COAL AND PETROLEUM

e use various materials for our basic needs. Some of them are found in nature and some have been made by human efforts.

Activity 5.1

Make a list of various materials used by us in daily life and classify them as natural and man-made.

Natural	Man-made

Does this list include air, water, soil and minerals? Since all these are obtained from nature, they are called natural resources.





Can air, water and soil be exhausted by human activities? You have already studied about water in Class VII. Is water a limitless resource?

In the light of the availability of various resources in nature, natural resources can be broadly classified into two kinds:

(i) Inexhaustible Natural Resources: These resources are present in unlimited quantity in nature and are not likely to be exhausted by human activities. Examples are: sunlight, air.

(ii) Exhaustible Natural Resources: The amount of these resources in nature is limited. They can be exhausted by human activities. Examples of these resources are forests, wildlife, minerals, coal, petroleum, natural gas etc.

Activity 5.2

(It is a group activity)

Take some containers. Fill them with popcorn/peanuts/roasted gram/toffees. Divide students into groups of seven each. Further divide each group into three subgroups containing 1, 2 and 4 students. Label them as first, second and third generation respectively.

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These sub-groups represent the consumers. As population is growing, second and third generations have larger number of consumers.

Put one full container for each group on a table. Ask consumers of the first generation from each group to consume eatables from the container of their group. Now, ask the second generation consumers from each group to do the same. Ask students to observe carefully the availability of eatables in each container. If some thing is left in the containers, ask third generation from each group to consume it. Now, finally observe whether all the consumers of the third generation got the eatables or not. Also observe if anything is still left in any of the containers.

Assume that the eatables in the container represent the total availability of an exhausible natural resource like coal, petroleum or natural gas. Each group may have a different consumption pattern. Are the earlier generations of any group too greedy? It may be that the earlier generations in some groups were concerned about the coming generation(s) and left something for them.

In this chapter we will learn about some exhaustible natural resources like coal, petroleum and natural gas. These were formed from the dead remains of living organisms (fossils). So, these are all known as **fossil fuels**.

5.1 Coal

You may have seen coal or heard about it (Fig. 5.1). It is as hard as stone and is black in colour.





Coal is one of the fuels used to cook food. Earlier, it was used in railway engines to produce steam to run the engine. It is also used in thermal power plants to produce electricity. Coal is also used as a fuel in various industries.

Story of Coal



About 300 million years ago the earth had dense forests in low lying wetland areas. Due to natural processes, like flooding, these forests got buried under the soil. As more soil deposited over them, they were compressed. The temperature also rose as they sank deeper and deeper. Under high pressure and high temperature, dead plants got slowly converted to coal. As coal contains mainly carbon, the slow process of conversion of dead vegetation into coal is called carbonisation. Since it was formed from the remains of vegetation, coal is also called a fossil fuel. A coal mine is shown in Fig. 5.2.



Fig. 5.2: A coal mine

When heated in air, coal burns and produces mainly carbon dioxide gas.

Coal is processed in industry to get some useful products such as coke, coal tar and coal gas.

Coke

It is a tough, porous and black substance. It is an almost pure form of carbon. Coke is used in the manufacture of steel and in the extraction of many metals.

Coal Tar

It is a black, thick liquid (Fig. 5.3) with an unpleasant smell. It is a mixture of



Fig. 5.3: Coal tar

about 200 substances. Products obtained from coal tar are used as starting materials for manufacturing various substances used in everyday life and in industry, like synthetic dyes, drugs, explosives, perfumes, plastics, paints, photographic materials, roofing materials, etc. Interestingly, naphthalene balls used to repel moths and other insects are also obtained from coal tar.

These days, bitumen, a petroleum product, is used in place of coal-tar for metalling the roads.

Coal Gas

Coal gas is obtained during the processing of coal to get coke. It is used

Coal gas was used for street lighting for the first time in London in 1810 and in New York around 1820. Now a days, it is used as a source of heat rather than light.

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as a fuel in many industries situated near the coal processing plants.

5.2 Petroleum

You know that petrol is used as a fuel in light automobiles such as motor cycles/ scooters and cars. Heavy motor vehicles like trucks and tractors run on diesel. Petrol and diesel are obtained from a natural resource called **petroleum**. The word petroleum is derived from petra (rock) and oleum (oil) as it is mined from between the rocks under Earth as shown in Fig. 5.4.

