



"It is our collective and individual responsibility... to preserve and tend to the world in which we all live." **-Dalai Lama**

Nature's Treasure

The Big Question

Look around you—the air, water, food, and materials you use are all gifts from nature. But are they unlimited? This chapter explores Nature's Treasures, helping you understand the difference between renewable and non-renewable resources, and why recognizing this is vital for a sustainable future.

Meet EeeBee.AI



Hello, curious treasure guardians! I'm EeeBee, your AI buddy. Let's delve into ecosystem resources—their types—and discover why managing them wisely is so vital!



Still curious? Talk to me by scanning the QR code.

Learning Outcomes

By the end of this chapter, students will be able to:

- Understand the diverse resources that nature offers, collectively known as Nature's Treasure, and their role in supporting life on Earth.
- Identify and differentiate between ecosystem resources, finite resources, and those that can replenish naturally.

From Last Year's Notebook

Environment and Interdependence in Nature

Science Around you

Our lives are intricately linked to natural resources. From powering our homes and industries to providing raw materials for everything we use, these resources are the backbone of human society. Understanding their categories and sustainability is critical for addressing global challenges like climate change, resource depletion, and environmental pollution.

NCF Curricular Goals and Competencies

CG-1 (C 1.4): Understands the structure, properties, and behavior of various materials and their connections to natural resources. **CG-3 (C 3.3):** Explores the relationships between ecosystems and the resources they provide. **CG-6 (C 6.1):** Engages in inquiry-based learning to understand sustainable practices and the conservation of Earth's natural treasures.



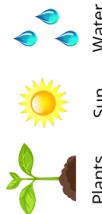
Mind Map

Nature's Treasure

Ecosystem Resources

- ❖ **Types of Natural Resources** - Resources classified based on their availability and renewability.

- ✓ Renewable Resources - Resources that replenish naturally over time.



Plants Sun Water

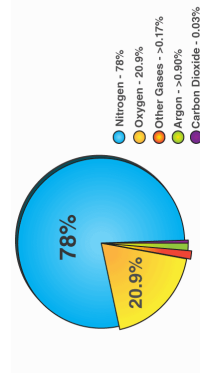
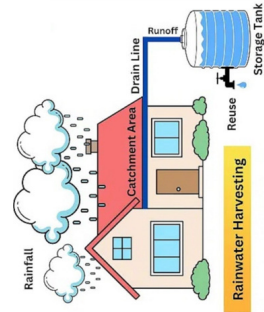
- ✓ Non-Renewable Resources - Resources that take millions of years to form and are finite.



Minerals Coal Soil

Renewable Resources

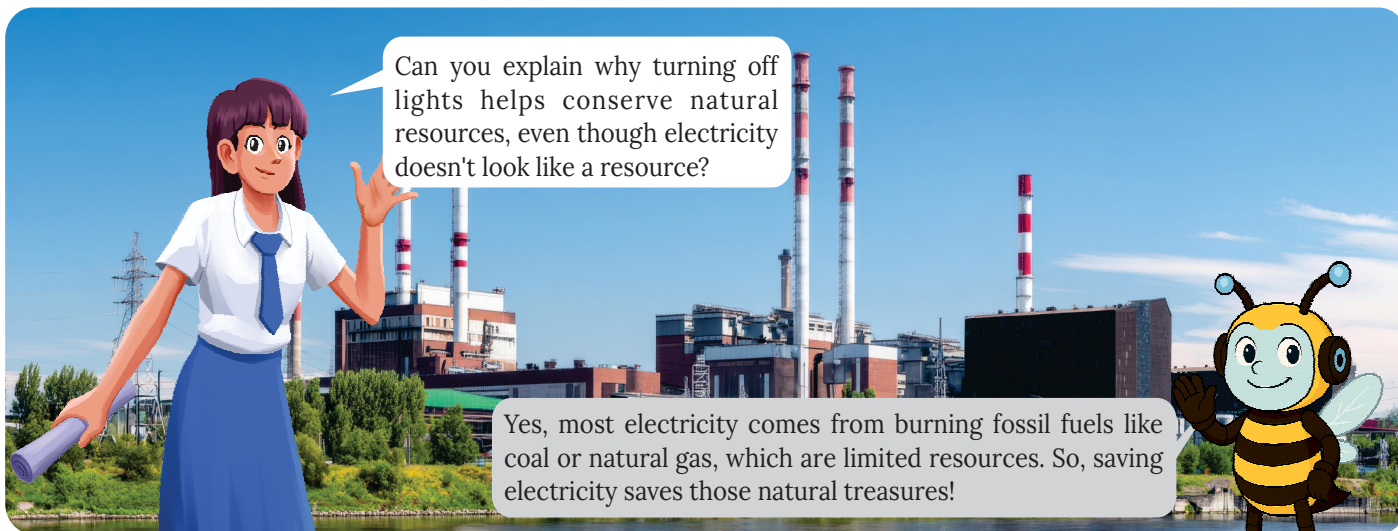
- ❖ **Air and its Composition :**
 - ✓ Air is a mixture of gases essential for life.
- ❖ **Wind Power:** Generating Electricity -
 - ✓ Wind turbines convert wind energy into electrical power.
- ❖ **Water** - A vital resource necessary for all living beings and ecosystems.
- ❖ **Rainwater Harvesting** - A technique to collect and store rainwater for future use.
- ❖ **Solar Energy** - The sun is an abundant source of renewable power.
- ❖ **Solar Panels:** Harnessing the Sun's
 - ✓ Energy - Devices that convert sunlight into electricity.
- ❖ **Forest** - Forests provide oxygen, shelter, and ecological balance.
- ❖ **Efforts for Forest Conservation** - Conservation programs protect and restore forests, such as the Chipko Movement and Van Mahotsav.



Non-Renewable Resources

- ❖ **Rocks:** An Essential Natural Resource - Rocks are used in construction and various industries.
- ❖ **Minerals:** Naturally occurring substances used in numerous applications.
- ❖ **Fossil Fuels:** A Key Source of Energy - Coal, oil, and natural gas power industries but cause pollution.
- ❖ **Sustainable Development:** Balancing resource use with environmental and future needs.





In Focus

- Ecosystem Resources
- Renewable Resources
- Non-Renewable Resources

Introduction

Nature is a vast treasure trove, offering countless resources that sustain life on Earth. From lush forests and flowing rivers to the minerals buried deep within the Earth's crust, these resources form the foundation of human existence. Natural resources are vital for sustaining all forms of life on Earth. They include essential elements like sunlight, water, air, soil, forests, and minerals. These resources are derived directly from nature and are indispensable for our survival and development. For example, sunlight provides heat and light, water from rivers supports hydration and agriculture, and plants and animals supply food.

Ecosystem Resources

Nature is a vast treasure trove, offering countless resources that sustain life on Earth. From lush forests and flowing rivers to the minerals buried deep within the Earth's crust, these resources form the foundation of human existence.

