Unit I : Environment

(Weightage -10marks)

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Environment	1a. Discuss the scope of Environment. 1b. Describe various types of environment 1c. Describe the importance of environment studies. 1d. Discuss about the need of public awareness about environment. 1e. Describe various environmental issues.	1.1 Definitions, need of environmental studies. 1.2 Segments of environment- Atmosphere, Hydrosphere Lithosphere, Biosphere. 1.3 Environmental Issues - Green house effects, Climate change, Global warming, Acid rain Ozone layer depletion, Nuclear accidents. 1.4 Concept of 4R (Reduce, Reuse, Recycle and Recover), 1.5 Public awareness about environment.

Definition of Environment

- The environment is everything around us. It includes living things (like plants, animals, and humans) and non-living things (like air, water, soil, and sunlight).
- It forms the natural world and also the conditions we live in

Types of Environment

 Natural Environment:

- Original, unaltered environment without human interference.
- Includes all living and non-living things occurring naturally.

 Man-made Environment:

- Altered or created by human actions.
- Examples: Infrastructure, utilities, institutions, industries, housing, energy networks, etc.

 Social Environment:

- Involves social, economic, and political conditions.
- Examples: Customs, traditions, language, professions, and living conditions.

 Psychological Environment:

- Pertains to an individual's personal mental environment.
- Focuses on understanding personality and individual goals

Components of the Environment

1. **Biotic (Living Things)**
    - Examples: People, animals, trees, plants, insects, and birds.
    - These interact with each other and depend on non-living things for survival.
2. **Abiotic (Non-Living Things)**
    - Examples: Air, water, sunlight, land, mountains, and playgrounds.
    - These provide the foundation for life.

Scope and Need of Environmental Studies

- **Definition**: Understanding the environment and solving problems related to it.
- **Need**:
    - Helps protect nature and resources.
    - Provides knowledge to reduce pollution and manage resources wise
    - **Public Awareness**:
    - Addresses environmental challenges through education and action.
    - **Conservation of Resources**:
    - Reduces pollution, saves species, and manages energy resources.
    - **Sustainable Planning**:
    - Ensures that future generations inherit a healthy environment.
    - **Global Impact**:
    - Recognizes environmental issues as global concerns.

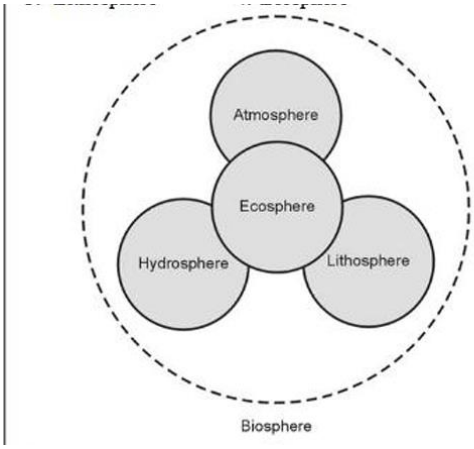
Structure of Environment:

- **Physical Environment**:
    - Includes:
        - **Solid (Lithosphere)**: Soil, landforms, mountains.
        - **Liquid (Hydrosphere)**: Water bodies like oceans, rivers.
        - **Gas (Atmosphere)**: Air and gases essential for life.
- **Biological Environment**:
    - Comprises:
        - **Flora** (plants like trees, shrubs, grass).
        - **Fauna** (animals, birds, insects, humans).

Segments of Environment:

1. **Atmosphere**:
    - Protective blanket of gases surrounding Earth.
    - Functions:
        - Sustains life by regulating temperature and providing oxygen.
        - Filters harmful **ultraviolet rays** and cosmic radiation.
2. **Hydrosphere**:
    - Represents water bodies like **oceans, rivers, lakes, glaciers, and groundwater**.
    - Covers 71% of Earth's surface:
        - 97% in oceans.
        - 2% in polar ice caps/glaciers.
        - 1% fresh surface water (rivers, lakes) usable by humans.
3. **Lithosphere**:
    - Solid outer layer of Earth, including **soil, rocks, and minerals**.
    - Examples: **Mountains, soil, and landforms.**
4. **Biosphere**:
    - Comprises all living organisms and their interactions with the **lithosphere, atmosphere, and hydrosphere**.

- **Atmosphere**: The layer of air around Earth.
- **Hydrosphere**: Includes all water bodies like oceans, rivers, and lakes.
- **Lithosphere**: The solid outer layer of Earth (land and soil).
- **Biosphere**: All regions on Earth where life exists (plants, animals, humans).



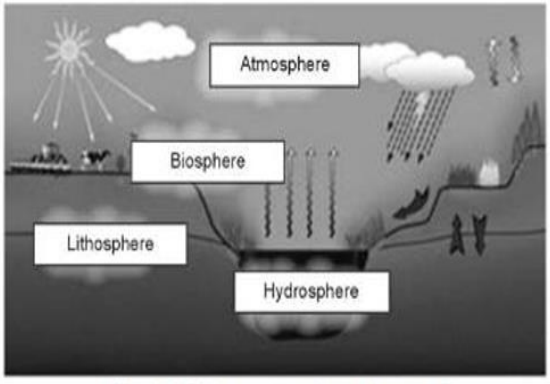


Fig. 1.2.1 Segments of environment

Environmental Issues

Environmental issues are challenges arising from human and natural activities that affect the Earth's ecosystems and life.

