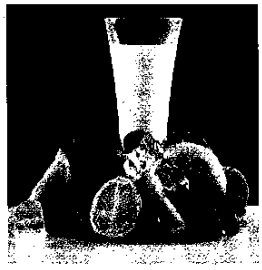
5 Conservation

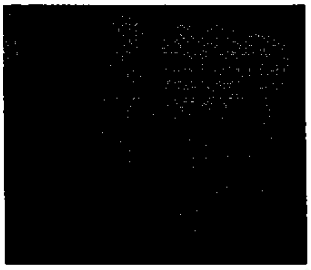
LEARNING OUTCOMES

- Conservation of natural resources
- Balance of nature
- Conservation of renewable resources: forests, wildlife, soil, and water
- Conservation of non-renewable resources: fossil fuels and mineral deposits
- Setting personal goals and practicing methods of conserving energy and materials

(a)



(b)



(c)

Observe pictures (a) to (c) carefully and try to answer the following questions.

1. Do you use the things shown in these pictures in your day-to-day life? If so, how?
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   .....
2. How essential are these things to you?
   .....
   .....

Name any five resources you use in your day-to-day life.

1. .....
2. .....
3. .....
4. .....
5. .....

Anything that is essential for living or which makes our lives easier is called a *resource*. Thus, we can say that pictures (a) to (c) show different resources. Most of the resources we use in our day-to-day lives (including those shown in these pictures) come from nature, and are called *natural resources*.

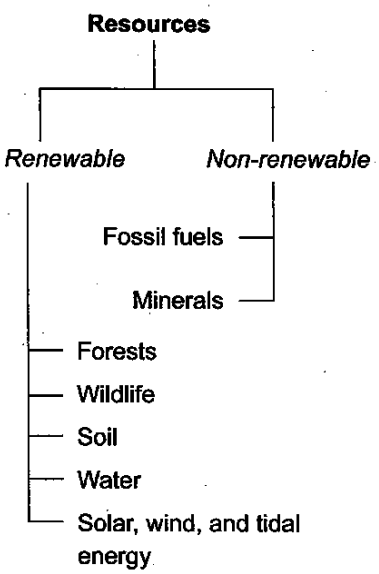
In this chapter we will learn about different types of resources. We will also discuss the impact of human activities on these resources.

TYPES OF NATURAL RESOURCES

Natural resources are of two types: renewable and non-renewable.

Renewable resources are those that can replace or renew themselves, if used carefully. All living things (e.g., animals, crops, and forests) belong to this group. Soil and water are also renewable resources.

Non-renewable resources are those that cannot be replaced in the environment after they have been used up. These include coal deposits, oil deposits, natural gas, minerals, and metals.



Humans have been using the resources provided by nature from time immemorial. In ancient times, they had limited needs and lived in perfect harmony with nature. With the development of agriculture, human dependence on natural resources increased. With urbanization and industrialization, coupled with a rapid increase in population, human influence on the environment has been ever increasing. One of the main aspects of human influence on the environment has been the increased demand for natural resources, which has resulted in their overexploitation.

The world we live in is still very rich in natural resources, despite their greedy exploitation in the recent past. Therefore, wise management or *conservation* of natural resources is the need of the hour.

Find out and write a few uses of the following:

Solar energy

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Wind energy

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Tidal energy

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CONSERVATION OF NATURAL RESOURCES

Conservation is the sensible management of natural resources. It involves the use and preservation of these resources without overexploitation, misuse, or waste.

Conservation of renewable resources

Renewable resources such as solar energy, wind, and tidal energy are virtually inexhaustible. Resources such as plants, animals, soil, and water, are said to be 'potentially renewable'. They are renewed, at a fairly rapid rate, through natural processes. This does not mean that they can be exploited indiscriminately. Their

THINK QUEST

Read the following story and answer the questions given below it.

Borneo, located in the Malay Archipelago, is the third-largest island in the world. In the 1950s, insecticide was sprayed in the region to control the population of mosquitoes, in an effort to prevent malaria. The mosquitoes died, as desired, but so did the lizards, after eating the dead mosquitoes (whose bodies contained the poisonous insecticide). Cats died from eating these dead lizards. With no cats to eat them, the rats (which harboured disease-carrying fleas) increased in number, threatening the region with outbreaks of plague and typhus. The insecticide killed wasps too, which fed on caterpillars that ate the leafy roofs of huts.