Natural resources are vital for sustaining all forms of life on Earth. They include essential elements like sunlight, water, air, soil, forests, and minerals. These resources are derived directly from nature and are indispensable for our survival and development. For example, sunlight provides heat and light, water from rivers supports hydration and agriculture, and plants and animals supply food. Human society also uses natural resources to create useful items such as furniture, electric bulbs, solar panels, and bicycles, which enhance daily life. These items, created through human effort using natural materials, are categorized as human-made resources.

From History's Pages

The Indus Valley Civilization (3300–1300 BCE) relied heavily on rivers like the Indus for irrigation, transportation, and fertile soil. Ancient Egyptians referred to the Nile River as the “Gift of the Nile,” utilizing its annual floods to cultivate crops.

Coal was used as early as 2000 BCE in China as a fuel for smelting copper. The first recorded oil well was drilled in China around 347 CE, using bamboo pipes. In 1859, Edwin Drake drilled the first commercial oil well in Pennsylvania, USA, marking the beginning of modern petroleum usage.

The first known forest reserves were established in ancient India by Emperor Ashoka in the 3rd century BCE. The Yellowstone National Park, established in 1872 in the USA, became the world's first national park, emphasizing the importance of preserving natural treasures.

Types of Natural Resources

Natural resources can be broadly classified into two categories: renewable and non-renewable resources.

Renewable Resources

Renewable resources are those that can replenish themselves through natural processes within a relatively short time frame. Examples include:

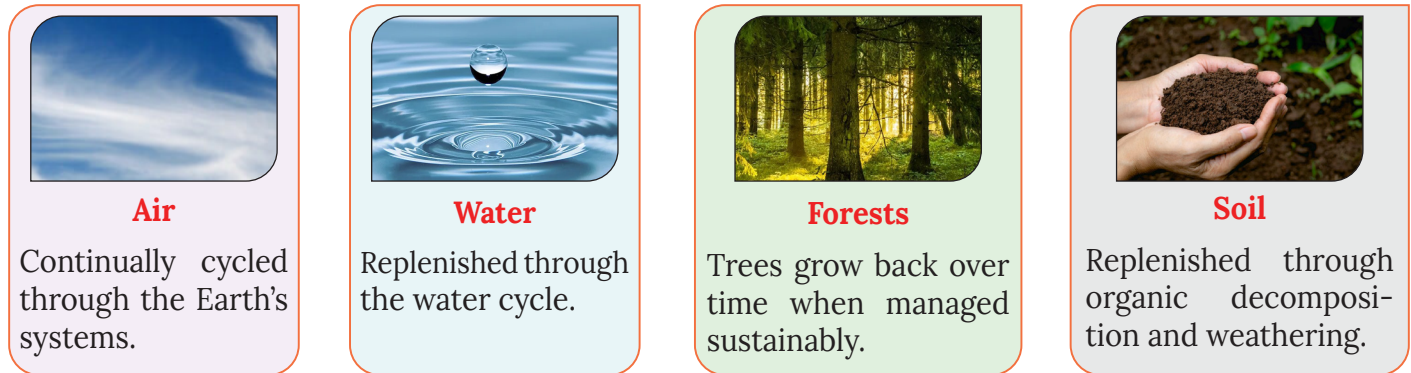


Fig. 11.1 Renewable Resources

Non-Renewable Resources

Non-renewable resources, on the other hand, are limited in quantity and take millions of years to form. Once depleted, they cannot be replenished within a reasonable time. Examples include:



Fig. 11.2 Non-Renewable Resources

Impact of Human Activities

The use of fossil fuels in vehicles and industries generates pollutants like smoke and harmful gases, contributing to air pollution. Urban areas often experience poor air quality compared to rural regions with abundant greenery. However, alternatives like electric vehicles are being developed to reduce emissions and mitigate pollution.

Conservation of Natural Resources

Sustainable practices are essential for conserving natural resources and ensuring their availability for future generations. These include:

- Walking or cycling to nearby places instead of using vehicles.
- Using public transportation to reduce individual carbon footprints.
- Adopting renewable energy sources like solar and wind power.
- Minimizing waste and promoting recycling and reuse.
- Planting trees and preserving forests to maintain ecological balance.

Quote on Resource Conservation

A reminder of the importance of moderation comes from Mahatma Gandhi:

“Earth provides enough to satisfy every man’s need but not for every man’s greed.”

- By prioritizing conservation and adopting sustainable practices, humanity can preserve the Earth’s treasures and maintain a harmonious balance with nature.

Fact Flash



Did you know that a single mature tree can absorb over 20 kilograms of carbon dioxide per year and release enough oxygen for two people to breathe? Forests are incredibly efficient ecosystem resources!

Common Misconceptions



- × **Misconception:** Natural resources are only things we can dig out of the ground.
- ✓ **Correction:** Natural resources include much more than minerals; they encompass air, water, sunlight, soil, plants, animals, and entire ecosystems like forests and oceans.
- × **Misconception:** All ecosystem services are tangible products.
- ✓ **Correction:** Many ecosystem resources provide “services” that are not products, such as climate regulation, water purification, pollination of crops, and spiritual/recreational value.

Science Around You



An ecosystem is a community of living organisms (plants, animals, microbes) interacting with their non-living environment (air, water, soil, sunlight). Within ecosystems, we find ecosystem resources (also known as natural resources). These are materials and components found in the environment that are considered valuable or useful to living organisms, especially humans. They can be broadly categorized as biotic (living or derived from living things, like forests, wildlife, and fish) and abiotic (non-living, like water, air, sunlight, minerals, and land). From the clean air we breathe and the freshwater we drink, to the fertile soil for growing food and the vast biodiversity that sustains ecological balance, ecosystem resources are the foundation of all life and human civilization.

Activity

Local Ecosystem Resource Mapping

- **Objective:** To identify and categorize various ecosystem resources present in a local environment.
- **Materials Required:** Large sheet of paper, Markers or colored pencils, Access to a window overlooking outdoors, or an outdoor space (garden, park).
- **Procedure:**
 1. **Define Area:** Pick a local spot to observe, like your school garden, a nearby park, or the view from a window.
 2. **Observe and List:** Spend 15-20 minutes carefully observing everything in that area. List down all the natural components you see or infer are present.
 3. **Categorize:** Draw two columns on your paper: “Biotic Resources” and “Abiotic Resources.” Write each item you listed into the correct column.




Fig. 11.3 Materials Required

4. **Discuss Importance:** Discuss why each of these listed items is considered an “ecosystem resource” and how it might be valuable to living things, including humans.

- **Observation:** Observe the diversity of natural components in a small area and recognize their classification as either living (biotic) or non-living (abiotic) resources crucial for an ecosystem.

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**Knowledge Checkpoint**

Multiple Choice Questions:

1. Which of the following is an example of an abiotic resource?

- a) Trees ☐ b) Fish ☐ c) Sunlight ☐ d) Animals ☐

2. An ecosystem refers to a community of living organisms interacting with:

- a) Only other living organisms ☐ b) Their non-living environment ☐
c) Humans only ☐ d) Factories ☐

3. Why are plants considered an ecosystem resource?

- a) They only provide shade. ☐ b) They provide food, oxygen, and habitat. ☐
c) They cause pollution. ☐ d) They are non-living components. ☐

Short Answer Question:

4. State the main difference between biotic resources and abiotic resources with an example.
5. Give two examples that show how humans depend on water as a resource in ecosystems.

