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.

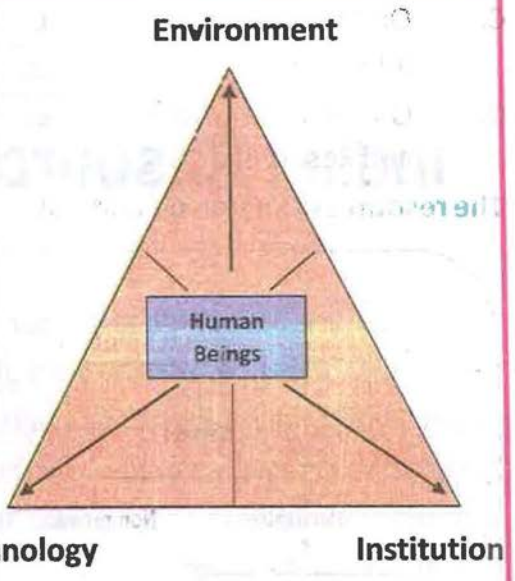


Fig. 1.1: Relationship of human beings with environment, technology and institutions.

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:

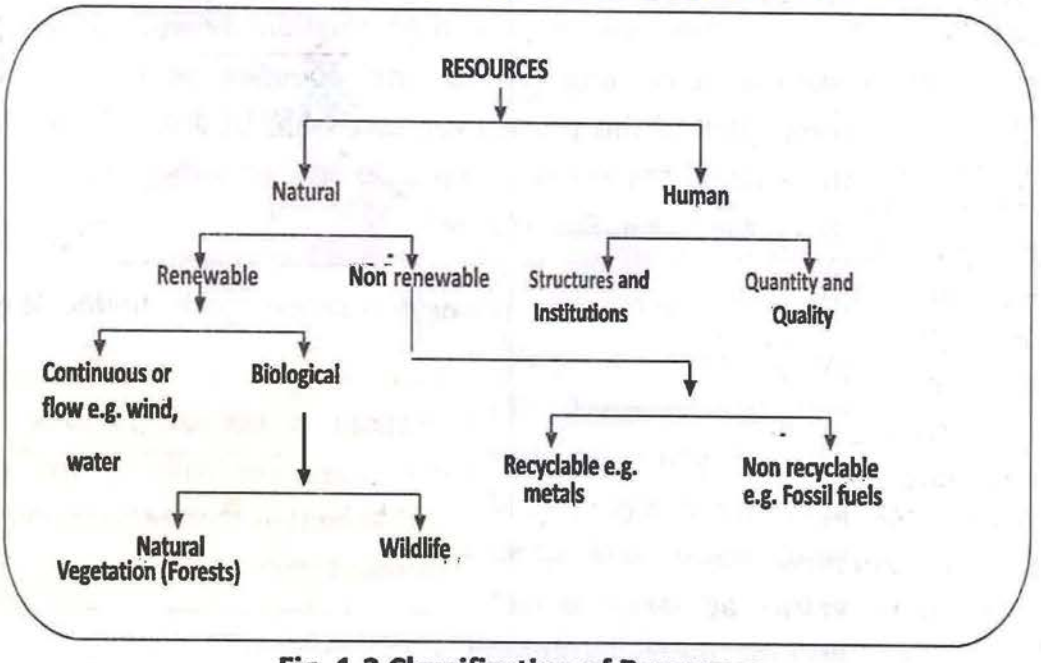


Fig. 1.2 Classification of Resources

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.

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

- **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.

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.

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

- 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.

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 Sundar 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, Gandhanian Philosophy was published. For the conservation of resources, the Brundtland Commission Report, 1987 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.

> **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.

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 'Word 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 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

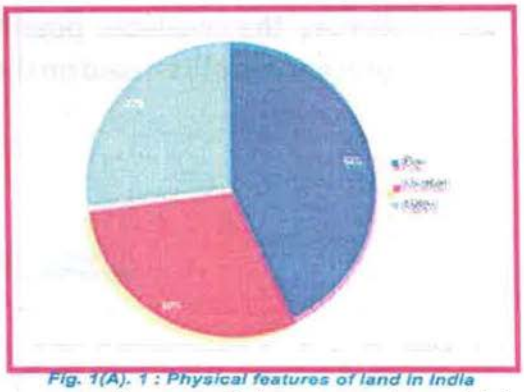


Fig. 1(A). 1 : Physical features of land in India

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:

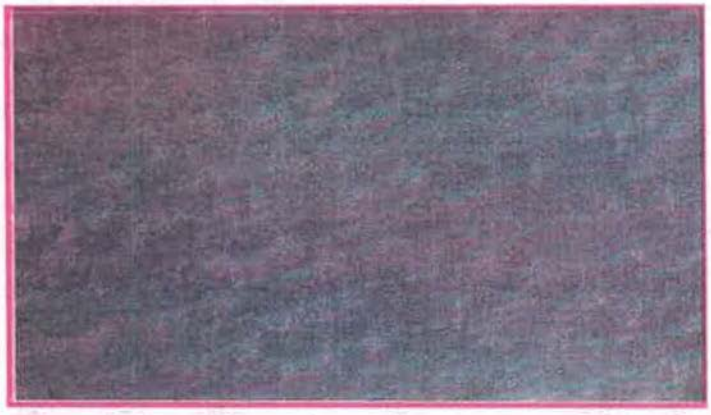


Fig. 1(A). 3 : Alluvial Soil

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 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 :

Fig. 1(A). 4 : 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 '.

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, Saurastra, Kucch, 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.

Fig.1 (A).6 : Arid Soil

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.