. Greenhouse Effect

- **Definition**:
    - The warming of the Earth's surface due to the trapping of heat by greenhouse gases in the atmosphere.
    - Greenhouse gases include:
        - **Water vapor, Carbon dioxide (CO_2), Methane (CH_4), Nitrogen oxides (NO_x), and Chlorofluorocarbons (CFCs).**
    - Contribution of greenhouse gases:
        - Carbon dioxide (CO_2): **57%**
        - Chlorofluorocarbons (CFCs): **25%**
        - Methane (CH_4): **12%**
        - Nitrogen oxides (NO_x): **6%**
- **Effects**:

1. **On Animals**:
    - Increases diseases like malaria, cholera, and diarrheal infections due to temperature rise.
    - Promotes growth of disease vectors (e.g., insects).
2. **On Plants**:
    - Alters water cycles and soil moisture.
    - Changes cultivation and harvesting cycles, and decreases crop yields.
3. **On Climate**:
    - Melts polar ice caps, raising sea levels.
    - Alters rainfall patterns and weather conditions.

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2. Global Warming

- **Definition**:
    - The rise in Earth's average temperature due to excessive accumulation of greenhouse gases.

    - Solar energy absorbed by Earth increases surface temperature, with heat trapped by greenhouse gases.

- **Effects**:

1. Temperature increases.
2. Melting of glaciers and rising ocean levels.
3. Changes in seasons and ecosystems.
4. Impacts on forests, crops, and human health.

- **Global Warming Potential (GWP)**:
    - Measures the warming impact of a greenhouse gas over 10 years using CO_2 as the baseline.

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3. Climate Change

- **Definition**:
    - A long-term change in the average weather patterns of a region, occurring over decades.
    - Influenced by:
        - Changes in solar radiation.
        - Earth's orbit and drifting continents.
        - Volcanic eruptions.
        - Greenhouse gases.
- **Impact**:
    - Extreme weather conditions.
    - Shifts in ecosystems and biodiversity.
    - Changes in water availability and agricultural productivity.

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4. Acid Rain

- **Definition**:
    - Rainfall with a low pH caused by air pollution from burning fossil fuels (coal, oil, and natural gas).
    - Pollutants include **sulfur dioxide (SO_2)** and **nitrogen oxides (NO_x)**, which react with water to form sulfuric and nitric acid.

- **Effects**:

1. Damages soil, forests, lakes, and aquatic life.
2. Corrodes buildings, monuments, and infrastructure.
3. Harms plants and animals by altering ecosystem chemistry.

5.Ozone Layer

Definition:

- A protective layer of ozone (O_3) gas in the Earth's stratosphere that absorbs the majority of the sun's harmful ultraviolet (UV) radiation.

Importance:

- Shields life on Earth from excessive UV rays, which can cause skin cancer, cataracts, and damage to ecosystems.

Causes of Ozone Depletion:

- **Chlorofluorocarbons (CFCs)**: Released from aerosols, refrigerants, and solvents.
- **Halons**: Found in fire extinguishers.
- **Other Chemicals**: Methyl bromide and nitrogen oxides.

Impacts of Ozone Depletion:

- Increased UV exposure leads to:
    - Higher skin cancer rates.
    - Reduced crop yields.
    - Harm to marine ecosystems (e.g., phytoplankton damage).

Efforts to Protect the Ozone Layer:

- **Montreal Protocol (1987)**: International treaty to phase out ozone-depleting substances (ODS).
- Use of alternative chemicals like hydrofluorocarbons (HFCs).

6.Nuclear Accidents

Definition:

- Events where nuclear reactors or materials release significant amounts of radiation, causing harm to people, the environment, and ecosystems.

Examples of Major Nuclear Accidents:

1. **Chernobyl Disaster (1986)**:

- Location: Ukraine (then USSR).
- Cause: Reactor explosion due to design flaws and operator error.
- Impact: Widespread radiation contamination, evacuation of thousands, long-term health effects (cancers).

2. **Fukushima Disaster (2011)**:
   - Location: Japan.
   - Cause: Earthquake and tsunami leading to reactor meltdown.
   - Impact: Radiation release, contamination of water and land, disruption to local communities.

Impacts of Nuclear Accidents:

- **On Humans**: Acute radiation sickness, cancer, genetic mutations.
- **On Environment**: Long-term contamination of soil and water, harm to wildlife.
- **Economic Costs**: High costs of cleanup and rebuilding, loss of livelihoods.

Preventive Measures:

- Use of advanced reactor designs with safety features.
- Strict regulatory frameworks and emergency preparedness plans.
- Transition to safer energy sources like renewables where possible.

