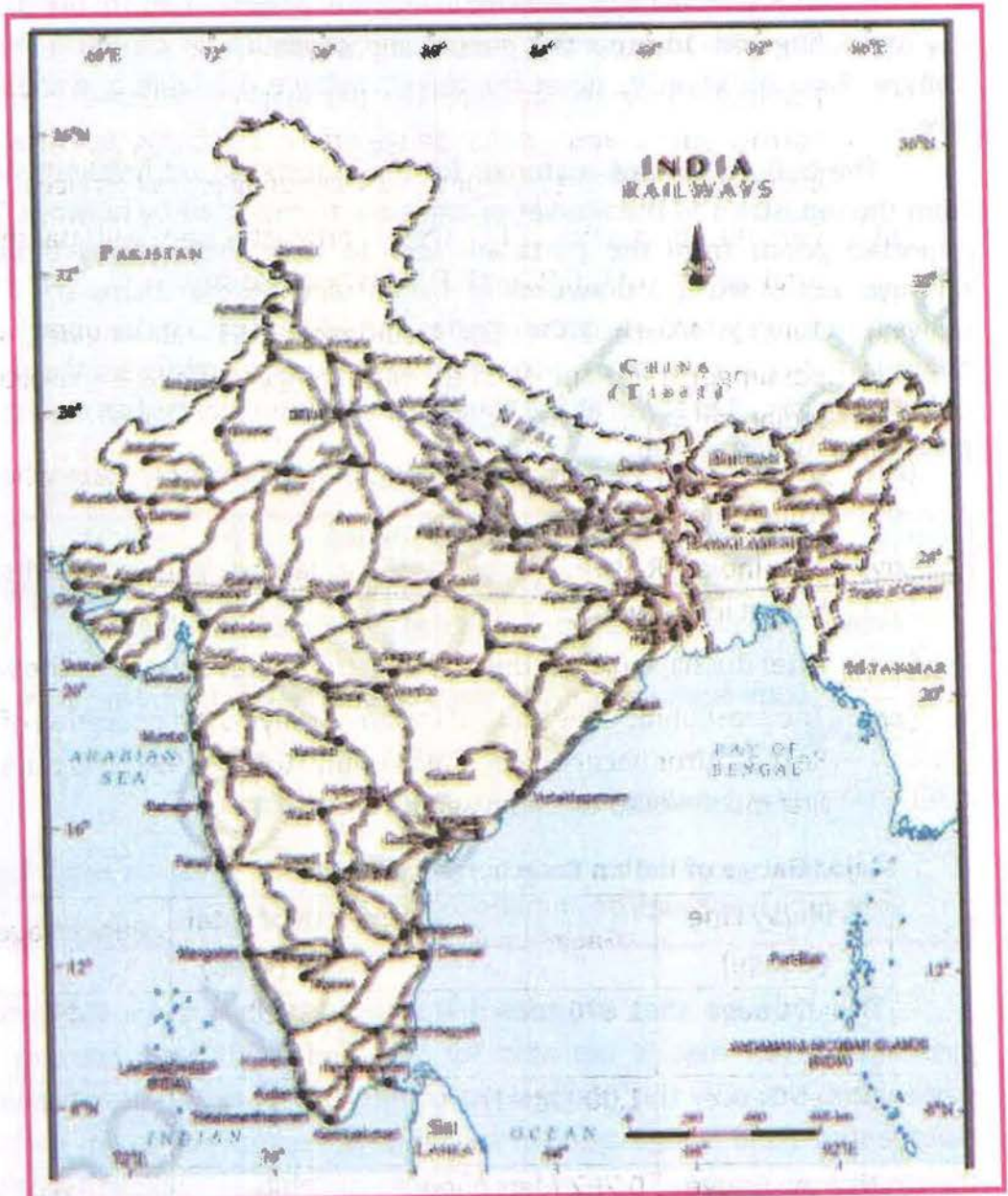


Fig- 4.3 India: Important Railways

Railways play an important role in Indian economy as well as our day to day life. Along with transporting people and goods it also connects Indian Culture. Through Monthly ticket the travel facility is available at a cheaper fare.

The bulk of the raw materials for the industries and finished goods from the industries to the market or cities are transported by railways. The imported goods from the ports are sent to their destinations through railways. But there is a drawback of Indian railways that there are 3700 railway crossings which are without gates and while crossing the unmanned railway crossing accidents are a common sight. Such accidents are the result of human error. Therefore, at the time of crossing such crossings necessary precaution must be taken.

Precautions at the Unmanned Railway Crossings

- (i) **Stop**: Stop before the signal board by decreasing the speed of your vehicle before the speed breaker at the railway crossing.
- (ii) **Look**: Look both side of the track to ensure whether any train is coming.
- (iii) **Hear**: Hear the whistle or sound of the arriving train.
- (iv) **Go**: Make sure that no train is coming from any direction only then your vehicle through on unmanned railway crossing.

The railways that provides transportation facility to 1.24 crore passengers even day, is available for rich and poor both category of passengers. Not only this, though the country is having different types of relief features and a huge area but still railways has made different parts of the country accessible. The number of passengers has increased to 6 billion 21 crore and 90 lakh in 2006-07 from 1 billion 28 crore and 40 lakh in 1950-51. During the same period the revenue earning goods transportation increased

to 72.76 crore tonnes from 7.32 crore tonnes. These facts highlight the significance of railways in the economy of the country. .

The Indian railways working as national property have certain problems. Even today number of passengers travel without tickets and inflict revenue loss to the railways. Precious time is wasted by stopping trains through chain pulling. Huge loss to railway property is caused in the event of terrorist, Naxal attacks and during strikes. Effort should be made by everybody to stop these irresponsible acts.

3. Pipelines:

You are well acquainted with the use of pipe for water supply to every home in towns. But at present the importance of pipeline as a means of transportation is increasing day by day. The pipelines are used for the transportation of liquid materials like petroleum along with gas. It is possible to transport through pipelines in deserts, forest, mountainous regions, plains and even through sea.

Pipelines in India:

The future of pipelines in India relies mainly on oil and natural gas. The crude oil is transported from oil fields to oil refineries and from refineries the oil products are sent to markets through pipelines. These are also sent to the market through roadways by oil tankers.

In refineries the different products received from the crude oil (L.P.G., Motor gasoline, Neptha, Kerosene, Aircraft fuel, high speed diesel, light diesel, furnace oil, lube oil etc.) are transported from one place to other with the help of pipeline. At present solids such as minerals can also be transported through pipeline when converted in to liquid form.

Along with the increase in production of petroleum products and increase in imports, there has been successive increase in the pipelines also. Its density is more in the western parts of the country. Till 1985 the total extension of pipelines in the country was 6535 kilometers which increased to 18546 kilometers in 2004.

Distribution of Pipelines:

In India the pipelines can mainly be divided into two categories :-

(A) Oil Pipeline : (i) Crude oil Pipeline (ii) Oil product pipeline

(B) Gas Pipeline : (i) L.P.G. Pipeline (ii) H.B.J. Pipeline

For the transportation of crude oil, pipelines have been laid down in East, North- East and Western India. In the East and the North-East India it runs from Digboi to Barauni up to Haldia which is to be extended up to Paradip. In the western India a pipeline runs through Kandala-Ajmer to Panipat and from Jamnagar to Chaksu. From Chaksu, this pipeline is divided into two parts up to Panipat and Mathura. In south India there is a pipeline which runs between Vishakhapatnam, Vijayawada and Hyderabad. Parallel to this pipeline L.P.G. pipeline is also situated. In Gujarat from Hazira up to Jagdishpur, in Uttar Pradesh 1730 kilometer long Hazira-Bijapur-Jagdishpur gas pipeline is situated. This pipeline is also called as H.B.J. gas pipeline. Gas Authority of India Limited (GAIL) operates about 4500 kilometer long gas pipelines in the country.

So far as the distribution of petroleum products is concerned Guwahati-Siliguri pipeline, Barauni-Kanpur-Lucknow pipeline, Chennai-Trichi pipeline, Kochi- Karur pipeline, Mangalore-Hasan-Bengaluru pipeline, Mumbai-Pune pipeline and Naharkatia-Maungram-Haldia pipelines are important. The most productive pipeline of the country is Guwahati-Siliguri-Barauni-Kanpur-Rajband, Maungram-Haldia pipeline.

Do You Know?

Before laying the pipes, the steel pipes are covered with a layer of Bitumen and then a layer of fiber glass is coated. This prevents pipes from rusting.

For the transportation of solid materials, Kundremukh-Mangalore pipeline for the transportation of iron ore, from Mahan mines situated in Udaipur district up to Debari smelting factory for the transportation of Rock Salt are famous.

Airways:

You must have seen a aircraft flying in the sky above your village/city. The airway is the quickest, modern and costliest means of transportation. Comfortable and happy long distance journey in less time is possible through this means of transportation. In India it connects capital cities, Mega cities, industrial and commercial centres. This means of transportation is utilised in different ways in the country.

Air Transportation in India:

The air transportation in India began in 1911 with a short flight of 10 kilometers between Allahabad and Naini. This flight was meant for postal services. During the course of time, fresh efforts were made in this direction to develop air services. In 1933 Indian National Airways was established with its headquarters at Delhi. At the time of independence, up to the beginning of 1947, 21 aircraft companies were providing air transportation in the country. After independence, the government of India in its quest to develop airways constituted Air Transport Evaluation Committee in 1950 and it is on the suggestion of this committee that air transport was nationalised in 1953. After this the responsibility of internal or domestic air transport services was handed over to Indian Airlines and responsibility of International Air Transport services was handed over to Air India. Also the headquarter of *Bhartiya Viman Nigam* was established in Delhi. Apart from the different cities of India, the Indian Airlines is also providing air services for several neighboring countries. In general the air services made

available by Indian Airlines is possible by the support of several associate air transport companies. This is worth mentioning that from the 8th December, 2005 Indian Airlines is now known as 'Indian'.

Pawan Hans Helicopter Limited is providing Helicopter services in India since 1985, which is providing its services to the nation to accomplish different objectives. 'Airport Authority of India' has been established on 1st April, 1955 to control, development and management of all types of airports and other works of aviation areas. About 450 airports available in the country in which 12 are International Airports.

During last some years there are major development have been noted in aviation area. Today air transport companies are working in both areas i.e. public and private sectors. Important Airline companies in private sector are:- Jet Airways, Sahara Airlines, Deccan Aviation, Go Airways, Kingfisher Airlines, Paramount Airways and Inter Globe Aviation. A private goods transport company known as Blue Dart Aviation is operating goods transportation services in the country. Apart from these domestic services there are 86 such companies which are having Gatt directed flight operation permit. N.A.C.I.L. provides services at international level and also operates flights in south-east Asia and central Asian Nations. Among private Airlines Jet Airways operates air services in different international regions. India has bilateral agreement on air services with 103 countries. To keep in to consideration the expected utility of bilateral rights, only those air service providers will be permitted to operate air services to foreign destinations which have provided domestic air services for at least five years have minimum 20 aircrafts in their fleet.

Air transportation makes it possible to cross forest, mountains, plateau, rivers, lakes, sea etc. The long distance destinations is covered by it in a very short time. The Airport Authority of India (A.A.I.) managed 13.08 lakh flights (10.59 lakh domestic and 2.49 lakh international), 1168.7 lakh passengers (870.6 lakh domestic and 298.1 lakh international) and 17.14 lakh

Metric tonnes of goods (5.67 lakh Metric tonnes domestic and 11.47 lakh Metric tonnes international) in 2007-08.



Fig- 4.5 India : Important Ports and International Airports

The air transportation has brought the distant places closer. Not only this, there are many difficult areas in the country which cannot be reached either by road or by railways but such places can be reached by air transport very easily.

(V) Waterways:

Waterways have been an ancient means of transport. Several adventurous journeys were undertaken in the world through waterways. There are two types of waterways - (A) Inland waterways (B) International waterways. India has about 14,500 kilometer long navigable waterways through which about 5 crore tones of goods are transported every year.

In inland waterways mainly rivers, canals and Lakes are used for transportation. The inland waterways of India are lagging behind but it is in the developing stage. For the first time in India in 1806, in south India Bakigham canal was constructed and linked with Konnanor canal and finally it was connected to Godavari and Krishna rivers and 720 kilometers long waterways was created. Later it was further extended to 40 kilometers and connected to Pulikat Lake.

After Independence in 1952, the central government established 'Ganga-Brahmaputra Water Transport Board' in which included Assam, West Bengal, Bihar and Uttar Pradesh. In 1960 this board suggested for the survey of transportation in the river Ganga. Keeping this fact in mind the ministry of Shipping and transport conducted survey in river Ganga from Farakka to Allahabad.

During the course of time on 27th October, 1986 Indian Inland Waterways Authority was established. The authority has been handed over the responsibility of developing national waterways, its maintenance and regulation. It also gives advice to central as well as state government in the matters of development of inland waterways. Its headquarters is in Noida and regional offices are in Patna, Kolkata, Guwahati and Kochi and branch office is at Allahabad, Varanasi, Bhagalpur, Farakka and Kollam.

The following five inland waterways of India have been declared as national waterways

- (i) National waterways No. 1 : Its total length is 1620 kilometers between Allahabad and Haldia.
- (ii) National waterways No. 2 : Developed in Brahmaputra river it has a total length of 891 kilometers from Sadia to Dhubari. This waterway is jointly utilised by India and Bangladesh both.
- (iii) National waterways No. 3 : This canal is 205 kilometers in length from Kollam to Kottapuram which has been developed as western ghats canal and includes Chanpakara and Udhgmandal canals.
- (iv) National waterways No. 4 : This waterway extends along Krishna Godavari rivers for 1095 kilometers. This canal runs in Andhra Pradesh, Tamil Nadu and Puducherry along Puducherry — Kakinada canal.
- (v) National waterways No. 5 : This 623 kilometer long waterways is being developed alongside East Coast canal, Matai river, Brahmani river and Mahanadi delta.

Apart from these national waterways inland waterways have been developed, in Goa 555 kilometers, in Gujarat 320 kilometers and in Karnataka. The Indian Inland Waterways Authority has proposed the names of few other waterways to be upgraded as national waterways. For all round development of the inland waterways transportation in the country, it is essential to develop tributary waterways along with the national waterways.

In the field of inland waterways and trade, there is a treaty between India and Bangladesh which enables the ships of both nations to enter each other territories through stipulated waterways.

National Inland Navigation Institute is functional in Patna since 2004. This institute which is of national importance is the first institute of its kind in the country. Here the trainees are trained to become crew members of the ships.

International Waterways:

From the international waterways point of view, India has 7517 kilometer long coast line along which 12 major and 200 minor ports have been developed. About 90% (At cost value 70%) of the trade is operated through these sea routes. India holds 20th position in the world in commercial shipping fleet. Following are the large ports of India:-

Ports	State
1. Mumbai	Maharashtra
2. Nhavsheva	Maharashtra
3. Kolkata, Haldia	West Bengal
4. Chennai	Tamil Nadu
5. Tuticorin	Tamil Nadu
6. Kandla	Gujarat
7. Kochi	Kerala
8. Innor	Tamil Nadu
9. Paradip	Odisha
10. Vishakhapatnam	Andhra Pradesh
11. Mormaon	Goa
12. Mangalore	Karnataka

Communication:

The exchange of messages is called communication. Human beings developed different means of communication from time to time according to their needs. In the ancient times, messages were sent by clapping, beating of drums, burning of

Important Means of Communication
Postal service, Telegram, Telephone, Fax, Radio, Cinema, News Paper, Magazines, Internet, e-mail.

fire or through several different ways whereas during medieval period messages were sent through fast runners and through Pigeons. But all these means were not public and sending message to large group of people was not possible through this process, besides, it took longer time for the messages to reach their destination. Therefore, in the modern era such means of communication are required which is quick, accessible to distant areas and can reach to large group of people. Keeping these things in mind, in the modern times, various means of communication have been developed. We have been able to develop such means of communication through which it has become possible to send messages to large group of people.

II Communication : A Story II

In the night of 16th June, Shubham who lived in Patna remembered to extend his best wishes to his mother on her birthday who lived in Shekhopur village of Vaishali district. He had number of facilities available to him. One was through computer, he could have sent his message through e-mail or he could have talked to her on telephone and passed on his message. Due to non supply of electricity at that time it was not possible for Shubham to send his message through e-mail. He was in no position to send his message immediately by writing letter. Sending message through telegram could have taken some time and fax facility was also not available near his home in the village. In this situation Shubham immediately picked up his phone and talked to his mother on phone and extended his best wishes for her birthday. The story makes it clear that Telephone/Mobiles are easy and convenient means of sending and receiving messages.

At present the importance of means of communication has increased so much that through this it has become easier to receive and send goods and services through domestic, national and international trade. Similarly, the contribution of means of communication is highly commendable in sending essential information related to flood, storm, terrorist activities to the people and create awareness and alertness to face such situations. In short, it can be said that the present era is an era of communication facilities. Books are also a good means of communication.

Communication Facilities in India:

In India almost all means of communication or facilities are available. At first in 1837 the postal service started in India. It was contributed by the East India company.

In 1854, the Indian postal department was established which has progressed considerably in its services since then. Today the postal services is not only fully computerised but also connected to satellites. The postal department has divides the whole country into 8 Zones for rapid delivery of letters and to improve the postal system. This consist of 6 digits in which first digit is for zone, later two are for sub-zone and remaining three for post office where the post has been sent. It is called 'PIN Code'. Bihar and Jharkhand have been included in PIN Code No. 8.

In course of improvement of its services and for quick delivery of its services, the postal department is providing the facility of six postal channels. It is called Rajdhani channel, Metro channel, Green channel, Magazine or Document channel, Heavy channel and Trade channel.

Different Postal Channels:

1. Rajdhani Channel: This postal service is for 6 special state capitals from New Delhi for which yellow Letter Boxes are used. In other words, if a letter is dropped in yellow letter boxes kept in the post offices the envelop or letter will directly go to New Delhi. Then it will be distributed.

Do You Know?

- In Cities there is facility of getting services at home such as ration, tutor for tuition, domestic gas cylinder and medical facilities etc. through telephone services.
- Through internet payment of telephone bill, electric bill and loan installment payment facility is available.

- 2. Metro Channel:** This postal service is for Bengaluru, Kolkata, Chennai, Delhi, Mumbai and Hyderabad. The post marked with PIN code of these places should be dropped in blue color letter boxes.
- 3. Green Channels:** Posts marked with local PIN code are dropped in green color letter boxes.
- 4. Document Channel:** This postal service is for sending News papers and different magazines.
- 5. Heavy Channel:** This postal service is available for the posts of large business organisations.
- 6. Trade Channel:** This postal service is available for the posts of small business organisations.

The postal department is not only distributing letters and magazines these days but they have also diversified their services. At present, the postal services are providing services such as speed post, media post, satellite post, express post, data post, greeting post, e-post, bill post etc. Apart from these services the postal department is also doing works related to rapid postal service, banking and life insurance. On an average, there is one post office in every 21.16 square kilometer area and one post office is serving 6623 persons in the country.

After postal services, the most popular means of communication is telecommunication that includes various types of telephone services. There are 26 crore wireless telephone consumers in the country. Mobile phones are the most popular. Several private companies are providing their services in this field. STD facility is also available in all urban and rural areas. The government has put in creditable effort in this field. In the field of telecommunication, India is a leading nation in Asia and stands 10th in the world.

From the point of view of public communication Radio is a formidable means of communication. In India the Radio broadcasting was started by 'Radio Club of Bombay' in 1923. In 1930 'Indian Broadcasting System' was started which was named as 'All India Radio' in 1936. After independence, it was again re named as 'Akashvani'. At present this means of communication is working under 'Prashar Bharti'. Apart from government service, the Radio services are also made available by several private companies.

At present, the most popular means of communication is Television. Its services started from 1959 in India. It was named 'Doordarshan' (DD) in 1976. The color broadcasting started in 1982 during the Asian games. Like Radio several private companies are also providing their quality services in this field. This means of communication is very popular amongst all class of people — children, old, women, poor and rich. In real sense, it is the most important means of communication in the country.

The News paper and magazines are formidable medium of communication. About 65 thousand papers/magazines (2007) are printed in the country. Out of this about 25000 News papers and magazines are printed in Hindi language. After this English, Urdu, Bengali and Gujarati are placed.

Transport, communication and economic activities are having constructive relationship as a means of development. The importance of transportation has also been described in the ancient Indian religious books. It is important even today but its form, qualities and speed have changed.

Along with the regional development, the means of transportation and communication also affects common life style. From the Panchayat level to national level, in maintaining atmosphere of peace in the society, to and fro movement of the police and soldiers and for conversation this medium is essential. But its development level is regulated by the cultural level. In a country like India which is having large geographical area and diversified culture, the various means of transport and communication unify the country together. Not only this, means of communications contribute in the upliftment of the socio-cultural level. The transportation contact of India with Pakistan, Nepal and Bangladesh is an indicator of socio-cultural development between the countries.

Without any means of transport and communication, it is almost impossible to perform any economic activities. These means affect our life style also. Our life is dependent upon these means from birth to death. We take support of these means for the supply of grains, vegetables and fruits for our survival.

International Trade:

You must have seen purchase-sale of goods among two people in your village/city markets. The purchase — sale of goods and services among two people, states or countries is called trade. When this trade is among two or more than two countries then it is called international trade. The

international trade of a country is a barometer of its economic prosperity but this trade is also fully dependent on the means of transport and communication. The development of these means has brought changes in the form and pace of trade. Import-export and balance of trade is studied under trade.

Do You Know?

- When goods are brought from other or outside countries to our country then it is called Import.
- When goods are sent from our country to other or outside countries then it is called export.

At present all the nations of the world depend upon international trade. This trade is done because of several factors, but its main reason is the regional availability of resources or their uneven distribution when they are needed in every country. The difference between import and export establishes the balance of trade. When import is more in comparison to export then it is called negative balance of trade, on the other hand when export is more in comparison to import then it is called positive balance of trade.

International Trade of India:

After independence, the country witnessed rapid industrial and socio-economic development. In this situation, India is maintaining trade relations with all geographical regions and trading sections. Not only this, with the economic development of the country trade is also constantly increasing. The international trade of India in 1950-51 was of 1214 crore rupees which increased to 75751 crore rupees in 1990-91 and in 2007-08 it further increased to 1605022 crore rupees.

International Trade of India

(In Crore Rupees)

Year	Export	Import	Trade Deficit/loss
1991-92	44042	47851	- 3809
2001-02	209018	245200	- 36182
2005-06	456483	635013	- 178530
2006-07	571779	840506	- 268727
2007-08	640172	964172	- 324678
(Provisional)			

Though, there has been significant increase in the **total trade of the** country, but import is increasing in comparison to export. As a result of which the international trade of the country is becoming a symbol of negative balance of trade. Which means that trade deficit is increasing every year. In fact, the increase in the import expenditure due to continuous increase in the petroleum prices is responsible for this deficit.

During the year 2006-07 and 2007-08, of the total export of India 51.54% was exported to Asia and Oceania. After that Europe (22.99%) and

America (17.04%) were placed. In the same period India received maximum import from Asia and Oceania (65.52%), after that Europe (19.97%) and America (9.05%) were placed.

The export goods from India includes engineering goods, Petroleum Products, Precious stones and Ornaments, Chemicals and chemical based materials, Garments, Agro-based products, Ores and minerals and other goods whereas the import goods mainly include Petroleum and petroleum based products, machinery, electronic goods, gold and silver, fertilizer, chemicals, non-ferrous metals and other goods.

