UNIT 18 RESOURCE UTILISATION, PLANNING AND MANAGEMENT

Structure

18.1 INTRODUCTION

In Unit 17, you have studied about different types of natural resources and methods for their exploration. In this unit, you will study how best some of the limited and non-renewable resources such as water, soil, forests, and minerals etc. can be used.

You will also briefly study planning and management of resource utilisation. Resource planning is necessary to make the limited resources last longer and management is required to conserve and make most effective use of the available resources for national development.

Objectives

After you have studied the present unit, you should be able to:

- explain how, with wise and careful planning, various natural resources can be utilised for the betterment of mankind and how best our limited resources can be maximised
- describe various aspects of conservation of water and mineral resources
- describe how the forest resources can be used without depleting our forest stock
- outline some methods of utilising wastes such as municipal waste, slag, flyash etc.

18.2 USE OF NATURAL RESOURCES

In Unit 17, you studied about various natural resources such as land, water, soil, minerals etc. You know that these resources are limited and precious. Therefore, they should be used more efficiently. We will now discuss how various resources are being currently used in our country.

Land

Land is the most precious resource, because its produce supports human population and other living beings on land. Nearly 44% of land in India is used for agricultural purposes, of which 11-14% is covered with forests that include good as well as degraded forests, and 4% of the land is used as pastures and grazing fields. The remaining 8% is used for various other purposes such as housing, agroforestry, establishment of industries, development of roads and reservoirs etc..

About 14% of our land is barren i.e. it cannot be used for the cultivation of crops. Nearly 1/3 of the barren land has lost its productivity due to alkalinity or salinity of the soil, and water logging etc. Soil erosion causes a great harm to productivity of our land, because in this

process soil is broken up and washed away by water or swept away by wind. These facts indicate careless and unwise use of land and is a reflection of the mismanagement of our land resources.

Today, nearly 24% of our population lives in urban areas. The rapid increase of urbanisation and migration of population from rural to urban areas lead to two serious consequences. Migration of people to towns increases their population and expands their size, thus necessitating conversion of agricultural land to housing, office and factory buildings, roads and bridges etc. Rural land, on the other hand, may remain underutilised. The conditions of life in the cities often deteriorate due to increased population. Sewage and water supply come under strain; more vehicles cause more pollution; or the poor end up in unhygienic slums. Migration can be checked only if the living conditions in the villages are improved. Particularly transport and communication, health care, education, and other basic amenities like clean water and good sewage disposal should be provided in rural areas. Setting up of rural industries can lead to employment of growing numbers, so fewer people would leave their villages for urban areas.

Water

Water, used for irrigation of fields or for drinking, is obtained from rivers and streams and from wells which give access to the underground water reserves. In spite of the abundance of the water flowing down the rivers or stored underground, most of the villages, even today, do not have adequate supply of good quality drinking water. Quite often, in rural areas, drinking water has to be brought from a distance of a few kilometres. Even all the towns do not have a municipal water supply system. On the other hand, a lot of water is misused or wasted. Ground water accounts for about 48% of the irrigation water. Ground water often remains under-utilised. If necessary equipment and energy are available to pump it out, it could provide assured irrigation to sizable part of our land.

Forest cover

An analysis of satellite imageries and air photos indicates that in 1982 about 11%of land area in India was thick forests and the remaining 3% degraded or thin forests (Fig. 17.2). The world figures are much higher than this, and a higher figure is considered necessary from the point of view of climate as well as maintenance of the composition of the air we breathe. In India, most of the forests resources are used as fuel by people living in or around them. A good deal of forest trees are felled for timber, and for packing fruit and for making paper. Besides, forests are being overgrazed by the increasing number of cattle. During the last 30 years, approximately 4.3 million hectares of forests were converted into agricultural fields or lost in construction of dams and roads. This is quite a good fraction of the 75 million hectares of total forest area. According to the latest information, the country is losing its forests at the rate of 0.16 million hectare every year. If the present rate of deforestation continues, a good deal of the country would become a mere grassland within a hundred years, with drought and floods becoming a regular feature in India.

Minerals

Minerals like coal, iron, copper, steel etc. are used in all kinds of industries and in every-day life. The rate of consumption of minerals is increasing every year. Although the per capita consumption of some minerals like lime stone and iron ore is higher than some other minerals like bauxite, clay, gypsum, silica, sulphur, coal etc. Our per capita mineral consumption is very small compared to that of the developed countries like USA, USSR or Japan. A major proportion of minerals produced in our country are exported to other countries as raw material to earn foreign exchange. However, quite a few minerals, like uranium, diamond, some kinds of steel, copper, non-ferrous alloys, crude oil etc. are imported in one form or another.

An important issue in the utilisation of resources is how to handle waste, so as to extract the useful resources from it. Let us now consider the recycling of waste materials. But before that you may like to try the following SAQ.

SAQ 1

Statements regarding the use of various natural resources are given below. Match the statement given in column B with the resource in column A.