1. Which concept discussed in the chapter does this story illustrate?
2. What do you think happened to the roofs of huts after the wasps died?

Fig. 5.1 *Trees prevent soil from being carried away by wind*

proper management is still essential. If they are used at a faster rate than the rate at which nature renews them, they can be lost forever.

Plants and animals, which are also natural resources, often depend on one another. You may already know this from your study of food chains and food webs in lower classes. This interaction between organisms in nature, which produces a stable, continuing system of life, is often termed *balance of nature*. Thus, in nature, the survival of one species often depends on the survival of another. Human activities that affect a certain species often upset this balance of nature, affecting all organisms which depend on that particular species. Let us consider an example to understand this better.

Suppose there is a forest from where animals cannot move out or move in because of natural barriers. Producers, herbivores (such as deer), and carnivores (such as the tigers) live in harmony and the forest thrives well. Let us say, the deer population is 100 and the tiger population is four. Now imagine a poacher entering this forest and shooting down two tigers. What will be the impact of this event on the forest? With fewer tigers to hunt them, the deer would multiply fast and would soon become numerous enough to eat up all the available vegetation and exhaust it. They would then die of starvation. This example clearly shows how human interference in an ecosystem could upset the balance of nature with disastrous consequences.

Let us consider various aspects concerning the conservation of natural resources such as forests, wildlife, soil, and water.

Forest conservation

Forests are dominated by trees and plants. They provide shelter to a variety of animals.

Importance:

1. Forests provide timber and pulp wood.
2. Roots of trees bind soil particles together (Fig. 5.1) and prevent them from being carried away by wind or water.

   The loss of fertile top soil by the action of wind, water, etc., is termed *soil erosion*.

3. Many forest plants have medicinal value.
4. Forests assist in the control of floods, conservation of water supplies, and maintaining water cycles.

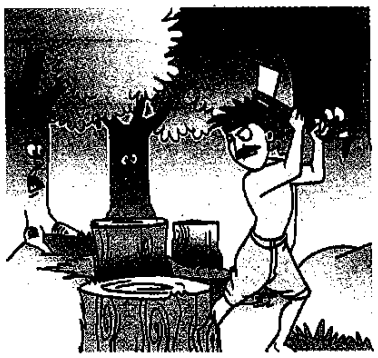

Fig. 5.2 Deforestation

Problem: Presently the rate of timber consumption outstrips the rate at which it is replaced. The growing demand for land, mainly for housing and agriculture, has also led to large-scale destruction of forests.

The large-scale destruction of forests is termed *deforestation* (Fig. 5.2).

Deforestation results in *soil erosion.* The soil that is carried away tends to block the mouths of rivers, resulting in floods. Forest fires, too, pose a serious threat

Steps for conservation

1. *Forest conservation laws* Realizing the importance of protecting the forests of our country, the Government of India has enacted the Forest (Conservation) Act 1980. The act regulates the use of forest land for non-forest purposes and seeks to check deforestation. The act was amended in 1988 with stricter provisions against violators.

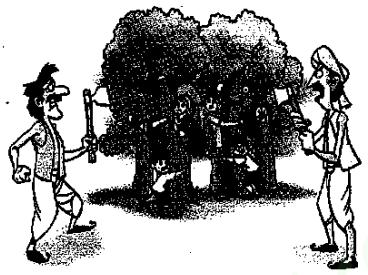

Fig. 5.3 The chipko movement

2. *Public participation* The concept of *social forestry* was started in 1976 in India. One of its main objectives was to encourage villagers and schoolchildren to cultivate plants for firewood and fodder and fast-growing timber trees, fruit trees, etc., on private land to relieve the pressure on forests.

The *chipko movement* was started in the Himalayas by the local tribal women in 1972. It gathered momentum in 1978 when these women used a unique way to protect trees from woodcutters—by embracing them (*chipko* means to embrace) (Fig. 5.3). The movement continued under the leadership of Sunderlal Bahuguna and spread to other parts. Although initially conceived by the illiterate tribal women, the *chipko* movement questioned developments based on the ruthless exploitation of nature to achieve short-term gains.