Long Answer Question:

6. Imagine a forest ecosystem. Describe at least three different ecosystem resources (both biotic and abiotic) found in a forest and explain their importance to the organisms (plants and animals) living within that forest.

Renewable Resources

Natural resources play a vital role in supporting life on Earth. Among these, renewable resources are unique because they can regenerate naturally over time, making them an essential component of sustainable living. Unlike non-renewable resources that deplete with excessive use, renewable resources are replenished through natural processes, ensuring their availability for future generations. Let's dive deeper into understanding what renewable resources are, their importance, and examples of how they support life and the environment.

Air

The Importance of Air in Our Lives

Air is a crucial element of life, present everywhere around us. Though invisible to the naked eye, its presence can be felt in various ways. For instance, you can observe the rustling of leaves on a tree, the gentle fluttering of pages in an open book when a fan is switched on, or the flying of a kite in the sky. Air is also what moves our hair in the breeze. These small yet significant phenomena highlight the ever-present and dynamic nature of air.

Keywords

Breeze: A gentle and soft wind that flows with minimal force, often providing a refreshing and calming effect.

What is Air Composed Of?

Air is not a single gas but a mixture of various gases, each playing an essential role in maintaining life and supporting natural processes. The major components of air are:

- **Nitrogen (78%):** This is the most abundant gas in the atmosphere. While nitrogen is not directly used by humans for breathing, it plays a critical role in plant growth, as it forms the building block of proteins and is vital for the **nitrogen cycle**.
- **Oxygen (21%):** Oxygen is indispensable for life. It supports respiration in humans, animals, and many microorganisms, which is the process through which energy is released from food.
- **Other Gases (1%):** This small but significant portion consists of gases like argon, carbon dioxide, water vapor, and trace gases. Carbon dioxide is essential for plants as it fuels photosynthesis, while water vapor contributes to the water cycle and influences weather patterns.

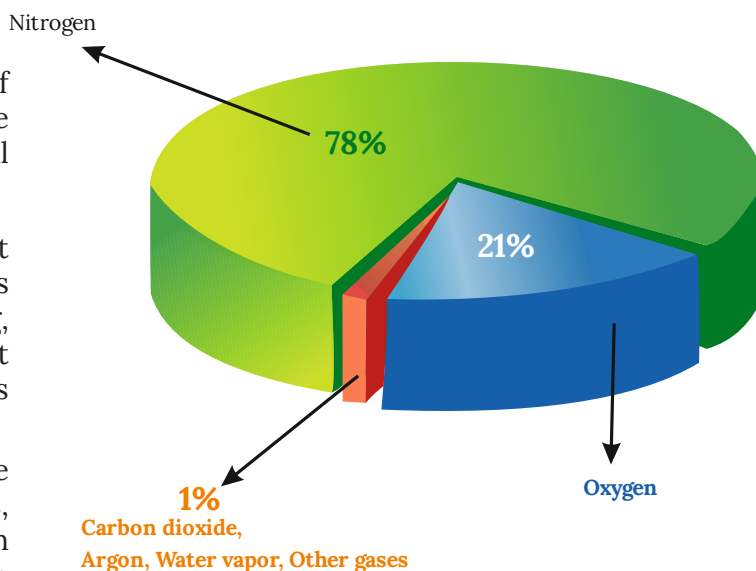


Fig. 11.4 Composition of Air

Air in Motion: Wind

When air moves, it is referred to as wind. The movement of air can vary in speed and intensity:

- **Gentle Breeze:** A soft wind can cool the environment and provide a soothing effect.
- **Strong Winds or Storms:** At higher speeds, moving air can become powerful and destructive, shaping weather patterns and causing natural phenomena like cyclones and storms.

The Need for Clean Air

Although air is abundant, its quality is often compromised due to pollution caused by human activities. Harmful emissions from vehicles, industries, and other sources introduce pollutants into the atmosphere, reducing the availability of clean, breathable air. Ensuring the purity of air is essential for the health of humans, animals, and plants.

Some steps to maintain clean air include:

- Planting more trees to absorb carbon dioxide and release oxygen.
- Reducing industrial and vehicular emissions by adopting cleaner technologies.
- Promoting the use of renewable energy sources to minimize air pollution.

Wind Power Today: Generating Electricity

In the modern era, windmills have become powerful tools for generating electricity. Large wind turbines, often referred to as modern windmills, are equipped with blades that rotate when the wind blows. The rotation of these blades drives a generator that produces electricity. Here's how wind power is generated today:



Fig. 11.5 Windmill

Keywords

Nitrogen Cycle: The continuous process in which nitrogen moves between the atmosphere, soil, and living organisms, supporting life by enabling the formation of essential compounds like proteins.

Wind Farms:

- To generate significant amounts of electricity, multiple windmills are installed together in what are known as wind farms. These farms are usually located in flat, open areas with strong and consistent winds.
- In India, several wind farms have been established in states like Tamil Nadu, Gujarat, Maharashtra, and Rajasthan, where wind conditions are ideal for generating electricity.

Clean and Renewable Energy:

Unlike fossil fuels, wind power does not produce greenhouse gas emissions, making it an environmentally friendly source of energy.

Wind energy is also renewable, meaning it will never run out as long as the wind blows, making it a sustainable choice for meeting energy needs.

India's Growing Wind Power Capacity

India has emerged as one of the leading countries in wind energy production. With a vast coastline and flat terrains that experience consistent winds, the country has immense potential to expand its wind power capacity. Key regions contributing to India's wind energy generation include:

- **Tamil Nadu:** Home to several large wind farms, this state is one of the leaders in wind energy production.
- **Gujarat:** Known for its strong coastal winds, Gujarat has invested heavily in wind power infrastructure.
- **Rajasthan and Maharashtra:** These states also contribute significantly to India's wind energy sector.

Water

Water is an indispensable natural resource crucial for sustaining life on Earth. It is essential for a wide range of activities, including drinking, washing, agriculture, industrial processes, construction, and electricity generation. Despite its abundance, the usability of water is highly limited due to its availability in different forms and the growing demand for it.

Approximately two-thirds of the Earth's surface is covered with water, primarily in the form of oceans and seas. However, the majority of this water is saline and unsuitable for direct human consumption or most agricultural and industrial uses. Freshwater, which is found in underground aquifers, rivers, lakes, glaciers, and as snow on the Earth's surface, is the primary source for these needs. Yet, this freshwater constitutes only a small portion of the total water available on the planet, making it a scarce resource in many regions.

Water is not an infinite resource, and its availability is shrinking due to human activities and natural factors. As the demand for water continues to rise, proactive measures to conserve and manage this resource are imperative. By adopting sustainable practices and protecting natural water sources, society can ensure that the needs of both present and future generations are met without compromising the environment. The conservation of water is not merely an environmental concern but a necessity for the survival and well-being of all life forms on Earth.