A	B
Land	i) The world figures are much higher than this, and a

		higher figure is considered necessary from the point of view of climate as well as maintenance of the composition of the air we breathe.
Water	ii)	A major proportion produced in our country is exported to other countries as raw material to earn foreign exchange.
Forest cover	iii)	If necessary equipment and energy are available to pump it out, it could provide assured irrigation to sizable part of our land.
Minerals	iv)	The conditions of life in the cities often deteriorate due to increased population. Sewage and water supply come under strain, more vehicles cause more pollution.

18.3 RECYCLING OF USED RESOURCES AND WASTE

Some of the materials once used need not go waste, these can be re-used. The process through which the waste resources are again made usable is known as recycling.

Scraps and used metals

Scrap metal is produced in large quantities in mills and factories. Old used metal of discarded vehicles, machine, aircrafts, ships, buildings etc. can be melted and recycled for useful purposes. Used aluminium utensils, for example, can be collected, melted and shaped into new utensils. We can meet the growing demand of such scarce metals as copper, zinc, lead, platinum etc. by recycling the used materials.

Waste water

Domestic and municipal waste water is rich in organic nutrients. If this kind of water is made free from disease carrying germs and poisonous elements, it can be used for irrigation of farms, gardens and other vegetations.

For the removal of germs and toxic elements, the waste water or sewage is treated in a tank or in ponds for several days. In doing so, the heavy particles settle down to the bottom by themselves, while the finer particles are made to settle down by adding alum and caustic soda. The clear liquid is then allowed to pass through filters or sand or earth and finally air is blown through it. This treatment not only removes carbon dioxide and hydrogen sulphide which is generally dissolved in waste water, but also adds oxygen to the filtered water, thus helping in purification. Treatment of water with appropriate doses of chlorine, known as chlorination, kills all the harmful germs and makes water usable.

Growing of algae or water hyacinth, a wild plant that grows in floating masses in rivers, lakes etc. serves a double purpose. It cleans the water of pollutants like phosphates and nitrates that act as nutrients for these plants, and these plants can also be utilised for the production of biogas about which you have already studied in Unit-17.

Solid waste

Solid waste in some cases can be a resource. A good example is the factory at Yokohama in Japan which is engaged in converting waste paper into toilet paper. In our country, the main street of Patna city is being illuminated by biogas produced from nightsoil of the city dwellers. In Delhi, the sewage treatment plant produces cooking gas. Fermentation of wastes such as cattle dung, human excreta, garbage and aquatic weeds like algae and water hyacinth, produces biogas which can be used for a variety of purposes. Fermentation takes place at temperatures between 28° and 40°C and gases produced are predominantly methane and carbon dioxide with a small quantity of hydrogen sulphide and nitrogen.

Fermentation is a chemical change in the organic bodies in which complex compounds are broken down into simpler ones

Slag, a waste product left when the metal has been extracted from its ore, can be powdered and added to cement for construction. Flyash is another material used as a valuable cementing material.

It is clear from the above that the solid wastes can serve as very useful resource for providing raw material for our industries, for generating energy and for the production of manure. You can try the following SAQ to test what you have learnt.

SAQ 2

Complete the following sentences:

i) Scraps and old used metals can be remelted and ..... for useful purposes.

ii) Treatment of water with appropriate doses of chlorine kills the harmful..... present in water.

iii) Domestic and municipal waste water can be used for.....

iv) The process through which waste resources are again made re-usable is known as.....

v) Flyash is used as valuable .....

vi) Solid waste serve as useful resource for providing ..... for our industries.

18.4 RESOURCE PLANNING AND MANAGEMENT

You already know that our resources are limited and if they are not used properly they will get exhausted soon. It is, therefore, necessary for us to study, how with wise and careful planning, we can make use of our limited resources.

18.4.1 Land Use Planning and Management

People see land everywhere and get an impression that plenty of it is available. Besides, they do not care how it is being used, unless of course, it is their own property. Lack of concern on the part of the public and official agencies has led to widespread erosion, soil sickness and other damage to land resources. Land is an exhaustible resource and is very sensitive to changes in climate and physical processes in nature like rain, sunshine, vegetation, erosion, land slides etc.

Land should be used according to its suitability and capability. As you have studied in earlier sections, suitability and capability of land is assessed in terms of its load bearing ability and fertility.

Since food for an increasing population requires more land for cultivation, the encroachment of fertile agricultural lands for non-agricultural purposes like construction of roads and buildings should be reduced to the minimum. Extreme care should be taken in selecting sites for development of industries, construction of dams and water reservoirs etc., so that the environment and socio-economic conditions of the people living in that area are not disturbed. In locating sites for the development of urban centres, the need for housing, water supply, disposal of waste and garbage etc. should be taken into consideration.

Hill areas, as far as possible, should be put under forest cover because forests serve as a resource for fuel, fodder, and timber, and provide space for animal farming (Fig. 18.1). Besides, forests help in increasing the ground water, since they impede the free surface run-off, thus allowing water to be absorbed by the ground. In this process, soil erosion is minimised and flooding can be avoided. Forests help to maintain a balance in the ecosystem, that is, among animals, plants, air and water etc.