The government is continuously making efforts to increase its export, also keeping a strict vigil over export disposal works and also making export policies. On 31st August, 2004 International Trade Policy 2004-09 was announced keeping this target in mind that during these five years, India's share in the world trade will double.

India is the first nation of Asia which has recognised the importance of export resource region in export enrichment. Asia's first export enrichment region has been established at Kandla. After this, seven more such regions have been established. Ending the shortcomings of the export enrichment region, in April 2000 the policy of special economic zone was declared. The special economic zone policy is in effect since 10th February, 2006. All eight export enrichment regions namely - Kandla and Surat (Gujarat), Santacruz (Maharashtra), Chennai (Tamil Nadu), Kochi (Kerala), Falta (West Bengal), Vishakhapatnam (Andhra Pradesh) and Noida (Uttar Pradesh) are now converted in to Special Economic Zones. The benefit received from the Special Economic Zones is proof of this fact that there has been additional increase in investment, employment, export and structural development.

At present, India has emerged as software super power at the international level. As a result of which India is earning more precious foreign exchange through information technology trade.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. What was the total length of the roads in the country at the time of independence?
(a) 2.42 lakh K.M. (b) 1.46 lakh K.M.
(c) 3.88 lakh K.M. (d) 5.78 lakh K.M.
2. With the regards to Pucca roads, which state is placed at the first position?
(a) Bihar (b) Maharashtra
(c) Tamil Nadu (d) Kerala
3. Which of the following is not a category of Roads?
(a) East-West Corridor (b) Express way
(c) Golden Quadrilateral highways (d) Border Roads
4. In which cities of India is Metro Rail service available?
(a) Kolkata and Delhi (b) Delhi and Mumbai
(c) Kolkata and Chennai (d) Delhi and Bengaluru
5. In which year was the Indian Airlines named 'Indian'?
(a) 2006 (b) 2003
(c) 2008 (d) 2005
6. In which year was the Indian inland waterways authority constituted?
(a) 1986 (b) 1988
(c) 1985 (d) 1989
7. In which state is Ennor port situated?
(a) Gujarat (b) Goa
(c) Tamil Nadu (d) Karnataka

8. India has been divided into how many postal zones?
(a) 7 (b) 5
(a) 6 (d) 8
9. How many special economic zones have been developed in the country?
(a) 10 (b) 7
(c) 15 (d) 5
10. Where is Falta special economic zone situated?
(a) Bihar (b) West Bengal
(c) Kerala (d) Odisha

SHORT ANSWER TYPE QUESTIONS:

1. Describe the regional distribution of roads in India.
2. Describe the important qualities of the Indian Railways.
3. Describe briefly the different postal channels of India.
4. Describe the export and import goods of India.
5. Write about important national waterways of India.

LONG ANSWER TYPE QUESTIONS:

1. Describe the qualities of International trade of India.
2. Present a detailed account of different types of roads found in India.
3. Describe the importance of means of transport and communication in Indian economy.
4. Describe Pipeline transport in India.

MAP WORK:

Locate the following on the given map of India:

1. East-West corridor with two frontier cities.
2. Three important Ports on the Eastern coast.
3. Head Quarter towns of East- Central, Eastern and North-Eastern Frontier Railways.
4. Five important international Airports of India.

PROJECT WORK:

Write the names of headquarter towns of 16 railway zones on the map of India.

ACTIVITY:

1. Know the distance (Road) between your home and school.
2. Know the length of Pacca and kacha roads of your area.
3. Prepare a list of important cities situated on East West and North South corridors.
4. Prepare a list of five important national level News papers and five regional level News papers of the country.



Section-5

BIHAR : AGRICULTURE AND FOREST RESOURCES**Agriculture and Forest Resources:**

Bihar is an agricultural state and 80 percent of its population is dependent on agriculture. After its separation from Jharkhand, the importance of agriculture has increased for the people of Bihar. In 1990-91 agriculture was done on 48.88 percent of the total land. This increased to 59.37 percent in 2005-06.

Here four types of crops are grown Bhadai (Autumn), Agahni (Winter), Rabbi (Spring) and Garma (Summer).

Bhadai (Autumn) : It begins from May-June and is harvested in August-September.

Jute and vegetables are also grown apart from paddy, millet, Bajra and maize during this crop season.

Agahni (Winter) This is the most important crop of Bihar. Winter crop is grown on more than half of the total agricultural land of Bihar. This crop is sown from mid June to August and harvested in November-December. The main crops of this crop season are Paddy, millet, Bajra, Arhar and sugarcane among which Arhar and sugarcane takes one year to mature.

Rabbi (Spring) This crop is sown in the mid of October November and harvested in the month of April. The major crops of this crop season are Wheat, Barley, pulses and oilseeds.

Garma (Summer) These crops are sown in those areas where proper facility of irrigation is available or in low lying areas where soil remains wet from the local water sources. In this crop season Garma (Summer) paddy and summer vegetables are grown.

Do You Know?

- In Bihar intensive farming is done.
- Agahni (Winter) crop is also known as Kharif crop.

The important crops of Bihar are Paddy, Wheat, Maize, Barley, Sugarcane, Tobacco, Mahua, millet, pulses and oilseeds. Apart from these vegetables, fruits and flower cultivation is also done on very large scale. In the Map 5.1 agricultural regions of Bihar has been shown. Agricultural regions depict crops in groups. It is clear from this map that Bihar is basically a food crops producing state.

Food Crops:

Paddy has a very significant place in food crops of Bihar. Autumn, winter and summer, in other words three crops are sown and it is cultivated in all parts of Bihar. In 2006-07 on 33.54 lakh hectare land 50 lakh tonnes of paddy production was registered here.

In North and Eastern parts autumn paddy is cultivated where as all over the state winter paddy is cultivated.

The highest Paddy growing districts are West Champaran, Rohtas and Aurangabad. In these districts more than 18 percent paddy of Bihar is grown. The first position is held by West Champaran where as Rohtas and Aurangabad are placed second and third respectively. From the area point of view, Rohtas is first (5.76 percent).

Wheat:

Wheat is second most important food crop after paddy and it is an important production of Rabbi Crop. In 2006-07 on 20.5 lakh hectare land 43 lakh tonnes of wheat was produced. In the last few years there has been continuous increase in production of wheat and in its area, the main reason for this is after the harvest of paddy crop the fields does not remain as useless fallow land, rather with the help of irrigation and chemical fertilizers it is cultivated. This crop is sown in November-December and harvested in March-April. In 2006-07 Rohtas district was first in the production of wheat, in this district this year 4 lakh metric tonnes of wheat were produced on 136 thousand hectares of land and productivity per hectare was 2965.3 K.G.

Maize:

This is the third most important food crop of Bihar. It is grown in all four crop seasons — autumn, winter, spring, and summer. Through proper arrangement of irrigation and by the use of good variety of seeds its productivity has increased considerably. In 2006-07 its total production was 798.31 thousand metric tonnes. Its production is maximum in Khagaria district where as Samastipur and Begusarai are placed at the second and the third position respectively.

Coarse Crops:

In coarse crops Ragi, millet, Jowar and Bajra are included. It was cultivated on 46.71 thousand hectares of land and its total production was 45.07 thousand metric tonnes. Madhubani district stands first in the production of coarse grains where as second position is held by Kishanganj.

Oil Seeds:

Raye (Tori), Mustard, Linseed, Sunflower, Kusum, Castor, Groundnut are important oilseed crops but for extraction of oil mainly mustard, raye,

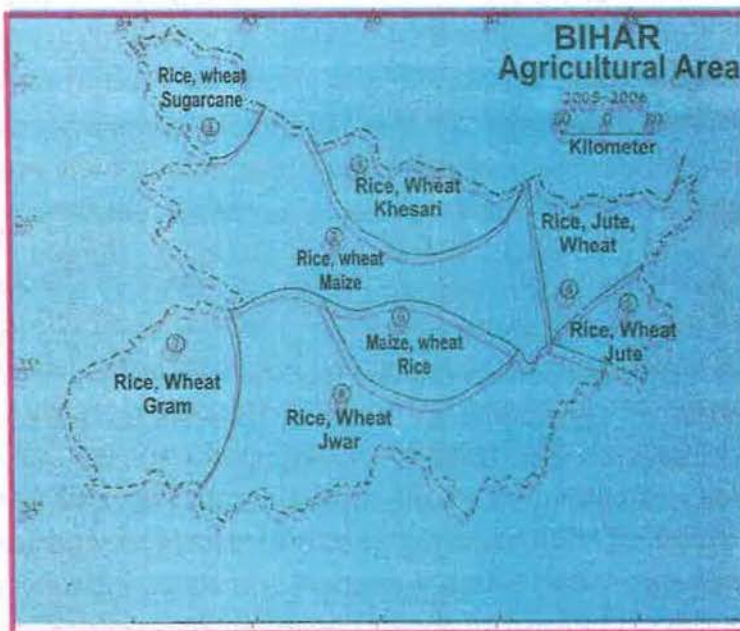


Fig-5.1 : Bihar : Agricultural Regions of important crops.

linseed and sunflower are used. In 2006-07 on 140.60 thousand hectares of land oilseed was cultivated and the total production was 149 thousand metric tonnes. West Champaran is a leading producer of oilseeds followed by Begusarai, Purnia and Saharsa.

Do You Know?

There are two crops of oilseeds, one is Rabi in which Ragi (Tori), Mustard, Linseed, Sunflower, Kusum and Castor and the second is Kharif in which Sesame, Sunflower and Groundnut is

Pulses: The important pulse crops of Bihar are Gram, Masur (Lentil), Khesari (Lethayrus), Peas, Moong (Green Gram), Arhar (Pigeon Peas), Urad and Kurthi (Horse Gram). Among that Gram, Masur (Lentil), Khesari, Peas and summer Moong (Green Gram) are Rabi pulse crops, whereas Arhar (Pigeon Peas) and Moong (Green Gram) are Kharif pulse crops. In 2006-07 on 519.6 thousand hectares of land 372 thousand metric tonnes of Rabi Pulse crop was produced. Similarly, on 87.26 thousand hectares of land 74 thousand metric tonnes of Kharif Pulse crop was produced. Patna is the leading district in the production of Pulses, whereas Aurangabad and Kaimur districts stand second and third respectively.

Commercial Crops:

Sugarcane: We have all the favourable Geographical conditions available for the cultivation of sugarcane in our state but still the per hectare yield of sugarcane in Bihar is very less. It is mainly cultivated in the North-Western parts of the state. The Doab of Gandak, Bagmati, Kamla and Ghaghra rivers is its main producing area. In 2006-07 on 117 thousand hectares of land sugarcane was cultivated and 5338 thousand metric tonnes of sugarcane was produced. In the last few years there has been increase in the production of sugarcane, as there is marked increase in area and production of sugarcane in 2006-07 in comparison to 2005-06. In 2005-06, the sugarcane was cultivated on 101 thousand hectares of land and the total production was 42.40 thousand metric tonnes. West Champaran is first in the production of sugarcane whereas second and third positions are held by Gopalganj and East Champaran districts respectively.

Jute: Jute is cultivated in the North-Eastern districts of Bihar due to fact that this area receives plenty of rainfall which is ideal for Jute cultivation. Bihar produces eight percent of the total production of the Jute in the country and stands third after West Bengal and Assam. In 2006-07 on 1.45 lakh hectares of land 14 lakh bales of Jute was produced but now there has been rapid decline in its production. Jute is mainly grown in Punea, Katihar, Madhepura, Kishanganj, Saharsa, Madhubani, Darbhanga and Samastipur districts.

Tobacco: Bihar stands sixth in the production of Tobacco in India. The 'Diara' land of the river Ganga is suitable for its cultivation. The districts of Samastipur and Vaishali are famous for Tobacco cultivation. Apart from this it is also cultivated in Darbhanga, Patna, Bhagalpur, Munger and Muzaffarpur districts. In these districts on 140 thousand hectares of land 16140 thousand metric tonnes of Tobacco is produced.

Vegetables, Spices and Fruits: The important vegetables cultivated in Bihar are Potato, Onion, Bhindi (Ladies finger), Paror (Spounge gourd), Lauki (Bottle gourd), Spinach, Lal Saag (Emaranthus), Lobia (Cow pea), Cauliflower, Patal (Pointed gourd), Cabbage etc. Among these vegetables, Potato is not only the most important vegetable but also a very important part of our food. It is cultivated in almost all the districts of Bihar. In some districts two crops of Potato is grown. In Bihar the total production of potato is 5, 66,000 metric tonnes and it is cultivated on 1, 68, 000 hectares of land. Patna and Nalanda districts are the leading producers of potato.

Onion is mainly cultivated in Patna and Nalanda districts. Onion is cultivated on large scale in Nawada, Gaya and Jehanabad also. The total production of Onion here is 3, 55, 000 metric tonnes. Other vegetables are grown on a very large scale in 'Diara' region of Ganga, Gandak and Baghmati. A variety of vegetables are grown on a very large land area in Patna and its surrounding areas.

Chilli: Chilli is cultivated on a very large scale in 'Diara' region on both banks of river Ganga. Other spices grown in Bihar are Turmeric, Ginger, Coriander, fennel seeds and Garlic.

Mangoes, Lichi, Guava, Banana, Papaya, Singhara (Water Chest nut), Makhana (Gorgon nut) are some seasonal fruits which are grown in Bihar. Bhagalpur, Muzaffarpur, Purnea, Darbhanga districts are famous for Mangoes. Muzaffarpur and Vaishali are famous for Litchi. Banana orchards in large scale have been developed in Vaishali, Khagaria, Begusarai, Samastipur districts. Madhubani and Darbhanga districts are famous for Makhana (Gorgon nut). In the 'Diara' region of river Ganga Cucumber, Kakri and water melon are cultivated.

Problems of Agriculture:

90 percent of the total population of Bihar lives in villages and 80 percent of its population is dependent on agriculture but still the per hectare yield is less in comparison to other states. This state is struggling with several problems associated with its agriculture.

(i) **Soil Erosion and Loss of Soil Quality:** Due to heavy rainfall and floods soil is eroded. Besides, due to continuous use of chemical fertilizers there is deterioration in the quality of soil.

(ii) **Use of Inferior Quality Seeds:** As high quality seeds are not used, therefore the per hectare yield is very less in comparison to other states.

(iii) **Small size of the Agricultural Fields:** In our state the agricultural fields are of very small size as a result of which in agricultural activities application of scientific method is not possible.

Do You Know?

- The Geographical area of Bihar is 93.6 lakh hectares out of which 64 lakh hectares are flood prone.
- Out of the total Geographical area of Bihar only 59.36 percent is sown area and more than 40 percent of the agricultural area remains unused.
- In Bihar 9.41 lakh hectares of land is prone to water logging, in which 8.35 lakh hectares of land is in North Bihar and rest 1.06 lakh hectares of land is in Mokama Tal.
- Bihar is the third largest vegetable producing state of the country.
- Bihar is the largest Guava and Litchi producing state of the country.

- (iv) **Orthodox opinion of the Farmers:** The farmers here believe less in hard work and more on luck and orthodox views.
- (v) **Irrigation problems:** The agriculture here is dependent on Monsoon which is also prone to frequent flood and drought but still there is no proper arrangement of irrigation. Out of the total agricultural land only 46 percent is having irrigational facilities and the rest remains without proper irrigation facility.
- (vi) **Floods:** Most of the rivers of the state are famous for their devastating floods. These rivers coming down from Himalayas carry huge amount of silt with them and deposit it on their bed which causes the change in its normal course as a result of which disastrous flood occurs which causes heavy loss to life and property. According to planning commission, 64 lakh hectares of land is prone to floods in Bihar. New land emerges due to change of course of the rivers in the flood prone areas. Over the ownership of these lands there is atmosphere of terror in the 'Diara' region due to criminals and Naxals. This year (2006), in the month of October there was unprecedented killing of people due to similar type of land dispute in Khagaria district.

Apart from these problems, scarcity of capital, deplorable conditions of animals, population, economic and social problems also create hindrances in the development of agriculture.

Agricultural Calendar:

The agricultural fields are ploughed after heavy rainfall in mid June. In July Kharif crop is sown. In August paddy plants are transplanted and in September Kharif crop is ready for harvest. In September the fields are prepared for Rabbi crop, in January weeding of rabbi crop is done and in March-April it is harvested; after this people engage themselves in the cultivation of sugarcane.

Water Resources:

There is huge reservoir of water in Bihar, which we get from two main sources :

(i) **Surface water:** This includes rivers, reservoirs and ponds.

(ii) **Underground water:** This includes wells, waterfalls, tube wells, hand pumps etc.

In Bihar the water resources are mainly used in irrigation, at homes and in industrial institutions. But at present more than 95 percent of total water resource is utilised in irrigation. The duration of rainfall through Monsoon is of only four months. Apart from this irregular and uneven rainfall is also received. Here some crops are grown in winter season and this season remains dry, but at the time of sugarcane, potato, Onion etc. cultivation irrigation is required. Irrigation is required to increase productivity of the food grains for the ever increasing population. The important means of irrigation in Bihar are canal, wells, tube wells, ponds, Aahar, Pyne.

Canal:

Canal is the most important means of irrigation in Bihar. Here 40.63 percent of the total irrigated land is irrigated through canal. In plains canals

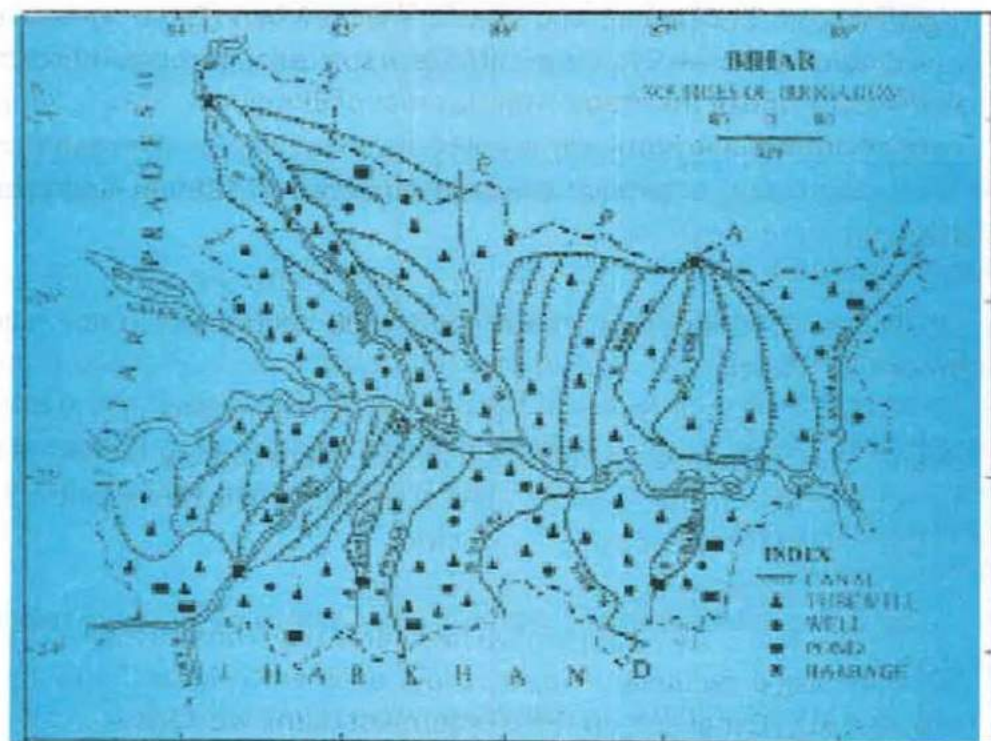


Fig-5.2 : Bihar : Important means of irrigation

are more developed, because the land is even, soil is soft, extended agricultural area and water is supplied through perennial rivers. Most of the rivers of North Bihar come out from the Himalayas and so they are perennial. Water remains in these canals throughout the year, on the contrary canals in the south Ganga plain depend on the rivers which come out from chotanagpur plateau which are seasonal and rain fed and that is why water does not remain in these canals throughout the year. In this part, Dams have been constructed on the rivers to collect water. The water is released from these Dams in to canals so that water may reach agricultural fields as per requirement.

In Bihar the development of few canals took place in the pre - independence period and few were developed in post - independence period.

Canals of Pre - Independence Period:

Son Canal - It is a part of son irrigation project. It is the first modern irrigation project of Bihar. It was constructed in 1874 on Dehri and two canals were drawn from it — Eastern and Western son canal; through these canals 4 lakh hectare land of the drought prone areas of Bhojpur, Rohtas, Aurangabad, Gaya, Jehanabad and Patna are irrigated.

Saran Canal - This canal was constructed in 1880 in Gopalganj sub division.

Dhaka Canal : It is a small canal in Dhaka sub division on river Lalbakia. Its total length is 30 K.M. and 4500 hectares of land is irrigated through this canal.

Triveni Canal : This canal was constructed in 1903 at a place called Triveni in West Champaran district on India — Nepal border on river Gandak. The total length of this canal is 1.094 K.M. and it irrigates about 1.25 lakh hectares of land in west champaran district.

Canals of Post - Independence Period:

Kosi Canal : Two canals have been drawn by constructing a Dam near Hanuman Nagar on India — Nepal border on river Kosi. On the Eastern Kosi bank East Kosi Canal and on the Western Kosi bank western Kosi canal have been constructed.

The total length of Eastern Kosi canal is 44 K.M. and there are four branches of this main Kosi canal— Murli ganj canal, Janki Canal, Purnea canal and Araria canal. Thus, the total length of this canal with its branches and sub-branches put together is 3040 K.M. About 6 lakh hectares of land in Purnea, Saharsa, and Madhepura districts is irrigated through this canal.

The total length of western Kosi canal is 115 K.M. About 3 lakh hectares of land in Darbhanga district is irrigated through this canal.

Gandak Canal : A 760 meter high and 743 K.M. long Barrage has been constructed near Valmiki Nagar 85 K.M. south of Triveni on river Gandak. From this barrage Tirhut canal that runs towards west and Saran canal that runs towards East has been drawn. From Tirhut canal about 4.8 lakh hectares of land in Saran district is irrigated and from Saran canal 6.9 lakh hectares of land is irrigated in Champaran, Muzaffarpur and Darbhanga districts.

Tube Well : After canal irrigation, tube well is the second most important means of irrigation. Tube wells were not a popular source of irrigation in Bihar before independence but after independence rapid development of tube wells took place and now 38.77 percent of the total irrigated land is irrigated through tube wells. Tube wells are popular means of irrigation in Samastipur and Sitamarhi.

Wells : Wells have remained very popular in Bihar since ancient times, but at present it has lost its significance. Now it has been replaced by pump sets and irrigation through wells has come down to 2 percent only. In some plain areas the percentage of well irrigation is still higher, among these Darbhanga, Madhubani and West Champaran districts are important. Utilisation of wells as means of irrigation is more in the southern plains of in comparison to northern plain. In this Nawada, Nalanda, Gaya and Jehanabad districts are important. The construction of wells is very convenient in these districts because the water level is high here.

Tanks or Ponds : Utilisation of tanks or ponds for irrigation and other works has been a very old tradition. In any village or city where there is no

river, all the religious rituals are performed on the bank of tanks. All the worship rituals and religious traditions of very sacred festival of Bihar 'Chhath' are performed on the bank of ponds. Facility of two types of ponds are available in flood prone

Do You Know?

