

# Resources and Development

## Our relationship with natural resources

Humans are an integral part of the natural world. Like other organisms, they enjoy and use nature's bounty - such as air, water, fruit, flowers, and other animals. However, humans differ from other organisms because they consciously change nature to suit their needs. They use nature's materials to make tools and use these tools to produce the things they want. The natural materials they use are called resources. For example, in prehistoric times, humans chipped stones to make sharp tools and used these tools to hunt, dig roots and tubers, make baskets from bamboo and sew clothes from animal hides. Thus, the natural resources they used in those days were stones, bamboo, animal hides, etc.

Humans expanded the range of their productive activities over the years. They began to rear animals and farm the land. While earlier they altered non-living things like stones, they now began to alter and use living beings like plants and animals. They used their tools to clear the forests and level the land. They selected seeds and sowed them in the land. The plants grew, flowered and bore fruit, which were food-grain. Humans harvested the crop and built houses to store the grain. Their houses grew into settlements.

In this way, the range of natural resources that humans used kept expanding and their ability to harness these resources kept improving. Historians call this age when humans began to domesticate animals and cultivate crops the *Neolithic Revolution*. It began about 10,000 years back. Humans acquired new skills and techniques and began producing many new things on a bigger scale. These included utensils made by baking clay, clothes made by spinning and weaving fibres, and numerous articles made from metals like copper, brass, and iron.

**What do you think were the natural resources used the early farmers and artisans? Make a detailed list.**

## Who owns natural resources?

As the importance of natural resources in human life grew, questions arose about who should control them, how should they be used and who should benefit from their use. Different communities answered these questions in different ways. In some societies, the people enjoyed collective rights to natural resources and framed community laws and rules to utilise them judiciously. They considered land, forests and water sources as common property. These societies saw natural resources as divine, not as something they could exploit for their personal use. For them, the land, trees, rivers, oceans, animals, and mountains were gods and goddesses who provided them their livelihoods. In these societies,

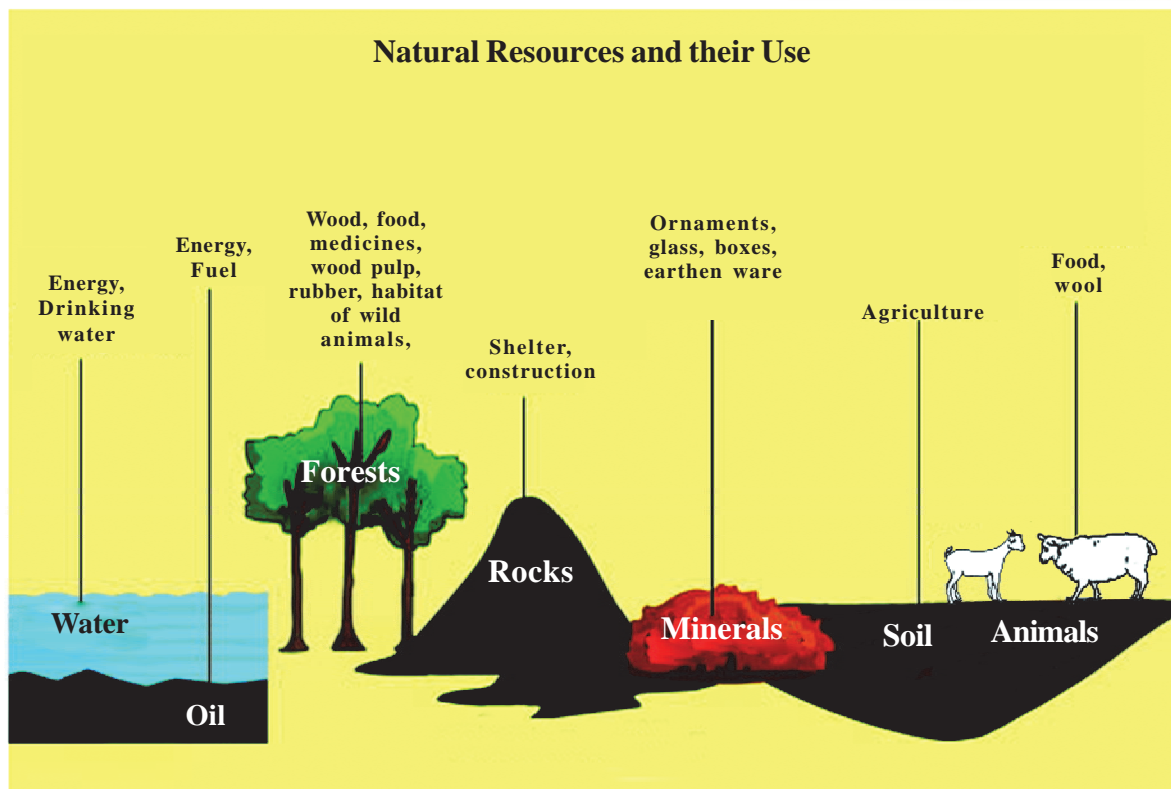


Figure 1.1 Natural Resources and their Use

everyone had access to natural resources but no one had the right to exploit them irrationally or irresponsibly.

