

Unit II : Energy Resources

(Weightage – 16marks)

Unit– II Energy Resources	2a. List various natural resources. 2b. Describe Renewable, Nonrenewable and Cyclic resources. 2c. State the causes and effects of depletion of resources. 2d. State advantages and disadvantages of forms of energy. 2e. Select appropriate solutions of efficient use of energy. 2f. State the impacts of overuse of natural resources.	2.1 Natural Resources - Forest Resources, Water Resources, Energy Resources, Land resources, Mineral resources. 2.2 Renewable, Non-renewable and Cyclic Resources. 2.3 Causes and effects of depletion of resources. 2.4 Energy forms (Conventional and non-conventional). 2.5 Present global energy use and future demands. 2.6 Energy conservation. 2.7 Over use of natural resources and its impacts on environment.
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What are Resources ?

Any thing, which is useful to man, or can be used to produce a useful thing, can be referred as 'resources'.

Example: rocks, minerals, soil, rivers, plants & animal.

Natural Resources

Resources that are drawn directly from the nature and used without modifications are called Natural Resources.

Eg.: air, water, minerals etc.

1. Forest Resources

Definition: Forests are areas rich in trees and other vegetation. They provide habitats for a variety of species, covering large parts of land.

Importance:

Forests are home to 50%-90% of the Earth's species.

They produce countless material goods such as timber, fruits, medicines, and raw materials for various industries.

Functions:

Environmental Stability: Forests help regulate climate and rainfall patterns.

Carbon Sequestration: Absorb CO₂, helping mitigate climate change.

Biodiversity Support: Provide habitats for wildlife and maintain ecosystems.

Water Cycle Maintenance: Facilitate water retention and distribution through transpiration.

2. Water Resources

Earth's Composition: Known as the "Blue Planet," 71% of Earth's surface is water. Of this, 97% is saline, and only 3% is freshwater, with just 1% being pure and usable.

Freshwater Sources:

Glaciers: Account for 70% of Earth's freshwater.

Underground Water: Makes up 29%.

Rivers and Lakes: Only 1% of freshwater.

Importance of Water:

Essential for all living organisms' survival.

Used in drinking, sanitation, agriculture, industrial processes, and energy production.

Challenges: Freshwater is renewable but limited, necessitating its conservation

3. Land Resources

Definition: Land covers 29% of Earth's surface and is a finite, vital resource that supports all terrestrial life.

Uses of Land Resources:

Agricultural Land:

Used for growing crops and food production.

Includes arable land for cultivation.

Habitat for Animals and Plants:

Land ecosystems like forests and grasslands provide shelter and sustenance to diverse species.

Industrial and Commercial Areas:

Allocated for factories, offices, and business activities such as retail stores and restaurants.

Residential Areas:

Designated for housing, schools, nursing homes, and other living spaces.

Waste Disposal Areas (Landfills):

Used for solid waste management, critical for environmental health.

Mineral Resources:

Land is the source of minerals that fuel industrial growth and economic activities.

4.Mineral Resources

Definition: Minerals are naturally occurring, inorganic solids with a crystalline structure and distinct physical and chemical properties.

Types of Minerals:

Metallic Minerals: Examples include bauxite, hematite, iron, copper, silver, and gold. These are essential for industrial applications like machinery, vehicles, and defense equipment.

Non-Metallic Minerals: Examples include coal, limestone, marble, granite, and sand. These are used in energy production, construction, and other industries.

Uses:

Industrial Applications: Machinery and equipment manufacturing.

Energy Generation: Coal and uranium for electricity production.

Construction: Building materials like marble and granite.

Defense: Creation of weapons and armaments.

Jewelry and Artifacts: Precious metals like gold and silver.

5.Energy Resources **Definition:** Materials or substances from which energy is derived for human activities.

Types of Energy Resources:

Renewable Energy: Resources replenished naturally and sustainably:

Solar Power: Energy from sunlight, used for electricity and heating.

Hydro Power: Energy from flowing water, commonly used in dams.

Wind Energy: Harnessing wind using turbines to generate power.

Tidal Energy: Generated from ocean tides.

Geothermal Energy: Heat extracted from beneath the Earth's surface.

Biogas: Produced from organic waste decomposition.

Non-Renewable Energy: Resources formed over millions of years and finite in supply:

Coal: Used in power plants and industries.

Petroleum: Fuels like petrol and diesel.

- **Forest Resources:** Forests provide habitats, materials like timber and medicines, and regulate the climate and water cycle.
- **Water Resources:** Earth's limited freshwater is vital for survival, agriculture, and industries, requiring careful conservation.
- **Land Resources:** Land supports agriculture, ecosystems, industries, and residential needs while supplying minerals.
- **Mineral Resources:** Minerals, metallic and non-metallic, are essential for construction, energy, and industrial uses.
- **Energy Resources:** Derived from renewable (solar, wind, hydro) and non-renewable (coal, petroleum) sources for power generation

Types of Natural Resources

Renewable Resources



NonrenewableResources



Cyclic Resources



The knowledge of Natural resources is very essential to understand the its applications, Global need, and future demands

Once you understand the importance of natural resources, you will understand the need of its conservation

Definition: Resources derived from nature that can be used by humans without modification.