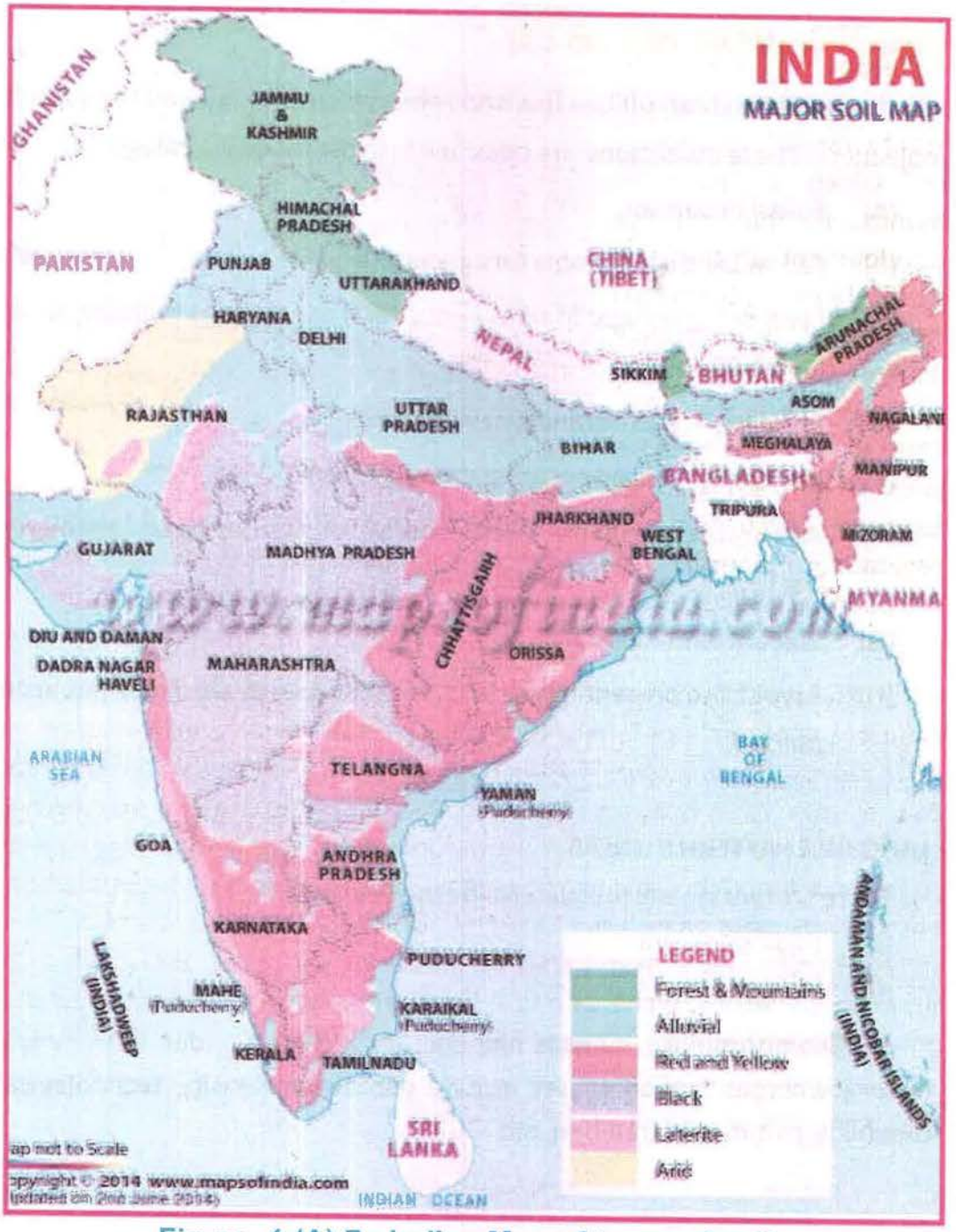


Fig no. 1 (A).7 : India : Map of types of soils

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.

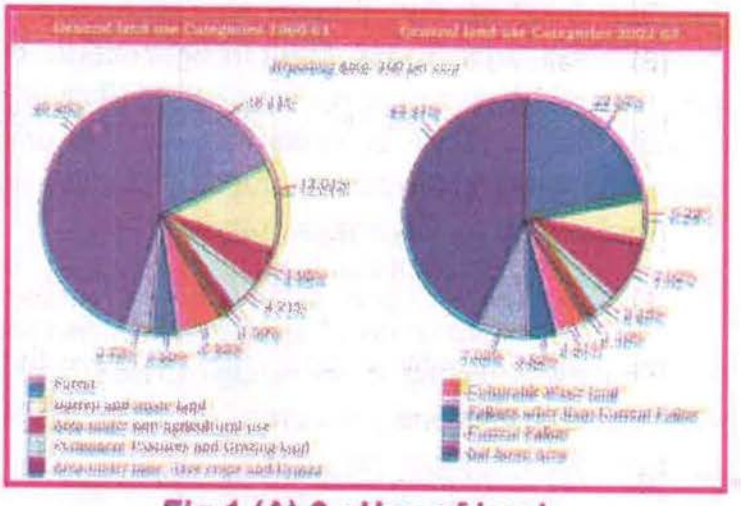


Fig.1 (A).8 : Use of land

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

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

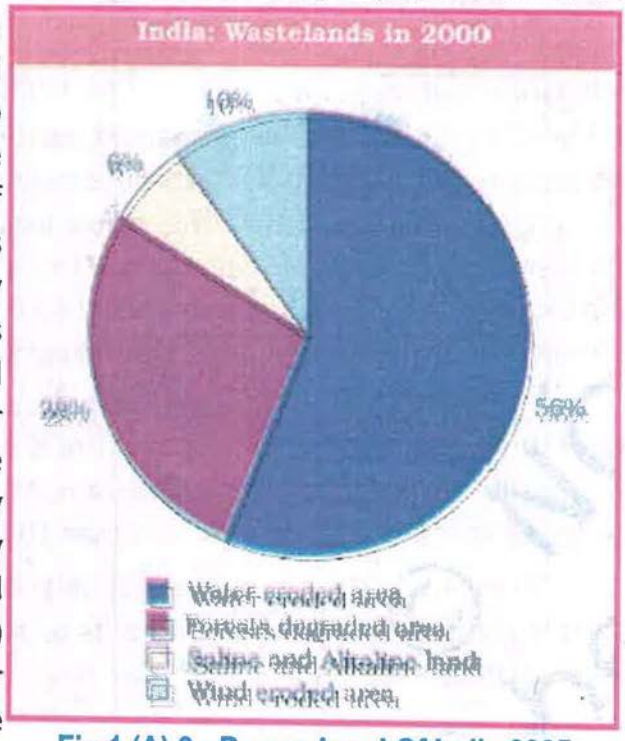


Fig.1 (A).9 : Barren Land Of India 2005

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. Odhisha 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
   (b) 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. Inspite 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. Oraganise 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-canals, 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 Brahamputra. 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.

Do you know?

Brahmaputra and Ganga are among the top 10 rivers of the world. These rivers are placed at eighth and tenth positions respectively among the large rivers of the world.

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	365.4	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:

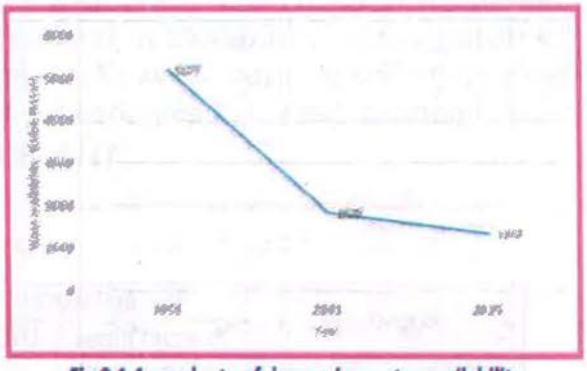


Fig.3.1 Annual rate of decreasing water availability

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 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 multi faceted 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 multi faceted 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.

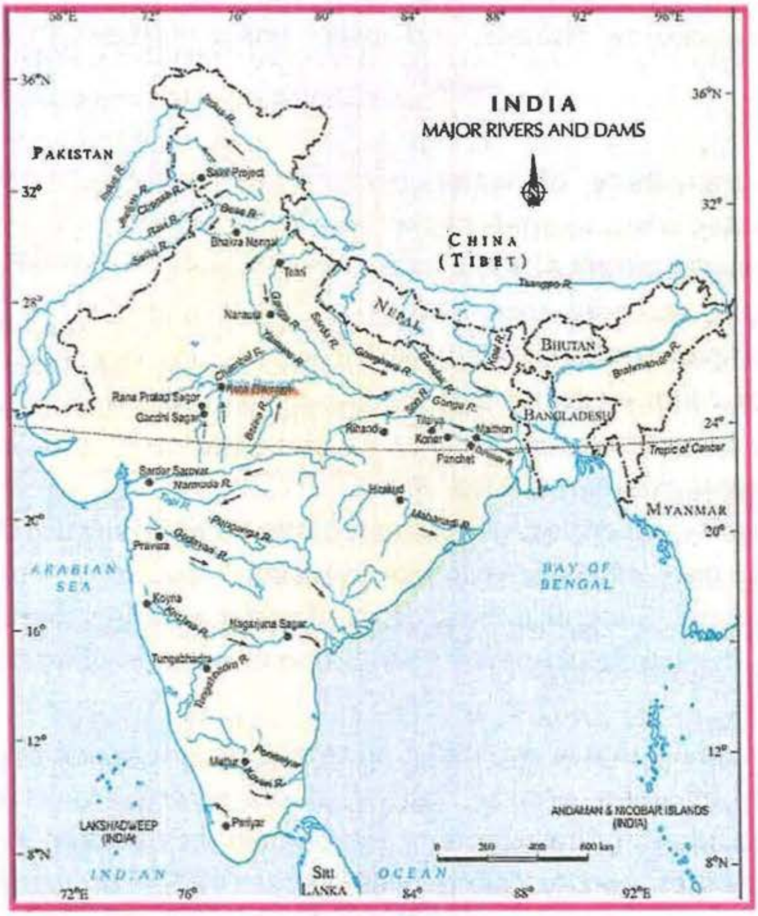


Fig. 1 (B) Major Rivers and Dams

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?

