

Department: Zoology

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ENVIRONMENTAL CONSERVATION

Natural resources and conservation

Natural resources: The word resource is used for means of supplying a

material generally held in reserve". The natural resources are the materials necessary for life and available in the normal environment. These include energy, air, water, land (soil), minerals, microorganisms, plants and animals. For man, resources are the substances required for his survival and comforts. These substances are obtained directly from the environment (biosphere).

The nature of resources vary from society to society. The variation is related to the culture, level of development, nature of work, etc., of a society. The Onge tribe of the Andaman group of islands do not use silver or gold, which are, therefore, not resources for them. Uranium had little importance earlier, but has now become a valuable resource because of its use in nuclear energy.

Threat to Natural Resources. Advancement in technology has provided favourable conditions which have led to increase in population, rise in standard of living and high expectations for better life. All these factors have created many new needs and have increased the demands on our natural resources, some of which are becoming exhausted and polluted.

A balance exists in nature in the relationship between organisms and their physical environment. Man has disturbed this natural balance by excessive use of natural resources. This has caused ecological crisis and has threatened his existence. The only way to save mankind is the conservation* of natural resources. Conservation may be defined as the most efficient and most beneficial utilization of natural resources. Whatever is drawn from the environment must in some way be returned to it. For example, a tree removed from a forest should be replaced by growing another.

Types of Natural Resources. The natural resources are classified in different ways—

1. The natural resources are of three types with regard to their chemical nature :

(i) **inorganic** including air, water and metallic minerals ;

(ii) **organic** including plants, animals, microorganisms and fossil fuel ; and

(iii) **mixtures** including soil which is an inorganic as well as an organic resource.

2. The natural resources are of two types : **inexhaustible and exhaustible**, with regard to their

abundance and availability.

(i) **Inexhaustible Resources.** These include air, clay, sand, tidal energy and precipitation. These are not likely to be exhausted by human use. Though the air is available in inexhaustible quantity, it may become a limiting factor qualitatively if its pollution is not checked.

(ii) **Exhaustible Resources.** These are likely to be finished by human use. They are further of two kinds : renewable and nonrenewable.

(a) **Renewable Resources.** The renewable resources can maintain themselves or can be replaced if managed wisely. They include water, soil and living objects — crops, forests, domestic animals and wildlife. Some of these materials are constantly renewed in nature. Others can be reclaimed or purified and used again and again. The renewable resources are, therefore, not likely to be exhausted. However, they too may be lost by excessive and unwise use. All the renewable resources are interlinked and all of them must be conserved.

(b) **Nonrenewable Resources.** The nonrenewable resources, once used, are lost for ever as they are not restored. They include metallic minerals and nonmetallic mineral fuels or fossil fuels — coal, natural gas and petroleum. We might regard all substances as renewable, since matter cannot be destroyed. However, coal or oil we burn cannot be used again, even though the carbon remains in the air or is picked up again by plants. The iron of cans rusting on a dump is lost to us, even though it remains in the soil. The cycles of these substances are too long for any possible management. Therefore, such substances are considered nonrenewable resources. Minerals are used up faster than recovered. Some minerals can be recycled, but this is usually expensive. Man is making excessive use of minerals and fossil fuel in industry and automobiles unmindful of the consequences. At current rates, all the known global reserves of industrial metals may last for less than a century, and those of petroleum and natural gas may exhaust in 15 to 20 years.

3. The natural resources are of three types with regard to their distribution : national, multinational and international.

(i) **National Resources.** These are confined to national boundaries, e.g., minerals, lands.

(ii) **Multinational Resources.** These are shared by more than one nation, e.g., some rivers, certain lakes, migratory animals.

(iii) **International Resources.** These are shared by all the nations, e.g., air, solar energy.

Importance of minerals:

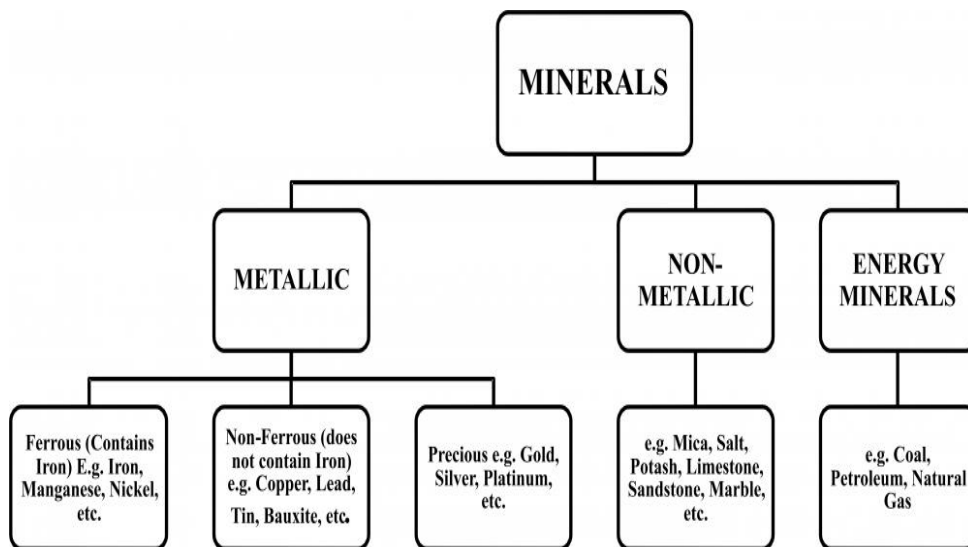
- (a) Minerals are used in industries. It is the backbone of industrial development.
- (b) Minerals are used for making tools, implements, machines, etc.
- (c) Minerals are used in the manufacturing of jewellery, coins, utensils, decorative items, etc.
- (d) Minerals are used for construction work.
- (e) Minerals are used for health purpose.

PROPERTIES OF MINERALS:

- (a) Minerals are non-renewable 'exhaustible' resources.
- (b) Minerals take millions of year to form and are present in impure form.
- (c) Minerals are unevenly distributed throughout the world.

TYPES OF MINERALS

Over 2000 minerals have been identified and only a few have been abundantly found. On the basis of composition, minerals are classified as:



Extraction of minerals

Minerals can be extracted by Mining, Drilling and Quarrying.

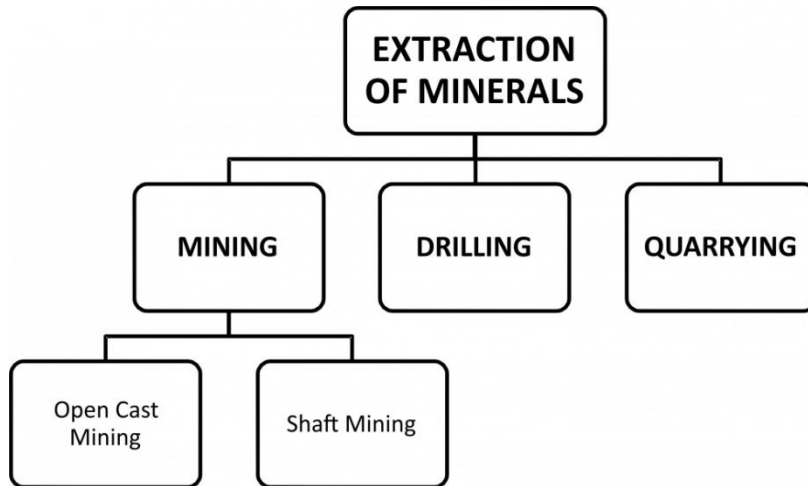
(a) **Mining:** The process of taking out minerals from rocks buried under the earth's surface is called mining.

(i) **Open Cast Mining:** Minerals that lie at shallow depths are taken out by removing the surface layer is known as "Open Cast Mining".

(ii) **Shaft Mining:** Deep bores, called shafts, have to be made to reach mineral deposits that lie at great depth, this is known as "Shaft Mining".

(b) **Drilling:** Petroleum and natural gas occur far below the earth's surface. Deep wells are bored to take them out, this is called "Drilling".

