



3. Energy Resources

BVES-151: Environmental Studies

Unit 1: Fundamentals of Environmental Science and Ecology

Topic: Energy Resources

⚡ What are Energy Resources?

Energy resources are natural sources of energy used by humans for heating, electricity, transportation, and various other activities. They are broadly divided into two types:

- **Renewable Energy Resources**
- **Non-Renewable Energy Resources**

□ Renewable Energy Resources

Renewable energy resources are naturally replenished and never run out. They are environmentally friendly and sustainable.

1. Solar Energy

- **Source:** Sunlight captured by solar panels.
- **Uses:** Electricity, water heating, cooking, lighting.
- **Benefits:** Clean, abundant, reduces carbon emissions.
- **Challenges:** Initial setup cost, weather dependency.

2. Wind Energy

- **Source:** Wind turning turbine blades connected to generators.
- **Uses:** Electricity generation (wind farms).
- **Benefits:** Clean, renewable, no pollution.
- **Challenges:** Needs consistent wind; noise concerns.

3. Hydropower (Hydroelectric)

- **Source:** Flowing water (rivers, dams).
- **Uses:** Electricity generation.
- **Benefits:** Reliable, large-scale electricity, no emissions.
- **Challenges:** Ecological disruption, expensive dams.

4. Geothermal Energy

- **Source:** Heat from the Earth's core.
- **Uses:** Heating buildings, electricity generation.
- **Benefits:** Continuous, reliable, low emissions.
- **Challenges:** Limited to areas near tectonic activity; costly initial investment.

5. Biomass Energy

- **Source:** Organic matter (plants, animal waste).
- **Uses:** Cooking, heating, electricity, fuel.

- **Benefits:** Reduces waste, renewable, widely available.
- **Challenges:** Air pollution, deforestation if unmanaged.

□ Non-Renewable Energy Resources

These energy resources are finite—once used, they cannot be quickly replenished.

1. Coal

- **Source:** Fossilized plant material.
- **Uses:** Electricity generation, heating, industrial energy.
- **Benefits:** Abundant, low cost.
- **Challenges:** High pollution, carbon emissions, finite supply.

2. Petroleum (Oil)

- **Source:** Fossilized marine organisms.
- **Uses:** Transportation fuel (cars, planes), heating, plastic production.
- **Benefits:** High energy density, versatile.
- **Challenges:** Pollution, greenhouse gases, oil spills.

3. Natural Gas

- **Source:** Gas formed from decomposing organic matter underground.
- **Uses:** Heating, cooking, electricity generation, fuel.
- **Benefits:** Cleaner burning than coal/oil, reliable.
- **Challenges:** Methane leaks, carbon emissions, finite resource.

4. Nuclear Energy

- **Source:** Energy from nuclear reactions (uranium fission).
- **Uses:** Electricity generation.
- **Benefits:** High power output, no direct air pollution.
- **Challenges:** Radioactive waste, risk of accidents, expensive setup.

□ Importance of Sustainable Energy Use

Sustainable energy use means using energy in ways that do not harm the environment or exhaust resources:

- Protects environment from harmful emissions.
- Reduces dependency on limited resources.
- Supports long-term energy security.
- Improves public health by reducing pollution.

□ Ways to Use Energy Sustainably

Action	Impact
Switch off unused lights/appliances	Saves electricity and resources
Choose energy-efficient devices	Reduces energy consumption
Use renewable energy when possible	Cuts carbon emissions



Action	Impact
Encourage public transportation	Lowers petroleum usage and pollution
Promote tree planting & green spaces	Helps offset carbon emissions

Renewable vs Non-Renewable: Quick Comparison

Aspect	Renewable	Non-Renewable
Availability	Unlimited	Limited
Environmental Impact	Minimal pollution	High pollution
Cost	Higher initial; lower long-term	Low initial; high environmental
Examples	Solar, wind, hydro, biomass	Coal, oil, natural gas, nuclear

□ Quick Self-Check Questions

1. What is the main difference between renewable and non-renewable energy?
2. Give two examples each of renewable and non-renewable energy sources.
3. Why is sustainable energy use important?
4. Name three ways you can conserve energy in daily life.

☐ Key Takeaways

- Energy resources power our lives but impact the environment significantly.
- Renewable resources offer clean and lasting energy alternatives.
- Sustainable energy practices are crucial for protecting the environment and future generations.