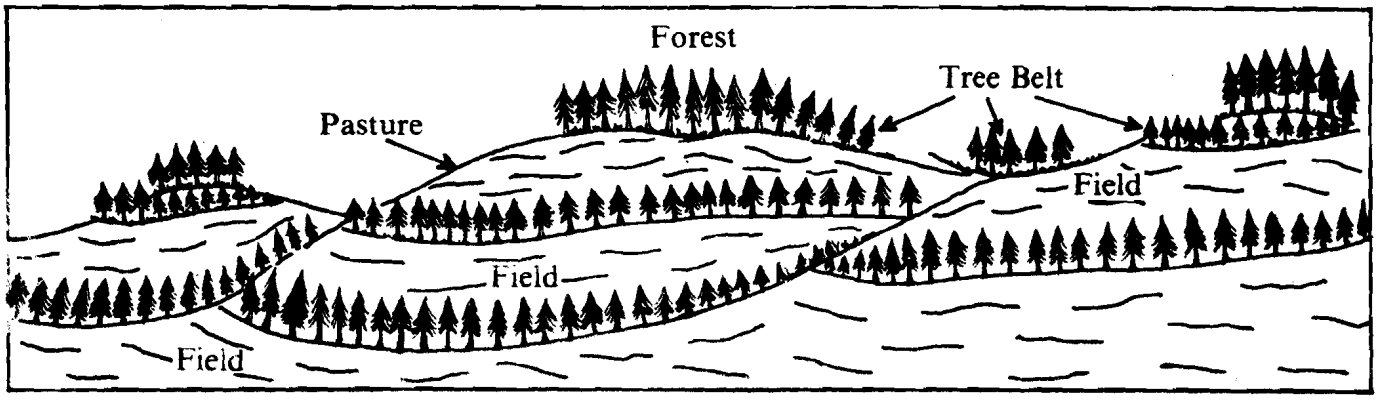

Fig. 18.1: An ideal land use in the hill region

Let us see what are the essential components of land management.

Essential components of land management

There are five essential components of land management:

i) Drawing up of a land capability map indicating soil productivity and ability to support various human activities in rural and urban areas. This kind of map is prepared with the help of aerial photos and satellite imageries. The map can also give information regarding the properties of rock and soil and underground potentials of water reserves.

ii) A detailed study of various aspects of land, such as type of soil, physical features of the earth's crust, water resource input, its distribution, utilisation, surface flow, surface storage, for example in ponds and ground water. A programme of land use can be worked out on the basis of such information.

iii) Changes resulting from land use have to be monitored. This can be done by remote sensing.

iv) Investigation and estimation of anticipated intensity of natural hazards likely to threaten a particular area or region.

v) A comprehensive study of the programme and plan of land management with a view to preserve the land by reducing or checking the intensity of erosion or soil sickness.

18.4.2 Soil Management

As we have said before, soil is a precious resource which takes millions of years to form, and hence proper management of soil is very necessary. The management of the soil is two-fold, i.e. (a) to minimise or check soil erosion and (b) restore productivity of the soil.

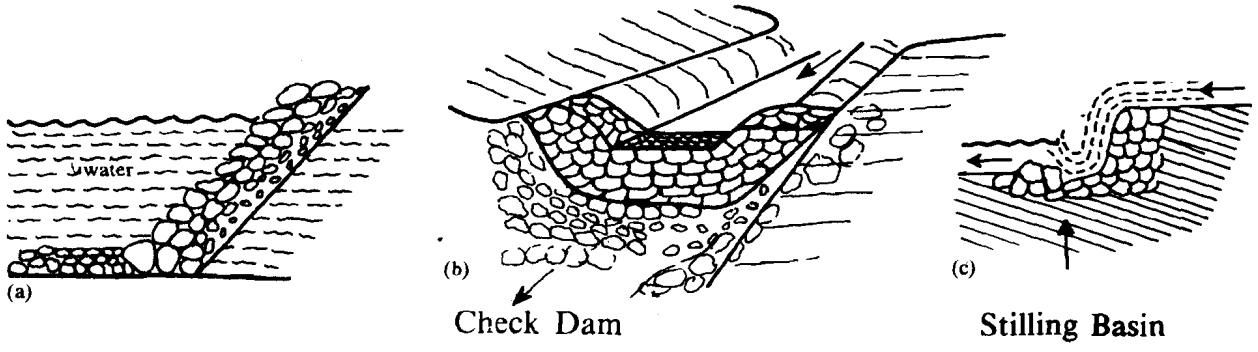

Fig. 18.2a: Drainage system for preventing uncontrolled flow of water. Fig. 18.2b, c; check dams for preventing the flow of running water

Control of soil erosion

The most significant measures of erosion control include (i) growth of grasses, shrubs and trees on soils and (ii) construction of a drainage system which can prevent free, uncontrolled flow of water (Fig. 18.2 a). Water flow causes formation of narrow channels or gullies and leads to development of deep narrow valleys leading to ravine land. The famous Chambal ravines have been formed as a result of deep soil erosion and the process is still continuing. This can be controlled by constructing a series of check dams which prevent the flow of running water and widening of gullies (Fig. 18.2b, c). Formation of a broad wall of stone along the coasts of Maharashtra, Kerala, Andhra Pradesh and Orissa has proved to be very effective in controlling erosion by sea waves and currents. Movement of sand by gusts of wind in the deserts and sandy coasts can be prevented by putting barriers of trees and shrubs across the path of wind (Fig. 18.3). In the mountain and hilly areas, planting of stems and branches of self propagating trees and shrubs, not only strengthens the slope of the terrace but also provides fuelwood and fodder to the farmers. Alternation of beds of crops with strips of erosion resistant vegetation like grasses, shrubs, trees, maize, sugarcane, cotton and tobacco etc. brings about stabilisation of the terraced fields on mountainous and hilly areas.