3. *Afforestation* Afforestation is the process of converting open land into a forest by planting trees (Fig. 5.4). It seeks to compensate for trees lost through deforestation. For every tree cut at least one should be planted—if not more.

Fig. 5.4 Afforestation

Fig. 5.5 A forest fire

4. *Protection from fire*: In a forest, fire spreads from tree to tree, across the entire forest (Fig. 5.5). Maintaining fire breaks, which consist of a strip of land from where the vegetation has been cleared, can prevent the fire from spreading to neighboring areas. Fire observation towers can also be built at strategic sites.

Wildlife conservation

The undomesticated or wild animals and plants that live in their natural habitats are collectively referred to as *wildlife.*

(a)

(b)

Fig. 5.6 (a) Passenger pigeon and (b) dodo have become extinct in the recent past

Importance

1. Since all organisms depend on one another in nature, the survival of wildlife is ultimately linked to our own survival.
2. Study of wildlife is of scientific importance.
3. Wild animals exhibit enormous variety and most of them are very beautiful. Recreational viewing of wild animals in zoos is of economic importance.

Problem Overexploitation is a serious threat to wildlife. If immediate steps are not taken to check this overexploitation, some animals may be lost forever.

An animal or plant that is no longer in existence is said to be *extinct.* Passenger pigeon, dodo (Fig. 5.6), and Indian cheetah are examples of animals that are thought to be extinct due to human exploitation. Organisms that are in danger of becoming extinct in the near future are termed *endangered* (e.g., tiger and blue whale). Those facing a serious, but not immediate, danger of extinction are termed *threatened.* International trade in live animals, in skins and hides for the leather industry, and other products such as bones, horns, nails, musk, etc., is a threat to wildlife.

Steps for conservation

1. Enacting and enforcing a Wildlife Protection Act by which killing endangered species is prohibited and made punishable
2. Protection of all threatened species in their natural habitats as well as under human care in special enclosures
3. Preservation of the whole ecosystem rather than a single species

4. Establishment of special projects for endangered species—such as Project Tiger, launched in 1973 with nine tiger reserves in nine different states
5. Establishment of *biosphere reserves* where all wildlife is protected, besides the *wildlife sanctuaries*, where particular species are protected

Organizations involved in wildlife conservation The International Union of Conservation for Nature (IUCN) lists the endangered animals and plants in its Red Data Book to provide information on them. In India, the Indian Board for Wildlife monitors the endangered species of wildlife. The World Wide Fund for Nature (WWF), a non-governmental agency, is also actively engaged in the conservation of our natural resources.

Find out which animals are protected in the following national parks/ sanctuaries:

Periyar (Kerala)

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Gir (Gujrat)

.....

Kaziranga (Assam)

.....

Kanha (Madhya Pradesh)

.....

Soil conservation

Soil consists of fine particles formed by the weathering of rocks over a long period of time. It also contains air, water, and living organisms.

Importance

1. Soil provides a medium for the growth of plants. It also provides plants with nutrients essential for their growth.
2. Animals such as ants and earthworms make their homes in soil.

Problem The biggest threat to fertile soil is soil erosion, which is chiefly brought about by wind and water (Fig. 5.7). Wind erosion usually affects dry and exposed soil, carrying it off physically and depositing it elsewhere. Water erosion is mainly due to the impact of raindrops on soil as well as by its surface flow. Landslides and deforestation also contribute to soil erosion.

Steps for conservation The methods of soil conservation can be divided into two broad categories: biological and mechanical.

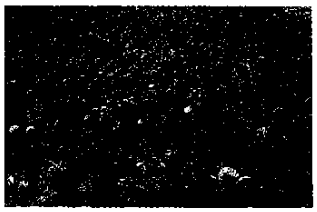
1. **Biological methods** involve providing a vegetation cover to prevent soil erosion and preserve soil fertility. The following six methods are commonly practiced.
   (i) *Mulching* This method involves covering the soil with agricultural wastes such as maize stocks, cotton stocks, tobacco stocks, etc. It also helps in the retention of moisture in the soil.