Types:

Renewable Resources

Nonrenewable Resources

Cyclic Resources

Renewable Resources

Definition: Resources that can naturally replenish over time.

Examples:

Solar Power: Energy from sunlight, converted to electricity using solar panels.

Uses: Solar cookers, water heaters, electricity generators.

Hydropower: Energy from falling or running water, converted to electricity via turbines.

Uses: Electricity generation, flood control, irrigation.

Wind Energy: Generated by uneven heating of the Earth's surface, captured using wind turbines.

Uses: Electricity generation in wind farms.

Tidal Energy: Energy from sea tides, converted to electricity at shorelines.

Uses: Turbine rotation for electricity, energy storage.

Geothermal Energy: Heat from Earth's interior, used near volcanic areas and hot springs.

Uses: Electricity generation, heating buildings, drying crops.

Biogas: Methane-rich gas produced from organic waste in biogas plants.

Uses: Cooking, lighting street lamps.

Nonrenewable Resources

Definition: Resources available in limited supply and cannot regenerate on a human timescale.

Examples:

Oil: Extracted as crude oil; used for fuel and as a base for products like plastics.

Uses: Gasoline, diesel, industrial chemicals.

Natural Gas: Fossil fuel extracted, then processed into liquefied petroleum gas (LPG).

Uses: Household fuel, vehicle fuel.

Coal: Combustible sedimentary rock formed from organic matter over millions of years.

Uses: Power plants, metallurgy, industrial processes.

Nuclear Fuels: Derived from nuclear reactions (fission, fusion, decay) to generate heat and electricity.

Uses: Power turbines in nuclear plants for electricity.

Cyclic Resources

Definition: Resources that can be reused after undergoing certain processes.

Examples:

Water treated and reused in industrial and domestic applications.

For example, water used in industry and domestic ways can be cleaned and used again for similar or other purpose. Such resources are given the name of Cyclic Resources.

- **Renewable Resources:**

- Continuously replenished by natural processes (e.g., solar, wind, water, biomass)

- **Non-Renewable Resources:**

- Finite resources that take millions of years to form (e.g., fossil fuels, minerals)

- **Cyclic Resources:**

- Resources that can be reused and recycled (e.g., water, some minerals)

Difference between renewable and non-renewable resources

Parameters	Renewable Resources	Non-renewable Resources
Definition	A renewable resource is one that naturally replaces itself at a rate near or equal to the rate at which you're using it.	Non-renewable resource does not replace itself at the rate it is being used.
Classification	Renewable resources can be further divided in two types : Living Renewable Resources and Non-Living Renewable Resources	Non-Renewable Resources can be further classified into two types : Recyclable and Non-Recyclable resources
Advantages	i) Renewable energy is beneficial because we do not have to worry about its depletion. ii) Renewable energies such as wind and hydropower provides for cleaner, environmentally friendlier power sources.	i) Non-renewable resources are easy to use as these are relatively cheap to mine and to convert into energy
Disadvantages	Technologies to utilize renewable resources is very costly and do not give much efficiency.	The non-renewable resources are fast depleting and causing a lot of environmental pollution
Examples	Hydropower, Wind, Solar energy etc	Coal, Oil, Natural gas etc.

2.3

Causes of Natural Resource Depletion

Resource Depletion occurs when the renewable and non-renewable natural resources become scarce because they are consumed faster than they can recover.

All of these resources have been depleted primarily because of human activities.

1. **Overpopulation:**

- Excessive demand for water, food, and energy exceeds the Earth's capacity.

2. **Overconsumption:**

- Misuse of resources for profit by private entities.

3. **Wastage:**

- Inefficient use of electricity, water, and other resources.

4. **Deforestation:**

- Caused by agriculture, timber extraction, mining, and infrastructure projects.

5. **Mining of Minerals and Oil:**

- Excessive exploitation leads to production decline (e.g., Copper, Zinc).

6. **Technological and Industrial Development:**

- Increased demand for materials for production and research.

7. Pollution and Contamination:

- Poor waste management and harmful agricultural practices degrade resources.

Effects of Natural Resource Depletion

1. Resource Scarcity:

- Depletion of fossil fuels, timber, water, and arable land leads to scarcity, impacting various sectors like agriculture and energy.

2. Rising Prices:

- Scarcity of natural resources increases their costs, making them less accessible to many people.

3. Water Shortages:

- Increasing global population and urbanization lead to reduced access to clean water.