Do you know how petroleum is formed?

Petroleum was formed from organisms living in the sea. As these organisms died, their bodies settled at the bottom of the sea and got covered with layers of sand and clay. Over millions of years, absence of air, high temperature and high pressure transformed the dead organisms into petroleum and natural gas.

Look at Fig. 5.4. It shows the deposits of petroleum and natural gas. You see that the layer containing petroleum oil and gas is above that of water. Why is it so? Recall that oil and gas are lighter than water and do not mix with it.

The world's first oil well was drilled in Pennsylvania, USA, in 1859. Eight years later, in 1867, oil was struck at Makum in Assam. In India, oil is found in Assam, Gujarat, Mumbai High and in the river basins of Godavari and Krishna.

Refining of Petroleum

Petroleum is a dark oily liquid. It has an unpleasant odour. It is a mixture of various constituents such as petroleum gas, petrol, diesel, lubricating oil, paraffin wax, etc. The process of



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Fig. 5.5: A petroleum refinery

separating the various constituents/ fractions of petroleum is known as refining. It is carried out in a **petroleum refinery** (Fig. 5.5). Various constituents of petroleum and their uses are given in Table 5.1.

Many useful substances are obtained from petroleum and natural gas. These are termed as 'Petrochemicals'. These are used in the manufacture of detergents, fibres (polyester, nylon, acrylic etc.), polythene and other man-made plastics. Hydrogen gas obtained from natural gas, is used in the production of fertilisers (urea). Due to its great commercial importance, petroleum is also called 'black gold'.

5.3 Natural Gas

Natural gas is a very important fossil fuel because it is easy to transport through pipes. Natural gas is stored under high pressure as compressed natural gas (CNG). CNG is used for power generation. It is now being used

S.No.	Constituents of Petroleum	Uses	
1.	Petroleum Gas in Liquid form (LPG)	Fuel for home and industry	
2.	Petrol	Motor fuel, aviation fuel, solvent for dry cleaning	
3.	Kerosene	Fuel for stoves, lamps and for jet aircrafts	
4.	Diesel	Fuel for heavy motor vehicles, electric generators	
5.	Lubricating oil	Lubrication	
6.	Paraffin wax	Ointments, candles, vaseline etc.	
7.	Bitumen	Paints, road surfacing	

 Table 5.1 Various Constituents of Petroleum and their Uses

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as a fuel for transport vehicles because it is less polluting. It is a cleaner fuel.

The great advantage of CNG is that it can be used directly for burning in homes and factories where it can be supplied through pipes. Such a network of pipelines exists in Vadodara (Gujarat), some parts of Delhi and other places.

Natural gas is also used as a starting material for the manufacture of a number of chemicals and fertilisers. India has vast reserves of natural gas. In our country, natural gas has been found in Tripura, Rajasthan, Maharashtra and in the Krishna Godavari delta.



Can coal, petroleum and natural gas be prepared in the laboratory from dead organisms?

No. Their formation is a very slow process and conditions for their formation cannot be created in the laboratory.



You have studied in the beginning of the chapter that some natural resources are exhaustible like fossil fuels, forests, minerals etc.

You know that coal and petroleum are fossil fuels. It required the dead organisms millions of years to get converted into these fuels. On the other hand, the known reserves of these will last only a few hundred years. Moreover, burning of these fuels is a major cause of air pollution. Their use is also linked to global warming. It is therefore necessary that we use these fuels only when absolutely necessary. This will result in better environment, smaller risk of global warming and their availability for a longer period of time.

In India, the Petroleum Conservation Research Association (PCRA) advises people how to save petrol/diesel while driving. Their tips are

- drive at a constant and moderate speed as far as possible,
- switch off the engine at traffic lights or at a place where you have to wait,
- ensure correct tyre pressure.
- ensure regular maintenance of the vehicle.

KEYWORDSCOALCOAL GASCOAL TARCOKEFOSSIL FUELNATURAL GASPETROLEUMREFINERY

WHAT YOU HAVE LEARNT

- Coal, petroleum and natural gas are fossil fuels.
- Fossil fuels were formed from the dead remains of living organisms millions of years ago.
- **Constitution** Fossil fuels are exhaustible resources.
- Coke, coal tar and coal gas are the products of coal.
- Petroleum gas, petrol, diesel, kerosene, paraffin wax, lubricating oil are obtained by refining petroleum.
- Coal and petroleum resources are limited. We should use them judiciously.