In some societies, the community did not control natural resources. Control lay in the hands of a few people. A small class of landowners owned the land and reaped the benefits by making the common people farm their land. In some societies, kings managed the land and irrigation resources and also protected the territory, and in turn took a large share of the agricultural produce as taxes. Human productivity grew in these societies as people exploited resources in complex ways. Towns and cities with large buildings developed as trade grew and art and culture flourished. The growth and spread of population over the years led to the foundation of the first empires. However, these societies experienced widening internal disparities that resulted in social inequality, class-caste differentiation, slavery, subjugation of women etc.

The next important revolution in human history was the industrial revolution, which began about 250 years ago. Factories were set up to produce goods on a large scale. These factories required vast quantities of raw materials and fuel, which led to a sharp rise in the demand for natural resources. The nations that were industrializing in the nineteenth century began to look for new raw material sources to keep their factories running. They sent their scientists and geologists on exploratory expeditions to all corners of the globe to identify countries rich in natural resources.

These nations believed that the world's natural wealth was a resource that it had to be used to the full. The resources were to be exploited to increase production in their factories and thus improve the living standards of their people. They also believed that scarcities of raw materials could be managed by

developing new technology and production techniques. They began to colonise countries across Asia, America, and Africa and to exploit the natural wealth of these colonies.

However, many of these colonies had tribal or agrarian societies that did not use their land and forests for industry or trade. Unlike the industrial nations, they did not exploit nature for consumption. They believed nature was divine. A clash of belief systems was, thus, inevitable because what one society saw as a resource was not a resource for the other. Thus, the industrialists wanted to clear the forests to grow commercial crops, divert forest and agricultural land for mining, and construct dams across rivers to generate electricity. On the other hand, the tribal people wanted to continue using their natural resources in traditional ways. This clash of cultures continues to this day.

Industrial economists and scientists till 1950s believed that natural resources are inexhaustible and could be exploited limitlessly to increase society's productivity. The only problem was that natural wealth was unevenly distributed across the globe, with some places being richly endowed and others having few resources. Trade was seen as a solution to correct this imbalance and make natural resources available to all nations.

### Scientific perspective of the environment

For the past 70 years, environmental scientists have been raising questions about the degradation of the environment from a scientific perspective. For example, in the decade of the 1950s, many people noticed that they seldom heard the chirping of birds or the buzzing of bees and insects in many parts of America. Subsequent studies traced the drastic fall in their populations to the extensive and persistent use of chemical pesticides.

Rachel Carson's 1962 book *Silent Spring* starkly highlighted the distressing effects of indiscriminate pesticide use on the environments, with humans, too, falling a prey to their impact. Her research showed how human activities damage the environment and affect human lives as well. For example, the DDT used to eradicate mosquitoes finds its way into fish in the lakes and rivers. Even small amounts of this toxic chemical can contaminate and kill the fish. When humans and birds consume the contaminated fish, the trace chemical residues are still enough to cause them harm. Following the publication of *Silent Spring*, scientists around the world began conducting research on how industrial progress is affecting the environment.

Environmental scientists say that our natural wealth is a vast and complex web in which damage to a small segment can impact the whole system. Every part of nature, whether non-living (like water, air, rocks or soil) or living (like insects, birds, animals or crops), is interconnected. An activity in one part can affect the other. If we use pesticides to control insects, they not only kill the insects but also enter our body via the food-grain we eat or the bodies of domestic animals via the hay they consume. These toxic chemicals accumulate in our bodies to cause long-term diseases such as cancer. If we release toxic industrial effluents into rivers and streams, then fish and other living organisms in the water, animals drinking the water and humans who eat the fish are affected. In the same way, air pollution, deforestation and mining activities affect the environment. All this happens because all living and non-living elements on earth are intertwined.



Figure 1.2 The coverage of Rachel Carson's 1962 book.