'Chhath' is mainly a regional festival of Bihar and eastern Uttar Pradesh. It is a very sacred festival and now it is celebrated in several parts of India. It is celebrated twice in a year one is 'Shardiye' and other is called 'Chaiti Chhath', which are celebrated in 'Kartik Shasthi' and 'Chait Shasthi' respectively. In this festival 'Ardhya' is devoted to 'Bhagwan Bhashkar' (the sun).

areas of Bihar, whereas facilities of manmade tanks are more in plain areas. Digging of tanks is easy here due to soft nature of soil. Fishery and Makhana cultivation is done here in the tanks.

In India 9 percent of the total cultivable land is irrigated through tanks or ponds but in Bihar the total share of tank irrigated land has come down to only 2.10 percent. Madhubani district stands first in tank irrigation where 17 thousand hectares of land is irrigated through this means of irrigation, the second position is held by Nalanda, where more than 12 thousand hectares of land is irrigated through tanks.

Other Sources:

Pyne, Ahar, Lakes, Ponds, Artificial Lakes, Dheku and Mot etc. are the other sources of irrigation in which Pyne and Ahar are important. Pyne is used in such areas where there is scarcity of water in which Rohtas, Gaya, Jehanabad, Nawada, Nalanda, Patna are important districts.

River Valley Projects:

For the utilisation of huge water resources and looking at the devastating floods, extremes of droughts, development of multipurpose river valley projects has taken place in Bihar through which production of hydro-electricity, irrigation facility, fishery, drinking water facility, industrial use, entertainment and communication could be developed. To achieve

these objectives several projects have been made in which three are most important ones

1. Son River Valley Project
2. Gandak River Valley Project
3. Kosi River Valley Project

Other Projects Are

1. Durgawati Reservoir Project
2. Chandan Bahua Project
3. Baghmati Project
4. Barnaar Reservoir Project

1. Son River Valley Project:

This project is the oldest and the first river valley project of Bihar. It was developed by English in 1874 for irrigation purposes. Through this two canals have been drawn that runs towards east and west from Dehri. Its total length was 130 K.M. From this canal several branches and sub-branches of canals was developed in Patna and Gaya districts, through which Aurangabad, Bhojpur, Buxar, Rohtas districts get irrigational facilities and now in total 4.5 lakh hectares of land is irrigated. Through this project irrigation facility was made available to drought prone areas which resulted in to considerable increase in the per hectare yield of south-west region of Bihar and rice cultivation also increased immensely. This is the reason why this region is called "Rice Bowl of Bihar".

For the production of hydro-electricity from this multipurpose project power stations have been established, on the west canal near Dehri a power station of 6.6 MW capacity has been established. Similarly, on the eastern canal at Baarun a 3.3 MW capacity power station has been built. There is a plan for the renovation of this project. Construction of Dam near Indrapuri on river son has also been proposed with a target of generating 450 MW of hydro-electricity.

2. Gandak River Valley Project:

It is a joint project of Uttar Pradesh and Bihar which has been started near Valmiki Nagar in collaboration with India and Nepal. Through this project electricity and water for irrigation is supplied to Nepal also. For the

construction of this project a 743 meter long barrage has been constructed across river Gandak near a place called Bhainsalotan and Valmiki reservoir has been created. Two major canals have been drawn from this reservoir, the western main canal and eastern main canal. Through this canal system about 4 lakh hectares of land in three western districts of Bihar, Gopalganj, Saran and Siwan is irrigated. In the eastern part of Valmikinagar eastern main canal has been drawn, it is also known as Tirhut canal and it runs parallel to river Gandak. It has several sub - branches, through these canals about 4-5 lakh hectares of land in west champaran, east champaran, Muzaffarpur, Vaishali and Samastipur districts are irrigated.

Through this project, east of Valmikinagar a hydro-electric generation station has been established on a water fall. Electricity produced here is supplied to Nepal.

3: Kosi River Valley Project:

This project was contemplated in 1896. but work could start on this project in 1955.

This project is an outcome of the joint effort of Government of Nepal, Government of India and state of Bihar. The main objective of this project is to check the shifting trend of course of this river, to control the destruction of fertile land, to stop destruction through devastating floods, development of irrigational facilities, generation of hydro-electricity, development of fishery, boating and control on environment. This project has been completed in many phases. The first phase includes control on shifting course of the river, construction of a barrage at Hanuman Nagar on Bihar-Nepal border, construction of embankments on both sides for flood control, construction of eastern and western Kosi canal and its branches. In addition to this 240 kilometer long embankment has been constructed on both sides of the river for flood control.

Plan was made to irrigate about 14 lakh acres of land through the eastern canal and its four major branches. Through this, irrigation facility could have been provided to Purnea, Saharsa, Madhepura and Araria districts. The Eastern canal has further been extended and its one branch Tajpur canal has been drawn. Several sub-branches have been drawn from the western canal, about 35 kilometer area of western canal lies in Nepal and the rest area lies in Madhubani and Darbhanga districts. Kosi barrage is 12, 161.30 meters long which was completed in 1963.

In second phase of this project when work related to electricity generation was completed and a power station of 20, 000 Kilowatt capacity on eastern Kosi canal is under construction.

Durgawati Reservoir Project The main objective of this project is to irrigate drought prone areas of Kaimur and Rohtas districts and flood control. A dam was constructed near Kudra on Durgawati river in 1962 with an objective to irrigate 17, 325 hectares of land but desired result could not be achieved, so on the same river near Karmchat in Chenari block, there is a plan to construct a 45.72 meter high Dam through which 36,000 thousand hectares of land can be irrigated.

Upper Kiul Reservoir Project It is a multipurpose project, which has been constructed on the upper parts of Kuil river. There is a plan to irrigate 14, 000 hectares of land in Munger and Lakhisarai district through this project. The main objectives of this project are irrigation, flood control and enrichment of environment.

Baghmati Project This project is situated in Sitamarhi district on river Baghmati, in the lower portion of the river near Ramnagar a Dam has been built. It is also a multipurpose project. The main objectives of this project are irrigation, flood control, to stop river erosion, water outlet and enrichment of environment. Through this 1, 19, 800 hectares of land in East champaran, Sitamarhi, Sheohar, Muzaffarpur districts are irrigated.

Barnaar Reservoir Project Through this project by constructing a pucca Dam on river Barnaar, in the drought prone areas of Jamui district 22, 400 hectare of land can be irrigated.

Forest Resources:

After the division of Bihar most of the forested areas are now a part of Jharkhand. At present, in Bihar forest cover can be found in only 76.87 (***Please check this data from the writer***) percent geographical area and average per capita forest land is only 0.05 hectares which is much below the national average of 0.53 hectares.

The Forests of Bihar can be Classified in to Two Categories

(i) Moist Deciduous Forest and (ii) Dry Deciduous Forest

(i) Moist Deciduous

Forest This type of forest is found in the southern hilly region and north-western parts. Extension of this type of forest is found in 917 square kilometer area in Someshwar-Doon (Shiwalik Region). Sal and Shisham trees are prominent in this

type of forest, apart from these Bamboos, Sawai grass, Mahua, Jamun, Karanj etc. trees are also found.

Do You Know?

- There are 6374 square K.M. notified forested area in Bihar.
- Very dense forest is found in only 76 square K.M. area.
- About 50 percent of the notified area is either deserted or extinct.

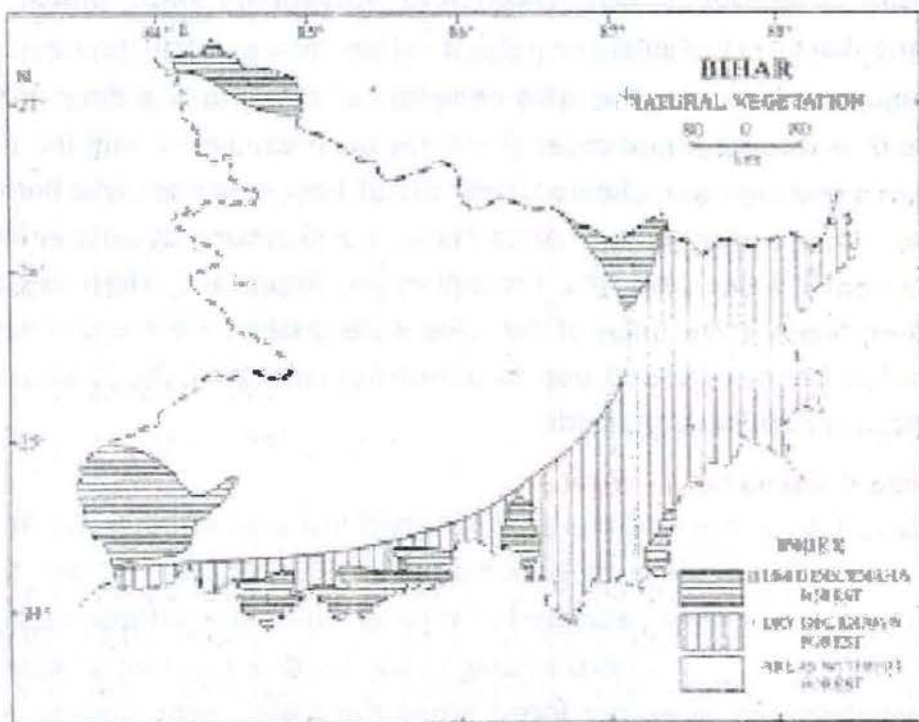


Fig- 5.3 : Bihar : Natural Vegetation

(ii) Dry Deciduous Forest In the east central parts and south west hilly parts of Bihar extension of this type of forest is found. Extension of this type of forest is found in Kaimur and Rohtas districts. The important trees of these forest are Khair, Bahera, Palash, Mahua, Amaltas, Shisham, Neem, Harre etc.

Do You Know?

The moist deciduous forest and dry deciduous forest are divided by 125 centimeter isohyets.

The distribution of forest in Bihar is very uneven. The plains and Diara area are completely devoid of natural forests. In Siwan, Saran, Bhojpur, Buxar, Patna, Gopalganj, Vaishali, Muzaffarpur, Motihari, Darbhanga, Madhubani, Samastipur, Begusarai, Madhepura, Khagaria, Nalanda districts forest is found on less than one percent of land. Extension of forests is found in hilly areas of West Champaran, Kaimur, Banka, Jamui, Gaya and Munger districts.

Due to agriculture and extension of constructed areas, forests are being destroyed. Lack of awakening about the significance of the forests is the most important factor for the rapid depletion of the forests in Bihar. In the absence of adequate forest cover there has been decline in wild life also. Among wild animals Tiger, Cheetah, Deer, Chital, Bear, wild Boar, wild Buffalo, Sambhar etc. are important, in birds Peacock and among aquatic animals Alligator, Fresh water Dolphins, Crocodiles are important. These aquatic animals are found in the rivers of the state. A steep decline in the number of wild life has been registered due to unmindful cutting of the forests and poaching of wild animals and birds.

Forest and Wild Life Conservation:

Only 6.87 percent of the total Geographical area of Bihar has forest cover, whereas according to national policy, 33 percent of the total Geographical area should be under forest cover. Therefore, efforts are being made to emphasise control over cutting of forests, development of national parks, rehabilitation of extinct forest areas along with farm forestry. As a result of these efforts, the area of rehabilitated extinct forests has increased to 15237 hectares in 2006-07 from 2849 hectares in 2004-05.

The plantation of forest has also increased considerably. Here in 2005-07 more than 2 crore plants were planted. A very important step in the direction of farm forestry has been taken by government of Bihar, under Rashtriya Sam Vikas Yojna (RSVY) community based forest management and conservation plan has been started. From farm forestry not only state income will increase but also base for raw materials for the establishment of wood based industry will also be available. These days popularity of social forestry and commercial forestry is increasing.

For the conservation of forests and wild life in Bihar, there are many rituals and customs prevalent since ancient times. There are many religious rituals that are performed under the trees. There are many regional festivals which are associated with trees.

Traditionally, Vat, Pipal, Anwala and Tulsi plants and trees are worshiped in this state. In our state food is given to ants and poisonous creatures like snakes are worshiped. Tradition of giving grains to the birds is also popular. Also several programmes are in operation at national and state levels for the conservation of wild life. There are 14 sanctuaries and one National park in our state which cover an area of 2064.41 hectares of land. In this Sanjay Gandhi Botanical Garden at Patna, Kanwar lake which is spread over an area of 2500 acres in

Manjhaul sub-division of Begusarai district, Kusheshwar Asthan in Darbhanga district are famous for wild life conservation.

Previously migratory birds were trapped in large scale at Kusheshwar Asthan but due to awakening of people, hunting in any form is totally prohibited here.

There are many institutions of state government which are working for the conservation of forest and wild life. Among them Forest, Environment and Water resource department are important. Apart from these there are number of self help institutions (NGOs) which are also working in this field. Among them Prayas, Taru Mitra, Pratyush and Mandar Nature Club of Bhagalpur are important.

Do You Know?

Sanjay Gandhi Botanical Garden, Patna is spread over in an area of 980 acres and is the only national park of Bihar.

Kanwar lake is an important nesting ground for the migratory birds. Famous ornithologist Dr. Salim Ali called this place as "heaven of Birds".

It is possible to study 300 species of birds at a time in Kanwar lake.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. In how many percent of area is agriculture done in Bihar?
(a) 50 (b) 60
(c) 80 (d) 36.5
2. What percent of population of the state is engaged in agriculture?
(a) 80 (b) 75
(c) 65 (d) 86
3. Which out them is not a sugarcane producing district?
(a) Darbhanga (b) West Champaran
(c) Muzaffarpur (d) Rohtas
4. Jute production in Bihar is —
(a) Increasing (b) Decreasing
(c) Stable (d) None of these
5. A Tobacco producing region is —
(a) Northern plain of Ganga (b) Southern plain of Ganga
(c) Tarai Region of Himalayas (d) Diara of Ganga
6. Kosi river valley project started -
(a) In 1950 (b) In 1948
(c) In 1952 (d) In 1954
7. At which place was Gandak project constructed?
(a) Bettiah (b) Valmikinagar
(c) Motihari (d) Chapra

8. Which is the most canal irrigated district of Bihar?
(a) Rohtas (b) Siwan
(a) Gaya (d) West Champaran
9. In how many notified area of Bihar is extension of forest found?
(a) 6374 K.M. (b) 6370 K.M.
(c) 6380 K.M. (d) 6350 K.M.
10. Kusheshwar Asthan is situated in which district?
(a) In Vaishali (b) In Darbhanga
(c) In Begusarai (d) In Bhagalpur
11. Kanwar lake is situated -
(a) In Darbhanga district (b) In Bhagalpur district
(c) In Begusarai district (d) In Muzaffarpur district
12. In which city is Sanjay Gandhi Botanical Garden situated?
(a) Rajgir (b) Bodh Gaya
(c) Biharsharif (d) Patna

SHORT ANSWER TYPE QUESTIONS:

13. Mention the favorable Geographical condition for Rice cultivation in Bihar.
14. Present a brief description of pulse production and distribution in Bihar.
15. "Agriculture is the backbone of Bihar's economy". Elucidate the statement.
16. Write the main objectives of river valley projects.
17. Write the problems associated with the development of canals in Bihar.
18. In which part of Bihar is irrigation required and why?
19. Write four reasons for the scarcity of forest in Bihar.

20. Discuss briefly the dry deciduous forest.
21. Write the names of those districts of Bihar where extension of forest is less than one percent.
22. Write the total number of National Parks and sanctuaries situated in Bihar and discuss the two sanctuaries.

LONG ANSWER TYPE QUESTIONS:

15. Describe in detail the agricultural problems of Bihar.
16. Which crops are sown in Bihar? Explain the important production of any one crop?
17. Name important river valley projects of Bihar and describe the significance of Son or Kosi projects.
18. Describe in detail about the wild life conservation in Bihar.

ACTIVITY:

- Prepare a list of canals in Bihar and mark that from which river they have been drawn.
- Write any local song or story related to conservation of forest and wild life.



MINERALS AND ENERGY RESOURCES

The availability of mineral wealth is an index of economic development of a region. After the separation of Bihar, the mineral rich areas went to Jharkhand and Bihar became almost devoid of any mineral wealth. Now it has less than one percent of the total reserves of mineral resources of the country. Limestone and Pyrites are only two such minerals which is available in sufficient quantity here; apart from these small deposits of Bauxite, Quartzite, Feldspar, Magnetite etc. are found. In 2005-06, the total revenue earnings of Bihar from mineral wealth was 96.38 crores of rupees. The minerals of Bihar can be classified in to following categories.

(i) Metallic Minerals: It includes Bauxite, Magnetite and Gold ore. The total Bauxite reserve in Bihar is 1.5 thousand metric tonnes and is found in Gaya, Jamui and Banka districts. The total reserve of Magnetite stone is 0.59 thousand metric tonnes and is found in the hilly regions of Bihar. Gold ore is found in very less quantity as sand deposits in south Bihar Rivers in which total amount of gold metal extracted from its ore is 0.1 to 0.6 gram per tonnes. The total gold reserve in Bihar is 128.88 metric tonnes and gold is not commercially produced in Bihar.

Do You Know?

Muscovite is a very high quality Mica and it is also known as Bengal Ruby. It is of red copper color and its layers are very thick, 15 to 30 centimeters long and 8-10 centimeters in width.

There are three main varieties of Mica, Muscovite, phlogopite, Biotite.

(ii) Non Metallic Minerals: Non metallic minerals like limestone, mica, dolomite, silica sand, pyrite, quartz, feldspar, china clay, slate and shora are also found here. The total limestone reserve in Bihar is 210.85 thousand metric tonnes and it is mainly found in Kaimur and Rohtas. Its annual production is 260 lakh tones and is mainly used as raw material for cement industries. It has some domestic use also.

The total mica reserve is 60.35 thousand metric tonnes and is found in the areas adjacent to Jharkhand. Its reserves are found in Nawada, Jamui and Banka districts. Muscovite mica is found in Bihar.

Dolomite reserves are found in Kaimur and Rohtas districts and its total reserve in Bihar is 180 thousand metric tonnes. Silica sand is mainly found in Munger district and its total reserve is 5.25 thousand metric tonnes Pyrite. Amjhor hills of Rohtas is famous for this. The other centre is Kaimur district. The total pyrite reserve in Bihar is 98.79 thousand metric tonnes and now it is most important mineral of Bihar.

DO YOU KNOW?

- From the Pyrites of Amjhor hills (Rohtas) 40 percent sulphur is found.
- For fertilizer industry of Sindri Pyrites are transported from the mines of Rohtas and Kaimur.
- The Pyrite deposit in Amjhor hills is found in 125 kilometer area.

Quartz mines are found in Gaya, Nawada, Munger and Banka districts. It is one of the precious stones. Its total reserve in Bihar is 10.83 thousand metric tonnes. Some amount of Feldspar is also available in Bihar (About 5 thousand metric tonnes); it is also a precious stone found mainly in southern districts. The reserves of China clay is in Bhagalpur, Munger and Banka districts, its total production is 1.2 lakh metric tonnes. The probable reserve of slate is in Lakhisarai, Munger and Banka districts and its total reserve is more than 4 lakh cubic meters. *Shora* is found in sufficient amount in Saran, East Champaran, West Champaran, Muzaffarpur, Patna, Nalanda, Jehanabad and Aurangabad districts.

Atomic Minerals : Graphite, which is also known as Black lead or Plumbgo is mainly used in refractory industries. It is found in Munger and Rohtas districts.

Fuel Minerals : There is possibilities of occurrence of mineral oil in Ganga basin (Bihar). Efforts are being made by Oil and Natural Gas Corporation (ONGC) with the support of Keners multinational company in this direction. Investigation work is in operation in Darbhanga and Champaran regions.

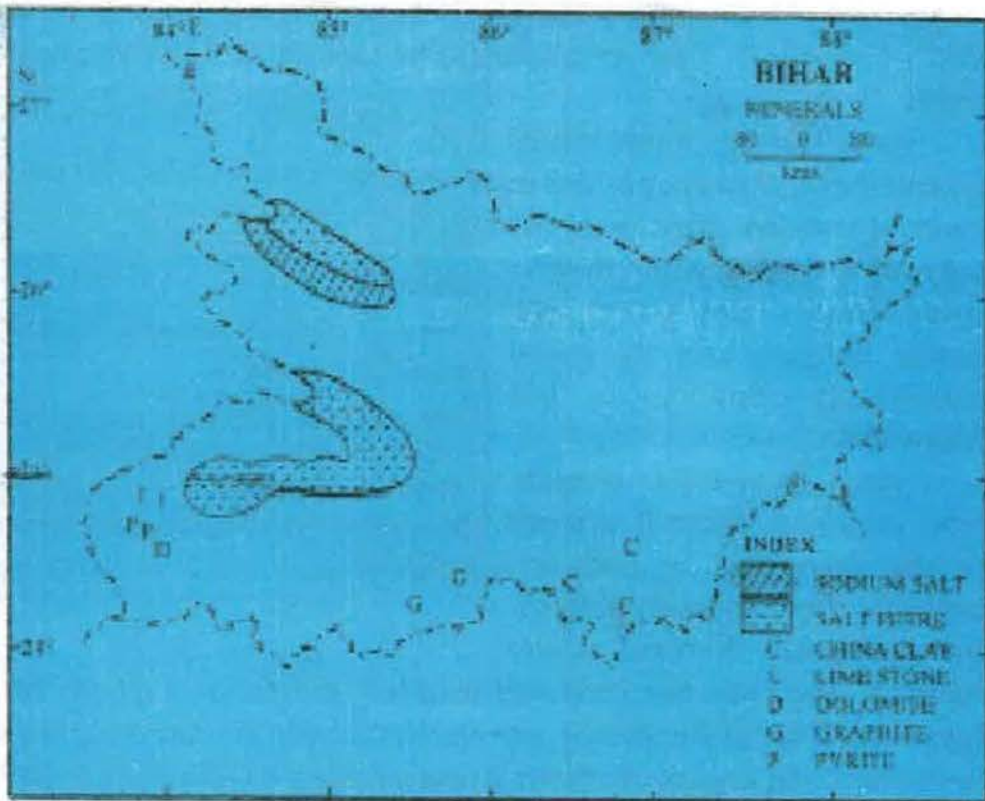


Fig- 5.4 Bihar : Minerals

Apart from these minerals, there are sufficient reserves of Granite, superior quality sand and clay soil etc. Granite reserves are found in Gaya, Jehanabad, Arwal, Munger, Jamui. Nawada, Bhagalpur and Banka districts.

Sources of Energy:

Bihar is not developed in any source of energy. In this regard we are more dependent on others. There are some developed units but they are thermal power centres in conventional sources of energy.

Conventional Sources of Energy:

In the conventional sources of energy there are many thermal power stations in Bihar. Among these Kahalgaon, Kanti and Barauni thermal power stations are important. The generation capacity of Kahalgaon super thermal power station is 840 Megawatts; this power station is sponsored by the Government of India and works under National Thermal Power Corporation (NTPC). It has been planned to increase its capacity to 1500 Megawatts in future.

Kanti thermal power station is situated near Muzaffarpur and its power generation capacity is 120 Megawatts. The Barauni thermal power project was setup with Russian support and its power generation capacity is 145 Megawatts.

Apart from these projects, some proposed thermal projects are also there such as Barh and Nabinagar thermal power projects. The proposed thermal power project at Barh has the proposed installed generation capacity of 200 Megawatts. After its completion, the electricity crisis of south Bihar will end. The construction work of this thermal power project is being done by NTPC. It is situated in Barh sub-division of Patna district. The progress of work is very rapid.

The construction of Nabinagar thermal power project is a joint venture of railways and NTPC. The proposed installed power generation capacity of this power station is 1000 Megawatts and it is situated in Aurangabad district.