Exercises

- 1. What are the advantages of using CNG and LPG as fuels?
- 2. Name the petroleum product used for surfacing of roads.
- 3. Describe how coal is formed from dead vegetation. What is this process called?
- 4. Fill in the blanks.
 - (a) Fossil fuels are _____, ____ and _____
 - (b) Process of separation of different constituents from petroleum is called _____.
 - (c) Least polluting fuel for vehicle is _____
- 5. Tick True/False against the following statements.
 - (a) Fossil fuels can be made in the laboratory. (T/F)
 - (b) CNG is more polluting fuel than petrol. (T/F)
 - (c) Coke is almost pure form of carbon. (T/F)
 - (d) Coal tar is a mixture of various substances. (T/F)
 - (e) Kerosene is not a fossil fuel. (T/F)
- 6. Explain why fossil fuels are exhaustible natural resources.

- 7. Describe characteristics and uses of coke.
- 8. Explain the process of formation of petroleum.

9. The following Table shows the total power shortage in India from 1991–1997. Show the data in the form of a graph. Plot shortage percentage for the years on the Y-axis and the year on the X-axis.

S. No.	Year	Shortage (%)	
1	1991	7.9	
2	1992	7.8	
3	1993	8.3	
4	1994	7.4	
5	1995	7.1	
6	1996	9.2	
7	1997	11.5	

Extended Learning — Activities and Projects

- 1. Get an outline map of India. Mark the places in the map where coal, petroleum and natural gas are found. Show the places where petroleum refineries are situated.
- 2. Choose any five families of your neighbourhood. Enquire whether their energy consumption (coal, gas, electricity, petrol, kerosene) has increased or decreased in the last five years. Enquire also about the measures they adopt to conserve energy.
- 3. Find out the location of major thermal power plants in India. What could be the reasons for their being located at those places?

For more information, visit:

- www.energyarchive.ca.gov
- web.ccsd.k12.wy.us
- web.pcra.org



X E R C I S E



CONSERVATION OF PLANTS AND ANIMALS



e saw in Class VII that Paheli and Boojho had visited the forest along with Professor Ahmad and Tibu. They were eager to share their experiences with their classmates. Other children in the class were also eager to share their experiences as some of them had visited Bharatpur Sanctuary. Some others had heard about Kaziranga National Park, Lockchao Wildlife Sanctuary, Great Nicobar Biosphere Reserve and Tiger Reserve, etc.



What is the purpose of making national parks, wildlife sanctuaries and biosphere reserves?

6.1 Deforestation and Its Causes

A great variety of plants and animals exist on earth. They are essential for the well-being and survival of mankind. Today, a major threat to survival of these organisms is **deforestation**. We know that deforestation means clearing of forests and using that land for other purposes. Trees in the forest are cut for some of the purposes mentioned below:

- Procuring land for cultivation.
- Building houses and factories.
- Making furniture or using wood as fuel.

Some natural causes of deforestation are forest fires and severe droughts.

Activity 6.1

Add more causes of deforestation to your list and classify them into natural and man-made.

6.2 Consequences of Deforestation

Paheli and Boojho recalled the consequences of deforestation. They remembered that deforestation increases the temperature and pollution level on the earth. It increases the level of carbon dioxide in the atmosphere. Ground water level also gets lowered. They know that deforestation disturbs the balance in nature. They were told by Professor Ahmad that if cutting of trees continues, rainfall and the fertility of the soil will

How does deforestation reduce rainfall on the one hand and lead to floods on the other?



decrease. Moreover, there will be increased chances of natural calamities such as floods and droughts.

Recall that plants need carbon dioxide for photosynthesis. Fewer trees would mean that less carbon dioxide will be used up resulting in its increased amount in the atmosphere. This will lead to global warming as carbon dioxide traps the heat rays reflected by the earth. The increase in temperature on the earth disturbs the water cycle and may reduce rainfall. This could cause **droughts**.

Deforestation is a major cause which leads to the change in soil properties. Physical properties of the soil get affected by plantation and vegetation. Recall from Class VII how trees prevent soil erosion. Fewer trees result in more soil erosion. Removal of the top layer of the soil exposes the lower, hard and rocky layers. This soil has less humus and is less fertile. Gradually the fertile land gets converted into deserts. It is called **desertification**.