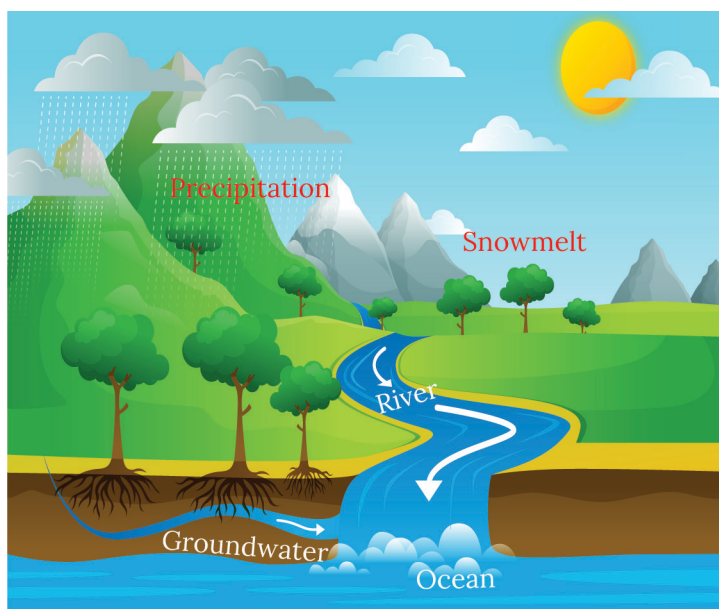


Fig. 11.6 Sources of Water

Rainwater Harvesting

Rainwater harvesting is a sustainable and practical method of water conservation that involves collecting and storing rainwater for future use. This approach is particularly important in the context of increasing water scarcity and urbanization. By capturing rainwater, this method helps reduce dependency on conventional water supply systems and ensures a steady availability of water for various needs. Rainwater harvesting is especially vital in urban areas where concrete surfaces prevent rainwater from percolating into the ground, leading to a significant loss of potential groundwater recharge.

Techniques of Rainwater Harvesting

Rainwater harvesting can be implemented using two main techniques:

Rooftop Rainwater Harvesting:

- In this method, rainwater is collected from the rooftops of buildings and directed into storage tanks through a network of pipes.
- The storage tanks can be above ground or underground, and the collected water can be filtered for use in daily activities such as washing, cleaning, and gardening.
- Rooftop harvesting is especially beneficial in urban areas where rooftops provide a significant catchment area for collecting rainwater.

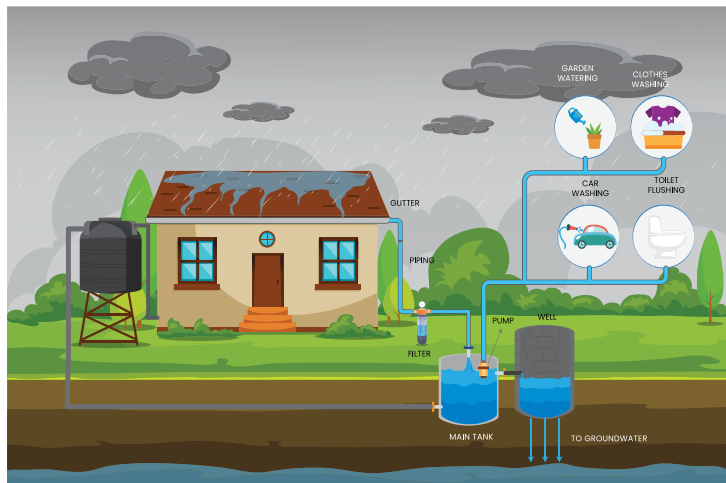


Fig. 11.7 Rooftop Rainwater Harvestion

Run-off Rainwater Harvesting:

- This method involves collecting surface run-off rainwater from areas such as roads, open grounds, or fields and channeling it into underground storage tanks.
- The stored water can be filtered and used for non-drinking purposes or directed to recharge groundwater aquifers
- Surface run-off harvesting is particularly useful in areas with heavy rainfall, as it minimizes water wastage while preventing waterlogging and urban flooding.

Traditional Rainwater Harvesting Practices in India

Stepwells: These are large, deep trenches dug into the ground with walls lined with stone blocks. They were designed to collect not only rainwater but also water seeping from nearby lakes, ponds, and rivers. The stepwell system allows water to seep through the stones, ensuring that it is filtered and remains cool even during the hottest months.

Solar Energy

The energy from the Sun is one of the most well-known and widely used renewable energy sources available on Earth. The Sun plays a central role in sustaining life on our planet by providing light and heat, which are essential for various natural and human activities. Solar energy is a clean, sustainable, and inexhaustible source of energy, making it a crucial component of efforts to transition away from non-renewable and polluting energy sources.

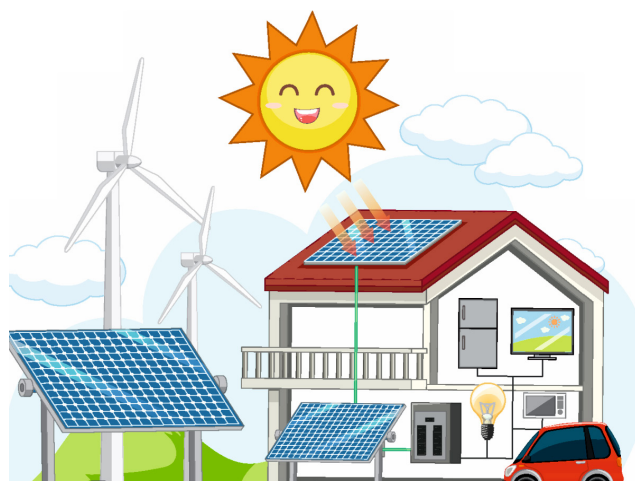


Fig. 11.8 Solar Energy

Solar Panels: Harnessing the Sun's Energy

Solar panels are innovative devices designed to capture and convert solar energy into usable forms of energy such as heat, light, and electricity. These panels consist of photovoltaic cells that convert sunlight directly into electrical energy. This electricity can then be used to power homes, businesses, and industries, making solar panels a highly efficient and sustainable energy solution.

Solar panels have various applications, including:

- **Solar Water Heaters:** Solar panels are used to heat water directly, which can then be used for domestic or industrial purposes.
- **Solar Cookers:** Solar energy is utilized in solar cookers for cooking food, reducing the reliance on traditional fuels like wood or gas.
- **Electricity Generation:** Solar panels provide clean electricity for powering appliances, lighting, and even entire buildings.

Forest

Forests are vital to the survival of all living beings on Earth. They serve as the habitat for a diverse range of wildlife, including birds, insects, and larger animals. Forests provide essential resources such as food and shelter to these species, creating a balanced ecosystem where every organism depends on others for survival. This interdependence ensures that food and shelter are available for all life forms. Moreover, forests play a critical role in supporting human populations, particularly tribal communities, by supplying food, shelter, oxygen, and other necessary materials for their sustenance.