Solutions to Reduce Natural Resource Depletion

1. Reduce the Use of Fossil Fuels:

- Opt for alternatives like renewable energy, carpooling, and energy-efficient appliances to save resources like gasoline and electricity.

2. Keep Water Clean:

- Avoid wasting water, and take actions like fixing leaks and adopting water-saving habits.

3. Preserve Trees and Forests:

- Reduce paper usage and encourage reforestation to combat deforestation.

4. Protect Coastal Ecosystems:

- Safeguard coastal areas to preserve marine biodiversity and their critical roles in reducing climate impact.

2.7 Overuse of Natural Resources

- Overuse occurs when the demand for natural resources exceeds sustainable levels due to **human greed** rather than need.

Overuse of Natural Resources

- ▶ We derive numerous useful substances from natural resources but when 'need' turns to 'greed' it starts over exploitation.
- ▶ **impacts of Overuse of Natural Resources on environment**
 1. Deforestation.
 2. Desertification
 3. Soil erosion
 4. Land Slides
 5. Extinction of species



Impacts of Overuse on the Environment

1. Deforestation:

- Clearing of forests for agriculture, infrastructure, and industrial purposes.
- **Effects:**
 - Loss of biodiversity.
 - Climate change and increased greenhouse gases.
 - Soil erosion and flooding.

2. Desertification:

- Fertile land turns into deserts due to deforestation and overexploitation of soil.
- **Effects:**
 - Reduced agricultural productivity.
 - Drought and loss of plant cover.

3. Soil Erosion:

- Topsoil is washed or blown away due to deforestation, overgrazing, and construction.
- **Effects:**
 - Infertile soil.
 - Water pollution and sedimentation in rivers.
 - Increased flooding risk.

4. Landslides:

- Movement of earth or rocks due to natural (rain, earthquakes) or human-induced (mining, dam construction) causes.
- **Effects:**
 - Loss of property, infrastructure damage, and transportation disruptions.

5. Extinction of Species:

- Loss of species due to habitat destruction, overhunting, or environmental changes.
- **Effects:**
 - Ecosystem imbalance and disrupted food chains.

Solutions for Conserving Natural Resources

- ▶ Controlling deforestation
- ▶ Reducing oil, mineral consumption
- ▶ More exploration and use of Renewable source of energy like biogas, biofuels etc
- ▶ Protecting wetlands and coastal ecosystem
- ▶ Awareness creation
- ▶ Treatment of industrial wastes and sewages before release in the water bodies.
- ▶ Rain water harvesting.
- ▶ Ensure the recycling of wastes.
- ▶ Sustainable farming practices like crop rotation.
- ▶ Constructions of reservoirs



Natural Resources are Very Important

Say No to Exploitation



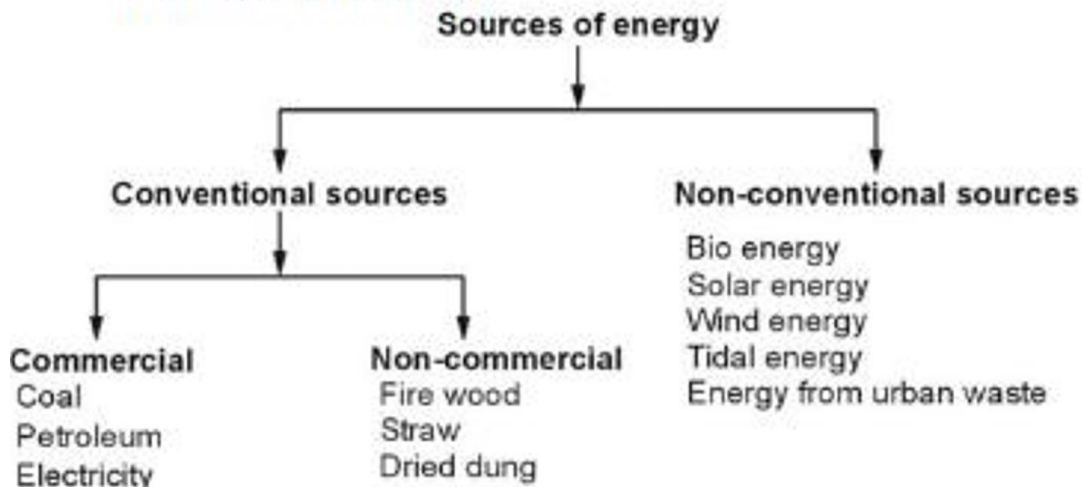
The knowledge of importance of Natural resources is very essential to understand the its applications, Global need, and future demands

Say Yes To Conservation



Once you understand the importance of natural resources, you will understand the need of its conservation

2.4 Energy Forms (Conventional and Non-conventional)



Energy Forms

Energy can be classified into two main types: **Conventional Energy Sources** and **Non-Conventional Energy Sources**.