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.

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

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 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.

Do You Know?

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

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 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.

Do You Know?

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

NEED FOR CONSEVATION 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, 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 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.

Do You Know?
22 percent of the underground water is accumulated when rain water goes below the surface.

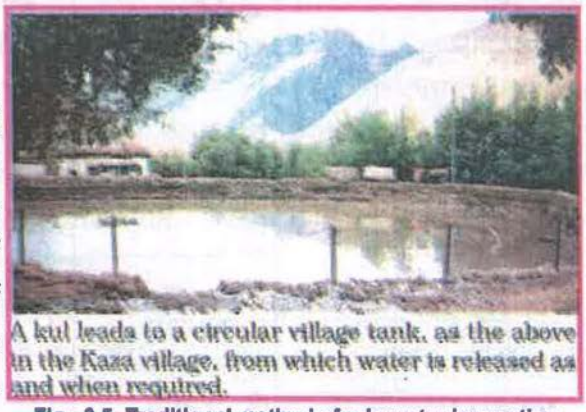
Do You Know?
Cherapunji and Mausinram situated in Meghalaya receive highest rainfall in the world. Here drinking water crisis is solved (25%) by rooftop rain water harvesting.

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



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

Fig.- 3.5- Traditional method of rain water harvesting

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 utlisation 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.

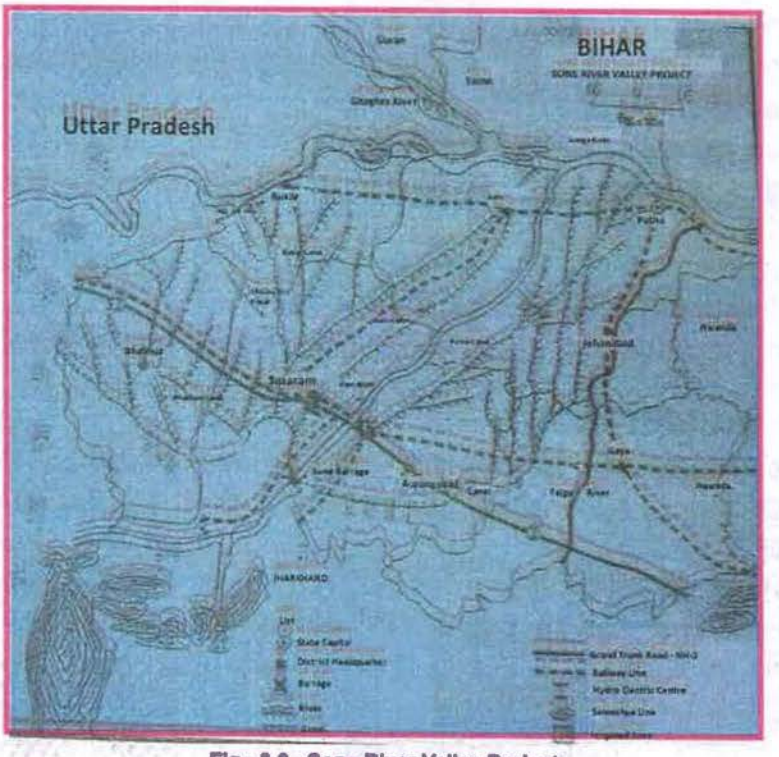


Fig.- 3.6 - Sone River Valley Project

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, Baghmati 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.

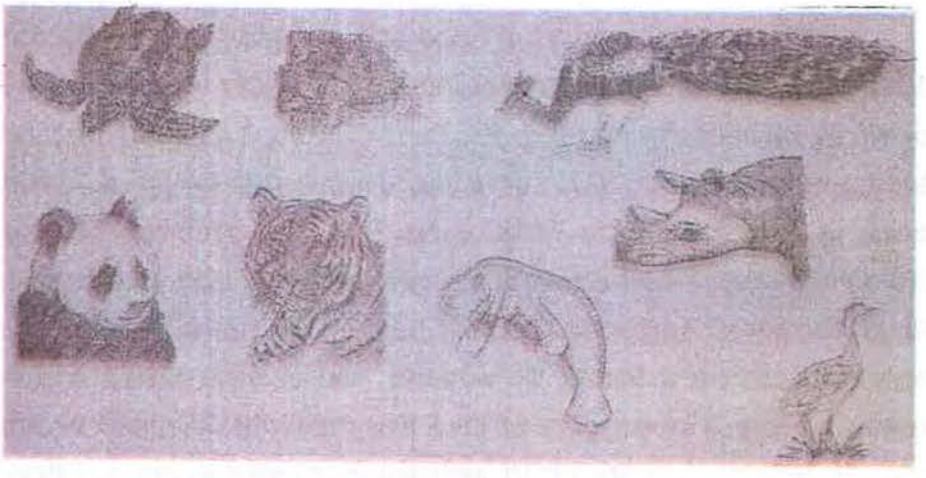
(C) FOREST AND WILDLIFE RESOURCES

"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 core 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 Nort-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 Uttrakhand. 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, Uttrakhand, 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 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.

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.

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 Chaurs, 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 Ashoak, 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 hvave 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

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 (Chikmanglur) 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 sanctuary (Aadilabad) Kinnarsani wildlife sanctuary Malapatti Bird Sanctuary (Nellore)
Kerala	Prmbikulam wildlife sanctuary (Palghat) Periyar National Park Vinayad wildlife sanctuary

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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) Dalma wildlife sanctuary
Tamil Nadu	Mudumalai wildlife sanctuary Annamalai Tiger sanctuary Gundi National Park (Chennai)
Maharashtra	Borivali National Park (Mumbai) Todoba 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.

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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 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.

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'.

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:

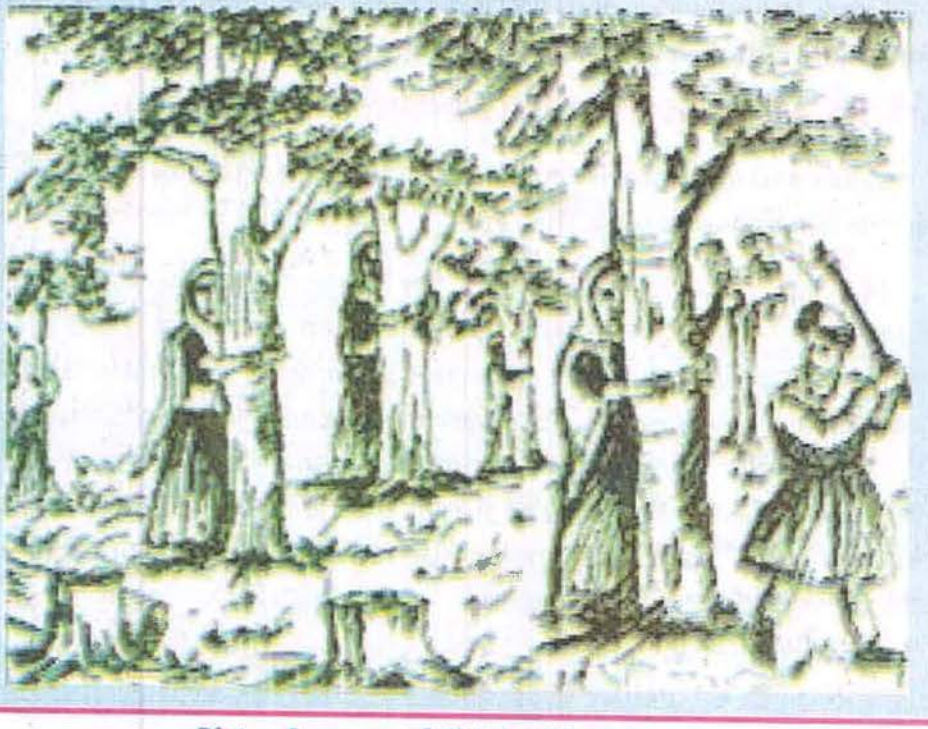
In some regions of India local communities are working together with the government officials to conserve wildlife habitats because since time immemorial, their needs are being satisfied by these forests and vegetation. In Sariska Tiger Reserve the villagers of Rajasthan, by citing the wildlife Protection 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 25 Hot Spots. In this lakhs of Bio -clusters are found. In India 33% flowering plants are of Indian origin.