Hydro Electricity:

There is rapid progress in Bihar on the hydro-electric projects. Bihar State Hydroelectric Power Corporation (BHPC) was constituted in 1982 for its development. Through this, a target has been set to generate 2055 Megawatts of electricity.

Do You Know?

Kahalgaon super thermal power station is the largest thermal power Project of Bihar. It was established in 1979.

Barauni thermal power project was established in 1970.

The coal for Kahalgaon and Kanti comes from the mines of Jharkhand, where as raw materials and diesel for Barauni comes from Barauni oil refinery.

Situated at Dehri (Rohtas district) west son project, Varun (Aurangabad district) Eastern son link canal, Valmikinagar (West Champaran) and Kataiya project (All these four projects operate under BHPC), through which only 44.10 Megawatts of hydro-electricity is produced. And in order of production they are 6.60, 3.30, 15.00 and 1.20 Megawatts respectively.

In Kaimur and Aurangabad districts work is in progress on many proposed hydro-electric projects under BHPC, apart from these there are six under construction hydro-electric projects Kaler (Arwal), Agnur Bagha (W. Champaran), Obra (Aurangabad), Delbag of Tejpur Dehri (Rohtas), Nasriganj (Rohtas), Jainagar of Nokha (Rohtas) hydro-electric projects.

Non Conventional Sources of Energy:

There are huge possibilities of non-conventional and renewable sources of energy in Bihar. Through hydro-electricity, bio-gas energy, solar energy and wind power, energy requirements of rural areas can be solved to a greater extent. Renewable Energy Development Authority has been appointed as nodal agency for the electrification and for the development of programmes of renewable source of energy in the remotest villages through non-conventional sources of energy in Bihar.

In Bihar 92 prospective places have been identified where small hydro-electric projects can be developed, whose total generation capacity is 46.1 Megawatts.

With these production plans in Bihar there is also potential of production of 200 Megawatts of energy through biomass based electric projects.

For the establishment of wind power based electricity projects and for the identification of adequate prospective places the nodal agency of the state with the help of Chennai is making an effort to take wind resource estimation programme in their control.

Biogas is an important renewable source of energy and is capable of fulfilling the energy needs of rural areas for cooking food. Continuous efforts are being made in this direction and 1.25 lakh plants have been established till now.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. Possibilities of finding mineral oil in Bihar –

8

- (a) In Himalayan region (b) In south Bihar plain
(c) Hilly regions of south Bihar (d) In Ganga Basin

2. In which industry is limestone mainly used?

- (a) Cement industry (b) Iron industry
(c) Lead industry (d) None of these

3. Pyrite is a mineral –

- (a) Metallic (b) Non-Metallic
(c) Nuclear (d) Fuel

4. In the gold ore of Bihar the extraction of pure gold per tonne is–

- (a) 05 to 06 Gram (b) 0.1 to 0.6 Gram
(c) 00.00 to 0.1 Gram (d) 0.001 to 0.003 Gram

5. In which district is Kahalgaon thermal power project situated?

- (a) Bhagalpur (b) Munger
(c) Jamui (d) Sahebganj

6. In which district is Kanti thermal power project situated?

- (a) Purnea (b) Siwan
(c) Muzaffarpur (d) East Champaran

7. How many large projects are being run by B.H.P.C. in Bihar?
(a) 3 (b) 10
(c) 5 (d) 7
8. What is the total electricity generation capacity of hydro-electric projects in operation in Bihar?
(a) 35.60 Megawatts (b) 44.20 Megawatts
(c) 50.60 Megawatts (d) 30 Megawatts

SHORT ANSWER TYPE QUESTIONS:

9. Where is Mica found? What are its uses?
10. Write about distribution of Graphite and Uranium in Bihar.
11. Mention about thermal power centres in Bihar.
12. Describe the hydro-electricity being produced in Son river valley project.
13. Describe the hydro-electricity development in Bihar.

LONG ANSWER TYPE QUESTIONS:

14. Classify the minerals found in Bihar and write about distribution and utility of any one category of minerals.
15. Describe the major sources of energy in Bihar and discuss in detail any one source?

ACTIVITY:

Explain about the importance of Wind Energy and Biogas in your village or Mohalla.



BIHAR : INDUSTRIES AND TRANSPORT

Majority of the large industries became a part of Jharkhand after the division of Bihar as most of them were situated in Chotanagpur region, and large industries almost vanished from the map of Bihar. Still there is no dearth of prospects of development of industries here.

All the favorable geographical conditions are available here for the development of industries, Raw materials for the industries are also available in neighboring states and all mining areas are connected with convenient rail routes and roadways. Agriculture and other resources for industries along with various types of natural resources and facilities are available.

During tenth five year plan period the industrial development rate was 9.8 percent but the industrial income of Bihar was only 0.4 percent of the total industrial income of the country (2004-05). There is also one more fact that in all the industrial regions of the state there is greater number of registered industrial units whose income is half of the total income of this region.

According to the 2007-08 survey report of the Government of Bihar, the total number of large and medium industrial units in Bihar is 262 which are confined to the limited areas only. Maximum centralisation of large and the medium industries is in Patna region (38.2%) where as it is 21.6 percent in Tirhut region and 9.7 percent in Magadh region.

Do You Know?

There was no favorable geographical condition available in New England of United States of America but still this state on the merit of its hard work and from the raw material of its neighboring states has presented a good example of industrial development.

In India for the Iron and Steel industry situated at Bhilai, all the raw materials particularly coal comes from neighboring states.

There is more development of small, very small and micro industries in Bihar. They play an important role in providing job opportunities. In 2007-08 job opportunities equal to 5.5 lakh human days were provided by them. It is also estimated that in Bihar 1500 small scale industries, 98000 very small/ micro industries and 68000 handicraft units are present. In the counting conducted by the third All India Small Scale Industries (2001-02). There are only 72.6 thousand permanently registered small scale industrial units in Bihar, out of which 52.1 thousand are working units. The small, very small and micro and handicraft units are spread all over the state.

Do You Know?

The first sugar mill of India was established by a Dutch company at Mobitiya.

In Bihar one tonne of sugar is produced from 10 tonnes of sugarcane.

Before 1960 one third of sugar of India was produced from here.

Agro-Based Industries:

Sugar Industries : Sugar industry is an important industry of Bihar. With this, the development of many associated industries also takes place. Till the mid twentieth century, Bihar had a very important position in the sugar industries of India. But after 1960, this industry experienced decline and now it is on the seventh position, despite the fact that all the favourable Geographical conditions are present here. Therefore, some improvement can be seen in recent years which is clear from the table No. 1.1

	2004-05	2005-06	2006-07
Total area under Sugarcane cultivation (In Lakh Hectares)	2.27	2.30	2.52
Sugarcane Production (In Lakh Tonnes)	125.82	129.95	143.64
Production of Sugar (In Lakh Metric Tonnes)	5.54	4.22	4.52
Crushing Period (In Days)	85	126	150

Previously, there were 29 sugar mills in Bihar but in 2006-07 its number came down to only 09. At present, the total production of Sugar

is 4.52 lakh metric tonnes.

Most of the sugar mills of Bihar are developed in the North-west region. The sugar mills are located in West Champaran, East Champaran, Siwan, Gopalganj and Saran districts due to the fact that this area is highly suitable for sugarcane cultivation.

Few sugar mills of Bihar are located in Sakri, Lohar, Hasanpur of Darbhanga district and Motipur of Muzaffarpur district. There are few sugar mills which are located in the southern portion of the state also, among them are Bikramganj, Bihta and Guraru sugar mills.

Emphasis has been given to encourage sugar production in the state during the eleventh plan period and particular thrust has been given to increase sugarcane production and area of its cultivation. There is a plan to restart 15 closed sugar mills and two under construction units of Bihar State Sugar Corporation. The state government has also decided to hand over the responsibilities of eleven sugar mills to Reliance, Hindustan Petroleum and multinational companies.

The sugar mills also produce electricity, paper, molasses and Ethanol along with sugar. At present special attention is being given to produce its by products in the sugar mills and several new projects.

Jute Industries : Jute is an important industry not only of Bihar but whole eastern India. Before independence there were 110 Jute mills in India and most of them were situated in West Bengal and Bihar but after independence most of the parts of Jute producing region went to Bangladesh, as a result of which this industry suffered a setback. There are three large Jute mills in Bihar which are situated in Katihar, Purnea and Darbhanga. At present only Jute mill at Katihar is working.

Tobacco Industry : Bihar stands sixth in tobacco production in the country. Bidi and Cigarette factories dependent on tobacco are situated at a number of places. In Munger, Imperial Tobacco is situated at Dilbarpur. For Bidi industry Tendu leaves are brought from plateau areas of Jharkhand. More than 250 Bidi factories are situated at Munger, Gaya, Patna, Jhajha, Lakhisarai, Jamui, Biharsharif, Ara, Buxar, Mahnar, Dalsinghsarai, Shahpur etc.

Rice, Pulses and Flour Mills : The most important crop of Bihar is Paddy. The Paddy is crushed to get rice. In the Tarai region of Bihar, a number of rice mills are situated. The other Paddy growing region is Bhojpur, Rohtas, Gaya, Jehanabad and Aurangabad in the South-West Bihar and so many rice mills are spread all over here. Maximum rice mills are situated in Bhojpur, Rohtas and East Champaran and the total number of rice mills is 520 in these districts. Apart from these, rice mills are situated in towns also. This work is also done in the form of cottage industry in the villages.

In the districts situated on the either side of river Ganga pulses are grown and that is why small mills of pulses have developed here. Among them Barh, Mokama, Barbigaha, Shekhpura, Patna, Bihar Sharif are important.

In Bihar Flour, Maida, Suji and Dalia mills have also been developed. There are about 2000 flour mills here and they are mainly situated in Patna and Gaya. Flour mills have also developed in Bhojpur, Rohtas, Muzaffarpur, Darbhanga and Bhagalpur districts.

Oil Mills : In Bihar oil is extracted from Linseed, Raye (Tori), Mustard and Sunflower and they are cultivated also. There are 500 oil mills here (According to government of Bihar. It is situated all over the state but it is mainly concentrated in Patna, Gaya, Jehanabad, Nalanda, Rohtas, Bhojpur, Munger and Bhagalpur.

Non - Agro Based Industry

Leather Industry: In Bihar there is large population of Cows and Buffaloes and looking at the quality of their skin, there are huge possibilities for the development of leather industry. This industry has developed in Bihar mainly as cottage industry and about 50,000 labourers are engaged in making shoes and sandals. The leather industries are mainly situated in Bettiah, Muzaffarpur, Purnea, Katihar, Patna, Ara and Aurangabad.

In Bihar there are three associations of Leather industries (A) Bihar State Leather Industry Development Corporation and units established under its associated unit Finished Leather Limited, (B) Private leather processing factory at Muzaffarpur and (C) Bata Leather Processing and Manufacturing Industry at Mokama and Patna. During 1970s under the auspices of Bihar State Leather Industry Development Corporation, seven leather processing factories were established but due to financial constraints most of the units are closed. 7 out of 9 units established at Bela in Muzaffarpur district are still working. All the products produced here are sent to Bata units situated in Tamil Nadu and Madhya Pradesh to manufacture leather goods.

There are 5 units working under Bihar State Leather Industry Development Corporation which manufacture Boots and Safety Boots. Fancy shoes and sandals are manufactured by Bata units. There are roughly 10 cottage industry units which are working in unorganised sectors and are situated at Muzaffarpur, Bettiah, Danapur and Patna and its sub-urban areas. Two large units of Bata situated at Danapur (Now known as Bata Ganj) and Mokama, where along with the manufacturing of shoes and sandals training is also imparted.

Textile industry is an ancient industry of Bihar and this industry has been dominated by a particular community. This work is done in both rural and urban areas. The Tasar silk cloth Lungi and Bed sheet of Bhagalpur are famous worldwide. The Carpets manufactured at Obra of Aurangabad district and Daudnagar are in great demand all over India. Cotton, Silk and Woolen clothes are also manufactured in Bihar.

Due to lack of raw materials, the cotton textile industry has not developed much in Bihar, but due to cheap labour and available market, this industry has developed at Dumraon, Gaya, Mokama, Munger, Phulwarisharif, Ormanjhi and Bhagalpur. Small mills are established here. Thread is brought from Kanpur and Ahmadabad.

The maximum development of Silk industry has taken place at Bhagalpur. Directorate of Handloom and Silk cloth has been established through which silk cloth industry has been developed on regional basis at Bhagalpur, Muzaffarpur, Gaya and Darbhanga. Under this Directorate, Varanasi Saree industry at Bhabhua and production of silk cloth at Nalanda and Nawada has been encouraged.

In Bihar the development of woolen industries is almost nil, only blankets etc are manufactured from the wool of local sheep. Blankets and carpets are manufactured at Obra of Bhagalpur and Daudnagar area and apart from these blankets are also manufactured at Munger, Muzaffarpur and Patna districts from the wool of local sheep.

The handloom sector is a large industrial sector of Bihar. There are 34, 320 Looms here out of which 10, 817 are in co-operative sector and 23, 503 are in non co-operative sector. Apart from these there are 11, 361 electric operated Looms. The handloom industries are mainly concentrated in Patna, Gaya, Bhagalpur, Banka, Darbhanga, Arwal, Jehanabad, Aurangabad, Bhabhua, Nawada, Khagaria, Nalanda, Madhubani and Siwan districts. Here there are 1089 primary weaver co-operative associations and total number of weavers are 1, 32, 294 (94 thousand in government and 34, 367 are in co-operative sector).

In 2007-08 to encourage this industry under new scheme Fair and exhibitions, textile parks, Handloom parks, Handloom clusters scheme, Jute park, workshop and seminar schemes, integrated handloom development scheme, Mulberry and Tasar projects are being organised, also loom modernisation scheme for the weavers, availability of generators for electric operated looms and scheme for modern training for weavers.

Mineral Based Industries

There is scarcity of minerals in Bihar, only limestone and pyrite is available in sufficient amount. Among mineral based industries Cement industry, Chemical industry and Glass industry are important.

Cement Industry:

Limestone is the most important raw material for cement industry. Generally for the production of one tonne cement 2.02 tonnes of raw material is required. Limestone is mined in the hills of Kaimur in

the state. About 5% of the total limestone of the country is found in Bihar. Cement industry is situated at Dehri on son near Dalmianagar in Rohtas district but presently it is closed and in sick state. The government of the state is giving priority to small factories of cement. That is why there is an ambitious plan to open mini plants in Rohtas and Kaimur districts.

Chemical Industry:

Acid, base and fertilizer are the main products of chemical industry. The most important fertilizer factory in Bihar is situated at Barauni which is known as Hindustan Fertilizers Industry. Its production capacity is four lakh tonnes. Meptha is received from Barauni petrô chemical. Apart from this color, Varnish, Oil, Soap, Medicine and chemicals of lighter class is also manufactured here.

Glass Industry:

This industry is an ancient industry here; previously glass bangles were made here but now with the development of medicine industry glass industry have also developed. For bottles and other works sand, silica, soda ash, limestone, sodium sulphate, potassium carbonate, shora, suhaga, Boric Acid, lead, sukha sankhiya, Berium oxide etc. are required as raw materials. Here Glass is manufactured at Patna, Hazipur, Darbhanga and Bhagalpur.

Industries Based on Forest Products

Among forest based industries wood, paper, pulp and lakhs of other industries have been developed.

In Bihar on the border of Nepal, wood industry is situated at Narkatiaganj, Jogbani, Bairganja, Gopalganj, Muzaffarpur, Samastipur, Patna, Bhagalpur and Katihar. Hazipur and Bettiah are famous for plywood factories. Due to ample availability of sugarcane Bagasse, rice bran, bamboo, sawai grass and soft wood, the paper and pulp industry has developed here. The important paper factories situated here are Thakur Paper Mills, Samastipur and Ashok Paper

Mills, Dalmianagar. Small paper mills are situated at Barauni and Patna.

Lac insects grow particularly on palas, Berry, Kusum etc trees and these trees are sufficiently found in Nawada, Gaya, Banka, Munger and Purnea districts. Therefore, Lac industry is situated in these districts.

Tourism Industries:

Bihar has the potential to develop tourism as a full blown industry. The ancient monuments and ruins of historical value of Bihar are of international importance. Its cultural heritage, religious places, natural beauty has the potential to attract people from all over the world. In the tourism map of Bihar Buddhist temples, Jain temples, Gurudwara of Sikhs and Dargah of sufi saints are present. Among these tourist places number of destinations like Rajgir, Patliputra, Vaishali, Bodhi Gaya, Nalanda, Pawapuri, Patna Sahib, Gaya, Sultanganj, Balmikinagar, Dev, Sonpur, Sasaram, Maner, Bihar Sharif are famous.

No particular attention has been given to this industry in Bihar but still there is increase in the national and international tourists here. According to 2007-08 government report 61.30 lakh tourists in 2003 and 1.07 crores tourists in 2006 visited Bihar which earned a profit of 156 lakh to the Bihar State Tourism Development Corporation which is more than the previous years. The number of tourists who visited the state in 2006 is clear from table number 1.2.

Year	Indian	Foreign	Total
2003	6044170	60820	6105530
2005	8667220	63321	8730541
2006	10670268	94446	10764714

Source- Government of Bihar, Economic survey, 2007-08

Other Important Industries : Apart from the above mentioned industries, there are few more industries which have developed here, among them are oil refinery and petro chemical industry at Barauni, Gun factory at Munger, insecticide industry at Purnea and Plastic industry at Bettiah. Thermal power stations are established at Kahalgaon, Barauni and Kanti. Cold storage and industries associated with potato (Powder and chips) have been established in Nalanda.

Do You Know?

A large railway workshop was established at Jamalpur in 1875. In which 10 thousand laborers got employment at that time and it was the first workshop of Asia.

Recently foundation stone has been laid by the the government of India for four large industrial units such as railway coach factory at Harnaut, ordnance factory at Rajgir, organic fertilizer factory at Chandi and railway wheel manufacturing industry at Dariapur (Chapra). Apart from these, thermal power stations at Barh and Nabinagar are under construction.

The central government has established a public sector managed heavy industry enterprise Bharat Wagon and Engineering Company Limited at Mokama. It manufactures railway wagon and engineering goods. Diesel engine work is being done at Jamalpur in Munger district; here a large railway workshop is also situated.

Information technology is also developing in Bihar these days. Patna silicon park has been developed and many institutions are also working in the field of computer hardware.

Following are the main reasons for the industrial backwardness of Bihar.

- (i) Scarcity of raw materials: The scarcity of raw materials is the biggest problem. Here not only minerals are scarce but because of the reduction of area in sugarcane and jute cultivation, the problem of scarcity of raw materials has been created and therefore, many factories related to them are closed.
- (ii) Lack of structural facilities: Lack of transportation, power, storage and market facilities.
- (iii) Scarcity of capital and technical knowhow for the modernisation is the main cause for the decline of agro-based industries and Jamalpur factory. The closer of cement industry and many units of Barauni are due to this reason only.

- (ii) The memorandum of understanding for foreign investment was signed but actual investment is not there; interest is there in consumer industries but there is no interest in basic industries; the internal capital is basically invested in hospital and hotel industries which gives immediate profit but still with the implementation of new industrial policy, 2006 and steps taken by the present state government to encourage new investment has given a new boost to this sector. At present 245 proposals for investment have been received in the state through which investment of 57.84 thousand crore rupees is proposed. State Investment Proposal Board (SIPB) has already recommended 115 proposals from these through which 40.72 thousand crore rupees investment is expected. Through Bihar Industrial Area Development Authority (BIADA) enterprising steps have been taken in this field. Important thing is that land was allotted to 15 units for the projects with an investment of 172.45 crore rupees in 2006-07. On the contrary this year land has been allotted to 627 new units which has an investment of 4, 218.62 crore rupees. Previously it used to take a lot of time in allotment but now BIADA has made arrangements for the allotment in 24 hours for new units. The construction work on Normal Basic Slurry refinement plant with an investment of 1.5 crore rupees has started, the first food park of Bihar is expected to develop here. Construction of Handloom Park at Bhagalpur and Begusarai, establishment of cargo complex at Patna airport and inland container depot at Fatuah is proposed for establishment.

Transportation:

Most of the part of Bihar is plain and therefore, almost all means of land transport has developed here. The northern portion of the state remains flood effected and so the development of normal means of transportation is less in this area in comparison to the southern part. Basically development of roadways, railways and limited development of waterways, airways and ropeways have been done here.

Roadways:

In Bihar, at first roadways was developed and it is one of the ancient means of transportation in Bihar. Not only this, the contribution of two emperors (Ashoka and Sher Shah) here, in the development of roadways should be written in golden letters. More extension of roadways in Bihar has occurred after independence, at the time of independence the total length of different types of roads was 2, 104 Km. whereas the present total length is 81, 680 Km. The present roadways have been classified into five categories from the administrative and personnel point of view. The following table 1.3 (A) shows the length of these roads.

Table 1.3 (A)
Road Network in Bihar
Length of the roadways (in Km.)

Sl.	Types/Class	Mettled	Unmettled	Total	Percent of the total
1.	National Highways	37, 34.00	0.00	37, 34.00	4.57
2.	State Highways	3849.00	0.00	3849.00	4.71
3.	Important District roads	7017.25	0.00	7017.25	8.59
4.	Other District roads	2828.00	990.00	3818.00	4.67
5.	Rural Roads	27400.00	35861.63	63261.63	77.46
Total Length		44828.47	36851.63	81680.10	100.00

Source - Government of Bihar, Economic survey, 2007-08

Source- Government of Bihar, Economic survey, 2007-08

National highways connect Bihar with other states and regions. The most important national highway in Bihar is National Highway No.2, it is also known as Grand Trunk Road and it was built by Sher Shah during the Mughal period. The total length of national highways in Bihar is 3, 734.00 Kilometers.

After Grand Trunk road, the other road going up to Uttar Pradesh border is Gopalganj Pipra Kothi-Muzaffarpur - Barauni highway number 28 which is 266.30 Km. in length. Similarly, Ara-Buxar high number 84, Chapra-Siwan Gopalganj highway number 85, Mokama Farraka (Highway Number 80), Gaya - Rajgir Bihar Sharif-Barbigha Sarmera Mokama highway number 82 which is 147 Km. in length. The longest road in Bihar (398 Km. long) is highway number 31, it is Rajaulighat Bakhtiarpur Barauni road. Among the national highway development project, NH 77 and 28 from Patna to Muzaffarpur is being converted in to four lane by NHA. 1. Under the golden quadrilateral plan by national authority 206 Km. and under East -West corridor 512 Km. road crosses through the state.

Do You Know?

The total length of Grand Trunk Road in Bihar is 204 Km. This road runs from Kolkata in the east up to Delhi and Peshawar (Peshawar now in Pakistan). This national highway crosses through Sherghati, Sasaram, Mohania in Bihar. Now this road has been converted in to four lanes and is under National Highway Authority (NHA.I).

The central road construction ministry has decided to undertake the construction of most of the roads in north and south Bihar in to their own hands.

There are few proposed national highways in Bihar which is given in table 1.3 (B).