Environmental Issues (summary)

- **Greenhouse Effects**: Trapping of heat by gases like carbon dioxide, causing global warming.
- **Climate Change**: Long-term changes in temperature, rain, and wind patterns.
- **Global Warming**: Rise in Earth's average temperature due to pollution.
- **Acid Rain**: Rain mixed with harmful chemicals from pollution.
- **Ozone Layer Depletion**: Reduction in the protective layer of ozone gas in the atmosphere.
- **Nuclear Accidents**: Harmful effects caused by the failure of nuclear plants

Concept of 4R 's

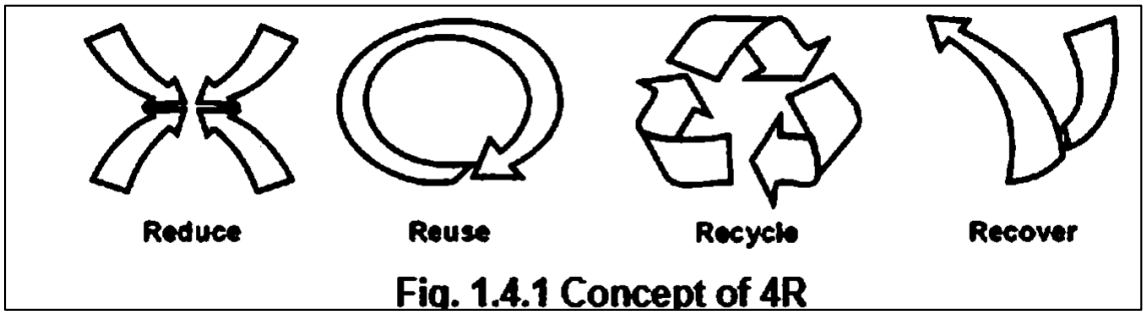

Fig. 1.4.1 Concept of 4R

The 4-R approach—Reduce, Reuse, Recycle, and Recover—is a simple and eco-friendly method for managing plastic waste.

- Reduce: Use less plastic to minimize waste from the start.
- Reuse: Find ways to use plastic items again instead of throwing them away.
- Recycle: Process old plastic to make new products.
- Recover: Convert waste into energy or other useful resources.

1. Reduce

- **Meaning**: Avoid creating waste by careful use of resources.
- **How?**
    - Plan and design better to minimize waste.
    - Use alternatives to unnecessary resources.
    - **Examples**:
        - Donate old items.
        - Take care of belongings to extend their life.
        - Walk or cycle instead of driving.
        - Use reusable glassware instead of disposable items.

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2. Reuse

- **Meaning**: Use things multiple times without changing them.
- **How?**
    - Find new uses for old items.
    - **Examples**:
        - Old newspapers for packing.

        - Plastic or steel containers for planting.

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3. Recycle

- **Meaning**: Convert waste into new products.
- **How?**
    - Process materials to make new items in the same or related industries.
    - **Examples**:
        - Recycling paper, glass, plastic, metal, and rubber.

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4. Recover

- **Meaning**: Create usable products or energy from waste.
- **How?**
    - Process waste into useful forms like energy or compost.
    - **Examples**:
        - Biogas, fertilizer, and waste-to-energy plants.

Benefits of the 4Rs

1. **Reduces Waste**: Less garbage in landfills.
2. **Reduces Pollution**: Cleaner air, water, and soil.
3. **Saves Energy**: Cuts down on energy needed for producing new materials.
4. **Saves Resources**: Conserves natural materials like wood, water, and minerals.
5. **Improves Economy**: Boosts industries that focus on recycling and reusing.
6. **Creates Jobs**: Provides employment in waste management and recycling sectors.

Public Awareness About the Environment

What is Environmental Public Awareness?

- Understanding the natural environment, its laws, and the changes that occur.
- Recognizing the connection between human behavior and environmental quality.
- Viewing the environment as a system where all parts are interconnected.
- Feeling responsible for preserving Earth's resources for future generations.

Key Aspects of Environmental Awareness

1. **Knowledge and Sensitivity**:
    - Gaining general knowledge about the environment.
    - Being sensitive to environmental changes and understanding their impacts.
    - Building a sense of responsibility to protect nature.
2. **Cause-and-Effect Relationships**:
    - Understanding how human actions affect the environment.
    - Recognizing that environmental damage often leads to consequences for humanity.
3. **Moral Responsibility**:
    - Knowing the difference between right and wrong when it comes to environmental behavior.
    - Acting responsibly instead of knowingly harming the environment.
4. **Values and Ethics**:
    - Building a system of values in society to foster environmentally friendly actions.
    - Encouraging a mindset that values nature for its own sake.

How is Public Awareness Developed?

- Through **education**: Teaching people about environmental issues and sustainable practices.
- By **participating** in environmental conservation activities.
- By following environmental laws and regulations.

- Via **community involvement**, like tree-planting drives and recycling programs.
- By adopting eco-friendly habits and technologies in daily life.

Importance of Environmental Awareness

- Helps conserve natural resources for future generations.
- Promotes good hygiene and a healthy lifestyle.
- Encourages collective responsibility for creating a clean and sustainable environment.

Vision for the Future

- A world where every person has:
    - Access to safe and adequate water.
    - A hygienic and healthy environment.
    - Proper sanitation facilities.