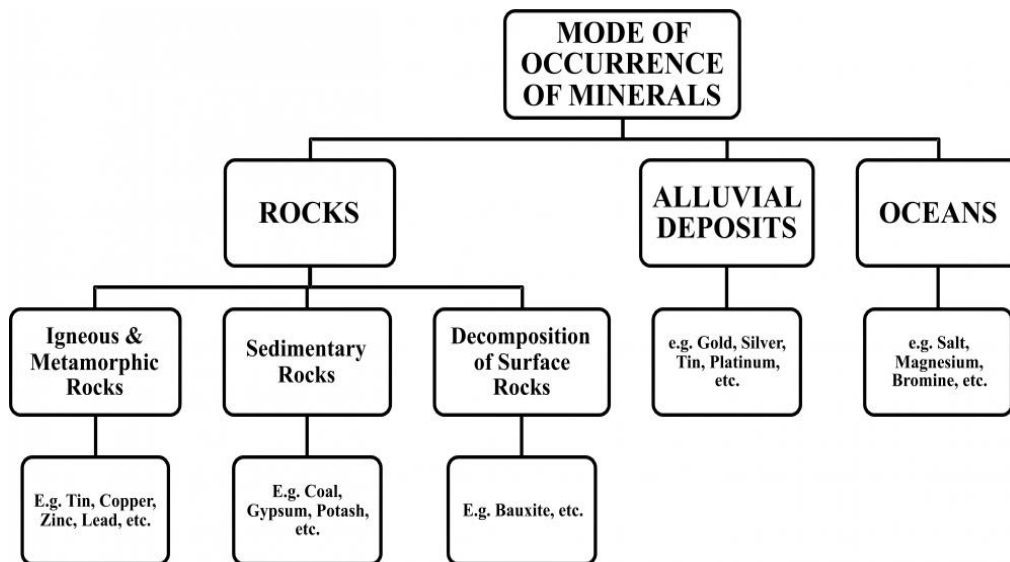
(c) **Quarrying:** Minerals that lie near the earth's surface are simply dug out by the process known as "Quarrying".



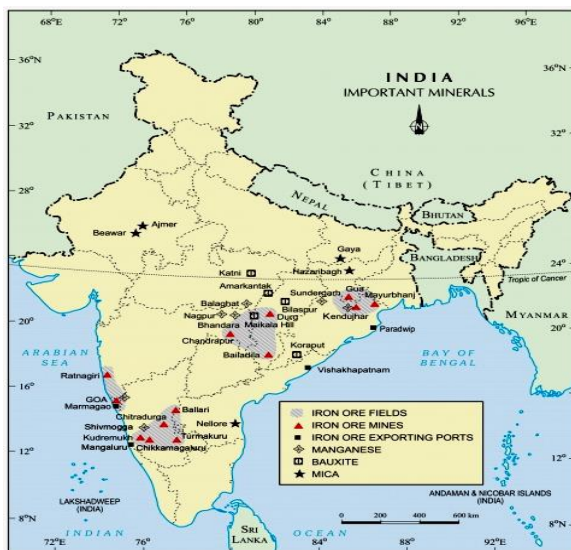
MODE OF OCCURRENCE OF MINERALS:

Minerals are found in the following places:

1. **In igneous and metamorphic rocks:** The smaller occurrences are called veins and the larger occurrences are called lodes. They are usually formed when minerals in liquid/molten and gaseous forms are forced upwards through cavities towards the earth's surface. Examples: tin, copper, zinc, lead, etc.
2. **In sedimentary rocks:** In these rocks, minerals occur in beds or layers. Coal, iron ore, gypsum, potash salt and sodium salt are the minerals found in sedimentary rocks.
3. **By decomposition of surface rocks:** Decomposition of surface rocks and removal of soluble constituents leaves a residual mass of weathered material which contains ores. Bauxite is formed in this way.
4. **As alluvial deposits:** These minerals are found in sands of valley floors and the base of hills. These deposits are called placer deposits. They generally contain those minerals which are not corroded by water. Examples; gold, silver, tin, platinum, etc.
5. **In ocean water:** Most of the minerals in ocean water are too widely diffused to be of economic importance. But common salt, magnesium and bromine are mainly derived from ocean waters.



DISTRIBUTION OF MINERALS IN INDIA



Ferrous Minerals:

- Ferrous minerals accounts for about three-fourth of the total value of production of the metallic minerals.
- Provide strong base for the development of the metallurgical industry.
- India exports good quantity of ferrous minerals.

IRON ORE:

- Iron ore is the basic mineral and is the backbone of industrial development.
- India is rich in good quality iron ores.
- Magnetite is the finest iron ore with a very high content of iron upto 70%. It has excellent magnetic properties because of which it becomes very valuable for the electrical industry.

• Hematite ore is the most important industrial iron ore; in terms of quantity usage. The iron content of hematite is 50-60%.