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.

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 (Uttrakhand)
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- Brahamputra 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	Similipal	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 Orzya nivara.

Bio-Diversity is utilised in various medicinal uses. From several materials disease curing qualities are derived from the plants such as Marphine used as pain killer and is derived from Papaver Sonniferem. Quinine is useful for Maleria and is derived from Chinchona Ledgenriana. Taxol is a Cancer resistant medicine and is derived from the bark of a type of evergreen trees Taxus Baccota 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.

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.

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?

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 (B) In AIDS
(C) In Cancer (D) For T.B.

15. 'chrak' was related to which country?

(A) Myanmar (B) Sri Lanka
(C) India (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.

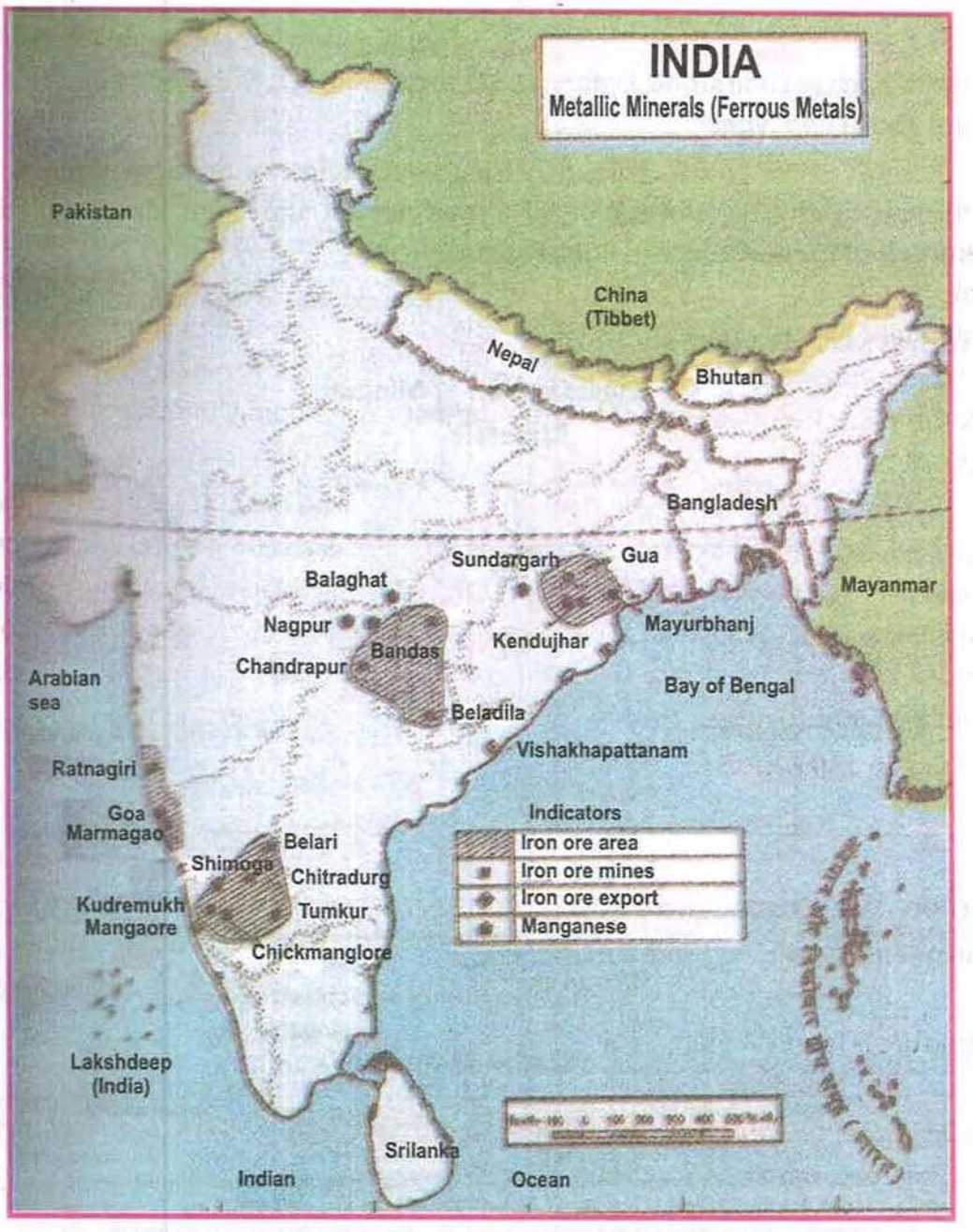


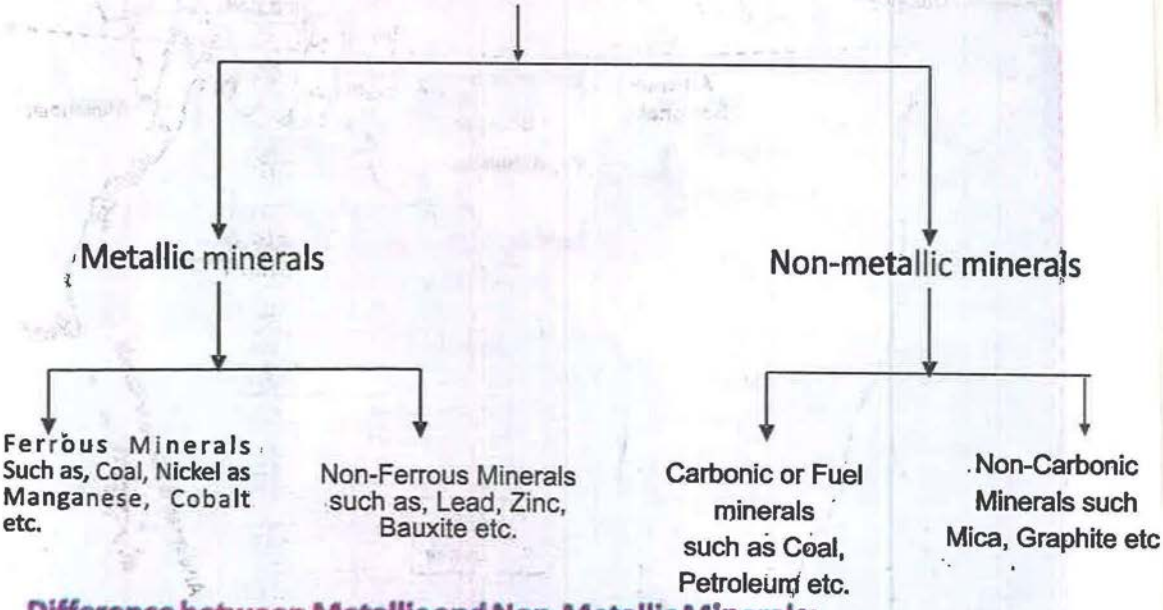
Fig.1 (D). 1 : Metallic Minerals (Ferrous Metals)

