

# Environmental Science Study Notes

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## **1. Pollution** (9 Marks)

**Definition:** Pollution is the introduction of harmful or toxic substances into the environment that cause adverse effects on living beings and natural surroundings.

### **Types of Pollution:**

#### **1. Air Pollution:**

- Caused by emissions from vehicles, industries, and burning of fossil fuels.
- Major pollutants include carbon monoxide, sulfur dioxide, and nitrogen oxides.
- Leads to respiratory diseases, acid rain, and global warming.
- Can reduce visibility and damage crops and buildings.
- Controlled by using cleaner fuels, planting trees, and reducing industrial emissions.

#### **2. Water Pollution:**

- Occurs when harmful substances enter rivers, lakes, or oceans.
- Sources include sewage, industrial effluents, and agricultural runoff.
- Leads to diseases like cholera and destroys aquatic ecosystems.
- Causes oxygen depletion and death of aquatic animals.
- Controlled by sewage treatment, banning plastic waste dumping, and proper waste disposal.

#### **3. Soil Pollution:**

- Caused by excessive use of pesticides, fertilizers, and industrial waste.
- Leads to loss of soil fertility and crop contamination.
- Affects microorganisms and reduces agricultural productivity.
- Polluted soil can contaminate groundwater.
- Controlled by using organic manure and eco-friendly farming practices.

#### **4. Noise Pollution:**

- Caused by loudspeakers, vehicles, construction, and machinery.
- Leads to stress, hearing loss, and sleep disturbance.
- Affects both humans and animals.
- Disturbs wildlife and natural habitats.
- Controlled by using soundproof materials and limiting noise levels.

##### **5. Thermal Pollution:**

- Caused by discharge of hot water or air from industries and power plants.
- Increases temperature of water bodies, harming aquatic life.
- Reduces oxygen content in water.
- Affects fish breeding and biodiversity.
- Controlled by cooling towers and reusing heated water.

## 2. Wasteland Reclamation (9 Marks)

**Definition:** Wasteland reclamation is the scientific and planned process of converting degraded, barren, or unproductive land into fertile and productive land for agriculture, forestry, or other purposes.

### Causes of Wasteland Formation:

- **Deforestation:** Removal of vegetation exposes soil to erosion.
- **Overgrazing:** Continuous grazing leads to soil compaction and loss of vegetation.
- **Soil Erosion:** Wind and water remove fertile topsoil.
- **Mining and Industrialization:** Leaves behind infertile and polluted land.
- **Waterlogging and Salinity:** Due to poor irrigation management and excess water use.

### Methods of Reclamation:

6. **Afforestation and Reforestation:** Planting trees and grasses to stabilize soil and increase fertility.
7. **Soil Conservation Techniques:** Use contour bunding, terracing, and check dams to prevent erosion.
8. **Irrigation Management:** Adopt drip irrigation and proper drainage to prevent salinity and alkalinity.
9. **Use of Organic Manure and Biofertilizers:** Restores microbial activity and soil fertility.
10. **Land Levelling and Drainage:** Reduces water stagnation and improves crop yield.
11. **Agroforestry and Crop Rotation:** Helps restore soil nutrients and maintains land productivity.
12. **Community Participation:** Involving local people ensures long-term maintenance and protection of reclaimed land.

### Benefits:

13. Increases agricultural productivity.
14. Prevents desertification.
15. Improves local climate and biodiversity.
16. Enhances groundwater recharge and sustainable land use.

17. Promotes eco-balance and supports rural economy.

### 3. Waste Management (9 Marks)

**Definition:** Waste management is the systematic collection, segregation, transportation, processing, and disposal of waste to minimize its impact on human health and the environment.

#### Types of Waste:

- **Biodegradable Waste:** Easily decomposes (food waste, leaves, paper, etc.).
- **Non-Biodegradable Waste:** Does not decompose easily (plastics, metals, glass, etc.).
- **Hazardous Waste:** Contains toxic materials like chemicals, paints, batteries.
- **E-waste:** Waste from discarded electronic devices like computers, mobiles, and appliances.

#### Steps in Waste Management:

5. **Segregation at Source:** Separate wet (organic) and dry (inorganic) waste at home or workplace.
6. **Collection and Transportation:** Use of covered vehicles to prevent littering and odor.
7. **Recycling:** Convert recyclable materials like paper, plastic, and metals into new products.
8. **Composting:** Biodegradable waste is converted into organic manure by microorganisms.
9. **Incineration:** Controlled burning of non-recyclable waste to reduce volume.
10. **Landfilling:** Safe disposal of residual waste in scientifically designed pits.
11. **Waste-to-Energy:** Conversion of waste into biogas or electricity through anaerobic digestion.