Major Iron Ore Belts in India:

1. Orissa Jharkhand Belt
2. Durg Bastar Chandrapur Belt
3. Bellary Chitradurga Chikmagalur Tumkur Belt
4. Maharashtra Goa Belt

MANGANESE:

- (a) Manganese is mainly used in the manufacturing of steel and ferro-manganese alloy.
- (b) Nearly 10 kg of manganese is required to manufacture one tonne of steel.
- (c) It is also used in manufacturing bleaching powder, insecticides and paints.
- (d) Odisha is the largest producer of manganese ores in India. It accounted for one-third of the country's total production in 2000-01.

NON-FERROUS MINERALS:

- (a) Availability of Non-Ferrous minerals in India is NOT of satisfactory level.
- (b) E.g. Copper, Bauxite, Lead, Zinc, Gold, etc.
- (c) These minerals play a vital role in a number of metallurgical, engineering and electrical industries.

COPPER:

- (a) Copper is mainly used in electrical cables, electronics and chemical industries.
- (b) Copper is a good conductor of electricity.
- (c) India doesn't have good reserves of copper.
- (d) Leading producers of copper in India are:
 1. Khetri mines of Rajasthan.
 2. The Balaghat mines in Madhya Pradesh.
 3. Singhbhum district of Jharkhand.

BAUXITE:

- (a) Bauxite is clay like substance, out of which aluminum is obtained.
- (b) Aluminum is incredibly popular because it is Lightweight, Strong, Durable, Ductile, Malleable, etc.
- (c) Amarkantak Plateau, Maikal hills and the plateau region of Bilaspur-Katni are the main areas of bauxite deposits.
- (d) In 2009-10 Orissa was the largest producer of bauxite in India with 34.97%.

- (e) Panchpatmali in Koraput district is the most important centre of bauxite deposit in Orissa.
- (f) Aluminum is used in: Automobiles, Aircraft, Spacecraft, Packaging (Cans, Foil, frame).
Food and beverage containers, etc.

NON-METALLIC MINERALS

MICA:

- (a) Mica is a mineral which is made up of a series of plates or leaves.
- (b) The mica sheets can be so thin that a thousand of them can be layered into a few centimetre thick mica sheet.
- (c) Mica has excellent di-electric strength, low power loss factor, insulating properties and resistance to high voltage.
- (d) Mica is widely used in electric and electronic industries.
- (e) Mica deposits are found in the northern edge of the Chota Nagpur plateau.
- (f) Koderma-Gaya-Hazaribagh belt of Jharkhand is the leading producer of mica.
- (g) Ajmer in Rajasthan and Nellore in Andhra Pradesh are the other important producers of mica.

ROCK MINERALS

LIME STONE:

- (a) Lime stone is found in sedimentary rocks of most geological formations.
- (b) It is found in association of rocks composed of calcium carbonates or calcium and magnesium carbonates.
- (c) It is the base raw material for the cement industry.
- (d) It is also used for smelting of iron ore in the blast furnace.
- (e) Major producers of Limestone in India are: Karnataka , Andhra Pradesh, Madhya Pradesh, Chhattisgarh, Rajasthan and Gujarat .

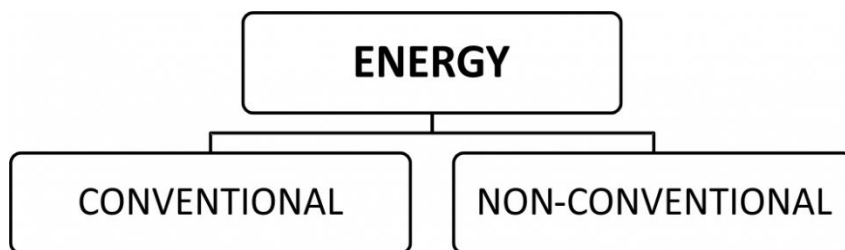
HAZARDS OF MINING

- (a) Mining is a hazardous industry; both for the workers and for the residents.
- (b) The Miners have to work under tough conditions where no natural light is available.
- (c) There is always a risk of collapse of mine roof, inundation with water and fire.
- (d) The areas around mines face the problem of too much dust from the mines.
- (e) Slurry from mines damages the roads and the farmland.
- (f) Houses and clothes become dirty more often than in other areas.
- (g) Miners are at great risk of getting afflicted with pulmonary disorders.
- (h) Cases of respiratory tract diseases are very high in mining areas.