Table 1.3 (B)
The Proposed National highways of Bihar

Sl.	No.	Name	Length
01	98	Phulwari, Bhusaula, Naubatpur, Vikram, Arwal, Aurangabad	110.00
02	99	Dobhi (NH2) Lilaganj	10.00
03	101	Chapra, Baniyarpur, Maharajganj, Barauli (NH28)	60.00
04	102	Chapra, Rewaghat, Muzaffarpur (NH28)	80.00

05	103	Hajipur, Musridhrari (NH28)	55.00
06	104	Chakia, Narhar, Pakri Bridge, Madhubani, Sheohar, Sitamarhi, Harlakhi, Umargaon, Jainagar, Kharauna, Narhiya (NH57)	160.00
07	105	Darbhangha, Onsi, Jainagar	66.00
08	106	Maheshkhut, Sonbarsa, Simri Bakhtiarpur, Bairati, Saharsa Baijnathpur, Madhepura, Murliganj, Purnea (NH31)	145.00

Source Road Construction Department, Government of Bihar (2004).

There is extension of 3849.22 Km. state level roadways in Bihar; these roads are maintained by government of Bihar and they mainly connect district headquarters.

The district level roads have also been developed in Bihar. All roads are metalled and their total length is 7017.25 Km. These roads connect main towns and sub-divisions of the district. Other district level roads connect sub-division and block headquarters. Some roads are unmetalled (990.00 Km.) and 2828.00 Km. long road is metalled. The main district roads and other district level roads are constructed and maintained by Public Works Department (PWD).

The maximum coverage of roads in the state is of rural roads, its total length is 83261.36 Km. in which 24.400 Km. is metalled and 35861.63 Km. are roads. This is 77.46 percent of the state roads. These roads are constructed and maintained by village Panchayat or Block development office. These roads are less broad in comparison to other roads.

At present greater emphasis is given on the development of roads. It includes repair of the total highways, renovation and up gradation work. In the year 2006-07 total 773 Km. and up to January 2008 total 552 Km. national highways were renovated. The upgradation of the state highways is also in progress along with the important district roads. In the year 2006 total 1054 Km. roads have

been declared as state highways and with the help of Asian Bank the upgradation work of these roads in to double lane highways is in progress. In the year 2008 total 722 Km. roads have been declared as state highways.

Many roads of Bihar go up to the international borders also. These roads go up to Nepal border.

In many areas due to natural obstructions the extension of roads is less. Among them are flood affected areas of Kosi basin, Tal, Chaur, Diara and other flood affected areas. Most of the roads of north Bihar are affected by floods and it obstructs the transportation.

Due to construction of bridges at many places on river Ganga, the contact between north and south Bihar has increased. After the construction of Mahatma Gandhi Setu, direct contact of capital Patna and south Bihar has been established with north Bihar.

One more bridge on river Ganga is under construction near Munger, after its completion direct contact between north-west Bihar and south Bihar will be established. A bridge is under construction on river Son at Arwal with an investment of almost one hundred crores; once the bridge becomes operational the distance between Rajgir and Saman Nath will greatly be reduced and communication for the tourists will become convenient. One bridge on river Gandak between West Champaran and Gopalganj and on river Kosi large bridges between Saharsa and Darbhanga are under construction. After the completion of all these large bridges the road communication will become more developed. For establishing contact with the distant and rural areas construction work is in progress on over one thousand five hundred small bridges. The Bihar State Bridge Construction Corporation Limited is responsible for the construction of bridges in the state.

As a result of the development and expansion of the roads in the state, the number of motor vehicles is continuously increasing. In the

year 2005-06 the number of registered motor vehicles was 80,363 which increased to 1,47,309 in 2006-07.

Table 1.4

Year	Truck	Bus	Car	Taxi	Jeep	Auto Rickshaw	Two Wheelers	Tractor	Tractor	Others	Total
2005-06	579	113	5062	427	2321	3273	61333	509	2440	1306	80363
2006-07	1989	921	7409	1326	4430	5027	112985	6160	5281	147309	147309

Source Department of Transport, Government of Bihar.

Railways: At first the development of railways took place in Bihar during British period in 1860. During this period, first railway line was constructed along river Ganga up to Kolkata by East India Company. This railway line was mainly constructed for defense and administrative purposes and through this contact of Patna was established with west and east India. After this east-west rail route was constructed in north Bihar. Like this the development of rail route continued further.

Till the last decade of the nineteenth century, many places of erstwhile Bihar was connected to Kolkata. By the mid twentieth century or at the time of independence, with the development of metre gauge in north Bihar many towns were connected whereas in south Bihar mostly broad gauge was developed. After independence, after the completion of Rajendra Setu near Mokama in 1959 contact between north and south Bihar through railways was established.

Till 2001 total length of railways in this state reached 6,283 Km. and in 2002 headquarters of east-central railways was established at Hajipur. In 2003 the rail line was further developed and Fatuah-Islampur broad gauge rail line was laid, after this Rajgir-Natesar rail line was extended. Rajgir to Bodh Gaya via Hisua rail line is being laid. Banka was connected to Bhagalpur-Mandar hill rail line.

Laying of rail line in progress on from Mandar hill up to Dumka. Between Digha-Sonepur construction work of Rail Bridge on river Ganga is in progress. On Kiul Ganga route, work is in progress to connect Koderma south of Tilaiya station and Rajgir in north.

In the inner parts of the state passenger, Express, Shuttle, E.M.U. and D.M.U. trains are operating. For big and famous cities Intercity Express trains are running. Work on several projects is on for the development and expansion of the railways. Electrification of Kiul-Mugalsarai rail line and Patna-Gaya rail line has already been done. Patna Junction has already been extended up to Rajendra Nagar. Double track is being laid on Patna -Gaya route.

Water Ways:

Bihar is a land-locked state. This is the reason why it has no connectivity with the sea route. Here, rivers are used for waterways. There are many large rivers in Bihar which remain full of water throughout the year. Perhaps this is the reason why water transportation has remained popular since ancient times in the state. Water ways was a important means of transportation during medieval period also, this the reason why development of cities took place on the bank of the rivers. Ganga, Ghaghra, Kosi, Gandak and Son rivers are mainly used for water transportation. Food grains through Ghaghra river, wood, fruits and vegetables through Gandak, sand through Son and through Punpun river bamboo is transported but siltation, floods and scarcity of water in rivers during summer season is obstructing water transportation. Steamer facility is available on many ports of river Ganga but due to the construction of the bridges its operation has reduced considerably. In river Ganga large boats are plying for local works.

At present, Haldia-Allahabad national waterways has been developed in river Ganga and recently National Ship Institute has been established near Mahendru ghat. There is possibility of development of the water transport system in the canals constructed for irrigation purposes from the rivers. Many canals drawn from the river Son in

south Bihar have been made navigable. The Ara canal drawn from western Son canal presents convenience of boat transportation. Work is going on several projects for transportation through canals.

Air Ways:

Because of the poor economic situation in Bihar, there is no adequate development of Air ways here. Only at Patna and Bodh Gaya, Air ports of international importance have been developed. The Patna Air port is known as Jai Prakash International Air port. From here air service for Kathmandu, Kolkata, Mumbai, Lucknow, Ranchi and Delhi are available. Weekly flights are available from Bodh Gaya for Bangkok. Apart from these, there are seven Air Ports at Muzaffarpur, Jogbani, Raxaul, Bhagalpur, Bihta etc. Patna — Bodh Gaya service has also started and Haj travelers depart from Patna and Bodh Gaya by special Aircraft.

The private companies also provide air service from Patna Air Port. Among them Jet Airways, Jet lite, Kingfisher and Sahara are important. There is a flying school and flying club at Patna.

Rope ways:

Rope ways are used for mountainous and inaccessible places. A rope way has been developed in Bihar for going to 'shanti Stupa' on Gridhkut mountain at Rajgir. It was constructed by government of Japan in 1972 and now it has been handed over to Bihar State Tourism Development Authority. Mandar hill in Banka district will soon be connected by rope way, it is a famous place for Jain pilgrimage.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. In which city of Bihar is Glass industry situated?
(a) Hajipur (b) Shahpur
(b) Murkunda (d) Bhavani Nagar
2. Where is the Cigarette factory situated?
(a) In Munger (b) In Patna
(c) In Shahpur (d) In Gaya
3. Where is the railway workshop situated?
(a) Jamalpur (b) Bhagalpur
(c) Munger (d) Patna
4. Where is the fertilizer factory situated?
(a) Barauni (b) Barh
(b) Mokama (d) Lakhisarai
5. In which city is Carpet manufactured?
(a) Obra (b) Daudnagar
(c) Biharsharif (d) Gaya
6. In which district is Ashoak paper mill situated
(a) Samastipur (b) Patna
(c) Purnea (d) Araria
7. Is the first rail line of Bihar?
(a) Martin Lite Railways (b) East India railways
(c) Indian Railways (d) Bihar rail service

8. What is the name of Patna Airport?
- (a) Jai Prakash International Airport
 - (b) Patna Airport
 - (a) Rajendra Prasad International Airport
 - (d) Bihar Airport
9. What is the national highway number of Grand Trunk road?
- (a) 1
 - (b) 2
 - (c) 3
 - (d) 4
10. When was the railway started in Bihar?
- (a) From 1842
 - (b) From 1860
 - (c) From 1848
 - (d) From 1862
11. Where is the East-Central railway headquarters situated?
- (a) In Patna
 - (b) In Hajipur
 - (c) In Muzaffarpur
 - (d) In Samastipur
12. What is the total length of the railways in the boundaries of Bihar?
- (a) 6,283 Km.
 - (b) 5,283 Km.
 - (c) 7,283 Km.
 - (d) 8,500 Km.
13. Where is the rope way situated in Bihar?
- (a) Biharsharif
 - (b) Rajgir
 - (b) Gaya
 - (d) Banka

14. In which district is Mandar hill situated?
- (a) Munger (b) Bhagalpur
(c) Banka (d) Buxar
15. On which port of Patna is National Ship Institute situated?
- (a) Mahendru Gha (b) Gandhi Ghat
(c) Digha Ghat (d) Baans Ghat

SHORT ANSWER TYPE QUESTIONS:

1. Write a note on Jute Industry of Bihar.
2. Mention the names of important industrial centres situated on the bank of Ganga
3. Describe the initiatives taken by BIADA for industrial development.
4. Describe the important points of new industrial policy.
5. Which workshop is situated at Jamalpur and why is it famous?
6. Present your view on the industrial development of Rajgir.
7. Describe the different industries which have developed at Munger.
8. The roads are more developed in south Bihar in comparison to north Bihar. Why?
9. What is the contribution of rivers to transportation in Bihar?
10. Write the names of important Airports of Bihar. Where are they situated?
11. Describe the railways of north Bihar.
12. Present your views on waterways in Bihar.

LONG ANSWER TYPE QUESTIONS:

1. Describe the development and distribution of any one agro-based industry of Bihar.
2. Describe in detail about the cloth industry in Bihar.
3. Describe the extension and development of important road ways in Bihar.
4. Discuss in detail the rail or water ways of Bihar.

ACTIVITY:

Locate G.T. road on the map of Bihar and also identify important cities and famous places situated on the side of the road.



BIHAR : POPULATION AND URBANISATION

Bihar has been a region of dense population from the very beginning. Evidences of human habitation which dates back to 3000 years are found here. During Magadh period, over 80 thousand villages flourished. Even today, it is one of the most densely populated states of India. Main cause for this is its geographical location, in other words plain land surface, fertile soil, perennial rivers that remains full of water throughout the year and convenient accessibility. At present as per the size of the population, Bihar is on third position after Uttar Pradesh and Maharashtra and from the point of view of population density it is on second place after west Bengal. According to the 2001 census, its total population is 8, 29, 98, 509 of which 4, 32, 43, 795 are male and 3, 97, 54, 714 are females. This population is 8.07 percent of the total population of India.

Do You Know?

Bihar is the least urbanised state among all large states of India.

According to the Central Accounts Organisation (CAO) in 2007, the population of Bihar has increased to 9.31 crores. The decadal growth rate during 1991-2001 period was 28.62 percent whereas the national growth rate is 21.11 percent. 89.05 percent of the total population of Bihar lives in rural areas.

The sex ratio in Bihar is 919 females on per thousand male. This is less than the national ratio of 933. So far as age classification is concerned, in Bihar the maximum percentage of population is found in 0-6 and 7-14 age groups (Table 1.6). The main cause for this is the high birth rate.

Table- 1.6

**Age Group Classification of the
population of Bihar (2001 Census)**

Total Groups	Total	Male	Female
0 – 4	13.3	13.0	13.5
5 – 9	15.4	15.5	15.3
10 – 14	13.3	13.8	12.8
15 – 19	8.7	9.3	7.9
20 – 24	7.6	7.3	7.9
25 – 29	7.1	6.7	7.6
30 – 34	6.7	6.3	7.1
35 – 39	6.1	6.0	6.3
40 – 44	5.0	5.1	5.9
45 – 49	4.2	4.1	4.2
50 – 54	3.3	3.6	2.9
55 – 59	2.5	2.3	2.7
60 – 64	2.5	2.6	2.5
65 – 69	1.6	1.6	1.7
70 – 74	1.2	1.3	1.2
75 – 79	0.5	0.5	0.5
80 – +	0.7	0.7	0.6
Untold Age	0.2	0.0	0.2
Total Age group	100.0	100.0	100.0

There are 83.23 percent Hindus and 16.53 percent Muslims in the total population of Bihar. Other than this, Christian, Sikh, Baudh and Jains also live here which is clear from the table 1.7.

Table 1.7
Classification of Population according to Religion

Sl.	Community	Population	Percent
1.	Hindu	6, 90, 76, 919	83.23
2.	Muslim	1, 37, 22, 048	16.23
3.	Christian	53, 153	0.06
4.	Sikh	20, 780	0.02
5.	Baudh	18, 818	0.02
6.	Jain	16, 085	0.02
7.	Followers of other Religion	52, 905	0.06
8.	Unknown Religion	37, 817	0.05

According to National Institute for Public Co-operation and Child Development (NIPCCD) related to Indian women as noted in 2007 and economic survey, government of Bihar 2007-08, the birth rate in Bihar was 30.4 in 2005 whereas the national average was 23.8. Similarly the death rate was 8.1 whereas the national average was 7.6. Because of the high birth rate the annual growth rate, the population of Bihar is 2.23 percent where as the national average is 1.63 percent.

Population Distribution:

The distribution of population of Bihar is not even everywhere. At places, it is very thickly populated and at places it is very sparse. Social settings and physical diversity are the main causes for this.

We find greater concentration of population where the land surface is even, alluvial and plain. Again we find thick population in those areas also where facility of irrigation, modern techniques of agriculture is being utilised, per capita income and urbanisations is more. This is the reason why we find greater concentration of population in Patna, Nalanda, Muzaffarpur and Bhojpur districts.

Patna district has maximum concentration of population in Bihar. Here on 3.40 percent of the total area of the state 5.68 percent of the total population is found, the main cause for this is that Patna city is the capital of state, and urbanisation, development, administrative centre, commercial, industrial and tourism service centers are situated here.

Do You Know?

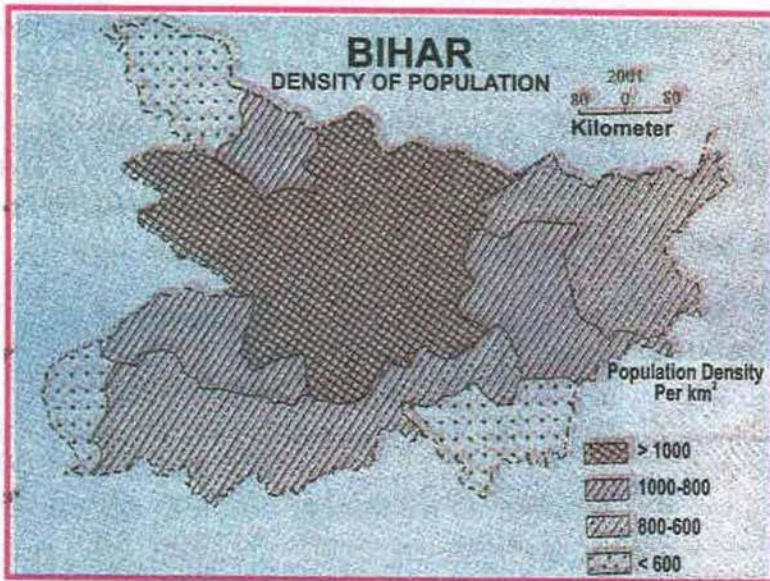
The district with maximum population in Bihar is Patna and Patna town is also a town of maximum population.

In Gaya, Muzaffarpur, Purnea, Hajipur, Bettiah, Motihari, Chapra, Siwan, Darbhanga, Madhubani, Sitamarhi and Samastipur districts the population percentage ranges between 3.00 -5.00 percent. These districts are densely populated districts of Bihar and among them only Gaya district is located in South Bihar and rest 11 districts are located in North Bihar. This is 39 percent of the total area of Bihar and in these districts 46 percent population of the state is concentrated.

Supaul, Nawada, Aurangabad, Araria, Gopalganj, Bhojpur, Begusarai, Nalanda, Katihar, Bhagalpur, Rohtas, Munger, Khagaria, Kaimur, Kishanganj, Jamui, Buxar, Saharsa, Jehanabad, Arwal, Madhepura and Banka are among medium populated districts. The population percentage of these districts ranges between 1.00-2.99 percent. This is 54.85 percent of the total area of Bihar and in these districts 45.84 percent population of the state is concentrated. Here due to development of agriculture and urbanisation positive population concentration is found.

In Sheohar, Sheikhpura, Lakhisarai districts the population percentage is less than 1.00 percent (between 0.60-0.97). In these three districts, on only 2.48 percent of the total area of Bihar 2.22 percent population of the state is concentrated. In these districts due to agriculture backwardness and less area the concentration of population is less.

North Bihar is comparatively more densely populated where 43.80 percent of the total area of the state and 63.42 percent population is concentrated. On the contrary, in south Bihar on 56.20 percent area 36.58 percent of the total population of the state is concentrated.



Population Density:

According to 2001 census the population density of Bihar is 881 persons per square kilometer. The maximum density is in Patna district where population density is 1, 471 persons per square kilometer, after this Darbhanga and Vaishali is placed where population density is 1, 342 and 1, 332 persons per square kilometer respectively. On fourth position is Begusarai district with a density of 1, 222 persons per square kilometer.

The population density is very uneven in different districts. On the basis of this uneven distribution of population, Bihar can be divided into following five categories.

- 1. Districts of very high density :** Those districts which are having population density of over 1200 persons per square kilometer

are categorised in this category. Patna, Darbhanga, Vaishali, Begusarai, Sitamarhi, Saran, Siwan etc come under this category. On 17.50 percent land of the state, 28.17 percent of its population is found in these districts.

2. Districts of high density : Those districts which are having an average population density of 1000 - 1200 persons per square kilometer are categorised in this category. Muzaffarpur, Samastipur, Gopalganj, Madhubani and Nalanda come under this category. On 14.41 percent land of these six districts of Bihar, 19.25 percent of its population is found.

3. Districts of medium density : Under this category 800-1000 persons per square kilometer lives. East Champaran, Bhagalpur, Jehanabad, Arwal, Bhojpur, Saharsa, Khagaria, Madhepura, Buxar and Munger districts come under this category. On more than 24 percent land of the state in these districts, 18 percent of state's total population is found.

4. Districts of less density : Under this category Purnea, Katihar, Araria, Nawada, Sheikhpura, Supaul, Gaya, Kishanganj, Lakhisarai, Rohtas and Aurangabad districts are included. The average density of these districts is 600-800 persons per square k.m. In these districts on 30 percent of the total area of the state 26 percent of the total population is found.

5. Districts of very less density : Those districts which have an average population density of less than 600 persons per square kilometer are categorised in this category. Included under this category are West Champaran, Banka, Jamui and Kaimur districts whose population density 382 persons per square kilometer. On 14.58 percent of the total area of the state 9 percent of the total population is found.

Development of the Cities:

The history of development of cities in Bihar is very old. Most of the cities here have developed on the bank of the rivers. The ancient cities have developed here in the form of capital, education, religious

and trade centers. Patliputra, Nalanda, Rajgir, Gaya, Vaishali, Bodh Gaya, Udvantpuri, Sitamarhi etc are examples of ancient cities. During medieval period also the development of cities and roads took place due to administrative reasons. Among these cities Sasaram, Darbhanga, Purnea, Chapra, Siwan etc are included. During English period, many changes took place in Bihar when rail and roadways were developed and because of this towns began to develop along the roads. At this time, few cities were also developed due to railways. After independence there was rapid development of the cities. Due to industrial, health, education and development in basic needs of life many new cities were also developed among them Barauni, Hajipur, Danapur, Dalmianagar, Munger, Jamalpur, Katihar are important, but at present there is very less development of cities in Bihar in comparison to other large states of India and is least urbanised state of the country. The total urban population here (according to 2001 census) is only 10.5 percent where as urban population of India is 27.78 percent. At present there are only 19 cities in Bihar with over one lakh population and Patna is the only city with more than ten lakh population. According to 2001, census the total number of urban settlements is 131.

The functional structure of cities in Bihar is related to its evolution. Here the ancient cities were related to administration and trade but modern cities are related to industry, transport, trade and education. From the beginning almost all the district headquarters have developed here on the basis of urban functions such as whole sale business, education and health along with administrative work. Most of the towns situated in the plain areas here are related to these functions. The industrial units are established at selected cities in Bihar; important among them are Dalmianagar, Munger, Barauni, Jamalpur and Katihar.

Before the division of Bihar, Tata Nagar was the only planned city of the state. Jamshed Ji Tata was the first to introduce modern town planning not only in Bihar but also in whole India. However, but after the partition of the state development of planned city has not taken place in Bihar. Even Patna which is a famous town since ancient times has developed as a partial planned town. This city is the capital of Bihar. Most of the towns of Bihar are unplanned and unorganised. Barauni and Valmikinagar can be categorised in to planned city to some extent.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. The total population of Bihar in 2001 was -
(a) Less than 8 crores (b) More than 9 crores
(b) More than 8 crores (d) None of these
2. The population growth rate of Bihar during 1991-2001 was...?
(a) 30 percent (b) 28 percent
(c) 28.63 percent (d) None of these
3. The rural population in Bihar is.....
(a) 89.5 percent (b) 79.5 percent
(c) 99.5 percent (d) Zero percent
4. How many persons live in per square kilometer in Bihar according to 2001 census?
(a) 772 persons (b) 881 persons
(b) 981 persons (d) 781 persons
5. Which district has the highest population?
(a) Bhagalpur (b) Patna
(c) Nalanda (d) Munger
6. The Sasaram city developed -
(a) In medieval period (b) In ancient period
(c) In present period (d) In modern period
7.was the only planned town in the undivided Bihar.
(a) Patna (b) Munger
(c) Tata Nagar (d) Gaya

8. The urban population of Bihar according to 2001 census is....
(a) 20.5 percent (b) 15.5 percent
(c) 10.5 percent (d) 25.5 percent
9. Which is the largest city of Bihar?
(a) Patna (b) Gaya
(c) Bhagalpur (d) Darbhanga

SHORT ANSWER TYPE QUESTIONS:

1. Write the name of district of Bihar with maximum density.
2. Which are the districts in Bihar with least density.
3. Explain the population size of Bihar.
4. The population of Bihar is not even at every place. Clarify?
5. How did the cities develop in the medieval period?
6. Write the names of two ancient and two modern cities?

LONG ANSWER TYPE QUESTIONS:

1. Discuss in detail the population density of Bihar.
2. Present an analysis of urban development in Bihar.



METHODS OF RELIEF REPRESENTATION

You all know that several topographical features are found over the surface of the earth. You also know the names of some of these topographical features. Among them conical hills, plateau, 'V' shaped valley, waterfall, Lake etc are important. The expression of these features on the map is called relief expression. In other words relief expression means that method of mapping through which three - dimensional features found on the surface of the earth are expressed on plain surface.

