ENVIRONMENTAL SCIENCE

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UNIT - I

1. Discuss the environmental effects of deforestation.

A: Deforestation, the large-scale removal of trees from forests or other lands, has significant environment effects that disrupt ecosystems and contribute to global challenges. Some of key impacts include:

① Loss of Biodiversity: Forests are home to about 80% of the world's terrestrial species. Deforestation leads to habitat destruction, which threatens the survival of countless plant and animal species, some of which may face extinction.

② Climate Change: Trees act as carbon sinks, absorbing carbon dioxide (CO_2) from the atmosphere. When forests are cleared, not only is this carbon storage capacity lost, but the carbon stored in trees is also released back into the atmosphere.

③ Disruption of the Water Cycle: Trees play a critical role in maintaining the water cycle by absorbing and releasing water through a process called transpiration. It results in droughts in some areas and flooding in others.

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④ Soil Erosion and Degradation: Forests act as a protective layer for the soil, reducing erosion by holding the soil together with their roots. This can negatively affect agriculture and water quality.

⑤ Loss of Ecosystem Services: Forests provide numerous ecosystem services such as air purification, water filtration, and climate regulation. Deforestation diminishes these essential services, that depend on forest resources.

⑥ Increased Risk on Natural Disasters: Without trees to stabilize the land and absorb water, deforested areas are more prone to landslides, floods, and other natural disasters.

⑦ Impact on Indigenous Communities: Many indigenous communities rely on forests for their livelihoods, culture and way of life. Deforestation can lead to the displacement of these communities.

Deforestation has far-reaching environmental consequences, from accelerating climate change to disrupting local ecosystems and human societies. The loss of traditional knowledge and practices related to forest ecosystems.

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2. Explain about the energy resources.

A: Energy resources are sources from which energy is derived to perform work or generate power. These resources can be broadly classified into two categories:

⇒ Renewable and

⇒ Non-Renewable.

Each type has different characteristics, availability and environmental impact.

① Renewable Energy Resources:

Renewable Energy comes from sources that are naturally replenished and often have a lower environmental impact compared to non-renewable resources.

a) Solar Energy: Energy from the sun.

b) Wind Energy: Kinetic Energy from wind.

c) Hydropower: Energy from moving water. (rivers, dams, tidal flows.).

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

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e) Biomass: Organic materials such as wood, agriculture waste, and animal manure.

② Non-Renewable Energy Resources:

Non-Renewable energy comes from sources that are finite and take millions of years to form. They are often associated with higher environmental impacts.

a) Fossil Fuels: These include coal, oil, and natural gas, which are derived from the remains of ancient plants and animals.

b) Nuclear Energy: Energy from nuclear fission of uranium or plutonium atoms.

Transition to Sustainable Energy:

As concerns about climate change grow, there is an increasing global push to transition from non-renewable to renewable energy sources. This shift requires investments in technology, infrastructure, and policy changes to reduce reliance on fossil fuels while promoting cleaner, more sustainable forms of energy.

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UNIT - II

3. Explain about structure and functions of ecosystem with examples.

A: An ecosystem is a community of living organisms interacting with each other and their physical environment within a defined area. Ecosystems can vary greatly in size and complexity, from a small pond to a vast forest, but they all share a basic structure and set of functions that support life

Structure of an Ecosystem: The structure of an ecosystem includes both biotic (living) and abiotic (non-living) components, which work together to maintain balance and sustainability.

① **Biotic Components:**

These are the living organisms in an ecosystem, classified based on their roles in the energy flow and nutrient cycling.

- producers (autotrophs)
- consumers (heterotrophs)
  - a) Herbivores (primary consumers)
  - b) Carnivores (secondary and Tertiary consumers)
  - c) Omnivores

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- Decomposers (detritivores)

② Abiotic Components:

These are the non-living elements of an ecosystem that influence the living organisms. Abiotic factors include:

- Sunlight
- Water
- Soil
- Air
- Temperature and Climate

Functions of an Ecosystem: Ecosystems perform several critical functions that maintain the balance of life. These include:

① Energy Flow
② Nutrient Cycling
③ Ecological Succession
④ Homeostasis

Examples of Ecosystems:

1. Forest Ecosystem:

- Biotic Components: Trees, Shrubs, Insects, Birds, mammals (like deer and foxes), fungi and Bacteria.