CONSERVATION OF MINERALS

- (a) It takes millions of years for the formation of minerals. Use of raw minerals should be restricted to industries.
- (b) Minerals should be recycled.
- (c) Hence, mineral resources are finite and non-renewable.
- (d) proper substitutes should be found for minerals. Eg. Plasticwares are replacing metalwares, silver has been replaced by alloys of other metals in coins.
- (e) Deep sea mining should be adopted.
- (f) Minerals are a non-renewable resource. It takes thousands of years for the formation and concentration of minerals.
- (g) The rate of formation is much smaller than the rate at which the humans consume these minerals. It is necessary to reduce wastage in the process of mining.
- (h) Designing smaller equipments can also reduce the use of minerals.

ENERGY RESOURCES



Energy can be generated from fuel minerals like coal, petroleum, natural gas, uranium and from electricity. Energy resources can be classified as conventional and non-conventional sources.

Conventional Energy Resources: Firewood, Cattle Dung Cake, Coal, Petroleum, Natural Gas and Electricity (both Hydel & Thermal)

Non-Conventional Energy Resources: Solar, Wind, Tidal, Geothermal, Biogas and Atomic Energy.

Firewood and cattle dung cake: As per estimates, more than 70% of energy need in rural households is met by firewood and cattle dung cake. A decreasing forest area is making it difficult to use firewood. Dung cake can be put to better use in the form of manure and hence its use should also be discouraged.

Conventional Source of Energy	Non-Conventional Source of Energy
Conventional sources of energy refer to traditional sources of energy like Coal, Natural Gas, Petroleum, Electricity, etc.	Non-conventional sources of energy are recently developed sources of energy like Solar, Wind, Tidal, Geothermal, etc.
These sources of energy are non renewable.	These sources are renewable.
Generation of energy is expensive.	Initial cost of generation is high but cheaper in the long run.
They cause large scale pollution.	They are Eco friendly sources of energy.

1. **COAL:**

- Coal is the most abundantly available fossil fuel in India.
- India is highly dependent on coal for meeting its commercial energy requirements.
- Depending on the degree of compression, depth and time of burial, there are different varieties of coal:

(a) **Lignite:** It is a low grade brown coal. It is soft and has high moisture content. Tamil Nadu is the main reserves of lignite coal. This type of coal is used for electricity generation.

(b) **Bituminous Coal:** Coal which was formed because of increased temperature and was buried very deep is called bituminous coal. This is the most popular coal for commercial use. High grade bituminous coal is ideal for use in metallurgy.

(c) **Anthracite Coal:** This is the highest quality hard coal.

Coal is a bulky material, which loses weight on use as it is reduced to ash. Hence, heavy industries and thermal power stations are located on or near the coalfields.

2. **PETROLEUM**

- After coal, petroleum or mineral oil is the next major energy resource in India.
- Petroleum is a major source of fuel for various uses like: heating and lighting, lubricants for machinery and raw materials for a number of manufacturing industries.
- Petroleum refineries act as a "nodal industry" for synthetic textile, fertilizer and numerous chemical industries.
- Petroleum also provides raw materials for various manufacturing industries; like plastic, textiles, pharmaceuticals, etc.
- Most of the petroleum in India occurs in anticlines and fault traps in the rock formations of the tertiary age.
- The oil bearing layer is a porous limestone or sandstone through which oil may flow.

- The intervening non-porous layers prevent the oil from rising or sinking.
- Petroleum is also found in fault traps between porous and non-porous rocks.
- Gas, being lighter usually occurs above the oil.
- Mumbai High produces about 63% of India's petroleum; Gujarat produces 18% and Assam 13%.
- Ankeleshwar is the most important oil field in Gujarat. Assam is the oldest oil producing state of India. Important oil fields of Assam are Digboi, Naharkatiya and Moran-Hugrijan.

3. NATURAL GAS

- Natural gas is an important clean energy resource found along with or without petroleum.
- Natural gas is considered an environment friendly fuel because of low carbon dioxide emissions and is, therefore, the fuel for the present century.
- It is used as fuel and also as an industrial raw material.
- Large reserves of natural gas have been discovered in the Krishna-Godavari Basin. Gulf of Cambay, Mumbai High and Andaman Nicobar islands are also important areas with large reserves of natural gas.
- Natural gas is mainly used by the fertiliser and power industries.
- Now-a-days, use of CNG (Compressed Natural Gas) is increasing as vehicle fuel in the country.

4. ELECTRICITY

- Electricity is generated mainly by two methods:

(a) **Hydo Electricity:** By running water which drives hydro turbines to generate Hydro Electricity.