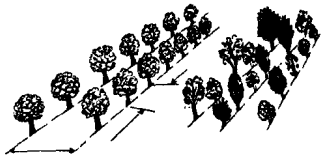

Fig. 18.3: Checking movement of sand gust by erecting barriers of trees and shrubs

The most effective step in controlling erosion and mass movement, such as landslides in the hills, is the construction of a network of the drainage ditches which are filled with fragments of stones or bricks so that water flows out through them. The hill slopes are stabilised by constructing walls around them which allows the free passage of water. On the vulnerable slopes, a cover of vegetation is provided and in the beginning, seeds are covered with coir netting pegged firmly to the ground (as shown in Fig. 18.4). Netting checks erosion, holds the soil material together and adds nutrients. The quick growth of grass stabilises the soil.

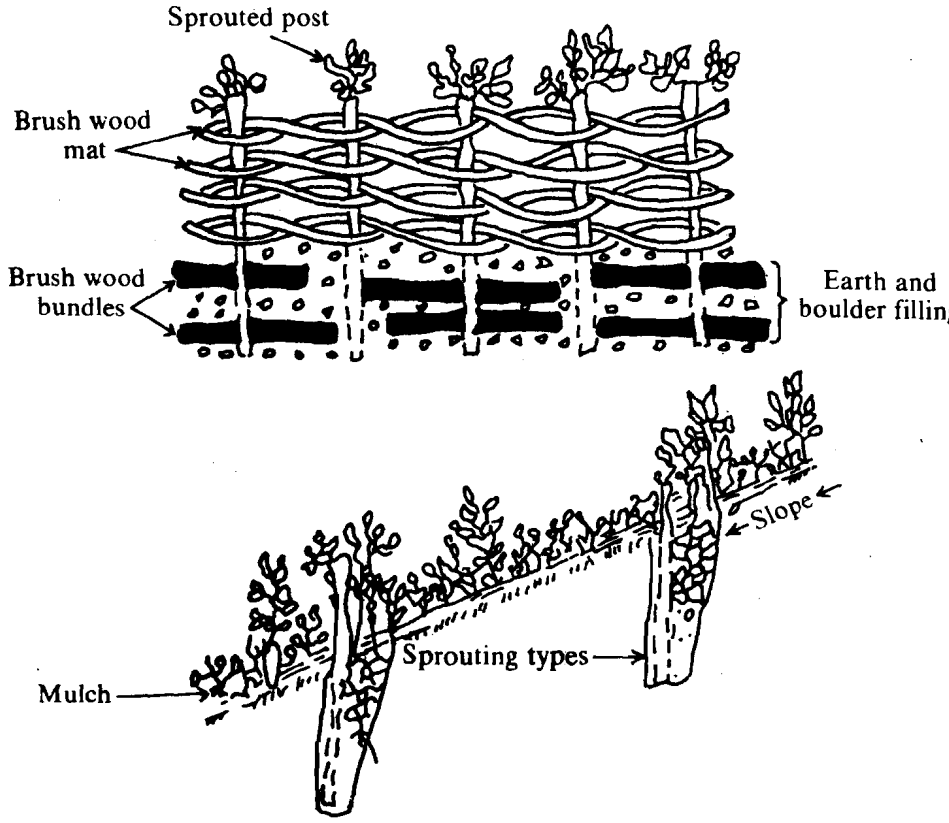

Fig. 18.4 : Plantation of vegetation cover and brush wood or coir netting on the slopes of mountain

Treatment of soil sickness

Due to overuse without rest, soil becomes deficient in the requisite nutrients and loses its fertility. Rotation of crops and vegetables, such as peas and beans, helps to remove the deficiency of nutrients. Plants such as peas add nitrogen to the soil and thus increase its binding property as well as productivity. The roots and off-shoots of the crops and their remains are left in the field for a certain period of time to protect the soil from erosion.

It is found that excessive irrigation causes complete saturation or water logging of the soil, which consequently loses productivity, partially or completely. As a result of over irrigation in some areas, salinity and alkalinity of the soil increases, making it "sick". This kind of soil sickness can be controlled by, first of all, sealing off all points of leakage from canals, reservoirs, tanks and ponds, and use of only the required amount of water. Alkalinity and salinity of the soil can also be reduced by application of some chemicals like gypsum (a chalk like substance, from which Plaster of Paris is made), phosphogypsum (gypsum with phosphates), pyrites (sulphides of copper, iron etc.) in addition to organic manures and fertilisers. Planting of salt resistant plants such as barley, millets, soya, cotton, spinach, date palm is another way of overcoming the problem of salination of the soil.