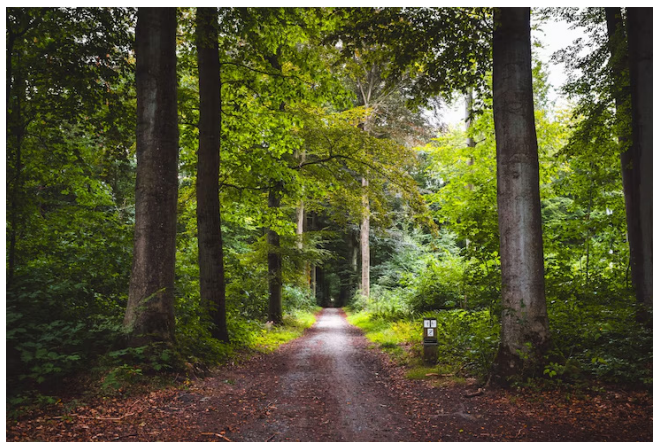


Fig. 11.9 Forest



Fig. 11.10 Forest Conservation

India has a rich history of forest conservation and has been home to several movements aimed at protecting forests from destruction. One of the most well-known efforts is the **Chipko Movement**, which began in the early **1970s in Uttarakhand**. Under the leadership of environmentalists like **Sundarlal Bahuguna**, this movement gained momentum as local communities, especially women, came together to prevent trees from being cut down. They protected trees by encircling and hugging them, symbolizing their commitment to forest conservation.

Efforts for Forest Conservation

To raise awareness about the importance of forests and the need for their conservation, India celebrates Van Mahotsav, or the “Festival of Trees,” during the first week of July each year. This week-long event involves planting new trees and promoting sustainable practices to protect forest cover. The aim of Van Mahotsav is to encourage people to participate actively in preserving forests and protecting natural resources. Such initiatives emphasize the collective responsibility of individuals and communities in safeguarding the environment.



Fig. 11.11 Chipko Movement

Fact Flash



Did you know that the Sun delivers enough energy to Earth every hour to meet humanity's global energy needs for an entire year? Solar energy is an incredibly abundant renewable resource!

Common Misconceptions



- × **Misconception:** Renewable resources are always available everywhere.
- ✓ **Correction:** While the source is renewable (e.g., sun, wind), their availability can vary geographically and seasonally (e.g., more sun in deserts, more wind on coasts).
- × **Misconception:** Using renewable resources has no environmental impact.
- ✓ **Correction:** While generally much lower, renewable energy technologies (e.g., dams, wind farms) can have localized environmental impacts (e.g., habitat disruption, visual impact) that need careful management.

Science Around You



Renewable resources are natural resources that can be replenished naturally over relatively short periods, making their supply effectively inexhaustible on a human timescale, as long as they are managed sustainably.¹⁸ Key examples include solar energy (from the sun), wind energy (from air currents), hydro energy (from flowing water), geothermal energy (from Earth's internal heat), and biomass (organic matter from plants and animals). Other renewable resources include freshwater (replenished by the water cycle, though localized scarcity can occur), fertile soil (replenished by natural processes, but can be degraded), and forests (can regrow if harvested sustainably). The growing reliance on renewable resources is crucial for reducing dependence on fossil fuels, mitigating climate change, and achieving long-term environmental and economic sustainability.

Activity



Designing a Renewable Energy Solution

- **Objective:** To creatively propose a solution using a renewable resource for an everyday problem.
- **Materials Required:** Poster board or large drawing paper, Markers, colored pencils, or paints, Access to information about renewable energy types (brief descriptions or pictures)
- **Procedure:**
 1. **Identify a Problem:** As a group or individually, choose an everyday problem that could be solved or improved using a renewable resource.

Examples:

- Lighting a small garden shed at night.
- Charging a mobile phone while camping.
- Heating water for a small outdoor shower.
- Moving a small toy boat in water.

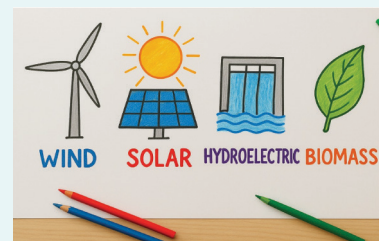





Fig. 11.12 Materials Required


2. **Choose a Renewable Resource:** Select one renewable resource (solar, wind, hydro, etc.) that would be suitable for your chosen problem.
 3. **Design a Solution:** Sketch or draw your proposed solution. Label the parts and explain how the renewable resource is harnessed to solve the problem.
 4. **Present:** Share your design, explaining your choice of resource and how it provides a sustainable solution.
- **Observation:** Observe how renewable resources can be harnessed through different technologies to provide sustainable solutions for various energy needs in daily life.



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Homework

Watch Remedial



Knowledge Checkpoint

Multiple Choice Questions:

- | | |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remembering | 1. Which of the following is a source of renewable energy?
a) Coal <input type="checkbox"/> b) Natural gas <input type="checkbox"/>
c) Geothermal energy <input type="checkbox"/> d) Uranium <input type="checkbox"/> |
| Understanding | 2. Why are forests considered a renewable resource?
a) They absorb carbon dioxide. <input type="checkbox"/> b) They can regrow if managed sustainably. <input type="checkbox"/>
c) They provide habitat for animals. <input type="checkbox"/> d) They are very old. <input type="checkbox"/>
3. The main advantage of using renewable energy sources is that they:
a) Are always cheap. <input type="checkbox"/> b) Produce no waste. <input type="checkbox"/>
c) Are replenished naturally and cause less pollution. <input type="checkbox"/>
d) Only short-term benefits <input type="checkbox"/> |

Short Answer Question:

4. List three renewable resources and explain how they can be used by people.
5. Explain with reasons why solar energy is always considered a renewable resource.

Long Answer Question:

6. Compare the environmental impacts of using renewable energy sources (e.g., solar, wind) versus non-renewable energy sources (e.g., fossil fuels). Discuss at least two key differences in their effects on the environment and human health.

Non-renewable Resources

Non-renewable resources are natural resources that exist in limited quantities and cannot be replenished within a human timescale once consumed. These resources are formed over millions of years through geological processes and include substances like minerals, fossil fuels, coal, petroleum, and natural gas. The limited availability and long formation periods of non-renewable resources emphasize the importance of their judicious use and the exploration of alternative, **sustainable energy sources** to reduce dependency on them.

Keywords

Sustainable Energy Sources: Energy sources that are renewable and environmentally friendly, such as solar, wind, and hydropower, ensuring long-term availability without depleting natural resources.

Rocks: An Essential Natural Resource

Rocks are made up of minerals and are the result of geological processes that occur over thousands to millions of years. These processes involve intense heat, pressure, and the gradual accumulation of materials, resulting in the formation of rocks with unique characteristics. Due to the extensive time required for their formation, rocks are considered non-renewable resources, meaning their availability is finite. Different types of rocks are used in specific applications based on their properties. For instance, slate, a fine-grained rock, is commonly used for roofing due to its resistance to weather and its aesthetic appeal. Similarly, laterite, a type of soil rock, is often used as a building material akin to bricks in regions where it is abundant.