(a)

(b)

Fig. 5.7 *Soil erosion caused by (a) wind and (b) water*

TECH FILE



Cover crops such as clover are ploughed under the soil before they reach maturity, to improve soil's fertility. Such cover crops are called *green manure*.

Fig. 5.8 *Wind breaks*

FACT FILE

Some cover crops, called *trap crops*, are grown to lure pests away from the main crop. The trap crop, which occupies lesser area than the main crop, can be treated with pesticides after it has attracted sufficient number of pests.

(ii) *Crop rotation* This method involves cultivating different types of crops, one after the other on the same piece of land. This is done because different types of crops may have different nutritional requirements. Growing the same crop over and over again can deplete the soil of a particular nutrient. Cereals, which require more nitrates, are often rotated with legumes. Legumes have nitrogen-fixing bacteria in their roots, which replenish the soil's nitrates.

(iii) *Cover cropping* This method involves cultivating grass or other hardy plants on unused farmland to prevent soil erosion. In orchards, such cover crops are grown between rows of trees.

(iv) *Wind breaks* This method involves growing rows of tall trees and shrubs to prevent the erosion of soil by wind (Fig. 5.8).

2. **Mechanical methods** include conservation achieved by supplementing the biological methods so as to reduce the water run-off. The following methods are commonly practiced.

   (i) *Terrace farming* Terrace farming consists of constructing a series of steps along the hill slope to prevent soil erosion. The sides of each step are protected by a stone wall. Ploughing is done across the outer edges (contours) of the slope. This slows water runoff and prevents soil from being washed away.

   (ii) *Basin listing* This method involves the construction of small, shallow pits or *basins* in the furrows to retain water and reduce its run-off to minimize soil erosion.

   (iii) *Gully control* Gullies are a result of soil erosion by running water, mostly on a hillside. Widening of gullies could be prevented by construction of drains located strategically.

Water conservation

Water is essential to all forms of life. About 97% of earth's water is found in the oceans. This water is too salty for drinking and for use in activities such as agriculture. Freshwater constitutes a very small percentage of the water available on earth. Most of this freshwater exists in frozen form, which further limits the amount of freshwater readily available to us. If the total water available on Earth was 100 litres, readily available water would be only 0.003 litres (about one teaspoon)!

Importance

1. In homes, water is used for a number of activities: drinking, cooking, bathing, washing clothes, etc.
2. Water is required for growing plants. Without water there would be no plants and, therefore, no food for animals.
3. Industries use water for various purposes: as a raw material, solvent, etc.

Problem Rapid population growth in recent years has resulted in a greater demand for water. This has put great load on water resources, resulting in shortage of water in many parts of the world.

List some ways in which one can recycle water.

.....
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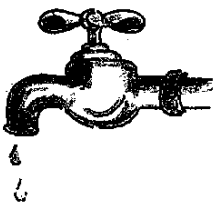
Steps for conservation

1. Almost 70% water is used for agriculture. Lot of water can be saved by adopting less wasteful irrigation practices.
2. Water can also be conserved by recycling it. Water recycling involves reusing treated wastewater for use in agriculture, industries, etc.
3. Rainwater harvesting is another way of saving water. This method involves capturing and storing rainwater during the monsoon for use during rest of the year. Artificial ponds and reservoirs are constructed for this purpose.
4. Water can also be saved by reducing wastage.

FACT FILE



Almost 72 litres of water is lost everyday from a dripping tap!

Conservation of non-renewable resources

Non-renewable resources such as coal and petroleum are available only in limited quantities and cannot be reproduced, at least in the near future. Therefore, wise utilization of these resources is very important.

Fig. 5.9 *A fossilized leaf*

Fossil fuel conservation

Fossil fuels include coal, diesel, petrol, and natural gas and are the common sources of energy we use today. Since they are formed from the remains of dead plants and animals (fossils) (Fig. 5.9), they are called *fossil fuels.*