18.4.3 Management of Forest Resources

Considering the ever growing demand of wood and realising the importance of conserving our forest resources, it has become necessary to find alternative fuels as well as raw materials to manufacture paper, sports goods, packing cases, furniture and beams used in buildings. Research is going on to discuss alternate sources; in some cases, plastics and composite materials have been developed, though they are not widely used as yet. The other way is to cultivate quick growing trees and herbages in large numbers in selected farms of degraded or wastelands. This will provide us fodder, fuelwood, timber, fruits and seeds. If deforestation has to be stopped, some necessary steps have to be taken:

i) adoption of a scientific method of harvesting forest stocks,

ii) developing a mechanism of monitoring forest growth rate and depletion,

iii) establishing an effective system of fighting forest fires,

iv) strictly enforcing laws to deal with unauthorised cutting of trees.

Tree plantation

Plantation, on a mass scale, of fast growing trees such as poplar, casuarina etc. should be undertaken. The productivity of **tree plantation** is found to be greater than that of natural forests. In a well irrigated tree farm, the productivity may be as high as 45 tonnes per hectare per year.

Social forestry

A farmer can partly meet his needs of wood from the fast growing trees planted within the limits of his village, along the footpaths, roadsides, alongside railway tracks, side roads or canals and streams, boundaries of fields and empty spaces. The aim of social forestry is to meet the needs of fuel, fodder, fruits, timber and other requirements.

18.4.4 Management of Water Resources

Management of water resources means a programme to provide an adequate supply of good quality of water for various uses without endangering the life of the source or the reserve of water. In other words, efforts should be made to see that: (i) water of the right quality is available for all kind of uses and (ii) there is no misuse or wastage of this precious resource.

Water management includes recharging the reserves of groundwater and diverting supply from an area of surplus to the region of scarcity.

Recharging of groundwater is the most important aspect of the water management. In the mountains and hills, the watersheds are covered with vegetation. The litter-covered soil of the watershed allows infiltration of rain water, which finds its way to the aquifers.

In urban and rural areas, storm water, used water or domestic drains can be fed into pits, trenches, or any depression, where it can filter underground. Flood water can be injected into aquifers through a series of deep pits or it can be spread on the fields through a network of ditches.

The excess flow of normal as well as flood water can be diverted to areas where there is scarcity of water. This will not only remove the danger of damage caused by floods but will also benefit the regions of scarcity.

By proper treatment of the domestic and municipal waste water, one can obtain a supply fit for many industrial and agricultural purposes. The treatment of waste water involves removal of pollutants, germs, and toxic elements as you have already studied in the previous section.

Desalination of sea water

By use of solar energy, sea water can be distilled, thus fresh water of good quality can be obtained. This method of desalination of sea water is being used in our country at places like Bhavanagar in Gujarat and Churu in Rajasthan.

Reducing over consumption

Using more water than necessary is an unpardonable waste of the precious and scarce resource. In our country, a lot of water is wasted due to leaking taps and bad plumbing. There is also need for a check on excessive irrigation.

So you see, there are ways in which we can better manage our limited resources. Before going on to the next section, you may like to check what you have learnt.

SAQ 3

Give very brief answers to the following questions:

i) What type of resource is land?

.....

.....

ii) Why should we take extreme care in selecting the site for development of industries, construction of dams, water resources etc.?

.....

.....

iii) Why should hill areas be put under forest cover?

.....

.....

iv) What does flow of water do to the land?

.....

.....

v) How do plants like peas help the soil?

.....

.....

vi) Why is social forestry important for a farmer?

.....

.....

vii) How is ground water recharged?

.....

.....

18.5 CONSERVATION OF MINERAL RESOURCES

In the previous unit you have studied that mineral reserves are present in a limited quantity and they can be exhausted. At the present rate of consumption many of them will not last long. Conservation means that there should be judicious use with minimum wastage. One way of minimizing or reducing wastage is recovering as much as possible and leaving nothing as waste. The quality of lower grade ore can be improved by processes which remove undesirable materials like earth, rock etc. and give enriched ore.

As described in the previous section, scraps of used metals can be recycled or used again. This will reduce the pressure of demand on many mineral reserves. The alloys of magnesium are fast replacing steel and are also reducing the demand for copper, lead and tin which are in short supply. There is a need to find substitutes for metals like mercury, gold, silver, platinum etc. and also for asbestos.

Further, the natural environment of the area from where the mineral ores have been taken out needs to be protected from deterioration. The dug out parts are devoid of nutrients. Hence, they remain barren and do not allow the growth of any vegetation. Such waste or damaged lands can be covered by fresh topsoil (Fig. 18.5). Use of fertilisers, sewage water, domestic or municipal waste, farmyard manure, etc. will help in restoring the fertility of these degraded lands.