All the topographical features found on the surface of the earth has length, width and height, this is the reason why they are three dimensional. These topographical features are expressed on plain surface in two dimensional form. Therefore, to express these three - dimensional features on the map many methods have been developed from time to time.

Details of some of the important methods developed to express relief features found on the surface of the earth are given here:-

1. Hachure Method :

This method was developed by an Austrian Army officer Lehman. In this method for expression of relief small, thin and broken lines are drawn in the map. These lines are drawn in the direction of slope or flow of water. As a result near the areas which are having steep slope, these lines are drawn in thicker and deeper shade. Whereas for lesser slope areas the lines drawn are thinner and far apart. The plain areas are left vacant. In this condition that part of the earth which is having greater slope, in the hachure method maps it

is expressed in much darker shade. In this method the map looks attractive and live and through this the slope magnitude can be gauged accurately. But it takes lots of time and effort to represent relief through this method.



Fig 6.1 : Hachure

2. Hill Shading:

In this method for the expression of relief it is imagined that light is falling from above on the north-west corner of the topographical feature. Due to this reason, the portion lying in darkness or the slope is filled with dark shade whereas portion lying in the light or portion having lesser slopes are shaded with light shade (or left) or can be left vacant.

Through this method it is possible to express the relief of mountainous region more effectively but from these maps also the accurate inclination of the slope cannot be gauged.

3. Bench Mark

Through actual survey, on the permanent structures such as buildings, bridges, pillars and stones, the mark expressing the height measured from the sea level is called 'Bench Mark'. To express such height on the map the height is written in either feet or meter.



Fig 6.2 : Hill Shading

1. Spot Heights:

Height of a particular place measured with the help of Bench Mark is called Spot Height. In this method different places are shown on the map by points and heights are written in digits.

2. Trigonometric:

Trigonometric station is related to those points which were used in triangulation method (a type of survey) survey in the form of station. By making a triangle on the map and writing their height from the sea level beside the triangle.

3. Layer Tints:

A standard has been fixed to show relief features through different shades of colour in the coloured maps.

You must have seen the use of this method in Atlas and wall maps. With the increase in height the shades of the colour becomes lighter. In these maps the ocean or water bodies are shown in blue colour, plains in green and mountains in Almond light brown colour whereas snow covered areas are shown in white colour.

4. Contour Lines:

The method of showing relief feature with the help of contour lines has been accepted as the best. It is a standard method. Thus, contours are imaginary lines joining places having the same elevation from the mean sea level. These lines are drawn on the basis of actual survey in the area. With every contour line in the map the value of their height is also written. In the map these contour lines are shown in Almond colour.

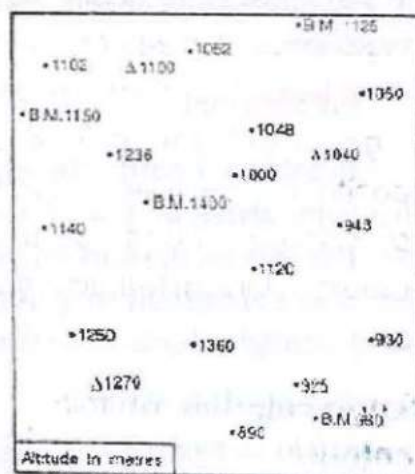


Fig- 6.3 : Spot Height, Bench Mark and Trigonometric station.

To show different relief features different forms of contour lines are drawn. To express even slope the contour lines are drawn at even space. The contour lines are closely spaced to show steep slope whereas for gentle slope these lines are drawn far apart. When the contour lines of greater height (value) are closely spaced and contour lines of lesser height are widely spaced in a map then it indicates that the group of contour lines are showing concave slope. Situation opposite to it represents convex slope. For stair shaped slope pair of two contour lines intervals are drawn. Similarly several geomorphological features are expressed on the map through contour lines.

Representation of Different Topographical Features Through Contours:

To represent topographical features through contour lines one must possess full knowledge of those features because shape of the contour lines are formed according to the topographical features and the numerical value of those contour lines (According to height) are determined. For example, if you draw eight ten circular shaped contours then through these two topographical features can be shown, first conical hill and second Lake. But in both these topographical features the

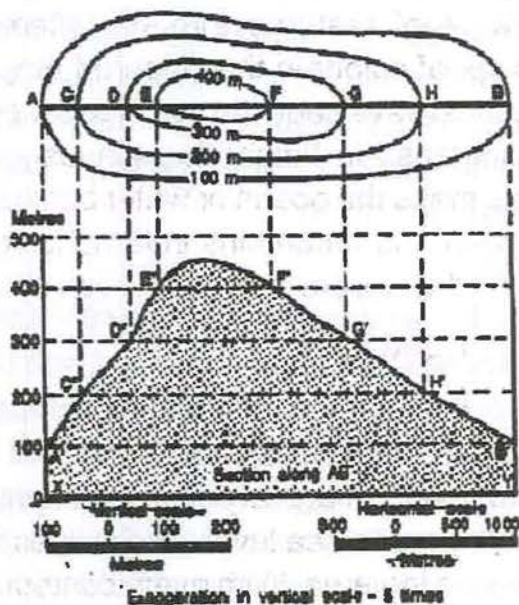


Fig 6.4

value of contours are different according to height. The value of contours drawn for conical hill increases from outside towards inside. In other words the contour with more height is towards inside. On other hand to express Lake, the value of contour is more on outside and less on inside, by saying this it is meant that while drawing the contours to represent topographical features the value of those lines must be understood properly. On the contour map after drawing the cross section line back ground figure is drawn. With the help of this background figure topographical features can be understood clearly

Mountain :

Mountains are that feature found on the surface of the earth whose base is very wide and top is very narrow. It rises above other topographical features nearby. It is conical in shape. The hills formed due to volcanic activity are conical in shape. The contours drawn for conical hills are almost circular in shape. The size of the circles decreases from outside to inside. The contour in the center expresses maximum height. The value of the contours increases from outside to inside respectively.

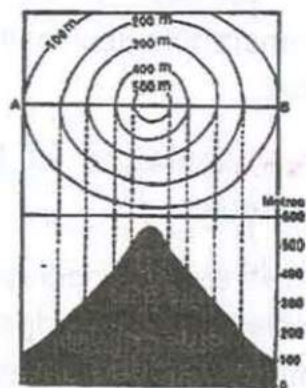


Fig 6.5 conical hill/Mountain

Plateau:

Plateau is such a feature found on the surface whose base and top both are broad and stretched. But its stretched top is rugged. As a result, to express plateau areas the contours drawn are almost vertical in shape. Each contour line is drawn in closed shape. Its central contour line drawn is also sufficiently broad.

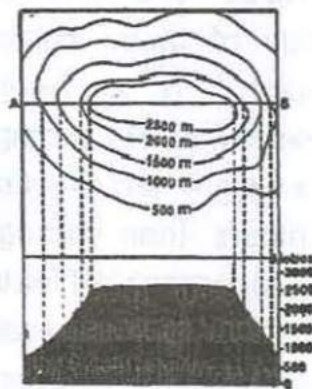
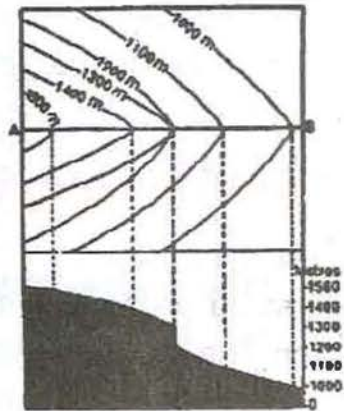


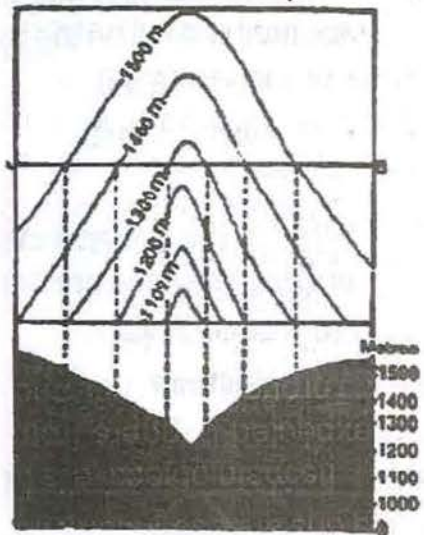
Fig 6.5: Plateau

Waterfall:

When a river in the course of journey through in its valley make a sudden descent on a steep slope then it is called Waterfall. To express this feature many contour lines are joined together at a place near the steep slope and the rest lines are drawn according to the slope.

**Fig 6.7: Waterfall****'V' shaped valley :**

This type of valley is formed by the river. Almost vertical 'V' shaped valley is formed by the river in its youth stage. To express this feature the contour lines are drawn in the form of inverted 'V' letter of English. In this, the value of contour lines decreases from outside towards inside respectively.

**Fig 6.8: Valley**

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. Who developed Hachure method to express relief?
(a) Gutenberg (b) Lehman
(c) Gigar (d) Ritter
2. In the hill shading method, from which direction is it imagined that the light will fall on the topographical features?
(a) North - East (b) East - South
(c) North - West (d) South - West
3. What is the method called to express relief in which small, thin and broken lines are drawn in the direction of the slope?
(a) Layer tints (b) Hill shading
(c) Hachure (d) Bench Marks
4. The height measured of a particular place with the help of bench mark is called...
(a) Spot Height (b) Special height
(c) Contour line (d) Trigonometric station
5. Which part of the map is shown in blue colour in the layer tints method?
(a) Mountain (b) Plateau
(c) Plain (d) Water

SHORT ANSWER TYPE QUESTIONS:

1. Differentiate between Hachure method and Hill shading method.
2. What is Bench mark and Spot height?
3. What do you understand by contour line?
4. What are Layer tints?
5. How is conical hill expressed through contour lines?

LONG ANSWER TYPE QUESTIONS:

1. Mention important methods to express relief.
2. What is a contour line? How are different types of slopes expressed by them?



PART-B**Section-1****NATURAL DISASTER : AN INTRODUCTION**

In class IX you have studied about those disasters which occur due to human error or in other words they are human induced disasters. You have also attained sufficient knowledge about their management. But you must not remain in this illusion that only human being is responsible for disasters. The fact is that in several disasters like conditions even human beings are totally helpless. Its cause is nature. In the natural system when due to several unwanted reasons unnecessary hindrances are developed then these hindrances come before us in the form of nature- induced disasters. You will be informed about these disasters in class X.

Do You Know What Tsunami is?

When due to the earthquake that occurs on the sea floor, its waves strikes the coast in ripples then towards coast the water rises up to few meters and brings disaster to the coastal areas and this is known as Tsunami.

You also know that when the water level of the river rises above the normal and spreads in nearby areas then that condition is known as floods.

In the natural disasters floods, drought, earthquake and Tsunami etc are very destructive. Apart from these incidents such as cyclones, hailstorm, avalanche, landslides are part of natural disasters but due to large scale effect of floods, drought, earthquake and Tsunami, a study of the assessment of its causes along with its outcome and management is presented in class X.

Have you ever experienced earthquake? If not, then you must know that any vibration in earth is called earthquake and it is measured on the Richter scale.

When there is a fall of more than 25 percent from the average annual rainfall then this is considered as drought condition. Normally, in the areas which receive less than 50 C.M. rainfall there drought like condition emerges every year.

You can ask your parents or grandparents whether they have experienced any natural disaster or not. You must have seen last year (2008) in newspapers, Television how the people were devastated by the Kosi floods. The channel in which river Kosi was flowing had changed. This incident is not new for the people of Bihar. Due to this destructive nature of Kosi, the river is called the 'Sorrow of Bihar'.

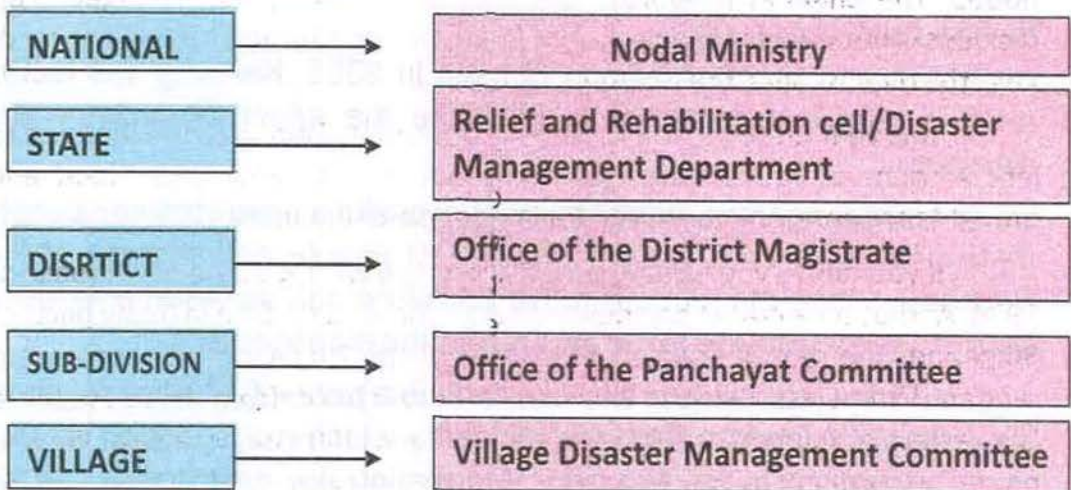
This year (2009) in many parts of the country along with Bihar due to less amount of rainfall drought like condition has emerged. Flood and droughts are permanent disaster for the people of Bihar.

If you talk to your grandparents then they will recall the earthquake of 1934. At that time cracks had developed on the land surface in many parts of Bihar and hundreds of people fell victim to death. Thousands of people were rendered homeless. Because Bihar is located far distant from the sea so there is no effect of Tsunami here but due to cyclonic effect heavy loss of life and property is brought by these cyclones almost every year.

In the mountainous region of India incidents such as landslide and soil erosion occurs frequently. Jammu and Kashmir, Himachal Pradesh and Uttarakhand are most effected states by such disasters. Due to continuous increase in the development work in the Himalayan region, the rocks situated on the steep slopes are weakened by such activities and when these rocks break problems like landslide emerges. The problem of avalanche occurs in very high mountainous regions. For the people living in the plains of India and particularly for the people of Bihar it is not a natural disaster but for the people living in the mountainous states it is a serious disaster.

Natural Disaster Management :

Disaster may be of any type but its management is mandatory. Disaster not only stops developmental work but also causes several hindrances in developmental work. Though at national level and at state headquarter level arrangement of disaster management has been made but failure of these arrangements can give birth to new problems.



People of north Bihar particularly of Kosi region are traditionally trained in flood control; they have adopted a life style to live in flood conditions since ancient times.

It is essential to work with the help of common people for the management of drought. With collective effort digging of wells could be done. Collective digging of Ponds and new areas of employment can be discovered.

Earthquake and Tsunami are also big challenges for India. For the management of earthquake, houses based on modern techniques are being built. In the construction of earthquake-resistant buildings in place of circular or polygonal structures, priority is being given to rectangular and square shaped building structures. Similarly, in the

coastal parts of India significant work has been done for the Tsunami warning system and its management.

Tsunami brought heavy destruction to the eastern coast and Andaman and Nicobar Islands of India in 2002. Keeping this fact in mind, strategy is essential to minimise the effect of cyclone and Tsunami.

Destructive cyclones of India - 29th December, 1999

Destructive earthquake of India - 1934

Major drought year of India - 1966

Major Tsunami of India - 26th December, 2004

No management work can be successful unless common people participate in it. With the participation of people and support of the Panchayat concrete administrative decisions can be taken and these decisions are essential in the long run for the management.

Its main objective is to make available prior information to you of the expected dangers from the incidents which may happen around you. Through forecast and prior information the destruction can be minimised. This is the main objective of this chapter.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. Which of the following is not a natural disaster?
(a) Tsunami (b) Floods
(b) Terrorism (d) Earthquake
2. Which of the following is human-induced disaster?
(a) Communal riots (b) Terrorism
(c) Epidemic (d) All of the above
3. What is the main cause of Tsunami?
(a) Earthquake in sea (b) Earthquake on land
(c) Earthquake on Island (d) None of these

SHORT ANSWER TYPE QUESTIONS:

1. What do you understand by disaster?
2. How many types of disaster are there?
3. Why is management of disaster essential?

LONG ANSWER TYPE QUESTIONS:

1. Present the difference between natural disaster and human induced disaster with suitable examples.
2. While clarifying the concept of disaster management, describe the need, compulsion of disaster management.



Section-2

NATURAL DISASTER AND MANAGEMENT: FLOOD AND DROUGHT

You often hear and get this information from television and news paper that in some part of the country flood conditions are prevailing and some part of the country is reeling under drought. Flood and droughts are those natural disasters which are directly related to rainfall. When there is excess of rainfall during Monsoon season then there is considerable rise in water level of the rivers and as a result flood condition emerges. But when in rainy season there are no clouds in the sky and bright sunny condition prevails then farmers are not able to work in their fields and even drinking water becomes scarce. This condition is called drought.

Due to uncertainty of the Monsoon, various parts of India are affected by floods. Few rivers are known for their floods such as river Kosi in Bihar, river Damodar and Tista in West Bengal, Brahmaputra in Assam, Mahanadi in Odisha, Krishna in Andhra Pradesh and Narmada in Gujrat. The water of these rivers has created havoc from time to time in their areas.

Floods have been an ancient phenomenon. According to Indian religious epics Indra is rain god. His anger brings heavy rainfall and creates disastrous floods. In recent years, floods are caused by human error also. To check floods, Dams and embankments have been constructed but when the rising water of rivers breaks them



Normal Life gets Disrupted due to Floods

then many new areas get inundated which were not flood prone earlier. In 2008 on the Indo-Nepalese border near Kusha, floods caused due to breakage in embankment resulted in to change of course of river Kosi .



Bangladesh: A Country of Floods

Normal Life gets Disrupted due to Floods

You will be surprised to know that floods occur every year which take thousands of people in its spate. People living here are accustomed to the spread of epidemic, collapsing of the houses and damage of crops but there are few states which, in spite of so much of damage, are one of the most densely populated states of the world. This state is also associated with floods. The flood water not only brings destruction but also brings with it precious alluvial soil and deposits them in the flood affected areas every year which contains ample natural fertilizer and mineral humus and makes it one of the most fertile plains of the world. As soon as the flood water recedes the farmers sing song of happiness and in no time the land looks lavish with crops.

Management of Floods: Construction of Dams and Embankments

The construction of Dams and embankments to check the destruction caused by the floods is being followed since English rule. But after independence for the management of disasters like floods, efforts have been made to check floods by constructing Dams and embankments. Question has been raised on this management after the break in Kusha embankment and cracks developed in the Dams of many rivers. But its not only India but countries like China, Egypt, Pakistan and Nigeria which have also constructed Dams on the rivers and created artificial water reservoirs. The management of draining of water through this procedure checks the emergence of flood like conditions.

Do you know that by constructing Dams on rivers artificial reservoirs are created? The names of the important reservoirs of India can be seen in the following table:

Name of the Dam	River	Name of the artificial reservoir
1. Bhakhra Nangal Dam	Satluj	Govind Sagar
2. Narmada Project	Narmada	Sardar Sarovar
3. Nagarjun Sagar Project	Krishna	Nagarjun Sagar
4. Kaveri Project	Kaveri	Krishna Sagar
5. Rihand Dam	Rihand	Pant Sagar

Alternative Management:

Embankments are not stable arrangements. They create more disastrous situation if they are broken. Therefore, this concept gets greater emphasis that priority must be given to ecologically suitable management. For this the following efforts are essential -

1. Low cost buildings/houses should be constructed in which chemical mixed raw materials should be used which in spite of the floods the houses must not be damaged.
2. The common people should be informed before the construction of the houses that their homes must not be constructed close to the bank of the river and on the narrow slope of the river. In such places the distance of the houses should be at least 250 meters.
3. After floods there should be an immediate arrangement of drainage of water. The role of village panchayat can be very significant in this work. In fact, there should

Do You Know?

The highest Dam of the world has been constructed on river Nile at a place named Aswan.

adequate arrangement of pump sets before floods in every village panchayat

4. The base and wall of the houses should be of cement and concrete.

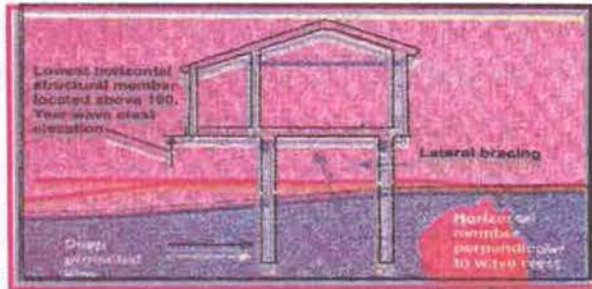


Fig 2.3

5. The houses should be pillar based and the pillars should be rooted very deep in to the land.

Management of Early Warning:

1. For flood forecast remote sensing information should certainly be collected. Through this, early warning can be given to the areas where flood is expected through various means of information before the coming of the floods. If the information is given on time then schools can be closed. Arrangement of doctors and medicines can be made in the local hospital. Administration can be alerted and emergency funds can be made available for food supplies, drinking water and medicines.
2. People should be trained to swim in the flood prone areas. Not only this, arrangement of swimming jackets should be made in all village panchayats and schools, so that maximum number of people may swim to safety in the event of floods.
3. The moment the flood water recedes, spread of epidemics emerges as the greatest problem. Therefore, D.D.T. and Bleaching powder should be sprinkled and carcasses of dead animals should be removed immediately.
4. In the flood affected areas with the help of self help institutions, it is essential to train people to help each other at the time of

disaster. For example, by forgetting personal disputes they should gather in high buildings of the village; the feeling of community responsibility should be developed by administering hot water, sugar and salt solution and making arrangement of food and clothes in the event of spread of epidemic.

Students, floods are such a calamity which cannot be checked completely, rather now it is a form of ecology. Therefore, we must learn and develop a habit of living happily in the event of floods. This is its best management. The villagers of Asia, while living along with their traditional new style, have made flood affected areas as the most densely populated regions of the world.

Drought and its Management:

Due to shortfall in rainfall drought conditions emerge and it they cause three major problems for the common people (i) Scarcity of food grains because crop was not sown (ii) Scarcity of drinking water (iii) Scarcity of fodder for the cattle. Indirect amassing of food grains illegally, astronomical rise in the price of food grains and incidents of loot also emerges as a serious problem. There is also rise in the number of deaths due to hunger.

The government of India has planned to connect all the rivers and thereby carry excess water of rivers of flood affected areas to those areas where normally drought condition prevails. But due to several reasons this work has not been accomplished as yet. Environment experts have also opposed this type of move.

Drought Prone Areas in India:

Students, do you know that 77 districts have been identified in the country by the government of India, where normally droughts are expected almost every year. These districts are mainly situated in

Rajasthan, Gujarat, Karnataka, Madhya Pradesh, Chhattisgarh, Maharashtra and Uttar Pradesh.

The important years for droughts in the nineteenth century were 1877 and 1899 when extreme drought like conditions had emerged. In the twentieth century also 1918, 1966 and 1987 are the years of extreme drought.

Management of Drought:

Two pronged planning is essential for the management of drought. These are long term and short term planning.

In the long term planning development of canals, ponds, wells, pane and Aahars is required. Through canals water can be brought in to reservoirs. The problem of drought has permanently been solved by

Do You Know?