Fig. 5.10 Coal

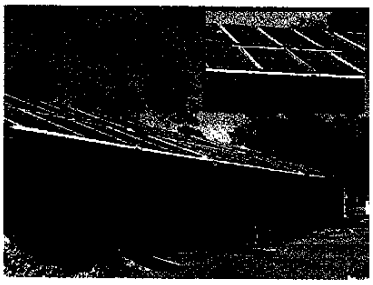


Fig. 5.11 Solar panels such as these are used to harvest solar energy

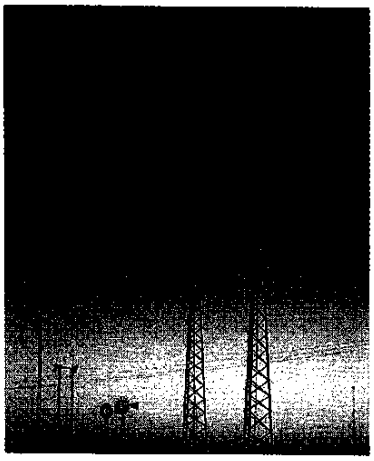


Fig. 5.12 Windmills such as these are used to harness wind energy

Importance

1. Fossil fuels such as petrol and diesel are used to run automobiles.
2. LPG and kerosene, obtained from petroleum, are used for cooking.
3. Fossil fuels such as coal (Fig. 5.10) are used for the production of electricity.

Problem Fossil fuels take a very long time to form. The coal that we are using today was formed over a period of 70 million years! Once these resources are depleted, we cannot get them back.

Steps for conservation The best method of conserving fossil fuel is not to waste them. We can also conserve fossil fuels by relying more on other renewable sources of energy, such as solar energy (Fig. 5.11), wind energy, and hydropower.

Alternate sources of energy Focusing on and promoting the use of alternate sources of energy is becoming increasingly important. Examples of alternate sources of energy include solar energy, biomass, wind energy (Fig. 5.12), geothermal energy, tidal energy, and hydroelectric energy. Greater dependence on renewable energy is the need of the hour. This is mostly biological in nature and is chiefly based on agriculture, forestry, and animals. Since they multiply and renew themselves through reproduction, the energy we derive from them is renewable. You will learn more about these in the chapter 'More about Energy' of physics.

CONSERVING ENERGY AND RESOURCES: SETTING PERSONAL GOALS

Some of the things one can do to conserve energy and resources are listed below.

1. Do not waste paper. Most paper is made from trees that have been cut and pulped.
2. Do not buy products made from animal skins or containing other animal parts.
3. Plant trees in one's school/locality, after seeking permission from relevant authorities.

4. For bathing, take water in a bucket instead of using a shower. A bucket bath consumes about 18 litres of water, whereas a shower bath uses about 100 litres.
5. Turn off electrical appliances when they are not in use.

KEYWORDS

Resource Anything that is essential for living or which makes our lives easier
Renewable resources Resources that can replace or renew themselves, if used carefully
Non-renewable resources Resources that cannot be replaced in the environment after they have been used up
Conservation Sensible management of natural resources to prevent their exploitation
Soil erosion The loss of fertile top soil by the action of wind, water, etc.
Deforestation Large-scale destruction of forests
Extinct An animal or plant that is no longer in existence
Endangered Organisms in danger of becoming extinct in the near future
Threatened Organisms facing a serious, but not immediate, danger of extinction
Fossil fuels Fuels formed from the remains of dead plants and animals

SUMMARY

- Natural resources are of two types: renewable and non-renewable.
- Natural resources need to be used wisely, or most of them will be lost.
- Roots of trees bind soil particles together and help in preventing soil erosion.
- Conservation laws, public participation, afforestation, and protection from fire are some of the ways in which forests can be conserved.
- Many wild animals are in danger of becoming extinct due to human exploitation.
- Biosphere reserves and wildlife sanctuaries can be established to preserve wildlife.
- Terrace farming, mulching, crop rotation, cover cropping, maintaining wind breaks, basin listing, and gully control are some of the methods of soil conservation.
- Water can be conserved by reducing wastage, recycling, and rainwater harvesting.
- Conservation of fossil fuels is especially important as they are non-renewable. Avoiding wastage and looking for alternate sources of energy are the best methods to conserve them.

EXERCISES

I. Review questions

A. Fill in the blanks

1. Forests and wildlife are examples of ..... (artificial/natural) resources.
2. Soil is a ..... (renewable/non-renewable) resource.
3. Deforestation results in ..... (forest fires/soil erosion).