Fig. 11.13 Natural Resource

Among the most significant types of rocks are granite, sandstone, and marble. Granite, known for its hardness and durability, is frequently used in flooring, countertops, and monuments. Sandstone, on the other hand, is favored for construction due to its strength and ease of shaping. Marble, with its unique patterns and elegance, is often chosen for decorative purposes, including statues, flooring, and interior designs.

Minerals

Minerals form the foundation of numerous vital materials and are indispensable to modern life. They are the primary source for extracting metals such as aluminum, gold, copper, and iron. These metals play crucial roles in various industries and everyday items. For example, aluminum is widely used in making aeroplanes and cars, while gold and silver are integral to crafting jewellery and luxury items. Copper and cobalt are essential for electronic equipment and gadgets.



Fig. 11.14 Minerals

Fossil Fuels: A Key Source of Energy

Fossil fuels are natural carbon-based substances that produce heat energy when burned in air or oxygen. They form over millions of years from decomposed plants, animals, and other organisms, making them non-renewable resources. The three primary types of fossil fuels are coal, petroleum, and natural gas.

Coal is a widely used fossil fuel, especially for generating electricity. It is found in several regions across India and plays a significant role in power production.

Petroleum is a thick, dark liquid with a strong odor, commonly refined into fuels like petrol and diesel, which are extensively used in vehicles. However, burning these fuels releases large amounts of carbon dioxide, contributing to pollution and global warming.

Natural Gas, primarily composed of methane, is used for cooking and generating electricity. Compressed Natural Gas (CNG) is a cleaner alternative for motor vehicles, producing less pollution compared to petrol and diesel.

While fossil fuels are crucial for energy and transportation, their excessive use leads to harmful consequences. Burning fossil fuels releases smoke and carbon dioxide, contributing to air pollution and **global warming** by increasing Earth's temperature.

Conservation of Natural Resources

Conservation of natural resources refers to the responsible and sustainable use of Earth's resources. With a growing population and increasing energy demands, the depletion of resources, particularly non-renewable ones, is becoming a significant concern. If this continues unchecked, many of these resources may eventually run out.

The conservation of resources involves using them judiciously to prevent wastage. This includes adopting practices that reduce energy consumption and transitioning to alternative energy sources, such as solar and wind power. Such actions can help balance the damage caused by earlier excessive use of resources.



Fig. 11.15 Natural Resources

Sustainable Development

Sustainable development refers to meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. It emphasizes responsible use of resources and environmental conservation. The key goals of sustainable development include:

- Identifying causes of resource depletion to address and manage them effectively.
- Preventing waste and over consumption to ensure resources are used efficiently.
- Recycling reusable materials to reduce pressure on natural resources.
- Preventing pollution to protect ecosystems and biodiversity.
- Preserving forests and wildlife to maintain ecological balance.
- Using alternative energy sources like solar and wind to reduce reliance on non-renewable resources.

The three Rs—**Reduce, Reuse, Recycle**—form a simple yet effective approach to conserving resources and minimizing waste. By adopting sustainable practices, we can ensure the long-term health of the planet and its resources for future generations.

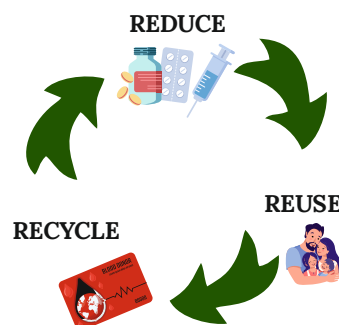


Fig. 11.16 Sustainable Development

Fact Flash



Did you know that the coal we burn today began forming from ancient plant matter millions of years ago under immense heat and pressure? It takes an incredibly long time for these resources to form!

Common Misconceptions



- × **Misconception:** Non-renewable resources will never run out.
- ✓ **Correction:** While some might last for centuries, they are finite. Their continued consumption at current rates will eventually lead to depletion, making them economically unfeasible to extract.
- × **Misconception:** All energy sources are non-renewable.
- ✓ **Correction:** Many energy sources, like solar, wind, and hydro power, are renewable, as they are continuously replenished by natural processes.

Science Around You



Non-renewable resources are natural resources that exist in finite quantities and are consumed much faster than nature can replenish them. Their formation typically takes millions of years, making their supply practically limited on a human timescale. The most well-known non-renewable resources are fossil fuels (coal, petroleum/oil, natural gas), formed from the buried remains of ancient plants and animals. These fuels are currently our primary source of energy for electricity, transportation, and industry. Other non-renewable resources include minerals (like iron, copper, gold, aluminum) and nuclear fuels (like uranium).

Activity

Identifying Non-renewable Resources in Everyday Items

- **Objective:** To identify everyday items that are made from or powered by non-renewable resources.
- **Materials Required:** A collection of various everyday items (e.g., a plastic bottle, an aluminum can, a small electronic gadget, a piece of coal or a picture of coal/oil, a coin)
 - Worksheet or notebook for listing, Pen or pencil
- **Procedure:**
 1. **Examine Items:** Look at each item in your collection.
 2. **Identify Raw Materials:** For each item, try to identify the main raw materials it is made from (e.g., plastic from petroleum, aluminum from bauxite ore). If it's an energy source, identify what it is.



Fig. 11.17 Materials Required

3. **Classify as Non-renewable:** For each identified raw material, determine if it is a non-renewable resource.
 4. **Discuss Impact:** Discuss why it's important to use these items wisely, considering the finite nature of their source materials and the environmental impacts of their extraction and use.
- **Observation:** Observe that many common items and energy sources rely on non-renewable resources, highlighting their pervasive role in our modern lives and the need for mindful consumption.



Knowledge Checkpoint



Gap Analyzer™
Homework

Watch Remedial



Remembering

Multiple Choice Questions:

1. Which of the following is a fossil fuel?

a) Solar energy	<input type="checkbox"/>	b) Wind	<input type="checkbox"/>	c) Natural gas	<input type="checkbox"/>	d) Water	<input type="checkbox"/>
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2. Non-renewable resources are considered finite because:

a) They are too expensive to extract.	<input type="checkbox"/>
b) Nature replenishes them very slowly over millions of years.	<input type="checkbox"/>
c) They are located only in a few places.	<input type="checkbox"/>
d) They are not useful anymore.	<input type="checkbox"/>
3. The use of non-renewable resources contributes to:

a) Infinite supply	<input type="checkbox"/>
b) Resource depletion and environmental concerns	<input type="checkbox"/>
c) Always clean energy	<input type="checkbox"/>
d) Only short-term benefits	<input type="checkbox"/>

Understanding

Short Answer Question:

4. List three non-renewable resources that are commonly used by humans.
5. Explain with reasons why coal is regarded as a non-renewable resource.

Applying

Long Answer Question:

6. Discuss the environmental consequences associated with the extensive use of fossil fuels (coal, oil, natural gas). Include at least two major impacts and explain how they relate to the non-renewable nature of these resources.