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

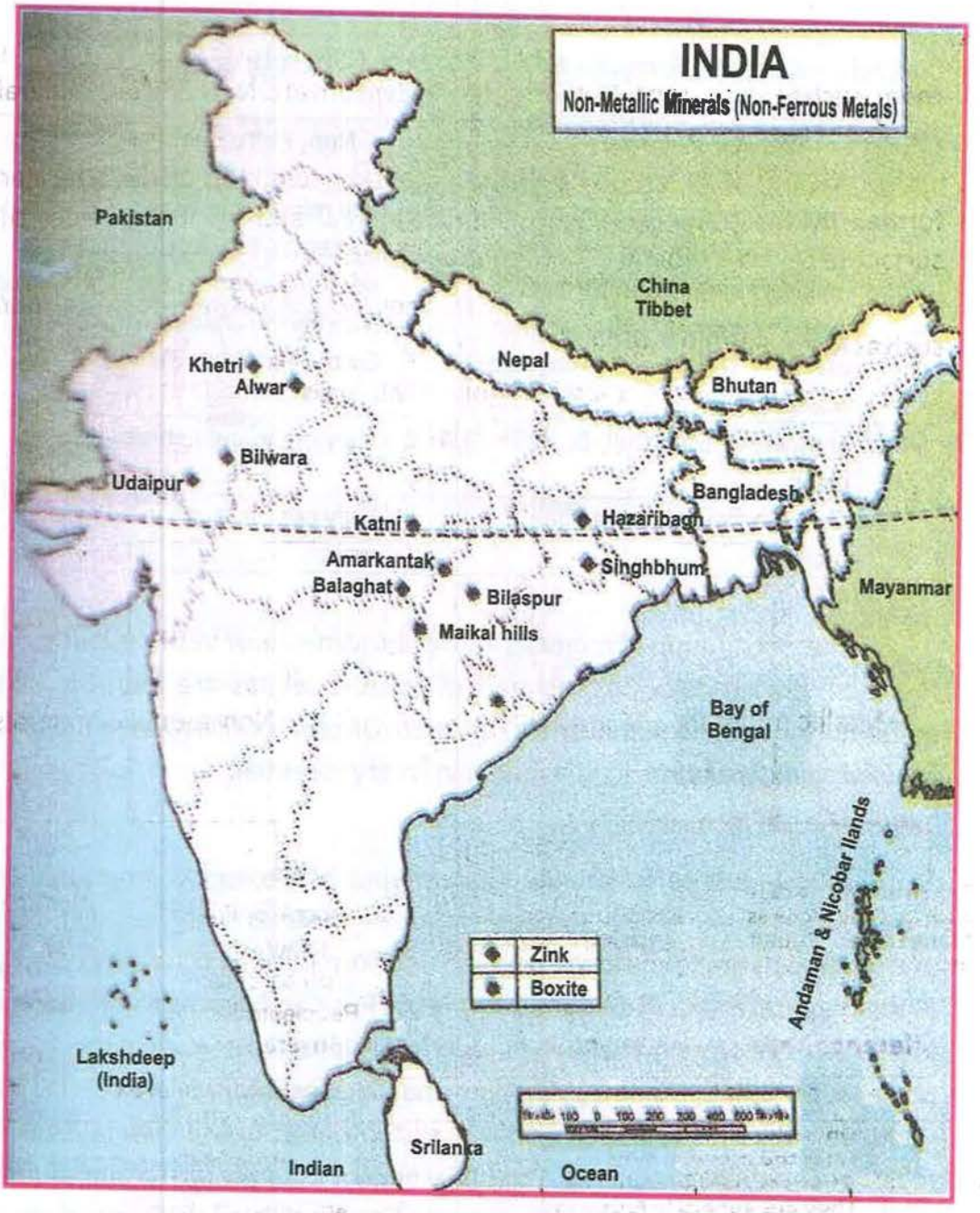


Fig. 1 (D). 2 :Non- Metallic minerals (Non- Ferrous Metals)

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 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, Silimenite 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

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 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.

Do You Know?

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

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 Chindbara 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, Rajgarh, Bolangir, Keonjhar, Jajpur and Mayurbhanj districts.

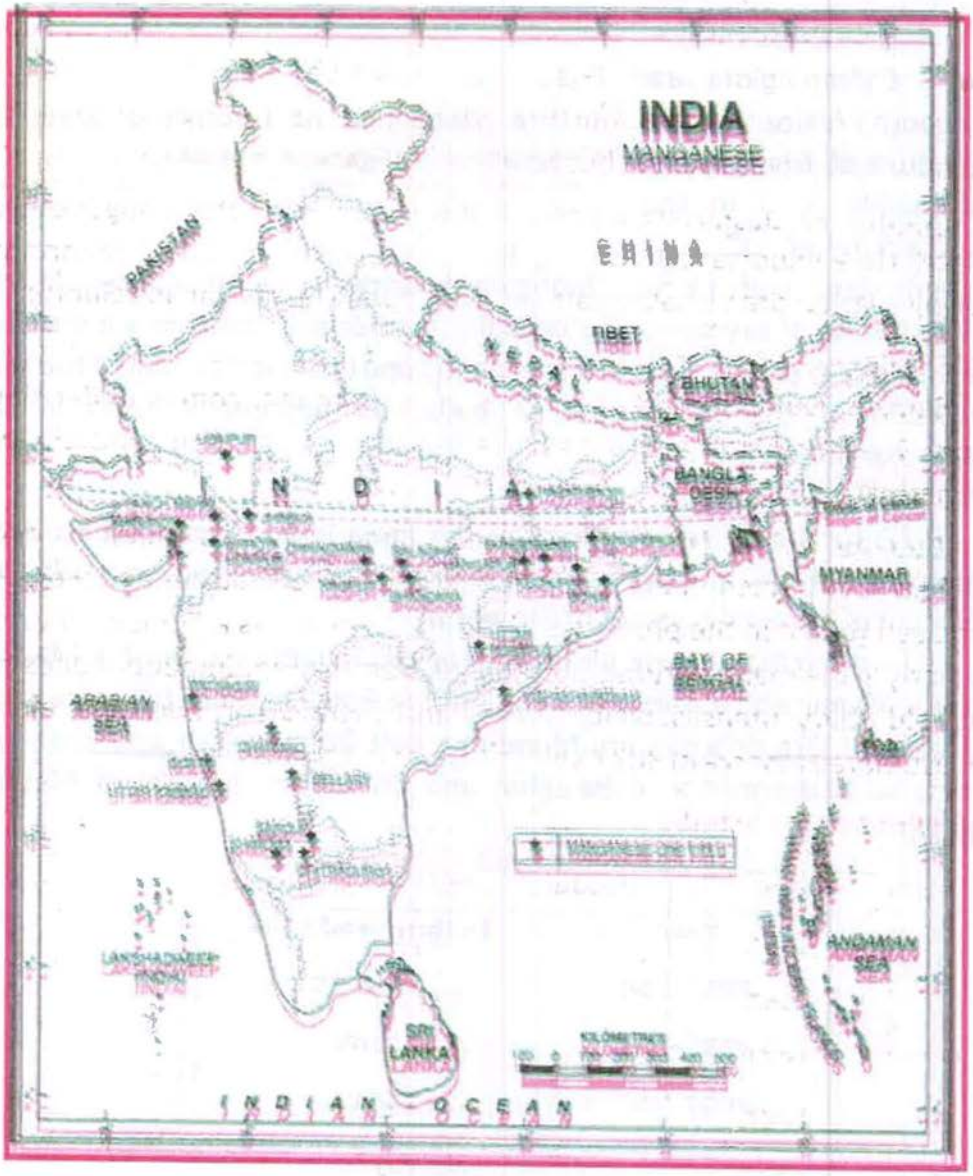


Fig 1 (D). 5 Distribution of Manganese Ore in India

Madhya Pradesh: This state is placed third by producing 21 percent of Manganese in the country. Manganese is produced in Balaghat and Chindawara 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 Srikakulum. 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	11598.0
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 are 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
   (a) 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 enrgy. 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 29 percent of production. Jharia, Bokaro, Giridih, Karnpura, 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.