1. Conventional Energy Sources

- These are traditional sources of energy that are **non-renewable** and commonly used.
- Examples include **coal, petroleum, and natural gas**.
- Characteristics:
 - **Non-renewable:** Limited availability; once exhausted, cannot be replenished.
 - **Environmental Impact:** Contribute to pollution, greenhouse gases, and global warming.
 - **Common Usage:** Used in industries, power generation, and transportation.

2. Non-Conventional Energy Sources

- These are **renewable** and considered alternatives to conventional energy.
- Examples include:
 1. **Solar Energy:**
 - Energy harnessed from sunlight using solar panels.
 - Widely used for heating, electricity generation, and cooking.
 2. **Wind Energy:**
 - Energy generated using wind turbines.

- Best suited for coastal and open plain regions.

3. Hydropower:

- Produced by harnessing water flow in dams.
- Clean and efficient but can impact aquatic ecosystems.

4. Biogas:

- Derived from organic waste decomposition.
- Used for cooking and lighting in rural areas.

5. Geothermal Energy:

- Utilizes heat from beneath the Earth's surface.
- Applied in electricity generation and heating.

Advantages of Non-Conventional Energy

1. Renewability:

- Infinite availability; does not deplete natural resources.

2. Environmental Benefits:

- Low or zero pollution; minimizes carbon emissions.

3. Cost-Effectiveness:

- Long-term savings despite initial setup costs.

Challenges

1. High Initial Investment:

- Setting up infrastructure like solar panels or wind turbines can be costly.

2. Dependence on Environment:

- Solar energy requires sunlight; wind turbines need consistent wind flow.

3. Technological Limitations:

- Limited efficiency and storage options in current systems.

Global Energy Use and Demands

- Developing countries use significantly less energy than developed nations.
- Major energy sources include fossil fuels (coal, oil, natural gas), nuclear energy, and renewables.
- The demand for energy is growing annually:
 - Oil demand: From 85 to 106 million barrels/day by 2040.
 - Coal demand: Increasing but lower compared to others.
 - Natural gas and renewables: Fastest-growing energy sources.
 - Nuclear energy: Expected to grow by 87%.

2. Why Conserve Energy?

- Limited non-renewable resources are depleting.
- Energy conservation reduces pollution and saves money.
- It enhances personal, national, and financial security.

3. Energy Conservation at Different Levels

- **Personal Level:**
 - Turn off unnecessary lights and appliances.
 - Use energy-efficient devices (check star ratings).
 - Improve water heating efficiency.
- **Public Places:**
 - Avoid unnecessary lighting in public spaces.
 - Switch off street lights and billboards when not needed.
- **Global Level:**
 - Adopt strategies for sustainable energy use.
 - Promote renewable energy and efficient technologies.

4. Strategies for Energy Sustainability

- **Immediate Actions:**
 - Use current resources efficiently.
 - Reduce energy losses in production and distribution.
 - Develop eco-friendly energy systems.
- **Medium-Term Actions:**
 - Shift to renewable energy sources.

- Change transportation systems to be energy-efficient.
- Encourage recycling and less energy-intensive industries.
- **Long-Term Actions:**
 - Build modern energy infrastructure.
 - Promote private sector involvement in energy projects.
 - Create strict energy efficiency and emission standards.

5. Key Benefits of Energy Conservation

- Saves resources for future generations.
- Reduces environmental pollution.
- Helps achieve socio-economic growth sustainably.

Summary

- The presentation emphasizes global energy usage, increasing demands, and the need for conservation.
- Practical strategies at personal, public, and global levels can lead to sustainable energy practices

Energy Conservation



2.6 Energy Conservation

- **Why is it Important?**
 - Energy resources, especially non-renewable ones, are depleting quickly due to high demand.
 - Conservation helps save these resources, reduces pollution, and ensures long-term availability.
 - It also leads to financial savings and greater environmental security.

- **How Can We Conserve Energy?**

- **At Home:**

- Turn off lights and appliances when not in use.
 - Use energy-efficient equipment (check star ratings).
 - Optimize water heating to reduce energy costs.

- **In Public Places:**

- Avoid unnecessary use of lighting and fans in bus/rail stations.
 - Minimize wasteful energy consumption from advertising hoardings.

- **Globally:**

- Invest in renewable energy sources.
 - Support research in energy-efficient technologies.
 - Implement and follow strict energy conservation policies.

- **Benefits of Conservation:**

- Reduces energy waste and pollution.
 - Saves money for individuals and nations.
 - Ensures a sustainable future by preserving resources.

- The global demand for energy is growing due to economic and technological development.
- Conservation is crucial to address resource scarcity and environmental concerns.
- Effective conservation involves actions at personal, community, and global levels.
- Emphasizing renewable energy, energy-efficient practices, and technology development can lead to a sustainable energy future