Figure 1.3 Fishes lying dead on the shores of a lake

**Waste:** They are the unutilised and discarded components of the production and consumption process. Examples include the bagasse that is thrown away after extracting juice from sugarcane, the wrapper we throw away after eating a packet of biscuits, the unusable portion of the raw material used in factories, or the chemical-laden water and smoke released after production. Many waste materials can find other uses.

For example, we can burn bagasse as fuel or use it to manufacture paper. We can also remove harmful chemicals from contaminated water and smoke with special equipment and reuse the water.

Large scale industrial production has badly affected the complex environmental web. The earth's natural resources are not inexhaustible. Using them indiscriminately will deplete them permanently. Our natural resources will be lost for good at our current rate of utilizing these assets. Many rivers are turning into open drains. Land and water are prone to pollution. The impact in coming years will be grievous. In this chapter, we shall reflect on these problems by trying to understand the nature of our resources.

**How has the relationship between human society and natural resources changed over the last 10,000 years?**

**How does natural wealth become a resource? Explain with examples.**

**How do tribal societies view natural wealth and how do they utilise these resources?**

**How does the industrial society view natural wealth? Does it use these resources in the same way that tribal societies do?**

**What are the different approaches to using natural resources today?**

**Project work**

**Read the book *Silent Spring* on the internet and present a synopsis in class.**

**Do people still use DDT in your area? If yes, then where and in what way? Who authorises its use?**

## Natural resources

Natural resources are resources in whose creation humans do not play a role. Humans only extract resources from their natural setting. For example, the wood we collect from the forest is a natural



resource but the cotton we grow in fields is not. Similarly, the iron ore we mine is a natural resource, but the steel we make from it is not.

**Which of the following would you categorise as a natural resource? Discuss with reasons:**

**River water, bottled mineral water, diesel, oxygen in a cylinder, mineral oil, marble, chicken, sugarcane**

Natural resources are classified in different ways. Resources derived from living things such as wood, fish etc. are 'organic resources'. Coal and mineral oil also belong to this category because they are fossilised living beings. Non-living physical resources such as land, air, water, metallic minerals etc. belong to the category of 'inorganic resources'.

We can also classify resources according to whether they are replenished in nature or not. Resources that replenish naturally are 'renewable resources'. Resources that are available in finite quantities and do not replenish easily are 'non-renewable resources'.

### **Renewable resources**

They replenish by natural processes. They are always present on earth, for example air, water, forests, animals etc. If humans do not interfere in their renewal process and utilize them carefully, they will be constantly available. However, there is a limit to their utilization. Exceeding this limit or spoiling the resource leads to their degradation and affects their renewal. For example, water is always available on earth. Water evaporates from the oceans and condenses as rainfall. Some of this rainfall seeps into the earth to replenish the groundwater. The rest flows into rivers and streams to reach the ocean. This endless cycle renews water. However, obstacles in the process disrupt the water cycle. For example, depletion of forest cover results in less water seeping into the earth. This affects the recharge of groundwater. The depletion of groundwater causes dug wells and bore wells to dry up.

We release polluted water into our rivers. If the volume of polluted water is limited then the organisms living in the flowing water have the

capacity to clean up the pollution. However, we release excessive quantities of waste into our rivers nowadays. Dams and irrigation canals also reduce the flow of water in rivers. When the rivers are unable to clean themselves, they turn into cesspools. We need to find other uses for this waste if we wish to arrest this pollution. For example, we can compost waste and recycle wastewater for use in gardens etc. We need to reuse and recycle industrial wastes. We need to increase the volume of water in rivers to ensure that they do not die. We need to maintain the process of water renewal by preventing disruptions in the natural water cycle.



*Figure 1.4 Pollution of Water Sources*

Hence, it is important to keep the renewal cycles of resources in mind if we wish to use them judiciously. Resources must renew naturally. Similarly, we should use groundwater only to the extent that it recharges naturally. Otherwise, the water table will fall.

**If we want to use wood from forests, how can we ensure that our extraction rate matches the natural renewal cycle?**

**How does the groundwater renewal cycle work? How should we use groundwater?**

**How do fish renew themselves in ponds? How should we harvest fish?**

**How do chemical fertilizers and pesticides affect the natural renewal process in soil?**

**Non-renewable resources:** These resources such as iron ore, coal, mineral oil etc. are available in limited quantities. The natural stock depletes the more we utilise them because they do not renew themselves. For example, metallic ore deposits deplete after mining and extracting the metal from them. We then have to look for new ore deposits. A day will come when we exhaust all available deposits. Even today, many mines have shut down after exhausting their stock. One such example is the Dalli Rajhara iron ore mines in Chhattisgarh.