4. Dodo and Indian cheetah are examples of ..... (endangered/extinct) animals.
5. Solar energy, ... (coal/biomass), and wind energy are examples of alternate sources of energy.

B. Tick the correct answer

1. A virtually inexhaustible natural resource:
   (a) biomass (b) wildlife (c) wind (d) forests
2. A movement started to protect trees
   (a) The Afforestation movement (b) IUCN
   (c) WWF (d) *Chipko* movement
3. A biological method of soil conservation
   (a) basin listing (b) deforestation (c) mulching (d) all of these
4. A fossil fuel
   (a) coal (b) petrol (c) LPG (d) all of these
5. The process of converting open land into a forest by planting trees:
   (a) cover cropping (b) mulching
   (c) afforestation (d) crop rotation

C. Correct the statements that are false

1. Deforestation results in soil erosion.
2. Terrace farming can help in preventing soil erosion.
3. Afforestation helps in preventing soil erosion.
4. Gullies can be constructed to prevent the spread of forest fires.
5. Tiger is a threatened animal.

D. Correct the statements that are false

1. What is a resource? Name the two types of natural resources, giving two examples of each.
2. What do you understand by conservation? Why is there a need to conserve natural resources?.
3. Explain the term 'balance of nature'.
4. What is the importance of forests?
5. List any two steps which can be taken to conserve wildlife.
6. Name any two organizations involved in wildlife conservation.
7. List any three methods of soil conservation.
8. Mention any two ways in which water can be conserved.
9. What is the importance of fossil fuels? How can they be conserved?

II. Skill-based questions

E. Classify the following resources as renewable or non-renewable.

Water	Metals	Petrol	Wind
Coal	Soil	Trees	Animals
Natural gas	Tidal energy	Diesel	Biomass

Renewable **Non-renewable**

F. The following table lists the populations of tigers and deer in a forest between the years 1980 and 1985.

Year	Tiger population	Deer population
1980	4	100
1981	2	200
1982	0	400
1983	0	200
1984	0	50
1985	0	4

1. Plot a graph showing the changes in deer and tiger population between 1980 and 1985 (take year on the x-axis and the number of animals on the y-axis).
2. In which years did the deer population increase sharply? What do you think was the main cause for this sharp increase?
3. What do you think was the reason behind the sudden drop in deer population?

III. Fun Time

Complete the following words

.... E .... O .... CE C .... S .... R .... T .... R .... I .... N

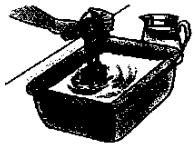
PROJECT IDEAS

- Students can write a report explaining how human activities were responsible for the extinction of the following animals: Dodo, Indian cheetah, passenger pigeon. They can use books/Internet for reference.
- Students can carry out the following activity to make recycled paper

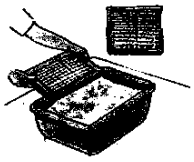
Materials required: Old newspapers and magazines, starch, water, a large plastic box, a crusher or similar device to beat the paper, a wire mesh sieve.

Procedure:

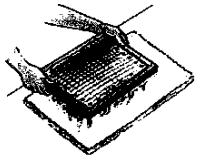
1 Tear the old newspapers/ magazines into small pieces. Soak them in warm water after adding some starch to it



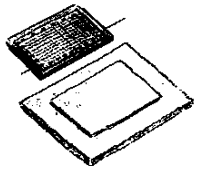
2 After a couple of hours, drain out the water and beat the contents with a crusher till the paper is reduced to a soft pulp.



3 Lower a wire mesh sieve into the pulp.



4 Turn the sieve upside down (so that the pulp end faces downwards) and place it on a smooth surface. You may need to put some weight over the sieve.



5 After some time remove the sieve without disturbing the paper.

6 Leave the paper under sunlight for some time to dry it. Your recycled paper is ready!

TEACHER'S NOTES

- Students can be encouraged to celebrate the World Environment Day (5 June) by planting saplings.
- Students could be encouraged to find out more about movements/programmes related to conservation of natural resources in India and worldwide.
- Photographs of endangered/extinct plants and animals could be displayed in the classroom.

Website references

http://www.epa.gov/recyclecity/ (accessed 8 June 07)