According to irrigation commission, every year on about 16% area drought-like condition emerges in the country.

spreading the network of canals in Punjab and Haryana. In Bihar also at the time of drought, through management of canals from Kosi command area, Gandak command area and Chandan Kiul - Barua command area, efforts are being made to minimise this natural calamity. The main purpose of digging canal is to collect rain water and also if excess water is received from the canal then it can be collected in the pond. By digging wells the underground water is utilised and to some extent the problem of drinking water is also solved. At present through boring and tube well there has been rapid increase in the exploitation of underground water due to which ecological problem has emerged. The lowering of the underground water table is a cause of concern and it gives rise to ecological imbalance.

What is Underground Water?

Do you know that where you are standing, just beneath that there could be large reservoir of fresh water? The rain water slowly

percolates below the surface and becomes underground water. There has been rapid increase in the exploitation of this water through wells, tube wells and power generated machines. This has not only contributed in the lowering of the water level of the underground water but it is also creating problem of ecological imbalance.

Canals, paine and Aahars are manmade water ways, with the help of these water ways and use of underground water is mainly done in agriculture and for drinking water. Canals are long range water ways and are connected to source of water. Mainly water of reservoirs are drained into then but as per necessity water is also drained in to then with the help of diesel pump sets for irrigation. Paine and Aahars are manmade short distance water drainage system, which indicates that farmers want to utilise rainwater and underground water without wastage. Through drip irrigation and sprinkle irrigation the underground water can be utilised as per the ecological laws.

Shortage of fresh water is a serious challenge to the whole world. The fall in the water level of underground water even in absence of droughts continues to be a matter of grave concern. Looking at the gravity of the situation, programmes like rainwater harvesting and watershed management have been started. The main objective of the both programmes is maximum harvesting of the rainwater and its maximum utilisation. In watershed management, several programmes have been made to increase underground water level, to reduce soil erosion and to increase grass and forest cover. For this support of self help institutions and panchayats are being taken.

In a small state like Rajasthan up to 50 hectare watershed areas HAVE been identified for water harvesting at small scale.

Rain Water Harvesting:

Students! have you ever seen rain water being collected in a

large water tank through pipe beneath any house? On the roof of the house the rain water goes waste but this water is very clean and fresh and therefore this water is collected through pipe in a water tank and then this water is used as drinking water by the people living in the house through taps. Not only this, the irrigation of gardens, orchards are also possible through this water. In many states of India this water is collected by digging tanks and ponds.

It increases the level of underground water and animals and plants also get water from it. The technique of rain water harvesting is proving to be a boon during drought period. It is proving fruitful even if the rainfall is less.

In the regions of drought and scanty rainfall, through drip and sprinkle method of irrigation, not only water is being utilised judiciously but also crops which consume less water can be grown during drought period. Among such crops are flowers, vegetables and oilseeds. In the areas which receives less than 75 cm of rainfall in India, this type of irrigation has been given adequate importance under rural development programme. In the event of drought, this type of irrigation can be done in the areas where the average annual rainfall is more than 75 cm. In states like Karnataka, Madhya Pradesh and Rajasthan, the drip and sprinkle irrigation system has been made a part of rural development programme. Special financial help is also being given to farmers in Rajasthan. It is very essential that with the support of self help institutions, the farmers must be introduced to these methods of irrigation and it is essential to train them as to how in the event of uncertain rainfall such crops should be grown which can provide more profit with the support of less expensive irrigation facilities.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. What are the main causes of floods in the rivers?
 - (a) Excess of water
 - (b) Deposition of silt on the bed of the river
 - (c) Excess of rainfall
2. Which part of Bihar is flood prone?
 - (a) Eastern Bihar
 - (b) Southern Bihar
 - (c) Western Bihar
 - (d) Northern Bihar
3. Which of the following rivers is called the 'sorrow of Bihar'?
 - (a) Ganga
 - (b) Gandak
 - (c) Kosi
 - (d) Punpun
4. What is flood?
 - (a) Natural disaster
 - (b) Man induced disaster
 - (b) Normal disaster
 - (d) None of these
5. Which type of disaster is drought?
 - (a) Natural disaster
 - (b) M a n induced disaster
 - (c) Normal disaster
 - (d) None of these

6. How does the drought occur?

- (a) Sudden
- (b) According to prior information
- (c) Slowly
- (d) None of the above

7. Factor responsible for drought:

- (a) Scanty rainfall
- (b) Earthquake
- (c) Flood
- (d) Volcanic activities

8. One measure to prevent drought -

- (a) Connecting the rivers together
- (b) Rainwater harvesting
- (c) Flood
- (d) None of these

SHORT ANSWER TYPE QUESTIONS:

1. How does the flood occur? Clarify.
2. Discuss the damages caused by the floods.
3. Write the measures taken to prevent floods.
4. Suggest measures to control floods.
5. Define drought.
6. Discuss the factors responsible for the droughts.
7. Write the measures taken to prevent drought.

LONG ANSWER TYPE QUESTIONS:

1. Describe the flood condition in Bihar.
2. Describe in detail the causes of flood and its preventive measures?

3. Describe in detail the causes of drought and its preventive measures.

PROJECT WORK:

1. Collect data from any area regarding damages caused by the floods.
2. Identify the drought prone areas of your state.



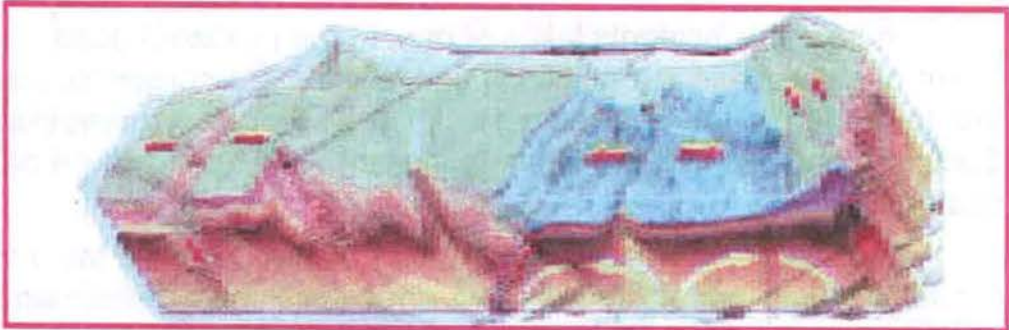
Section-3

NATURAL DISASTER AND MANAGEMENT: EARTHQUAKE AND TSUNAMI

Earthquake and Tsunami are two such natural disasters which are related to internal structure of the earth. We live on solid land surface but inside it fire waves are blowing. You will be surprised to know that inside the solid surface of the earth the temperature is more than 1000°C . Here the rising currents of energy develop vibrations in the rocks. When the focus of this vibration is on the land surface then it is known as earthquake but when it is on the ocean floor then it is known as Tsunami. The effect of Tsunami creates vibration in the sea water. This vibration generates horizontal motion in the water. When the internal energy generated horizontal movement created in the sea water strikes the coast then destruction or disaster created by Tsunami is seen on the coast.

Do You Know?

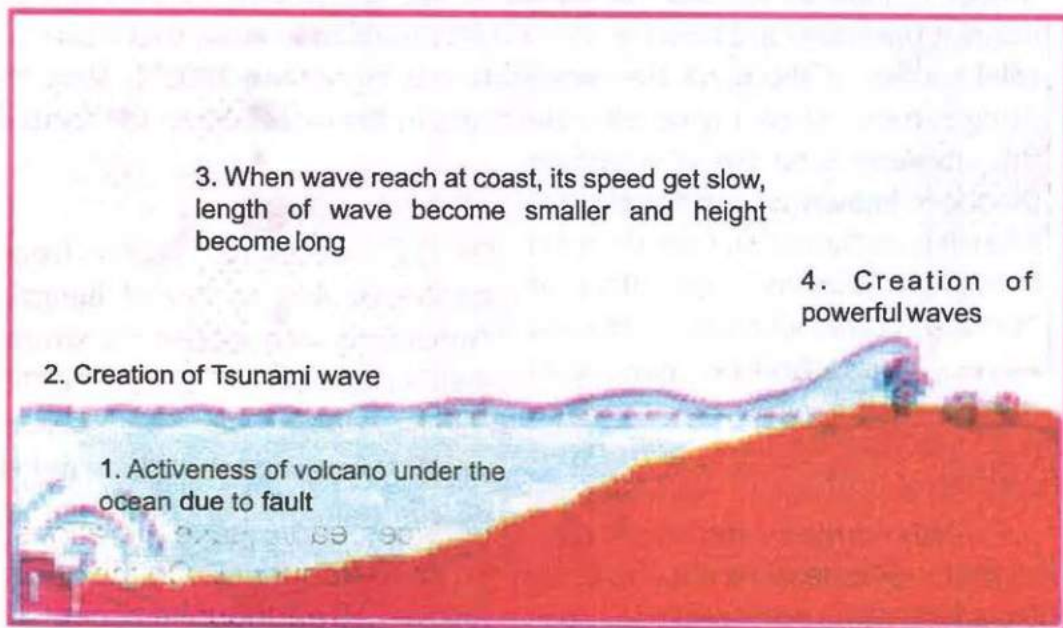
On 26th December, 2004 from south-east Asia to Bay of Bengal, Tsunami of such magnitude struck that hundreds of people were engulfed in it, numerous sailors went missing and Indira point situated south of Nicobar islands was lost once for all by the power of the Tsunami waves.



Through circular circles and arrow marks, origin point of earthquake/ Tsunami and effected land surface is shown.

The intensity of energy waves of earthquake and Tsunami is measured with the help of Richter scale. It is a logarithmic scale in which after every one unit there is ten times increase in the intensity.

The effect of earthquake and Tsunami is seen more in those areas where the rocks of the surface are destroyed. In other words regions of fold mountains, regions of faulted areas on the surface, oceanic deeps, mid oceanic ridges and other such regions where the rocks are weak, they come under energy flow and fell victim to earthquake and Tsunami.



In both the incidents lakhs of people are rendered dead. In the event of earthquake the buildings and bridges are collapsed, cracks are developed on the land and hot water gushes out from these cracks. Such incidents are very common during earth quake and cause heavy destruction.

The Tsunami waves cause heavy destruction on the coast. Tsunami affects tourists who are enjoying on the coast, fishermen and coconut farmers. There is erosion of sand and soil in the coastal bars and creates situation of ecological imbalance.



Earthquake Zones of India:

Almost every part of India experiences earthquake vibrations. But there is huge difference in its intensity and frequency. On the basis of this fact, India has been divided into following 5 earthquake zones:

1. Zone 1 In this zone come the southern plateau regions where the danger of earthquake is almost negligible.
2. Zone 2 Included in this zone are the coastal areas of peninsular India. Here there are chances of earthquake but due to less intensity the dangers are limited.
3. Zone 3 Mainly Indo Gangetic plains, Rajasthan and some parts of northern Gujarat come under this zone. Here the effect of earthquake can be seen but at times they are destructive. For

example, during the twentieth century in Bihar, 20 earthquakes of higher intensity experienced but only the earthquake of 1934 was destructive, in 2008 the earthquake was experienced but due to less intensity some people even did not take note of it.

2. Zone 4 There are chances of greater danger in it. In this mainly Shiwalik Himalayan regions, northern part of West Bengal, Assam valley and north-eastern India are included. In this category Andaman, Nicobar Islands are also included.
3. Zone 5 It is the most vulnerable earthquake zone and is the most dangerous earthquake region. Under this Kutch region of Gujarat, Jammu & Kashmir, Himachal Pradesh, Kumaun mountainous region of Uttarakhand, Sikkim and hilly regions of Darjeeling are included. These regions of India have experienced several destructive earthquakes.

Seismic Waves:

The vibrations arising at the time of the occurrence of the earthquake are mainly divided into Primary (P), secondary (S) and Long (L) waves.

P waves are the first to arrive on the surface of the earth.

S waves are transverse waves and their speed is less than the primary waves.

L Waves originate on the surface of the earth and their intensity is the least. It moves horizontally at a slow speed and that is why it reaches later at any place but it is the most destructive wave.

Do You Know?

- (i) **Epicenter** That centre on the surface of the earth where the seismic waves are at first recorded.
- (ii) **Focus** The place beneath the surface of the earth where the vibration of the earthquake originates.
- (iii) **Pre and post vibrations** Low intensity vibrations occur before and after the occurrence of the earthquake. Normally without the support of the instrument this vibration is not even felt.

Preventive Measures from Earthquake:

Earthquake is a natural disaster and multi faceted measures are essential for its prevention. In fact, these efforts should be broad and farsighted. These efforts can be studied under following heads:

1. **Forecast of the Earthquake:** If the pre and post earthquake waves are measured properly on the seismograph then on the basis of the tendency of the waves, forecast of the expected high intensity earthquake can be done. In a country like China, on the basis of the movement and sound created by the reptiles, big animals and birds, forecast of the earthquake is being done but such forecast is not fully accepted.
2. **Construction of the Building:** Looking at the destruction caused by the earthquake, before granting permission for the construction of the building it is essential to check these facts whether these buildings are built on earthquake resistant techniques. In fact, in earthquake affected areas special economic package is also required for the construction of the buildings based on earthquake resistant techniques.
3. **Safety of the Life and Property:** Any earthquake directly affects life and property. Therefore, special protection force is required for the safety of the life and property.
4. **Administrative Work:** To minimise the destruction caused by the earthquake administrative alertness is very essential. For example, on the basis of pre vibrations if there are chances of earthquake then that area should be declared expected earthquake area immediately. For this, it is essential that modern media, police and district administration should become more active. Though the central and the state government have constituted disaster management committees, but it is essential that their participation should be made more active.
5. **Support of Non-Government Organisations :** In any type of disaster management including earthquake self help institutions, schools and common public can play an important role. Self help

institutions can not only help immediately but before earthquake it can train people in the construction of earthquake resistant houses and in immediate safety measures during the occurrence of the earthquake. For pulling out people buried under the debris, they can adopt normal measures with modern techniques with the help of government machinery and take out those people buried under debris who are still breathing and alive. In country like Norway dogs have been trained for this purpose. In Japan through small size video camera signals of live people is received and preventive work is done. Also the non - government organisations can train people that at the time of earthquake instead of running people should stand with the support of the wall because there they will be least affected by the falling debris.

The students should also be trained about the safety measures to be adopted at the time of earthquake. It should be permanently imprinted on their mind that in the event of disasters like earthquake they should forget the cast, creed and religious divide and come forward to help each other. It is necessary for the common people that they come forward for the management of the relief camps and do not allow cast and gender divide happen. In this Panchayats can play an important role. Because there are more chances of physical damage to the victims in the earthquake affected areas, so without waiting for the arrival of the administration, the nearby hospital or nursing home should be informed through telephone immediately and arrangement of treatment should be made. If someone is having car, tractor or other vehicle in the village then they should take seriously injured people to the hospital. In fact in the event of disaster like earthquake community can perform immediate management work, in real sense.

In the event of death due to accident then his last rites should be performed as per the rules of the religion. D.D.T. and other chemicals should be sprinkled to check the spread of any epidemic.

Preventive Measures from Tsunami:

The destructive effect of Tsunami is seen on the coastal regions. The currents rise up to several meters and strike the coast with such an impact that they destroy fishing boats, motor boats and settlements situated along the coast. Not only this, the Tsunami does not give time to tourists sitting on the sea beaches to escape. It even uproots the coconut trees along the coastal areas. The management of this disaster is very essential. Like earthquake waves, pre and post vibrations occur also in Tsunami and so its forecast is possible. For this, a station/platform needs to be made in mid sea which after analysing the horizontal movement beneath the surface of the sea water can send signal to the coast. Thus the people can be moved to safer places and fishermen on the coast could be warned of not going to coast and they can go to mid sea. Fishermen in the mid of the deep sea remain safe because there horizontally moving currents in absence of any hindrance cause no destruction. Right forecast can save people from Tsunami.

Construction of Embankments and Development of Mangrove Bushes:

To minimise the destructive effect of Tsunami, construction of concrete embankments is essential because the Tsunami waves striking the coast will have limited effect on coastal plains. Also along the coast vegetation like Mangrove should be planted because it minimises the impact of the Tsunami waves so that there is less pressure on the embankments. On the coastal wetlands, only dense Mangroves can be useful.

Training of People Living in Coastal Regions:

Arrangement should be made to train people living in coastal areas to prevent themselves from Tsunami by state government and non-government organisations. As soon as the Tsunami signal is received preparations should be made to run either towards sea or towards land; as soon as the Tsunami waves subside they must

participate in relief operations collectively, Apart from providing medical facility to the injured, clean drinking water and food must be arranged for the injured people, help of common people should be taken to check loot by the anti social elements is very essential. For the resettlement of the settlements such building designs should be adopted for the construction of the houses that there is least impact of the Tsunami water.

Support of local people, self help groups and participation of administrative institutions can only provide relief from the disasters like earthquake and Tsunami.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. By which name the vibration that occurs on the sea floor is known?
(a) Earthquake (b) Cyclone
(b) Tsunami (d) None of these
2. In which part of the world did disastrous Tsunami struck on 24th December, 2004?
(a) West Asia (b) Pacific Ocean
(c) Atlantic Ocean (d) Bay of Bengal
3. What is the name given to the earthquake wave that reaches the surface of the earth first?
(a) P - Waves (b) S - Waves
(c) L - Waves (d) T - Waves
4. What do we call the origin point of the earthquake situated on the surface of the earth?
(a) Focus (b) Epicenter
(b) Pre center (d) None of these

5. Which of the following is not a correct measure of rescue from earthquake or Tsunami?
- (a) To take the forecast of the earthquake seriously.
 - (b) To construct earthquake resistant buildings
 - (c) The non-government organisations to remain vigilant for relief work
 - (d) To sit idle depending on god.

SHORT ANSWER TYPE QUESTIONS:

- 1. Differentiate between Focus and Epicenter of the earthquake.
- 2. What do you understand by earthquake waves? Write the names of important earthquake waves.
- 3. Differentiate between earthquake and Tsunami.
- 4. Suggest any three preventive measures to be adopted to escape from the effect of Tsunami?

LONG ANSWER TYPE QUESTIONS:

- 1. What is earthquake? Divide India into major earthquake zones and describe each one of them briefly.
- 2. What do you understand by Tsunami? Describe preventive measures to be adopted to escape from the effect of Tsunami.
- 3. Describe the measures to be adopted to escape from the disastrous effect of earthquake and Tsunami.



Section-4

LIFE SAVING EMERGENCY MANAGEMENT

Disaster management should be implemented in two phases, They are (i) Emergency management (ii) Long Term Management. At the time of disaster, it is life saving management whereas the main objective of long term management is to minimise the effect of expected disaster. The emergency management is the yard stick of success for administration. Its main objective is to give relief to the affected people immediately after the disaster has struck. In the emergency management of different types of natural disasters, there are different types of priorities.

(1) Emergency Management in Flood Situation :

Immediately after the arrival of floods animals, life and property find themselves in deep crisis. Therefore, the first priority is not to check floods but to save people from the floods. Only that management is appreciated which rescues people by boats or through swimmers who pulls the flood victims out of the flood water with the support of rubber tubes and drag them to safer place. After that animals and household goods are pulled out. This safe place could be higher land on embankments outside the village, roofs of the higher houses of the village or any other public constructed flood free area.

After arriving at the safer place, it is essential to make arrangements of food and drinking water. Arrangement of milk for the children, hot water as safety measure to prevent epidemics, hot food and creation of conducive atmosphere to live together in a small place is a part of emergency management. Arrangement of fodder for the animals is equally important. So is safety from snakes and scorpions who also come out in the higher open places. If the flood water remains stagnant for several days then there are chances of spread of epidemics.

Only that emergency management succeeds which remains prepared to counter above mentioned problems before the arrival of the disaster such as food materials, fodder, life saving medicines related to epidemics, materials for sprinkling, etc. The arrangement of all these materials before the arrival of the disaster makes the emergency management successful.

(1) Emergency Management in the event of Earthquake and Tsunami :

In the event of earthquake, the emergency management has to perform three major works (A) To take the surviving flood victims to the relief camps or make available all the essential facilities. (B) To pull out those people who are still buried under the debris. (C) To perform last rites of dead persons as per the belief of their religion and immediately bury dead animals. If this is not done then there are chances of spread of epidemics.

Do You Know?

Tsunami brings great disaster to the people living in the coastal areas. There are chances that people may drown, they could be engulfed by sea water and even get injured by the impact of the sea water that rises up to several meters. Therefore, the first priority should be to administer first aid to the injured and then they should be taken to the hospital. Also the traceless people should be searched with the help of Helicopter and Radar. Power operated sea boats should be pressed in to service after Tsunami. Also, identification of the dead and then consoling of the related family with all types of help along with counseling is also essential. If the trained self help person remains with these families then they can come out of the mental strain/disaster. Also to search the traceless persons, support of not only power operated boats but also of Radar, Helicopter and Satellites can be taken. In such works Navy support is also essential.

If the people buried under the debris are alive then they should be taken out immediately. Initially the sniffer dogs let us know about the alive persons under the debris. But at present we come to know about the people buried under the debris with the help of infra red camera and sound sensor equipments (Bio Radar). For this type of emergency management, it is very essential that the arrangement of such equipments should be made in village panchayats beforehand.



Physical examination of injured person To improve the condition of injured person

(3) In the event of Fire : In the dry summers destruction of village after village by the fire is a form of disaster. In such disasters the emergency management has three big responsibilities:

(A) To bring out people to safety caught in fire,

(B) To administer first aid to the injured people and then take them to hospital. In the first aid putting cold water, rubbing ice and use of primary medicine such as Burnol on the wound gives relief to the fire victim from burning.

(C) To check the spread of fire use locally available sand, soil, and if pond is there then use of pond water, informing the fire brigade and if it is huts then uprooting the front huts so that the other huts may not be affected by fire. If the cause of fire is electric short -circuit, then the electricity line must be disconnected first. After this, above mentioned emergency management should be followed.

If somebody is stranded on the roof top at the time of fire then effort should be made to rescue him by putting ladder from outside. If that is not possible then he should be taken out by making him to wear helmet or fire resistant jacket.

First Aid Equipments and Treatment for Relief Personnel:

In the event of different types of disasters the primary management work can also be done by village or people from same locality. Therefore, it is essential for village Panchayats to form disaster management committee in every village. Self-help institutions should give them necessary training. Also, it is essential for state governments to make available some essential equipments and first aid materials to these committees. The essential equipments can be classified into two categories (A) Personal equipments for relief personnel (B) Equipments for relief team.

Personal equipment for relief personnel <ul style="list-style-type: none"> ☐ Helmet ☐ Life Jacket ☐ Torch ☐ Gum – Boot ☐ Whistle 	Equipment for relief team <ul style="list-style-type: none"> ☐ Ladder ☐ Rope ☐ Pulley ☐ First-Aid Box ☐ Hammer ☐ Stretcher 	Equipment for first-aid <ul style="list-style-type: none"> ☐ Soap ☐ Cotton ☐ Insecticides ☐ Thermometer ☐ Scissors ☐ Gloves ☐ O.R.S. Packet ☐ Antacid ☐ Bandage ☐ Antiseptic ☐ Crape bandage ☐ Adhesive tape
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Factors Affecting Emergency Management:

There are three main factors of emergency Management:-

- (1) Local Administration
- (2) Self Help Institution
- (3) Residents of village or Mohalla

In the front row of the management can be people living in village and mohalla. For this youth need to be trained in such a way that they become mentally tough and technically proficient. This work can be done by self help institutions. In fact it is necessary for the self help institutions that they not only motivate and train youth but also show people films or videos of brave deeds which impresses people and develop mental toughness to fight disasters.