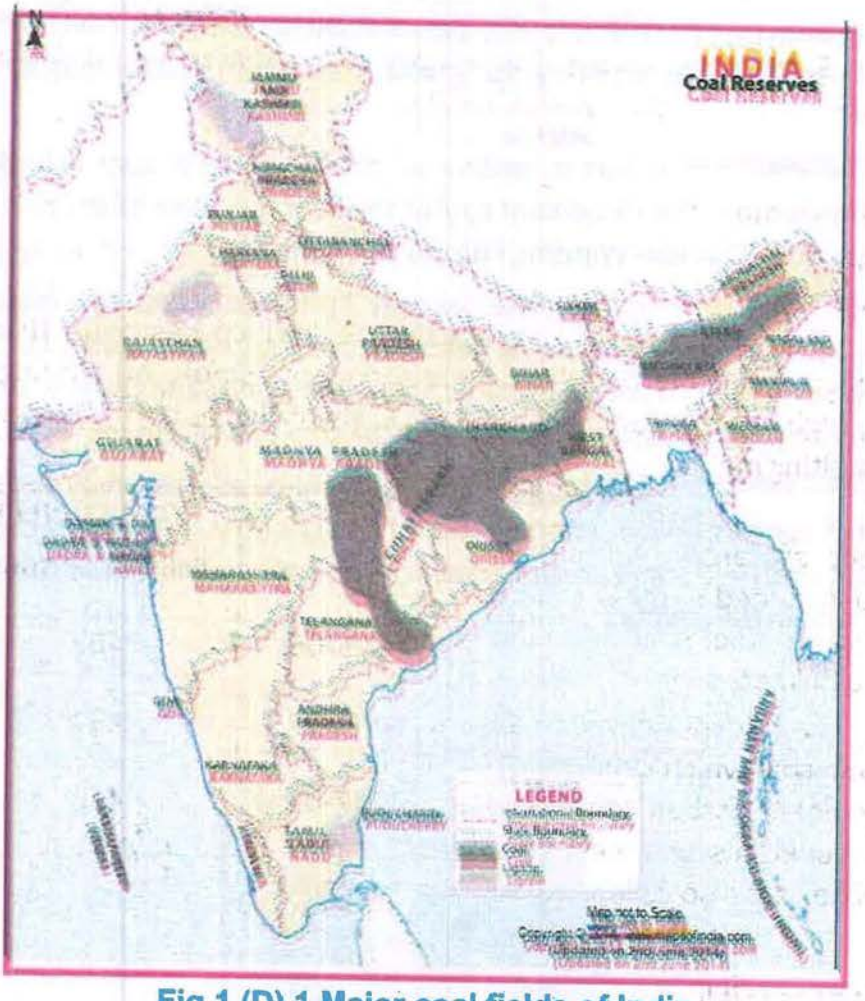


Fig.1 (D).1 Major coal fields of India

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, Lakhanpur 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.

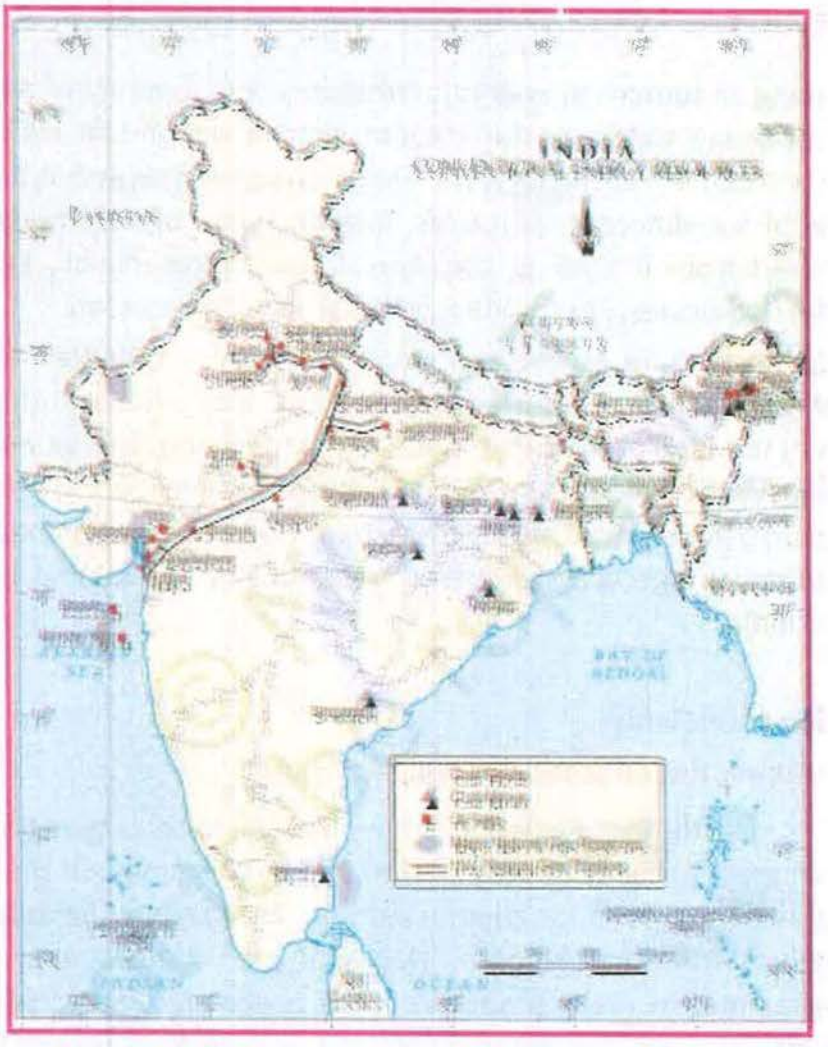


Fig.1(D).3:Conventional Source of Energy

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

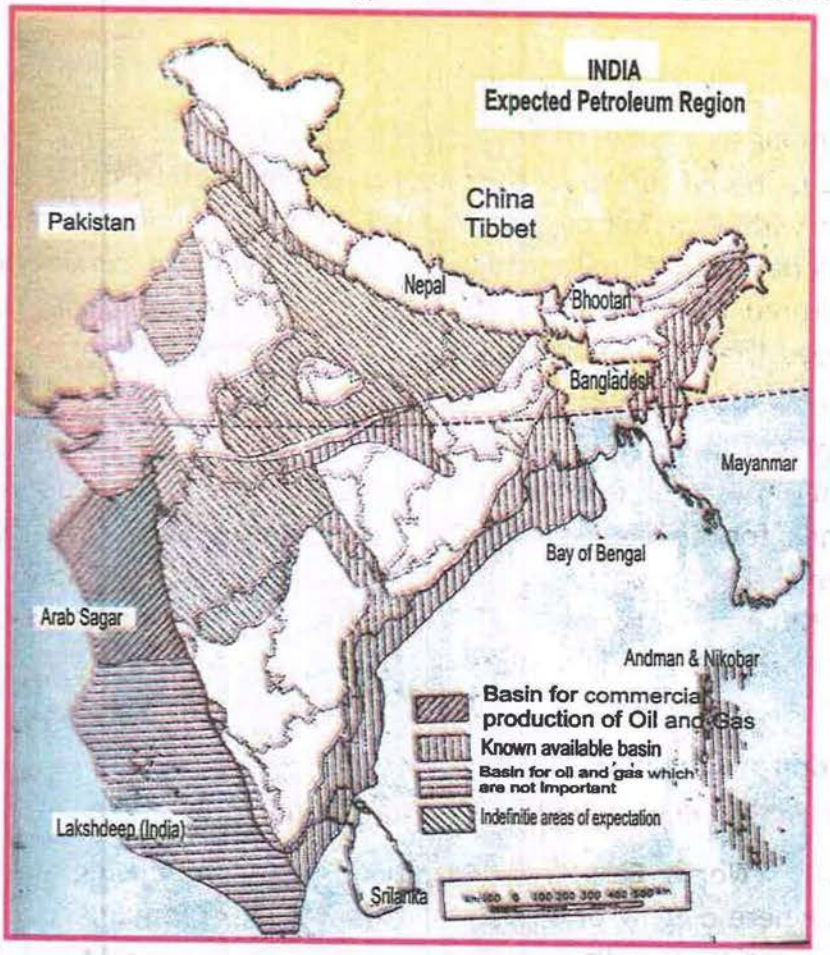


Fig-1 (D).4: India: Expected Petroleum Region

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.