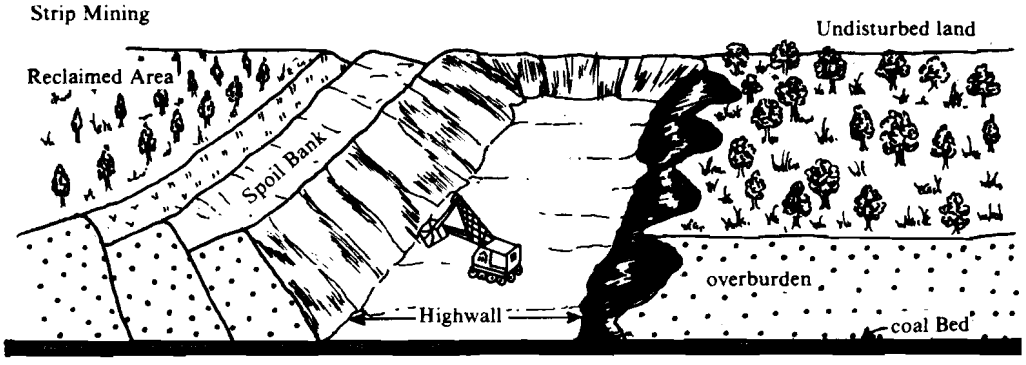

Fig. 18.5: After scrapping off top soil, the excavated parts are covered with soil and afforested

Monitoring of resource utilisation

Continuous recording of the changes in the quality and quantity of various resources is as important an element of resource planning as evaluation of original reserves.

The monitoring of resource utilisation is best done through remote sensing. It involves studying the nature and size of reduction or deterioration of the forests, soil, land, mineral deposits, water bodies and snowpacks. For example monitoring of the behaviour of rivers will help us in averting or reducing the menace of floods and erosion. Monitoring has also demonstrated that over-irrigation of arid or semi-arid areas causes salinity or alkalinity of the soil. Such harmful effects of over-irrigation are witnessed in southern Haryana and adjoining Rajasthan.

SAQ 4

Given below are some statements. Write true (T) for correct statement and false (F) for incorrect statement.

i) Conservation means that there should be no use of the resource.

ii) The dug out parts from where minerals have been taken out are full of nutrients and as such these areas are very productive.

iii) Use of sewage, domestic or municipal waste, farm yard manure etc. will decrease the fertility of the degraded lands.

iv) Monitoring of resource utilisation is best done through remote sensing.

v) Monitoring has demonstrated that over-irrigation of arid or semi-arid areas increases the fertility and productivity of the soil.

18.6 SUMMARY

In the present unit, you have studied how best we can make use of our limited and non-renewable resources like soil, water, forests, minerals, etc., and if we use our limited resources with wise and careful planning, they will last longer and can be spared for future generations. For example:

- a comprehensive programme and plan of land management will enable us to preserve our land resources by lessening or checking the intensity of soil erosion or soil sickness.
- by adopting scientific method of harvesting forest stocks, monitoring the growth of forests, establishing a system of controlling and preventing forest fires and enacting stringent laws for protecting forests, we can preserve our forest resources.
- by recharging ground water reserves, diversion of excess water from the area of abundance to an area of scarcity, recycling used water and desalination of sea water, we can provide good water in adequate quantities to our people.
- by recycling wastes, the utilisation of resources can be improved and also pollution can be reduced.

18.7 TERMINAL QUESTIONS

Give brief answers for the following:

1 How can you use sewage water for irrigation?

.....

.....

2 What is recycling of a metal? What purpose does it serve?

.....

.....

3 In what way can you check soil sickness?

.....

.....

4 Why is conservation of mineral resources necessary?

.....

.....

18.8 ANSWERS

Self Assessment Questions

1) i) Forest cover, ii) mineral, iii) water, iv) land.

2) i) recycled, ii) germs, iii) irrigation, iv) recycling, v) cementing material, vi) raw material.

3) i) land is an exhaustible non-renewable resource.

ii) Because encroachment of fertile agricultural and forest lands for non-agricultural purposes will disturb the environment and socio-economic conditions of the people living in that area.

iii) Because forests serve as resource for fuel, fodder, timber and provide space for animals. Forests also help increase the ground water and check soil erosion.

iv) Water flow causes formation of narrow channels or gullies and leads to formation of deep narrow valleys converting it into ravine land.

v) Plants like peas add nitrogen to the soil and increases its binding property as well as productivity.

vi) Growing trees within the limits of village can meet the needs of fuel, fodder, fruits, timber and other requirements of the farmer.

vii) By plantation of vegetation and trees, the underground water reserves can be recharged.

4) i) F, ii) F, iii) F, iv) T, v) F.

Terminal Questions

1 The sewage water is rich in organic nutrients. It can be made free from germs and poisonous elements for irrigation by removing them.

2. The process through which the waste resources are again made reusable is known as recycling. Scrap and old used metals can be remelted and recycled for useful purposes.

3. Soil sickness can be checked by rotation of crops such as peas and beans which help to remove the deficiency of nutrients. Salinity and alkalinity of the soil can be controlled by sealing of all points of leakage from canals, reservoirs, tanks, ponds and use of required amount of water.

4. Mineral reserves are present in limited quantity and if they are used carelessly they will be exhausted soon. That is why there is necessity of conservation of mineral resources. Conservation means that there should be judicious use with minimum wastage.

GLOSSARY

Abiotic factors: non-living parts of an organism's environment

Acid rain: rain or snow having pH less than 5.6

Aquifer: a deposit of rock that yields economic supplies of water to wells or springs

Aerosol: suspension of small, liquid or solid particles (0.1-100 microns diameter) in a gas, e.g., smoke (solid particles in air). Aerosol sprays are widely used for insecticides, air fresheners, paints, cosmetics etc.