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- Abiotic Components: Soil, Sunlight, water, air and temperature.
- Function: In a forest, trees act as producers, absorbing carbon dioxide and releasing oxygen, while herbivores like deer eat plants, and carnivores like wolves prey on smaller animals. Decomposers breakdown organic matter to recycle nutrients.

2. Aquatic Ecosystem: (Pond or Ocean)
   - Biotic Components: Algae, aquatic plants, fish, amphibians aquatic insects and decomposers like bacteria.
   - Abiotic Components: Water, dissolved gases (oxygen and carbon dioxide), sunlight and temperature.
   - Function: In a pond, algae (producers) provide food from small fish (consumers), which are eaten by larger fish. Decomposers like bacteria breakdown dead organisms, releasing nutrients back into water.

Ecosystems are complex networks of living and non-living components that interact to support life.

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4. Explain about Biodiversity and its conservation.

A: Biodiversity refers to the variety of life on Earth, encompassing the diversity of species, genes, ecosystems, and the ecological processes that sustain life. It is crucial for ecosystem health, human survival, and the overall functioning of natural systems.

* Biodiversity can be understood at three main levels:

① Genetic diversity
② Species diversity
③ Ecosystem diversity

Biodiversity Conservation:

Conservation efforts aim to protect, restore and manage biodiversity to ensure the continued health of ecosystems and the survival of species. There are two main types of Conservation:

1. In-situ Conservation: Conservation of species in their natural habitats.

- Protected Areas: Establishing national parks,

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wildlife reserves, and marine protected areas helps safeguard ecosystems and the species that depend on them.

- Restoration Projects: Efforts to restore degraded ecosystems, such as reforestation or wetland restoration, help bring back biodiversity.

2. Ex-situ Conservation: Conservation of species outside their natural habitats.

- Zoos and Botanical Gardens: These institutions help conserve species through breeding programs, research and public education.
- Seed Banks and Gene Banks: Storing seeds and genetic material in seed banks ensures that plant species can be preserved and reintroduced if needed.

⟹ In conclusion, we can conclude that Biodiversity is essential for sustaining life on Earth. Conservation efforts, whether through protecting natural habitats, restoring ecosystems, or captive breeding, are crucial for maintaing biodiversity and ensuring that ecosystems can continue to support life.

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UNIT - III

5. Discuss about the causes, effects and controlling of water and air pollution.

A: **Water Pollution:**

Causes of water pollution: Water pollution occurs when harmful substances contaminate waterbiodies like rivers, lake, oceans or groundwater. Major causes include:

1. Industrial waste
2. Agricultural Runoff
3. Sewage and Wastewater
4. Oil Spills
5. Plastic Pollution
6. Thermal Pollution

Effects of water pollution: Water pollution has severe and far-reaching consequences for ecosystems, human health, and the economy.

1. Health Problems
2. Ecosystem Disruption
3. Loss of Biodiversity
4. Economic Losses
5. Eutrophication

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Control measures of water pollution:

1. Wastewater Treatment
2. Regulating Agricultural practices
3. Pollution control laws
4. Oil Spill Prerentation
5. Plastic Waste Reduction.

Air Pollution:

Causes of Air Pollution: Air pollution can be caused by both natural processes and human activities. Major causes include:

1. Burning of fossil Fuels
2. Industrial Processes
3. Agricultural Activities
4. Deforestation
5. Household Sources
6. Natural Events.

Effects of Air Pollution: The hazardous effects of air pollution on the environment include:

1. Health Impacts
2. Climate change
3. Acid Rain
4. Reduced Visibility
5. Damage to wildlife

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Control Measures of Air Pollution:

1. Renewable Energy Sources
2. Improving Public Transportation
3. Industrial Emission Standards
4. Air Quality Monitoring
5. Reforestation and Afforestation
6. Indoor Air Quality Improvements.

Water and Air pollution are interconnected issues that require global cooperation, innovation, and strict enforcement of environmental laws. While their causes are numerous and varied, effective solutions involve both policy interventions and individual actions aimed at reducing waste, emissions, and harmfull practices across industries, agriculture and daily life.