<b>Table 1.1: Mineral oil reserves</b>		
<b>Region/Country</b>	<b>Reserves as of 2013 (in 1,000 million barrels)</b>	<b>How long these reserves will last (in years)</b>
Middle East (West Asia)	809	79
United States of America	44	12
World	1,688	53

*Source: BP statistical review of world energy zone 2014*

Table 1.1 depicts the proven global reserves of crude oil. How many years will these reserves last if global consumption of crude oil continues at the current rate? They will be exhausted within 53 years. India depends on crude oil imports because the country does not have adequate proven reserves. As the global stock depletes, prices of oil will escalate. India and its citizens will have to bear the burden of higher prices. The sensible thing to do is to reduce consumption, use oil only when necessary and look for alternate energy sources. For example, we could increase production of solar and wind energy to reduce our dependence on mineral oil. The developed nations are not concerned about the needs of developing nations but want to control global oil reserves to protect their own interests and ensure they do not face any shortages.

The United States of America does not have adequate oil reserves to meet its domestic consumption so it uses its economic and military might to gain control of the oil reserves of other countries. This policy has led to wars that have caused large-scale destruction and brought misery to millions of people.

Some non-renewable resources can be recycled. For example, we use bauxite to produce aluminium and aluminium utensils. We cannot renew our bauxite deposits but we can recycle the aluminium of old utensils by melting and re-using it.

**Find out how and where India uses solar energy.**

**Do we need to depend on coal to generate electricity? What are the alternatives to coal-based electricity?**

**What other things, besides metals, can we recycle?**

## Resources and development

Natural resources are the basis of development because the agriculture, mining, construction, and energy sectors depend on them. So do other sectors of the economy. The 'environment source function' is the capacity of the environment to provide these resources. Developmental activities slow down if natural resources are polluted or over-exploited and get depleted. If we do not prevent the pollution of our atmosphere, rivers and streams, and if we do not use non-renewable resources in a rational manner, we will soon exhaust our natural wealth. We need to adopt a model of development that ensures that our resources remain healthy and available to us in the long term. The environment should sustain development and continue to bring us prosperity and happiness over the years. This is what we call 'sustainable development'.

There is no necessary conflict or contradiction between development and environment. We can have development while protecting and enriching our environment. We should not cause permanent damage to our resources in the pursuit of development. If we understand our environment better, we can manage development in a sustainable way. Environmental scientists have developed the concept of 'purification capacity' or 'sink capacity', which simply means that the environment has the capacity to contain pollution up to a certain extent. For example, if we throw household waste into a river, plants and animals living in the river consume this waste. The water then remains fit for consumption. However, if we throw excessive waste in the river, the waste cannot be fully consumed by the organisms in the water. The river soon turns into a polluted drain. Today most of the rivers on which our prominent cities are situated are open gutters. The pollution does not end there. Cities also discharge chemicals that the rivers cannot 'digest'. Detergent soap waste is one such example. It remains in the water and flows out to the sea, polluting it.

In villages, people burn wood in stoves, but the volume of smoke emitted by stoves is below the renewal limit of the atmosphere. On the other hand, the smoke released from factory chimneys in industrial complexes is above



*Figure 1.5 Sewage water in cities*



*Figure 1.6 Factories spewing smoke*

this limit. That is why factories pollute the atmosphere. We can prevent this pollution if we control smoke emission to below the renewal limit.

‘Sink capacity’ is the capacity of the environment to absorb pollutants. When the volume of wastes exceeds the sink capacity, the environment suffers long-term damage.

**Example 1:** Current data on groundwater levels in India indicate that the groundwater reserves in many parts of the country are severely under threat because of overexploitation. We are extracting more water than is being recharged. As a result, the water table in about 300 districts in the country has dropped by as much as four metres. This is a danger signal. We use huge quantities of groundwater for irrigation in agriculturally prosperous Punjab and Western Uttar Pradesh, the rocky plateau region of central and south India and some coastal areas. Our fast-growing cities and towns also use groundwater. This kind of indiscriminate exploitation will deplete our groundwater reserves and lower the water table.

**Example 2:** Endosulphan is a striking example of how a chemical pesticide can adversely affect our environment. In 1976, the government aerielly sprayed endosulphan over 15,000 acres of cashew to prevent pest attacks. This was in Kasargode district in north Kerala. This aerial spraying continued every year for 25 years. The pesticide badly affected the air, water and environment. People living in 11 panchayats faced severe health problems, especially the farm labourers. The population of fish, insects, crows and other birds fell drastically in the affected region. It took a court order a few years ago to discontinue endosulphan spraying. The government is now paying compensation to the affected people.