Evaluating

SUMMARY



Nature provides a vast array of resources collectively referred to as “Nature’s Treasure,” which sustain all life on Earth. These resources are categorized into **ecosystem resources, renewable resources, and non-renewable resources.**

Ecosystem Resources

Ecosystem resources include clean air, water, fertile soil, forests, and biodiversity, which result from the interaction of living and non-living components in ecosystems. They support life by providing essential services like oxygen production, food supply, and ecological balance. Human-made resources, like furniture and solar panels, are derived from these natural materials.

Renewable Resources

Renewable resources, such as air, water, forests, and soil, replenish naturally over time through natural processes. For example, air circulates continuously, water follows the water cycle, and forests regrow when managed sustainably. Although renewable, these resources require responsible usage to ensure availability for future generations.

Non-Renewable Resources

Non-renewable resources, like coal, petroleum, natural gas, and minerals, form over millions of years and cannot be replenished within a human lifetime. Fossil fuels, derived from ancient

organisms, are heavily used for energy and transportation but contribute to pollution and climate change. Conservation of these resources is essential to mitigate environmental impacts.

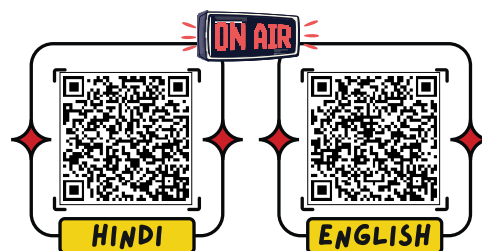
Importance of Conservation

As natural resources face overexploitation due to rising populations and increasing energy demands, conservation becomes critical. Sustainable practices, such as walking, using renewable energy, recycling, and minimizing waste, help protect these resources. Efforts like rainwater harvesting and forest preservation play a crucial role in addressing resource scarcity and environmental degradation.

Sustainable Development

Sustainable development focuses on meeting present needs without compromising the ability of future generations to meet theirs. Its key principles include:

- Reducing waste and overconsumption
 - Recycling materials
 - Protecting ecosystems and biodiversity
 - Using renewable energy sources
- The motto of sustainable development emphasizes the “Three Rs”—Reduce, Reuse, Recycle—to minimize waste and promote resource efficiency.



Example Based Questions



Multiple Choice Questions

1. Which of the following is an example of a renewable resource?

- (a) Coal
- (b) Petroleum
- (c) Solar energy
- (d) Natural gas

Answer: (c) Solar energy

Explanation: Solar energy is unlimited and continuously available. Coal, petroleum, and natural gas are non-renewable because they take millions of years to form and may run out if overused.

2. Which statement is true about non-renewable resources?

- (a) They can be used again and again without depletion
- (b) They get exhausted after continuous use
- (c) They are replaced quickly by natural processes
- (d) They include sunlight and wind

Answer: (b) They get exhausted after continuous use

Explanation: Non-renewable resources like coal and petroleum are limited and take millions of years to form. Overuse may lead to depletion and shortage in the future.

Short Answer Questions

3. What are ecosystem resources? Give two examples.

Answer: Ecosystem resources are natural materials and services provided by our environment that support life. Examples include:

- **Air and Water:** Essential for breathing and drinking.
- **Soil and Forests:** Provide food, raw materials, and habitat for living organisms.

They are nature's treasures that sustain both humans and animals.

4. Why are renewable resources considered better for the future than non-renewable resources?

Answer: Renewable resources (like sunlight, wind, forests, water) can be replenished naturally and are available for long-term use. Non-renewable resources (like coal, petroleum, and minerals) are limited and may finish if overused. Relying more on renewable resources ensures sustainability, less pollution, and energy security for future generations.

5. Give one example each of renewable and non-renewable resources used in your home.

Answer:

- Renewable: Electricity generated from solar panels or water from a hand pump.
- Non-Renewable: LPG gas cylinder (made from petroleum) used for cooking.

This shows how both types of resources are part of our daily life, but renewable ones are more eco-friendly.

Long Answer Questions

6. Explain the differences between renewable and non-renewable resources with four examples of each.

Answer:

Renewable Resources:

- Can be naturally replenished in a short period of time.
- Available in unlimited or continuous supply.
- Examples: Sunlight, wind, forests (trees), water.

Non-Renewable Resources:

- Form very slowly (millions of years) and cannot be replaced quickly.
- Get exhausted if used continuously.
- Examples: Coal, petroleum, natural gas, and minerals like gold and iron.

Conclusion: Renewable resources are environment-friendly and sustainable, while non-renewable resources must be used wisely to avoid future shortages.



Gap Analyzer™

Complete Chapter Test

EXERCISE



A. Choose the correct answer.

- Which of the following characteristics distinguishes living organisms from non-living objects?

(a) Coal	<input type="checkbox"/>	(b) Petroleum	<input type="checkbox"/>
(c) Sunlight	<input type="checkbox"/>	(d) Natural gas	<input type="checkbox"/>
- What is a key characteristic of non-renewable resources?

(a) They replenish quickly	<input type="checkbox"/>
(b) They exist in unlimited quantities	<input type="checkbox"/>
(c) They take millions of years to form	<input type="checkbox"/>
(d) They are not useful for energy production	<input type="checkbox"/>
- Which of the following is an ecosystem resource?

(a) Gold	<input type="checkbox"/>	(b) Clean air	<input type="checkbox"/>
(c) Plastic	<input type="checkbox"/>	(d) Petrol	<input type="checkbox"/>
- Which of these contributes to air pollution?

(a) Solar panels	<input type="checkbox"/>	(b) Wind turbines	<input type="checkbox"/>
(c) Burning fossil fuels	<input type="checkbox"/>	(d) Planting trees	<input type="checkbox"/>
- What is the primary source of renewable energy for solar panels?

(a) Coal	<input type="checkbox"/>	(b) Wind	<input type="checkbox"/>
(c) Water	<input type="checkbox"/>	(d) Sunlight	<input type="checkbox"/>

B. Fill in the blanks.

- Renewable resources like _____ and _____ replenish naturally over time.
- Non-renewable resources such as _____ and _____ take millions of years to form.
- _____ is a renewable resource that provides oxygen and maintains ecological balance.
- Burning fossil fuels releases _____ into the atmosphere, causing pollution.
- The three Rs of resource conservation are _____, _____, and _____.

C. Write True or False.

- Non-renewable resources can replenish naturally within a human lifetime. _____
- Renewable resources like forests do not require conservation. _____
- Air pollution is primarily caused by the burning of fossil fuels. _____
- Solar panels use sunlight to generate electricity. _____

D. Define the following terms.

- Ecosystem Resources
- Renewable Resources
- Non-Renewable Resources
- Fossil Fuels
- Sustainable Development

E. Match the columns.

Column A		Column B
1. Non-renewable resources	(a)	Wind, sunlight, and water
2. Renewable resources	(b)	Cannot replenish naturally
3. Ecosystem resources	(c)	Clean air and fertile soil
4. Conservation of resources	(d)	Reducing waste and recycling
5. Fossil fuels	(e)	Coal, petroleum, and natural gas

F. Assertion and Reason

Instructions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is NOT the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.
- e) Both A and R are false.

1. **Assertion:** Petroleum is a non-renewable resource.