Aerosol propellants: compressed gas or vapour in a container which upon release of pressure and expansion through a valve carries another substance from the container. These are used for cosmetics, household cleaners etc. butane, propane, nitrogen, carbon dioxide, chloroflourocarbons, are common aerosol propellants

Agrochemicals: chemicals used in agriculture

Algae: simple plants, found in places where abundant moisture is available, these grow on walls that are constantly wet, or on moist soil, ponds, and other water bodies including the sea

Amphibians: animals like frog, salamander etc. their young ones live in water, whereas adults are terrestrial

Arid: land area having not enough rainfall to support vegetation

Atmospheric pressure: the pressure at any point in the atmosphere, due to the weight of the atmospheric gases above the point concerned

Bark: the outer portion of the stem. It consists of cork, which is largely a dead tissue; and also some living tissue of the stem

Bauxite: clay-like substance from which aluminium is obtained

Biodegradable: a substance that can be broken down by living beings such as microorganisms etc.

Bioluminescence: the emission of visible light by living organisms

Biomass: the total weight of all or selected group of living beings in a particular area

Biotic factors: living components of an organism's environment

Bog: wetland ecosystem, having acidic conditions, and lot of peat and moss

Buoyancy: power to float or keep things floating

Camouflage: any device used to deceive or mislead an enemy, e.g., many insects living on a plant, resemble its leaves in colour, shape, size etc. and is difficult to locate it easily

Canopy: a covering at some distance from the level of ground, formed by branches, twigs, and leaves of woody plants.

Carnivores: those animals that eat other animals

Cell: the structural unit of life. It consists of cytoplasm and genetic material, that are enclosed in a membrane that allows selected materials to pass through

Combustion: the burning of gas, liquid or solid evolving heat, and often light also

Consumers: organisms that obtain energy in the form of organic matter

Corrosive: substances that corrode. Corrosion means slow destruction by chemical action

Currents: a type of water movement

Deciduous: plants that lose their leaves during one season of the year; are not evergreen

Decomposers: organisms that use dead organic matter as a source of energy

Ecology: a branch of biology that studies the relationships between organisms and their environment

Ecosystem: an interacting collection of organisms and the abiotic factors that affect them

Environment: anything that affects an organism during its life time

Estuary: where fresh water and sea water meet and mix

Fern: small, tender plants having few leaves, large in proportion to the stem, and bear spore containing structures on the under surface or margins; many of these grow at high altitudes

Fertiliser: material that is added to soil to supply chemical elements needed for plant nutrition

Filter: a device to separate any undesirable substance

Food chain: a sequence of organisms that feed on one another resulting in the flow of nutrients and energy from a producer through a series of consumers

Food web: a system of interlocking food chains

Fungi: (singular-fungus), e.g., yeast, mushrooms, molds, mildew, puffballs

Gamma rays: electromagnetic rays of very short wave-length emitted by radioactive substances

Gastric secretion: these are the digestive fluids secreted by the wall of the stomach

Gastrointestinal: concerning the digestive system that includes stomach, intestine and all the accessory organs

Genetic: concerning heredity

Geothermal energy: heat within the earth's interior that is a potential source of energy

Gills: the breathing organ of animals that live in water

Gravity: the force that attracts objects towards the centre of the earth

Greenhouse: glass-enclosed, climate controlled structure in which young, or out-of-season plants are grown and protected

Gynaecological: dealing with the diseases of women, particularly those affecting the sex organs

Habitat: it includes land, water or vegetation, which is the natural home of any living being

Heavy metals: a metal whose specific gravity is approximately 5.0 or higher

Herbivores: those animals that feed directly on plants

Hibernation: a condition of partial or complete torpor into which some animals relapse during the winter season

Humidity: water vapour content in the atmosphere

Insecticide: a chemical agent that destroys insects

Leaching: washing away of elements that are necessary for plants by rainfall etc.

Leaf mottling: appearance of spots or areas of different colours without a regular pattern on the leaves

Limestone: a rock made up largely of calcium carbonate, known as calcite, e.g., chalk

Mammal: animals which are characterised by the presence of hair, a muscular diaphragm, milk secretion, and placenta development, e.g., cat, cow, human beings

Microbe: any small organism such as bacteria; yeast etc. (also called micro-organism)

Microscopic: things that are not visible to unaided eye, and can be seen clearly under the microscope. Microscope is an instrument that produces a large image of small object

Moss: tiny green plant, occurring in nearly all damp habitats except oceans

Neuro-muscular: pertaining to both nerves and muscles, functionally and structurally

Non-persistant- pollutant: pollutants that do not remain as such in the environment for a long time, that is, they are broken into simple forms

Nuclear reactor: a device in which a controlled nuclear reaction is carried out to generate energy

Omnivores: those animals that are carnivores at times and herbivores at others

Ores: rock earth, minerals etc. from which metals can be mined or extracted

Organic substances: substances containing carbon, hydrogen, and sometimes oxygen, nitrogen and other elements

Pesticides: these are chemical substances that are deliberately introduced into the environment, to kill organisms that are considered undesirable