**Why is it important to maintain a balance between exploitation and recharge of groundwater?**

**Why did people have to approach the courts to stop the spraying of endosulphan?**

**Do people still use endosulphan in your area?**

## Resource management

We need to plan the utilization of our natural resources to maintain the ecological balance. This means meeting our current requirements and conserving natural resources for the future. We can adopt the following measures to achieve this balance.

**1. Focus on alternative resources:** We can replace resources that cause high levels of pollution with alternative resources. For example, we can avoid the use of coal as far as possible and use natural gas instead. We can also make greater use of solar energy and wind power to ensure long-term energy availability. In addition, we can give incentives and develop systems to promote such alternate energy sources.

**2. Implementation of pollution control laws:** The government has enacted many environment-related laws and set environmental standards to achieve this goal. What is now required is strict implementation and observation of these laws and standards. For example:

- ◆ Wastes should be segregated and recycled.
- ◆ Installing pollution control equipment should be mandatory for industries.
- ◆ The government should establish waste treatment facilities in every region.
- ◆ Industries using dangerous pollutants such as mercury, chromium etc should be monitored to control their emission.

**3. Equitable utilization of resources:** We live in a consumer age where people aspire for physical comforts. However, a small segment of the population uses a disproportionately large share of natural resources for its own comfort. We would need the resources of four planet earths to provide this level of comfort to everyone. Gandhiji rightly said, “The world has enough for everyone’s need, but not enough for any one’s greed.” Everyone of us needs to consider how we can rationally use resources and products.

**We generate waste in our homes every day. Some of this waste can be re-used. Make a list of these wastes and explain how we can re-use them.**

**Give a few examples of renewable resources in your area.**

**Discuss and prepare a poster on the proper utilization of resources.**

**Can solar energy be the dominant source of energy in India 30 years hence? Discuss in class.**

## New opportunities and challenges in resource management: a case study

**Indira Gandhi canal command area:** This canal starts from the Harike barrage in Punjab. It traverses the Thar Desert and flows parallel to the Pakistan border. The length of its main canals is about 650



*Figure 1.7 Rajasthan Canal*

km. If the feeder and distributary canals are included, the total length of the canal system is about 9060 km. The estimated irrigated area is about 20 lakh hectares. This irrigated area is the command area.

The Thar Desert has massive sand dunes and sparse vegetation. Strong winds constantly shift the sand. So soil erosion is pronounced. In summer, the temperature rises to 50°C. Average annual rainfall is below 10 mm.

**Development work:** Irrigation in Phase I in the command area began in 1960 and in 1980 in Phase II. The canal transformed the desert into a lush and moist area. This arrested soil erosion. Afforestation and pasture development were also taken up. Where farmers earlier grew *chana*, *bajra* and *jowar*, intensive irrigation allowed them to cultivate wheat and cotton. Productivity increased manifold. However, excessive irrigation and intensive agriculture over the years led to problems such as water logging and increased salinity.

**EXERCISES**

1. Each of the following questions contains a statement and a qualifying reason. Choose the correct option from among the four options given:

A. **Statement:** Iron ore was not a resource in the early Stone Age.

**Reason:** There is no evidence of its use during the Stone Age.

- a) Only the statement is correct
- b) Only the reason is correct
- c) Both statement and reason are correct
- d) Both statement and reason are wrong

B. **Statement:** There is no need for water conservation.

**Reason:** Rainwater recharges groundwater.

- a) Only the statement is correct
- b) Only the reason is correct
- c) Both statement and reason are correct
- d) Both statement and reason are wrong

C. **Statement:** Forests are a renewable resource.

**Reason:** Forests regenerate felled areas.

- a) Only the statement is correct
- b) Only the reason is correct
- c) Both statement and reason are correct
- d) Both statement and reason are wrong

**2. Answer the following questions:**

1. 'Resources do not exist; they are made.' Explain this statement.
2. What are the differences between renewable and non-renewable resources?
3. Why is it important to manage resources?
4. What resources depend on water resources?

**3. Match columns I and II and choose the correct alternative from the options given below:**

- |             |                         |
|-------------|-------------------------|
| 1. Coal     | A. Cyclic renewable     |
| 2. Iron ore | B. Renewable            |
| 3. Animals  | C. Continuous renewable |
| 4. Air      | D. Non-renewable        |

- (a) 1-A, 2-B, 3-C, 4-D
- (b) 1-D, 2-B, 3-C, 4-A
- (c) 1-D, 2-B, 3-A, 4-C
- (d) 1-D, 2-A, 3-B, 4-C.