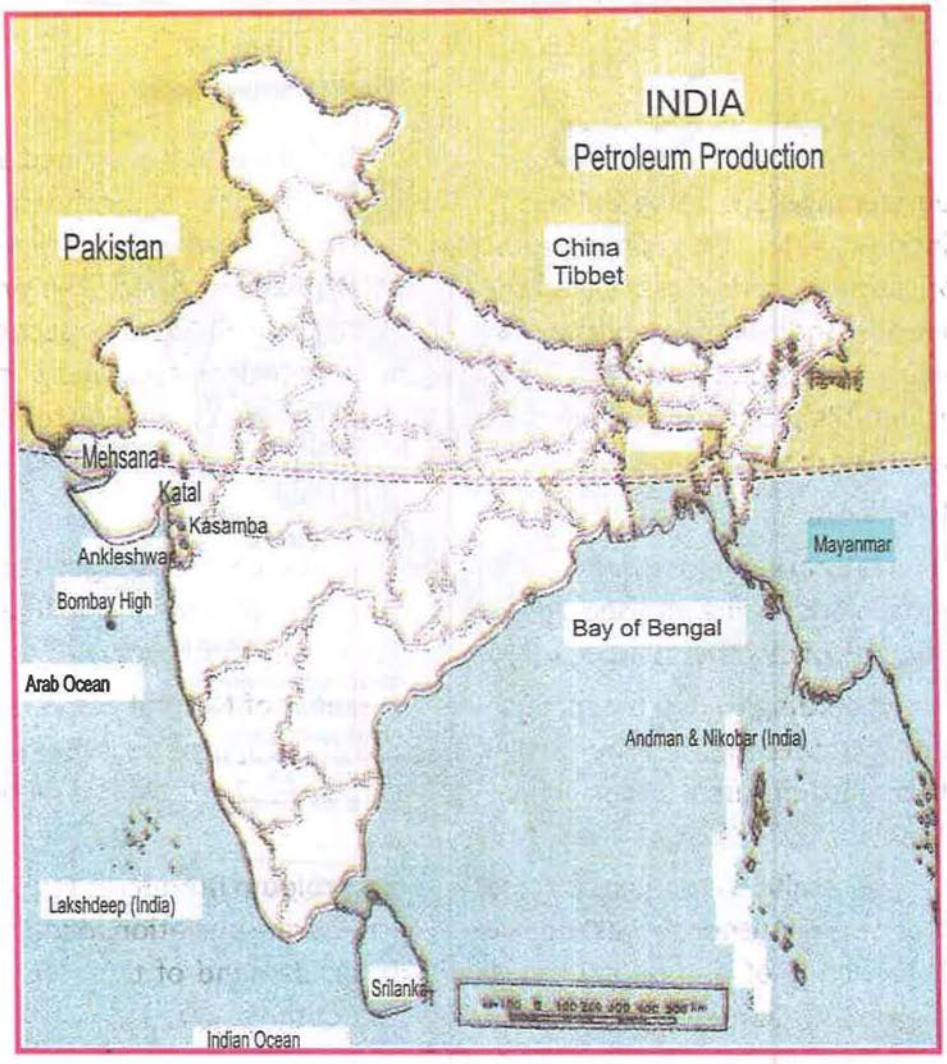


Fig-1(D).5: Petroleum producing region of India.

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.

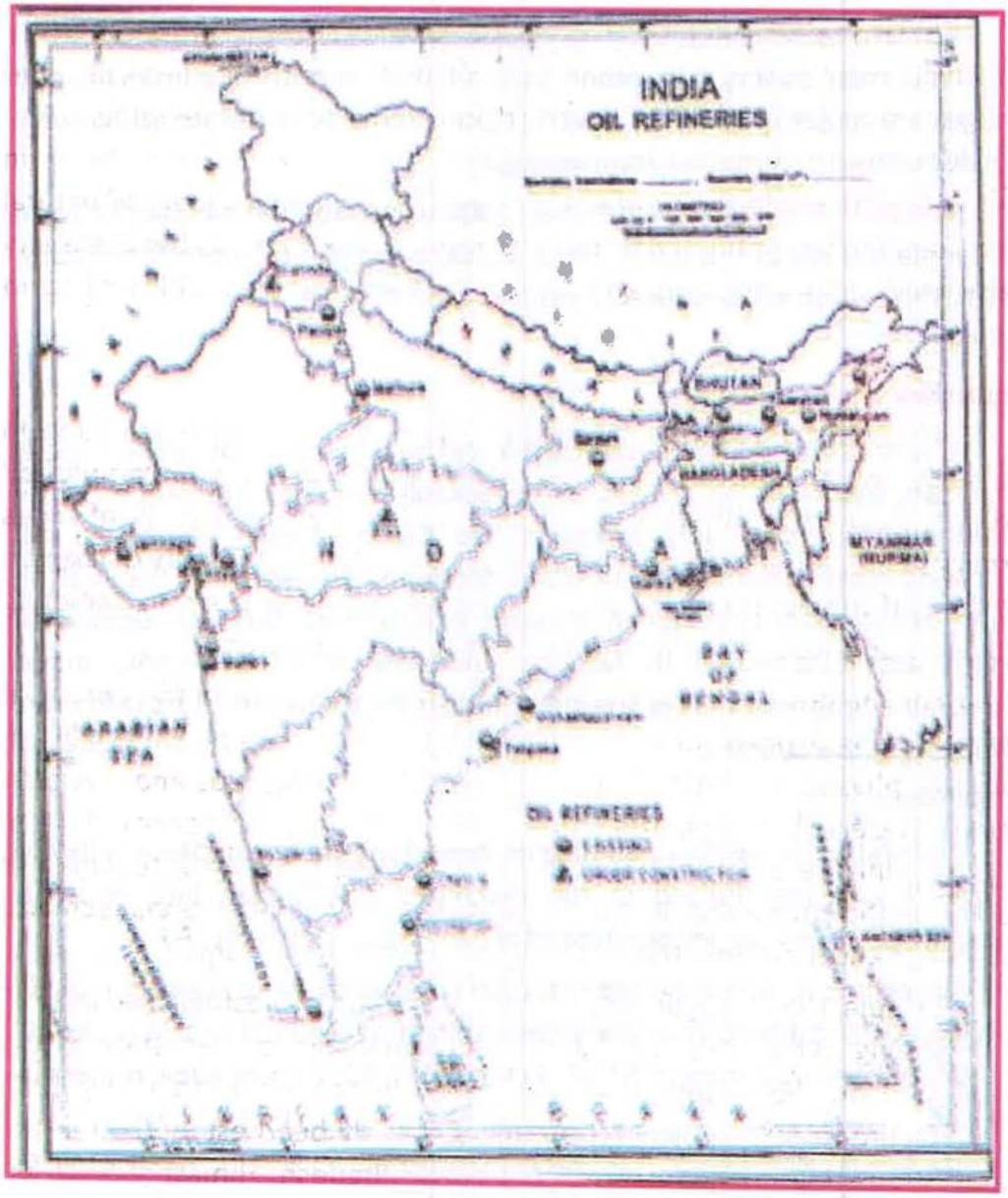


Fig-1(D).6: Oil Refineries of India

Electrical Energy:

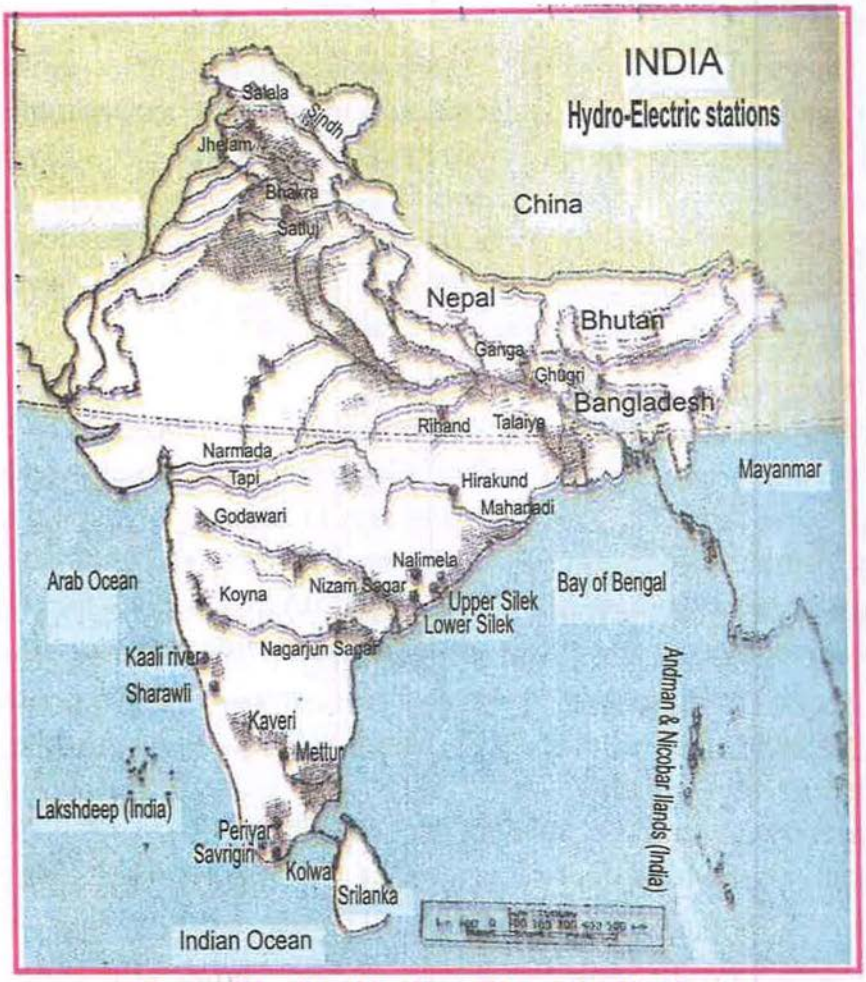
Electrical energy is an important source of power. In the present world the per capita consumption of electricity is an indicator of development. The energy produced from the running water is called hydro- electricity. When in the production of electricity heat produced from coal, petroleum or natural 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 r** **that electricity is also** produced along v **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 utlisation can also be expressed in units. The meaning of one unit is the use of 1000 watts of electricity for one hour.

1. Bhakhra-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.

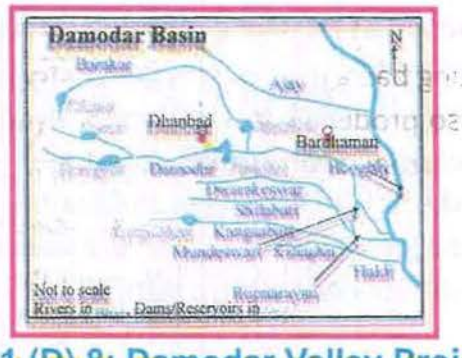


Fig-1 (D).8: Damodar Valley Project

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.

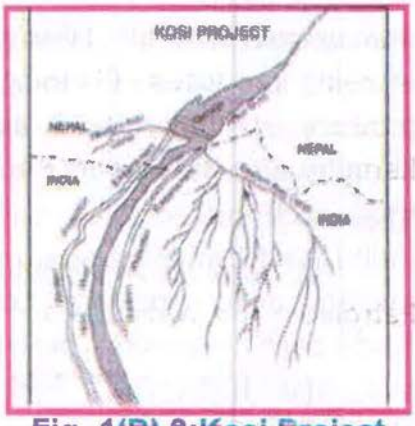


Fig- 1(D).9: Kosi Project

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

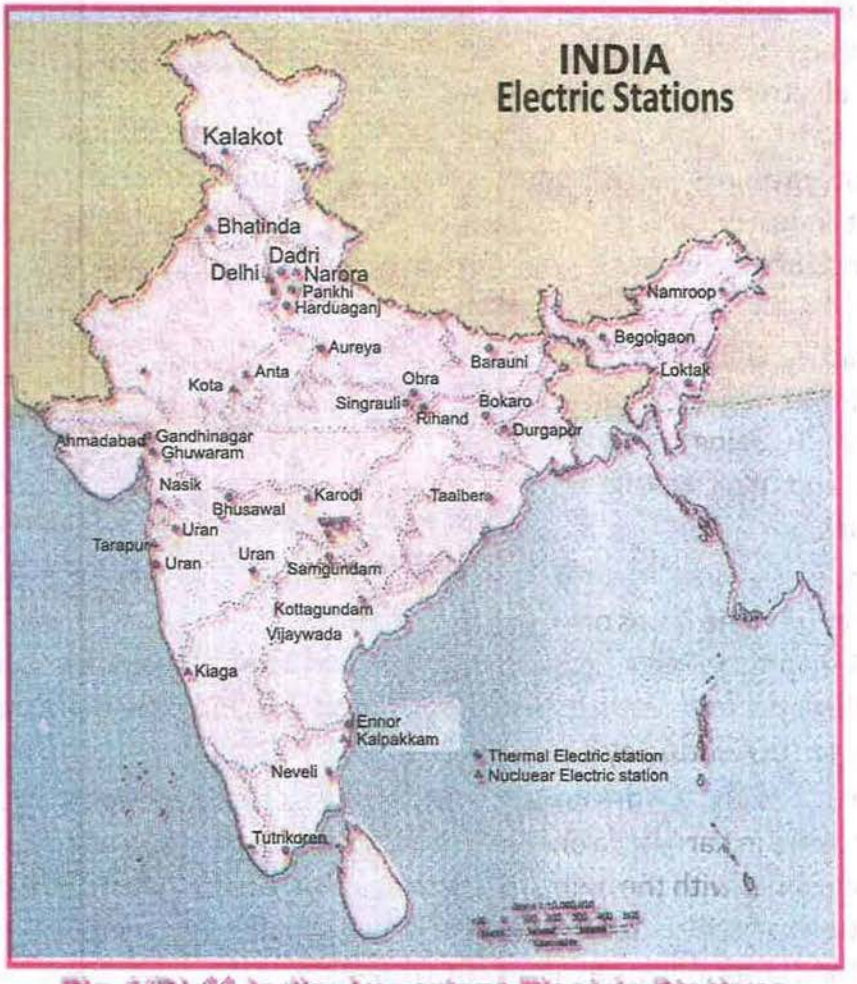


Fig-1(D).11 India: Important Electric Stations

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. **Kakrapara 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.

Fig-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 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.

Fig. 1(D). 14: Biogas Plant

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 enery?
   (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
   (a) 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) Rajsthan (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 Khambhat
    (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 Gondawana 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 is 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 Gondawana 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.