Reason: It takes millions of years for petroleum to form naturally.

2. **Assertion:** Solar panels are a great way to generate electricity in all regions.

Reason: Solar energy is a renewable resource and is equally available in all parts of the world throughout the year.

3. **Assertion:** Forests are considered a renewable resource.

Reason: Trees can be replanted and grown, but only if they are managed sustainably.

G. Give reasons for the following statements.

- 1. Renewable resources need to be conserved even though they replenish naturally.
- 2. Non-renewable resources are at risk of depletion due to overuse.
- 3. Burning fossil fuels contributes to air pollution and climate change.
- 4. Forests are vital for maintaining ecological balance and biodiversity.
- 5. Sustainable development helps in preserving resources for future generations.

H. Answer in brief.

- 1. What are some examples of renewable and non-renewable resources?
- 2. Why is it important to conserve non-renewable resources?
- 3. How does the use of renewable energy benefit the environment?
- 4. What role do ecosystem resources play in supporting life on Earth?
- 5. What does the term “sustainable development” mean?

I. Answer in detail.

- 1. Discuss the differences between renewable and non-renewable resources, with examples.
- 2. Explain how human activities contribute to the depletion of natural resources.
- 3. Describe the role of forests in maintaining ecological balance and their conservation efforts.
- 4. How can sustainable development practices help mitigate environmental issues?

SKILL-BASED PRACTICE



Activity Time

STEM

Renewable and Non-Renewable Resources

- **Materials Needed:** Chart paper or A4 sheets, Colored pens/pencils, Internet access or science textbook, A small solar calculator or toy, and a torch (to show battery use)
- **Activity Steps:**

Step 1 – Learn the Basics

Discuss/Research: What are renewable resources? (sun, wind, water, plants). What are non-renewable resources? (coal, oil, natural gas, petrol, diesel)

Step 2 – Make a Resource Chart

Draw two big boxes:

Left side : Renewable Resources

Right side : Non-Renewable Resources

Fill in each box with at least 4 examples, a picture/drawing, and one sentence about how it is used in daily life.

Step 3 – Mini Demonstration (Optional)

I Show a solar calculator or solar toy : works with renewable energy (sun).

Show a torch with batteries : works with non-renewable stored energy.

Ask: Which one will last forever, and which will finish one day?

Step 4 – Think About Energy in Your Area

Find out (from internet or teacher) how much electricity in your state/country comes from renewable resources. Write 2 sentences on why switching to renewable is important.

Step 5 – Solutions & Ideas

Brainstorm 3 ways your family or school can use more renewable resources (e.g., use solar lamps, plant more trees, use bicycles).

Questions:

1. Write two examples each of renewable and non-renewable resources.
2. Why are coal and petrol called non-renewable?
3. Which resource (renewable or non-renewable) is better for nature? Why?
4. If you were the school principal, what renewable resource would you like to install in your school?
5. Draw one renewable resource and one non-renewable resource.



Materials Required

Skills Covered: Observation, Creative Thinking, Environmental Awareness, Problem-Solving

Creativity Art

Art

“Renewable Energy Future” Poster

Design an artistic poster illustrating a future where renewable energy sources dominate. Show a city, a home, or a landscape powered entirely by clean, renewable energy. Include creative representations of solar, wind, hydro, or geothermal power being used in innovative ways. Use bright, hopeful colors.

- **Materials to Use:**

- Large poster board or drawing paper
- Coloured markers, pencils, paints, or collage materials
- **Optional:** Glitter, recycled materials (e.g., bottle caps for solar panels)



Materials Required

Questions:

- Which renewable energy source did you highlight most prominently in your poster? Why?
- How did you use colors and imagery to convey a sense of sustainability and positive change?
- What is one new idea about renewable energy that you explored while creating your poster?

Skills Covered: Creativity, Visual Communication, Future Thinking, Artistic Expression

Resource Dependency Inquiry

Group Activity

Tracing a Product's Resources

1. **Choose a Product:** Select a common everyday product (e.g., a plastic water bottle, a simple toy, a t-shirt, a book, a pencil).
2. **Brainstorm Raw Materials:** List all the raw materials that went into making that product (e.g., for a plastic bottle: petroleum, water, dyes).
3. **Identify Resource Type:** For each raw material, determine if it is a renewable or non-renewable resource.
4. **Trace Production Steps:** Briefly outline the main steps in making the product (e.g., extraction of raw material, manufacturing, packaging, transportation), considering the energy needed for each step.
5. **Discuss Impact:** As a group, discuss the overall environmental impact of producing and using this item, considering both resource depletion and pollution.

Questions:

- What product did your group choose?
- List the main raw materials for your product and classify them as renewable or non-renewable.
- Which stages of your product's life cycle (from raw material to disposal) likely consume the most energy or resources?
- Suggest one way to make the production or consumption of your chosen product more sustainable.

Skills Covered: Research & Analysis, Understanding Resource Chains, Critical Thinking, Collaboration, Environmental Awareness

The Thirsty Farm

Case Study

Read the given passage below and answer the question:

A small farm relies on water from a nearby river for irrigation. Recently, the region has experienced a long drought, and the river level has dropped significantly. The farmer is worried about his crops and future harvests. Meanwhile, the nearby town uses electricity generated from a coal-fired power plant.

Guiding Questions:

1. Is the river water a renewable or non-renewable resource? Explain your answer.
2. What energy resource is the town primarily using, and is it renewable or non-renewable?
3. How does the drought affect the farmer's use of the river water?
5. What could the town do to reduce its reliance on the non-renewable resource for electricity?



Skills Covered: Classification, Analysis, Teamwork, Communication, Scientific Investigation

Renewable Resources in India

Source Based Question

According to the Ministry of New and Renewable Energy (MNRE), India is one of the world's leaders in renewable energy. As of May 2023, the country had installed about 179 GW of renewable energy capacity. Out of this, 67 GW came from solar energy and 43 GW from wind energy, while the rest came from small hydro and biomass sources. The government is promoting renewable energy to reduce pollution and meet the growing energy needs of India's large population. Renewable energy is called "clean energy" because it is available naturally, does not run out, and is safer for the environment compared to coal and petroleum.

Questions:

1. Understanding the Source
 - a) What are renewable resources?
 - b) Name the ministry that promotes renewable energy in India.
2. Trends & Data
 - a) What was India's total installed renewable energy capacity in May 2023?
 - b) Which two renewable sources contributed the most to this capacity?
3. Population Link
 - a) Why does India need more renewable energy as its population grows?
 - b) Why is renewable energy considered "clean energy"?

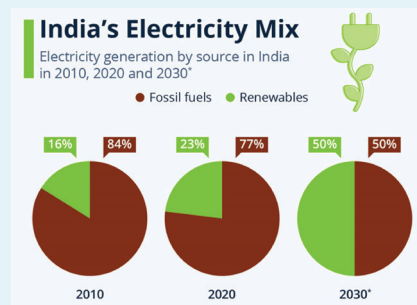


Image Credit: IEA

Skills Covered: Observation, Curiosity, Critical thinking, Connecting real-life observations