(b) **Thermal Electricity:** By burning other fuels like coal, petroleum and natural gas to drive turbines to generate Thermal Electricity.

Hydro Electricity	Thermal Electricity
Hydro electricity is generated by fast flowing water, which is a renewable resource.	The thermal power stations use non-renewable fossil fuels like coal, petroleum and natural gas for generating electricity.
India has a number of multi-purpose projects like the Bhakra Nangal, Damodar Valley corporation, the Kopili Hydel Project etc. producing hydroelectric power.	There are over 310 thermal power plants in India. For e.g. Vijayawada Thermal Plant, Ramagundam Thermal Plant, etc.

NON-CONVENTIONAL SOURCES OF ENERGY

1. NUCLEAR ENERGY

- Nuclear energy is obtained by altering the structure of atoms.

- When the structure of an atom is altered, too much energy is released in the form of heat.

This heat is utilized to generate electric power.

- Uranium and Thorium are used for generating atomic power.
- These minerals are available in Jharkhand and the Aravalli ranges of Rajasthan.
- The Monazite sand of Kerala is also rich in Thorium.

2. **SOLAR ENERGY**

- Photovoltaic technology is used to convert solar energy into electricity.
- The largest solar plant of India is located at Madhapur near Bhuj.
- Solar energy holds great promises for the future.
- It can help in minimizing the dependence on firewood and animal dung cakes in rural areas.
- This will also help in conservation of fossil fuels.

3. **WIND POWER**

- India has great potential of wind power.

- The wind farm cluster in Tamil Nadu (from Nagarcoil to Madurai) is the largest cluster in India.
- Andhra Pradesh, Karnataka, Gujarat, Kerala, Maharashtra and Lakshadweep are also important centres of wind power production.
- Jaisalmer are well known for effective use of wind energy in the country.

4. **BIOGAS**

- Biogas can be produced from shrubs, farm waste, animal and human waste.
- Decomposition of organic matter yields gas, which has higher thermal efficiency in comparison to kerosene, dung cake and charcoal.
- Biogas plants can be set up at municipal, cooperative and individual levels.
- The biogas plants using cattle dung are known as 'Gobar Gas Plants' in rural India.
- These plants provide twin benefits to the farmer:
 - (a) In the form of energy
 - (b) Improved quality of manure.
- It also prevents the loss of trees and manure due to burning of fuel wood and cow dung cakes.

5. **TIDAL ENERGY**

- Oceanic tides can be used to generate electricity.
- Floodgate dams are built across inlets.

- The water flows into the inlet during high tide and gets trapped when the gate is closed. Once the tide recedes, the gates are opened so that water can flow back to the sea. The flow of water is used to run the turbine to generate electricity.
- In India the Gulf of Khambhat, the Gulf of Kutch in Gujarat on the western coast and the Gangetic delta in Sunderban regions of West Bengal provide ideal conditions for utilizing tidal energy.

6. GEO THERMAL ENERGY

- Geo thermal energy refers to the heat and electricity produced by using the heat from the interior of the Earth.
- We know as we go deeper and deeper in the earth it become hotter and hotter.
- Where the geothermal gradient is high, high temperatures are found at shallow depths. Groundwater in such areas absorbs heat from the rocks and becomes hot. It is so hot that when it rises to the earth's surface, it turns into steam. This steam is used to drive turbines and generate electricity.
- Two experimental projects have been set up in India to harness geothermal energy. They are; the Parvati Valley near Manikarn in Himachal Pradesh and the Puga Valley in Ladakh.

CONSERVATION OF ENERGY RESOURCES

- Energy is a basic requirement for economic development.
- Every sector of the national economy: agriculture, industry, transport, commercial and domestic needs energy. As a result, consumption of energy in all forms has been steadily rising all over the country.
- There is an urgent need to develop a sustainable path of energy development.
- India is presently one of the least energy efficient countries in the world.
- We have to adopt a cautious approach for the judicious use of our limited energy resources.

Different ways of conserving power resources are:

- (a) We can make use of energy efficient equipments.
- (b) Looking for alternative sources of energy.
- (c) Use of public transportation system instead of private vehicles.
- (d) Switching off electricity when not required.
- (e) Making people aware about the importance and conservation of power resources. Etc.
- (f) use of biogas plants should be encouraged.
- (h) Population growth should be controlled to check the increase in energy requirements.
- (i) Oil consumption in automobiles should be checked by keeping the engines in good condition.

(j) Energy efficient appliances should be used.