

UNIT – I ENERGY AND ENVIRONMENT:

Energy Resources and Their Exploitation:

Energy resources refer to the various forms of energy that can be harnessed to perform work or generate power. These resources can be broadly categorized into renewable and non-renewable sources.

Exploitation of energy resources involves the extraction, conversion, and utilization of these resources to meet human energy needs.

Sun as the Source of Energy: Nature of its Radiation:

The sun is the ultimate source of energy for Earth. It emits energy in the form of electromagnetic radiation, primarily in the form of sunlight.

Understanding the nature of solar radiation, including its composition, intensity, and variability, is crucial for harnessing solar energy through technologies like solar panels.

Conventional Energy Sources:

Conventional energy sources include:

Coal: A fossil fuel formed from the remains of ancient plants. Its combustion releases carbon dioxide and other pollutants.

Oil: Another fossil fuel that is refined into various products, including gasoline and diesel. It also contributes to greenhouse gas emissions.

Biomass: Organic materials like wood, crop residues, and animal waste used for energy. Biomass combustion can produce pollutants and contribute to deforestation.

Natural Gas: A fossil fuel primarily composed of methane. It is less polluting than coal and oil but still contributes to greenhouse gas emissions.

Nonconventional Energy Sources:

Nonconventional or renewable energy sources are more environmentally friendly alternatives and include:

Hydroelectric Power: Generated by the kinetic energy of flowing water, typically through dams and turbines.

Tidal Energy: Captured from the rise and fall of ocean tides.

Wind Energy: Produced by harnessing the kinetic energy of wind using wind turbines.

Geothermal Energy: Extracted from the Earth's internal heat.

Solar Collectors and Photovoltaic Cells: Convert sunlight directly into electricity.

Solar Ponds: Use solar energy to generate heat and produce electricity.

Nuclear-Fission and Fusion:

Nuclear fission involves splitting atoms (e.g., uranium) to release energy. It is used in nuclear power plants but poses risks related to radioactive waste.

Nuclear fusion involves combining light atoms (e.g., hydrogen) to release energy, similar to the sun's process. It has immense potential but is technically challenging.

Magnetohydrodynamic Power (MHD):

MHD is a theoretical concept that aims to generate electricity by exploiting the conductivity of hot plasma using magnetic fields. It has the potential for highly efficient and low-emission energy generation.

Energy Use Pattern in Different Parts of the World and Its Impact on the Environment:

Energy consumption patterns vary globally, influenced by factors such as economic development, industrialization, and population.

The impact on the environment includes air pollution, water contamination, habitat destruction, and most notably, the release of greenhouse gases like CO₂, contributing to global warming and climate change.

CO₂ Emission in Atmosphere:

Carbon dioxide (CO₂) is a greenhouse gas produced primarily from the combustion of fossil fuels.

Elevated CO₂ levels in the atmosphere contribute to the greenhouse effect, trapping heat and causing global temperatures to rise, resulting in climate change.

Understanding the interplay between energy resources and the environment is crucial for developing sustainable energy solutions that minimize environmental degradation and combat climate change. This unit provides the foundation for exploring these complex issues and the technologies and policies aimed at mitigating their impact.