Deforestation also leads to a decrease in the water holding capacity of the soil. The movement of water from the soil surface into the ground (infiltration rate) is reduced. So, there are floods. The other properties of the soil like nutrient content, texture etc., also change because of deforestation.

We have studied in Class VII that we get many products from forests. List these products. Will we face shortage of these products if we continue cutting trees?

Activity 6.2

Animal life is also affected by deforestation. How? List the points and discuss them in your class.

6.3 Conservation of Forest and Wildlife

Having become aware of the effects of deforestation, Paheli and Boojho are worried. They go to Professor Ahmad and ask him how forests and wildlife can be saved. Biosphere is that part of the earth in which living organisms exist or which supports life. Biological diversity or biodiversity, refers to the variety of organisms existing on the earth, their interrelationships and their relationship with the environment.

Professor Ahmad organises a visit to a biosphere reserve for Paheli, Boojho and their classmates. He selects a place named Pachmarhi Biosphere Reserve. He knows that the plants and animals found here are similar to those of the upper Himalayan peaks and to those belonging to the lower western ghats. Professor Ahmad believes that the biodiversity found here is unique. He requests Madhavji, a forest employee, to guide the children inside the biosphere reserve. He explains that preserving areas of such biological importance make them a part of our national heritage.

Madhavji explains to the children that apart from our personal efforts and efforts of the society, government

To protect our flora and fauna and their habitats, **protected areas** called wildlife sanctuaries, national parks and biosphere reserves have been earmarked. Plantation, cultivation, grazing, felling trees, hunting and poaching are prohibited there.

Wildlife Sanctuary: Areas where animals are protected from any disturbance to them and their habitat. **National Park**: Areas reserved for wild life where they can freely use the habitats and natural resources.

Biosphere Reserve : Large areas of protected land for conservation of wild life, plant and animal resources and traditional life of the tribals living in the area.

agencies also take care of the forests and animals. The government lays down rules, methods and policies to protect and conserve them. Wildlife sanctuaries, national parks, biosphere reserves etc., are protected areas for conservation of plants and animals present in that area.

Activity 6.3

Find out the number of national parks, wildlife sanctuaries and biosphere reserves in your district, state and country. Record in Table 6.1. Show these areas in an outline map of your state and India.

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BORI SANCTUARY

6.4 Biosphere Reserve

Children along with Professor Ahmad and Madhavji enter the biosphere reserve area. Madhavji explains that biosphere reserves are the areas meant for conservation of biodiversity. As you are aware that biodiversity is the variety of plants, animals and microorganisms generally found in an area. The biosphere reserves help to maintain the biodiversity and culture of that area. A biosphere reserve may also contain other protected areas in it. The Pachmarhi Biosphere Reserve consists of one national park named Satpura and two wildlife sanctuaries named Bori and Pachmarhi (Fig. 6.1).

 Table 6.1 : Protected Areas for Conservation

Protected Areas —	National Park	Wildlife Sanctuary	Biosphere Reserve			
In my district						
In my state						
In my country						
N TAWA RESERVIOR NEEMGHAN NEEMGHAN PACHMARHI SANCTUARY TO PIPARIYA PANARPANI GATE						

Fig. 6.1 : Pachmarhi Biosphere Reserve

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Activity 6.4

List the factors disturbing the biodiversity of your area. Some of these factors and human activities may disturb the biodiversity unknowingly. List these human activities. How can these be checked? Discuss in your class and write a brief report in your notebook.

6.5 Flora and Fauna

As the children walk around the biosphere reserve they appreciate the

green wealth of the forest. They are very happy to see tall teak trees and animals inside the forest. Suddenly, Paheli finds a rabbit and wants to catch it. She starts running after it. Professor Ahmad stops her. He explains that animals are comfortable and happy in their own habitat. We should not disturb them. Madhavji explains that some animals and plants typically belong to a particular area. The plants and animals found in a particular area are termed **flora** and **fauna** respectively of that area.

Sal, teak, mango, *jamun*, silver ferns, *arjun*, etc., are the flora and *chinkara*, bluebull, barking deer, *cheetal*, leopard, wild dog, wolf, etc. are examples of the fauna of the Pachmarhi Biosphere Reserve (Fig.6.2).



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