Pastures: grassland for cattles

Photovoltaic devices: device used in producing electric signals in response to solar radiation

Phytoplankton: minute photosynthetic organisms floating in the upper layers of a body of water (marine or fresh waters)

Plateaux: level land high above sea level

Pollen grains: (Latin-pollen dust) appear dust-like. A pollen grain is the male reproductive unit of plant. It unites with the egg, and together they form a seed

Pollution: destruction of the purity of the environment

Precipitation: any or all the forms of water, whether liquid (rain) or solid (snow) that fall from the atmosphere and reach the ground

Precipitator: a device that separates an undesirable substance from a mixture, by making it settle down

Primary pollutant: pollutants like carbon monoxide, oxides of sulphur, and nitrogen, hydrocarbons and particulates

Producers: organisms that produce new organic material from inorganic material with the aid of sunlight

Propellant: a combustible substance that produces heat and supplies ejection particles as in a rocket engine

Radioactive: substances like radium, uranium etc. having atoms that break up, and in doing so, send out rays in the form of electrically charged particles capable of penetrating opaque bodies

Ravine: deep, narrow valley

Recycling: returning to an original condition

Refrigerant: a substance that by undergoing a change in phase, i.e., liquid to gas causes cooling effect

Reptiles: animals with dry scaly skin, they lay their eggs on land, e.g., snake, lizards, turtles, alligators, crocodiles

Rodents: mammals (see also mammals), e.g., rats, mice and their relatives

Rotation of crop: varying the crops grown each year on the same land to avoid exhausting the soil

Salubrious: good for health

Satellite imageries: photos taken from satellite

Scrubber: also known as wet collector. It is a device for the removal of undesired components from the gas evolved

Semi-arid: land having better rainfall in comparison to arid area

Sensors: receptors that are sensitive to specific stimuli, e.g., sound, light, pressure, heat

Silica; a hard, white or colourless substance occurring abundantly in nature, main constituent of sand

Silt: rock fragments or a mineral particle in soil having a diameter of 0.002-0.05 millimetre, and are smaller than fine sand.

Skeleton: the rigid or elastic, internal or external, framework which gives support and protection to the soft tissues of the body and provides a basis of attachment for the muscles

Slag: waste matter remaining when metal has been extracted from ore

Snowpacks: frozen snow on mountains

Social forestry: tree raising programme to supply firewood, fodder, timber and minor forest produce to rural population

Soil erosion: the detachment and movement of top soil by the action of wind or flowing water

Species: closely related individuals that resemble one another, and are able to inter-breed with one another, e.g., human beings

Spectrum: image as a band of colours (red, orange, yellow, green, blue, indigo and violet, as seen in a rainbow) formed by a ray of light when it passed through a prism or any such substance

Spore: reproductive cell that can grow into a new individual, as seen in bacteria, fungi etc. Bacterial spores form when an individual cell encases itself in a protective covering, when conditions are unfavourable for growth. It is a resistant structure, that is capable of standing unfavourable environmental conditions.

Tanning: a process of preserving animal hides by chemical treatment to make them immune to bacterial attack, and subsequent treatment with fat and greases to make them pliable

Terrestrial: living or growing on land

Tide: the periodic rising and falling of the oceanic waters resulting from lunar and solar forces acting upon the rotating earth

Tissues: a group of cells that perform a particular task in an organism, e.g., cartilage, muscles etc.

Trench: a long narrow, deep depression of the sea floor, with relatively steep sides

Trophic level: the level in the food chain at which an organism functions, e.g., herbivores, members of second trophic level, eat plants that are the members of first trophic level

Ultraviolet light: also known as ultraviolet radiation, electromagnetic radiation having a shorter wavelength than visible light and larger than X-rays, including wavelengths normally invisible to humans but visible to bees, humming birds etc. It is destructive to skin tissue and genetic material

Vine: a plant having a stem that is too flexible or weak to support itself

Water logging: land thoroughly soaked with water

Zooplankton: the minute animal life drifting near the surface layers of a body of water (marine or fresh water)

FURTHER READING

General Geography of India Part - I, NCERT - Publications

Geography of India Part - II, NCERT - Publications

Human and Economic Geography, NCERT - Publications

The State of India's Environment, The first citizen's report Centre for Science and Environment

The State of India's Environment, 1984-85, The second citizen's report Centre for Science and Environment

COURSE CONTENTS

Audio/Video Programmes

Audio :

1) Science and Society (Block 1)
2) Astronomical Development in India (Block 3)
3) Measuring Astronomical Distances (Block 3)
4) Evolution of Man (Block 3)
5) The Forest Ecosystem (Block 4)
6) Population Pressure (Block 4)
7) Common Misconceptions about Health (Block 5)
8) Human Factors in Engineering (Block 6)
9) New Information Order (Block 6)
10) Technology and Self-Reliance (Block 7)
11) Nuclear Disarmament (Block 7)

Video :

1) Method of Science (Block 2)
2) A Window to the Universe (Block 3)
3) The Story of a River (Block 4)
4) Green Revolution (Block 5)
5) Infectious Diseases (Block 5)
6) Jean Piaget Development Stages of a Child (Block 6)
7) INSAT (Block 6)