It is essential to consider disaster management as a part of daily routine. It is essential to maintain cohesion between self-help institutions, village youth and panchayat management, only then

the emergency management can be successful. In such management there is no importance of caste, religion and gender. It is essential to spread the message to combat disaster collectively. Such type of message should also be spread amongst students of the school. This work can be done by self help institutions.

In the emergency management, the local administration has an important role to play. For this it is essential that they construct relief camps and make available all equipments and first-aid materials, must remain active in arranging Ambulance, Doctor and fire brigade etc. Without involving themselves in unnecessary paper work, by making available the relief fund and materials to the disaster victims the disaster management can be made easy and convenient.

QUESTIONS

OBJECTIVE TYPE QUESTIONS:

1. To which place one should go at the time of floods?
(a) At higher place (b) Outside Village
(c) Remain at the same place (d) In agricultural fields
2. Which instrument is used to locate persons buried under debris?
(a) Binoculars (b) Infra red camera
(c) Helicopter (d) Telescope
3. In burnt cases which first-aid should be given on burnt wounds?
(a) Putting cold water (b) Putting hot water
(b) Take patient to hospital (d) None of these
4. What should be done in the event of fire in locality/house?
(a) Call Fire Brigade (b) Close Doors-Windows
(c) Wait till the fire douses off (d) None of these
5. In which part does the Tsunami occur?
(a) Land (b) Sea
(c) Sky (d) None of the above

SHORT ANSWER TYPE QUESTIONS:

1. What do you understand by life saving emergency management?
2. Describe briefly the emergency management measures to be adopted in the event of flood.

3. Discuss briefly the emergency management to be adopted in the event of earthquake and Tsunami.
4. Describe the role of local administration in emergency management.
5. Which management should be adopted in the case of fire. describe:

LONG ANSWER TYPE QUESTIONS:

1. What do you understand by life-saving emergency management?
2. Describe in detail the role of local administration and self-help institutions in emergency management.



Section-5

ALTERNATIVE COMMUNICATION SYSTEM DURING DISASTER

Disaster whether small or big occurs regularly on the earth. You must be getting information through different means of communication about the disasters that occur daily. We are also affected by destructive disasters such as flood, drought, earthquake, Tsunami, cyclone, landslide, avalanche, cold wave in one form or the other. Particularly country like India has to encounter such disasters on a regular basis. Flood and droughts are typical characteristic of Indian

Do You Know?

The cyclone affected areas in India are eastern coast, coastal areas of Gujarat and Andaman Nicobar islands.

The large river valleys in India such as Ganga and Brahmaputra are most affected by floods. 56 percent area in India is affected by earthquake.

In 16 percent area of 16 states in India remains in the spate of droughts.

Himalayan region and western Ghats are more prone to landslide in India. Avalanche occurs in Himalayan areas.

Monsoon because of its uncertainty. When destructive and intense disaster occurs anywhere in the world, then it disrupts the normal communication system of the affected area. Due to this reason the contact between the affected area and the rest of the world gets disconnected. Due to disruption of communication system, hindrance is caused in the exchange of information and in relief and rescue operations. In this condition the form of the disasters becomes more destructive.

Following are the reasons of disruption of normal communication system:

- (i) Breakage in cable.

- (ii) Disruption in electricity supply.
- (iii) With the destruction of communication buildings, the communication instruments in it also get destroyed.
- (iv) Damage caused to transmission tower.

Similar type of incident had occurred on 2nd August, 2008 when in Nepal near kusha the kosi embankment got damaged which caused

disastrous floods in kosi region of the north Bihar. Due to this flood there was wide spread destruction in the affected areas. Because the telephone exchange got inundated, the wires got damaged, road and railway link was disrupted and due to this the communication between several district headquarters with state headquarters and between the districts was broken. This

is the reason why the immediate relief and rescue was affected.

Even today, we cannot imagine having a normal life in absence of telecommunication system. At the time of disaster there is utmost need of telecommunication system but at that time all normal means of communication get disrupted which makes the situation in the affected areas even worse. In such conditions, we can establish contact with the affected areas only through the means of alternative communication system.

The most popular means of communication is public telephone service, which is an important network that connects all government and private offices, police stations, fire brigade stations, hospitals, most of the houses and working places, Public Switched Telephone Network (PSTN) sound, Fax and Data is sent and received through this major network. Presently, the use of mobile phones has increased immensely.

Do You Know?

- (i) After the Kosi embankment was damaged near Kusha all means of communication was virtually lost.
- (ii) This disaster affected 16 districts, 92 blocks and 1598 villages.
- (iii) Almost 27 lakh people were rendered homeless.
- (iv) Standing crops on 1.06 lakh hectares of land was damaged.

Unfortunately, during the devastating natural disasters like earthquake, cyclone, flood, Tsunami and landslides the basic structure of all the popular communication services gets disrupted and telephones stops to work in the disaster struck areas, mainly due to power failure. As the transmission towers also get damaged the

wireless radio communication network of police and civil administration are also affected. In critical conditions the communication network gets over burdened which disrupts the communication link or in most of the cases the network totally fails.

Do You Know?

Normally, PSTN system working with its full capacity is prepared. In which only 5 percent telephones connected to this system can communicate at a time but in critical situations this system is also over burdened and so this network also gets disrupted.



Alternative Means of Communication

(i) Radio Communication:

Radio waves are electromagnetic, which are sent from one place to another through Antenna. The radio waves can be of low, high and extremely high frequency. Radio receiver can be kept on any particular frequency and we can receive particular signal such as high frequency waves required for making contact with distant places and very high frequency waves used for making contact with short distant places (5 to 50 kilometers). Extremely high frequency band is used for hand wireless. The use of wireless instruments like walkie-talkie proves very useful at this time.

(ii) Amateur or HAM Radio:

Amateur radio is also called HAM radio. It does not require any basic infrastructure. In fact in HAM radio certain particular type of frequencies are used in accordance to International Tele communication regulations which is controlled by wireless project and

co-ordination cell under ministry of communication in India. According to set rules these frequencies can only be used for research, education and personal projects.

The meaning of amateur is the use of radio communication for non- commercial motives. For its operation, limited energy is required which can easily be supplied either through generator or batteries.

There are almost 15,000 license holder amateur radio operators in our country. Slowly its use

is increasing in India. It is said that it is developing in the form of hub of communication system in India. A micro wave satellite has been prepared by Indian Space Research Organisation (ISRO).

Amateur or HAM radio has worked successfully when all means of communication had failed during the disaster period. Therefore, it is considered most effective means of communication amongst all the alternative means of communication system. During 1999 super cyclone in Odisha and during Gujarat earthquake, the amateur self-help persons have given appreciable services.



Fig 5.1

Contribution of HAM operator at the time of Tsunami :



An enthusiastic amateur radio lover from Delhi achieved that success which most of the government agencies had failed.

License holder HAM operator, Sandeep Barua who works with some government organisation and enjoys his hobby in his home at night, succeeded in contacting Port Blair the capital of Andaman and Nicobar Islands and helped stranded people on the island to exchange messages with their family members on the mainland.

(I) **Satellite communication :**

There are different types of satellites which have been launched in the space for different purposes. Amongst them communication satellites and remote sensing satellites are important. In India for television telecast, meteorology and disaster related warnings Indian National Satellites (INSAT) and for the search and management of resources Indian Remote Sensing Satellite (I.R.S.) are being used.

The communication satellites launched in the space are (Com sets, Set coms, Set phones) relay radio stations. Among them 'set com' is used for satellite based communication and 'set phone' is used as satellite based phone terminal. The most important work of communication satellite is Mobile phone and e communication. 'Transponder' receives communication on a particular frequency and spreads it. With the help of other frequencies it sends it back on the earth. There are thousands of 'transponders' in a satellite. These transponders receive data, television image and some transmissions and re-telecast them.

In this system radio relay station and communication satellites are stationed in the space and it receives no damage from the any natural disaster happening on the earth, therefore this system is most reliable during disaster period.

The most used means of communication in disaster management is 'satellite phone'. This phone is very reliable and provides facility of data communication in a very clear voice. The government of India is supplying portable satellite phones to different states/districts and disaster affected areas to tackle critical disaster situations.

QUESTIONS

OBJECTIVE TYPE QUESTIONS

1. The main cause for the disruption of normal communication system is
 (a) Broken cable
 (b) Distance of communication towers
 (c) Less height of Towers
 (d) None of these
2. The most popular means of communication is:
 (a) Public telephone
 (b) Mobile
 (c) Walkie-talkie
 (d) Radio
3. For which purpose are remote satellites being used?
 (a) For telecommunication
 (b) For meteorology
 (c) To search the resources
 (d) For television

SHORT ANSWER TYPE QUESTIONS:

1. Write the main causes for the disruption of normal communication system.
2. Discuss one alternative means of communication used during the natural disaster.

LONG ANSWER TYPE QUESTIONS:

1. Describe the alternative means of communications during natural disaster?
2. Write notes on the following:
 (i) HAM Radio
 (ii) Satellite communication

ACTIVITY:

Make a public utility project on alternative telecommunication system used in natural disasters.

Section-6

DISASTER AND CO - EXISTENCE

By now you must have understood that occurrence of natural disasters such as flood, drought, cyclone, earthquake, volcanic eruption, Tsunami, landslide, avalanche is natural and it cannot be stopped. But we must always remain prepared to encounter it and we must make preparations prior to the arrival of the disaster so that damage could be minimised and maximum people and their property could be saved. We must never neglect it considering that it is a natural curse and it is not possible for mankind to encounter it.

Earthquake:

Earthquake is an ominous and destructive natural disaster. The earthquake causes so much destruction in seconds which cannot even be imagined. There are known expected earthquake zones on the earth. But the forecast of earthquake cannot be made. Therefore, we must remain vigilant in expected earthquake areas and in these areas such management should be done so that the damage is minimum. In our country

On 26th January, 2001 an earthquake of the intensity of 6.9 occurred in Bhuj. According to the state government report more than 1300 people lost their lives and 1.67 lakh people were injured and it affected about 1.97 crore people living in 21 districts. Almost 3.20 lakh pucca and kuchcha houses and 14, 000 huts were totally destroyed. Almost 7.33 lakh pucca and kuchcha house and 31, 000 huts were partially damaged.

earthquake causes maximum loss because we do not remain prepared prior to its arrival. We can minimise the damage caused by the natural disasters, if we work in a planned manner on all the points related to co existence and evaluate some of the countries such as America and Japan where earthquake is a regular phenomenon. In spite of this in these countries earthquake is considered merely as short lived disaster, because the houses here are earthquake resistant and people know how to keep themselves protected.

For the natural disasters like earthquake, safe residential or public buildings are of significance. In other words, we can minimise excess damage by constructing safe houses. For this, we should concentrate on the following points:

- The house should be rectangular and its map should be simple.
- To support long wall columns of bricks-stone or concrete should be erected.
- Effort should be made to construct houses in T, L, U and X shapes dividing them in to small rectangles and some space should be left in between the rectangles.
- The foundation of the house should be strong and earthquake resistant.
- Before the start of the construction work scientific test of the soil should be done and after that foundation and construction work should be started.
- The location of the doors and windows should be earthquake resistant.
- The weight created by iron concrete sand and the design of the building should be proportionate and from the technical point of view safe structure should be constructed.
- The streets and roads should be broad and there should be sufficient space between the two buildings.

Landslides :

There are five types of landslides (i) Slump with flow (ii) Debris slide (iii) Debris fall (iv) Rock slide and (v) Rock fall. Due to all these landslides everything gets damaged that falls in their way and heavy damage is inflicted to human beings, animals and vegetation. As a result of which means of communication and transport is affected. For this natural disaster, particular attention must be given on the following facts so that its frequency may be reduced.

- Suitable foundation should be laid as per the nature of the soil.
- Houses should not be constructed on the slopes.
- Proper arrangement of normal and alternative communication system should be made.
- Suitable plant species should be intensively planted on the slopes which are situated at higher reaches and are devoid of any vegetation.
- While constructing roads, canals and in the process of irrigation, it must be ensured that drainage of natural water should not be clogged.
- To prevent landslide, walls should be constructed.
- To keep the landslide under control, a plain level water drainage control centre should be made with the arrival of rain water and waterfall.
- The pipe line and cables etc which are to be laid beneath the surface should be flexible so that they can withstand the pressure generated due to landslide.
- Straw, wood chips or bark should be used at least up to the depth of one inch in such areas where slope is gentle or normal.

Apart from this, owner of the houses which are built at the base of the steep slope should construct obstructions or catchment areas which may check minor landslides. The design of the construction should be such that in the event of landslide it can withstand the effect and speed of the huge amount of sliding debris. Also the design should be such that the deposited debris should be removed easily. The obstructions, towards the slope side of the buildings strong walls should be constructed.

Tsunami :

After 26th December, 2004 you must have understood properly how destructive natural disaster like Tsunami is. It had brought huge destruction in many countries of the South-East Asia in seconds. Tsunami causes great damage to life and property. Also it turns the agricultural fields of the coastal areas in to a barren land. It also creates several health related problems. It inflicts heavy damage to ports and coastal towns.

Tsunami can neither be stopped nor we can escape from its effect but its impact can be minimised for which following measures can be adopted:-

1. People must be encouraged to settle away from the coast in those areas which are regularly affected by Tsunami waves.
2. The intensity of Tsunami waves can be reduced by intensive plantation of trees in the coastal areas.
3. Concrete obstructions should be constructed to save towns and ports.
4. In Tsunami affected areas houses of such design should be constructed which can minimise earthquake and Tsunami waves.
5. The harbours, can be secured by constructing high Dams.

6. In Tsunami prone coastal areas the houses should be constructed at higher places and at least hundred meters away from the coast.
7. "Tsunami Recording Centers" should be established to record the vibrations in the surface of the sea through 'Sunameter'.
8. Tsunami warnings should be received regularly through satellite technology and through different means of communication it must immediately be broadcast to common people.

Floods :

Flood is a destructive natural disaster but we can save ourselves from its destruction. Most of the flood prone areas are known and even the season of the flood is also known. These days we get information of coming disaster few days earlier. To get relief from it and minimise risks involved in it, at first we must prepare a map of flood affected areas and control the land use pattern of these areas. Before granting permission for any large scale development work flood control measures must be ensured. In cities ponds, lakes or in low lying areas water retaining areas are constructed. Building construction work should not be undertaken in water logged areas. For residential areas, safe higher places should be selected and buildings should be constructed on concrete pillars. Also, it will better if sand bags are kept adjacent to foundation all around the house.

By developing forests in flood affected areas, the intensity of the floods can be minimised and soil erosion can be checked. Also these forest areas become an excellent grazing ground for the animals and can be highly helpful in the protection of bio-diversity. The flood prone areas can be protected to a greater extent by constructing embankments on the both banks of the rivers. Also, there should be network of drains in these areas so that water may be flushed out immediately and it can be used for irrigation purposes also.

In the mountainous regions the water can be released in a controlled manner by constructing Dams on rivers and by creating back water reservoirs, and silt deposition can be cleaned and flood problems can be solved.

By constructing the network of canals in the flood affected areas not only the devastation of floods can be reduced but it can be used for the irrigational purposes also.

Ring Band is also helpful in protection from the floods. This solution of the problem is possible through rectification in river channels and construction of alternative course for the river.

Crops are badly damaged in floods. Blooming agricultural fields and at times ripe crops get inundated and are damaged. Therefore crops of such varieties or plants of such species should be developed which can grow even in water logged areas. For example, in some districts of north Bihar the farmers grow a type of paddy crop which can grow even in water logged areas and farmers harvest the crop from the boats.

In flood affected areas food grain bank should also be developed at few places. This can help in controlling famine like situation.

In 1954 the government of India had formulated a three dimensional strategy to control floods, such as Immediate, short term and long term measures. Through this priorities are fixed to solve the problem and its implementation becomes convenient.

Drought :

Droughts do not occur suddenly. It comes with a signal but period of its end is not known. Droughts are of three types : (i) Normal drought (ii) Agricultural drought (iii) Seasonal drought. Agriculture drought is considered as most dangerous amongst them. The devastation of natural disaster like drought can be minimised by adopting different

methods. For example, through scientific development and management of water resources the water problem can be solved because during drought. Due to scarcity of water during drought not only moisture from the soil is exhausted but also it becomes very difficult to save the life of all living beings. The plan to develop water divide becomes highly helpful in such situations.

Water Divide Areas :

The water divide areas are such elevated areas that separate the headstreams which are tributary to different river systems or basins. To minimise the wrath of drought all measures of soil and water conservation is adopted with the support of local community. By adopting this policy huge support is received in the effective management of soil, trees, plants, water and other resources. Inside these water divide areas for the conservation of these rare water sources and by improving the management of soil and trees and plants, along with the conservation of natural resources favorable agriculture conditions can be created.

For the conservation of available moisture in the soil and save them from direct sun grass cover should kept on the land. It is due to the absence of moisture in the soil agriculture drought occurs. Clouds are also attracted by planting trees in the catchment areas of the rivers and make the climate normal to some extent.

There are few crops which do not require much water or the crops grow by consuming very less water. These crops can be sown in drought prone or in those areas where the frequency of droughts are more such as mushrooms, medicinal plants, cactus, millets etc.

By developing irrigation facility we can save ourselves from drought. In our country, in states like Punjab, Haryana and Rajasthan, due to adequate irrigation facilities, in spite of being a semi - arid region they have become 'Granary of the country'.

To minimise the effect of drought dairy industries should be developed in the form of alternative economy. In the agriculture dominated areas, in the event of drought, either the farmers fail to sow the crops or the standing crops are damaged. As a result people are left with no alternative to earn their living. The development of grazing ground is a possible measure in this situation because it can provide opportunity to develop dairy industry as an important alternative.

Failure of agriculture can be supplemented by establishing agro based industries in the drought prone areas and by doing so the prosperity of the area can be maintained.

It is profitable to adopt dry agriculture methods in those areas where the drought occurs regularly.

Following are the procedures of dry agriculture method:-

- (i) The fields should be ploughed deeply so that the moist soil beneath the surface may come up.
- (ii) Such crops should be sown which can withstand longer dry spell.
- (iii) Drip and sprinkle irrigation method should be adopted in place of traditional irrigation method.
- (iv) Such seeds should be used which take lesser time in the production of the crop.
- (v) Maximum use of rain water must be done when the rain occurs.
- (vi) Construction of small Dams, reservoirs and canals with concrete base which restricts loss of water.
- (vii) The Dams should be constructed at right angle of the slope and fields should be made in stair form, so that maximum use of water could be made.

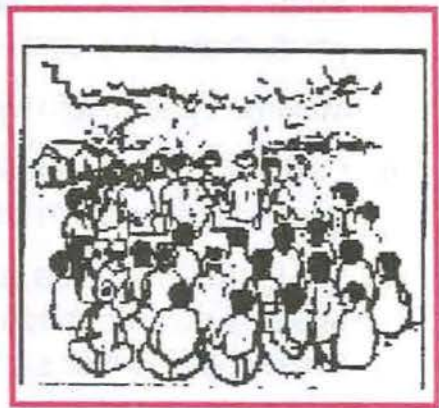
It is a fact that we cannot stop the occurrence of natural disasters. We can only remain vigilant and by performing works related to co-existence we can, at the most, save ourselves from its devastation. Earlier also, you have learnt about the techniques related to disasters. Apart from this, some facts are commonly useful for natural disasters, such as sensitising and educating common people about the devastations brought by the disasters, give them first hand knowledge about different natural disasters and join disaster management education with the main stream. For this it is necessary to give practical shape to the pre-planned strategies. It is seen on national and international level that where there is no pre-planned strategy or the planning is inadequate there the damage is more due to disaster.

Activity

Organise a meeting in your Mohalla or village along with your teacher and educate the common people how to face natural disasters in a united manner. It will minimise the devastation and damage.

In this context disaster mapping is an important step. For map making to collect information available on the surface of the earth, remote sensing and Geographical Information system can be helpful.

The success of co-existence depends upon co-operation amongst each other, non-government organisation, semi-government organisations such as National Service Scheme, Home Guard, Nehru Yuva



Villagers making disaster management plan

Kendra, National Cadet Corps and support of central and state governments. With the support of these organisations, the panchayats and villagers can themselves plan strategies for co-existence.



NCC cadets helping people in local hospital

The social workers of National Cadet Corps (NCC) and National Service Scheme (NSS) can save life of disaster affected people in emergency situations.

Therefore, it is the principles of co-existence which can teach the art of living with disasters and can create excitement as well.

QUESTIONS

OBJECTIVE TYPE QUESTIONS:

1. Which of the following is a natural disaster?
(a) Fire (b) Bomb Blast
(c) Earthquake (d) Chemical accidents
2. What should be the design of buildings in the earthquake prone areas?
(a) Oval (b) Triangular
(c) Square (d) Rectangular
3. Is it advisable to construct houses on slopes in landslide affected areas?
(a) Yes (b) No
(c) profitable (d) Useful
4. Where should houses be constructed in Tsunami affected areas?
(a) Near the coast
(b) Far from the coast
(c) Far from the coast on higher place
(d) None of these
5. Flood inflicts maximum damage to -
(a) Crops (b) Animals
(c) Buildings (d) All of the above
6. Agriculture drought occurs -
(a) Due to Scarcity of water
(b) Due to scarcity of moisture in the soil
(c) Due to soil erosion
(d) Due to salinity of soil

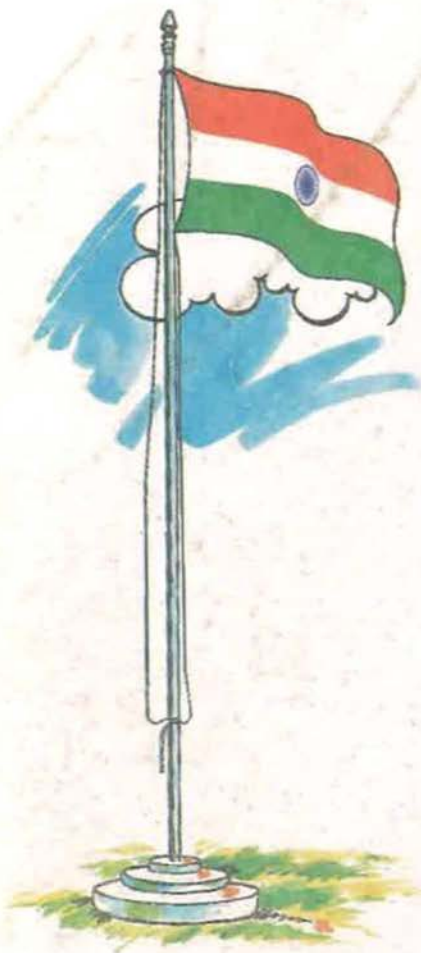
SHORT ANSWER TYPE QUESTIONS:

1. Suggest four measures to minimise the effect of earthquake.
2. Present your view on the construction of the house in Tsunami prone areas.
3. Suggest measures to maintain moisture of the soil during drought.

LONG ANSWER TYPE QUESTIONS:

1. Describe in detail how you will encounter natural disasters such as landslide or floods.





राष्ट्र-गान

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 भारत - भाग्य - विधाता।
 पंजाब सिंध गुजरात मराठा,
 द्राविड़ - उत्कल - बंग।
 विंध्य - हिमाचल - यमुना-गंगा,
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