#### Principles of Waste Management:

12. **3Rs Principle:** Reduce (minimize usage), Reuse (use again), and Recycle (convert waste into usable form).
13. **Extended Producer Responsibility (EPR):** Manufacturers are responsible for recycling or disposing of their products after use.
14. **Public Awareness:** Conduct campaigns to educate people about responsible waste disposal.

**15. Government Initiatives:** Programs like Swachh Bharat Abhiyan promote cleanliness and proper waste handling.

***Benefits:***

16. Reduces environmental pollution.
17. Saves natural resources through recycling.
18. Prevents spread of diseases.
19. Improves public health and hygiene.
20. Promotes a cleaner and sustainable environment.

## 4. Environmental Movements (9 Marks)

**Definition:** Environmental movements are collective efforts by people to protect and conserve natural resources and promote sustainable development.

### Chipko Movement (1973 – Uttarakhand):

- Started to prevent tree cutting in the Himalayan forests.
- Led by Gaura Devi and Sunderlal Bahuguna.
- Villagers hugged trees ("Chipko" means "to embrace") to stop deforestation.
- Highlighted the importance of forests for soil, water, and life.
- Resulted in government ban on tree felling in sensitive areas.

### Appiko Movement (1983 – Karnataka):

- Inspired by the Chipko Movement in the Western Ghats.
- "Appiko" means to hug in Kannada.
- Started by Pandurang Hegde to protect forests from logging.
- Aimed at forest conservation, afforestation, and sustainable living.
- Encouraged community participation and use of forest resources responsibly.

### Narmada Bachao Andolan (1985 – Madhya Pradesh, Gujarat, Maharashtra):

- Led by Medha Patkar and Baba Amte against construction of large dams on Narmada River.
- Focused on displacement of people and environmental destruction.
- Advocated sustainable development and proper rehabilitation.
- Brought international attention to social and ecological impacts of large projects.
- Helped shape environmental policies for dam construction and rehabilitation in India.

## 5. Food Chain (9 Marks)

**Definition:** A food chain is the linear sequence of organisms where each organism is eaten by the next, showing the direct flow of energy and nutrients.

**Example:** Grass → Grasshopper → Frog → Snake → Eagle

### Points:

- Begins with producers (plants) that convert solar energy into food.
- Primary consumers (herbivores) eat producers.
- Secondary and tertiary consumers feed on other animals.
- Decomposers break down dead organisms, returning nutrients to the soil.
- Energy flows in one direction — from producers to consumers.
- Energy decreases at each trophic level.
- Each organism depends on the next for survival.
- Helps maintain ecological balance and stability.
- Any disturbance affects all other levels in the chain.

## 6. Food Web (9 Marks)

**Definition:** A food web is a network of interconnected food chains that shows the complex feeding relationships among organisms in an ecosystem.

**Example:** Grass is eaten by deer, grasshopper, and rabbit → all are eaten by tiger, eagle, or snake.

### Points:

- Represents multiple food chains linked together.
- Shows how different organisms share common food sources.
- Provides stability and resilience to the ecosystem.
- Maintains natural balance among producers, consumers, and decomposers.
- Prevents ecosystem collapse if one species is lost.
- Demonstrates recycling of energy and nutrients.
- More realistic representation than a single food chain.
- Promotes biodiversity and interdependence.
- Ensures ecosystem sustainability through complex energy flow.

## 7. Carbon Cycle (9 Marks)

**Definition:** The carbon cycle is the continuous natural process through which carbon moves between the atmosphere, plants, animals, and soil.

### Steps (According to Diagram):

- CO<sub>2</sub> from the atmosphere is absorbed by green plants during photosynthesis.
- Plants convert CO<sub>2</sub> into glucose and release oxygen.
- Animals eat plants and release CO<sub>2</sub> during respiration.
- Death and decay of organisms release carbon back into the atmosphere.
- Some carbon forms fossil fuels over millions of years.
- Combustion of fuels releases stored CO<sub>2</sub> into the air.
- Maintains carbon balance on Earth.
- Helps regulate global temperature.
- Essential for the survival of all living organisms.

## 8. Water Cycle (9 Marks)

**Definition:** The water cycle is the continuous process by which water circulates through evaporation, condensation, and precipitation between the earth and the atmosphere.

### Steps (According to Diagram):

- **Evaporation:** Sun heats water, turning it into vapor.
- **Transpiration:** Plants release water vapor through their leaves.
- **Condensation:** Water vapor cools and forms clouds.
- **Precipitation:** Water falls as rain, snow, or hail.
- **Percolation:** Rainwater seeps into the ground to replenish groundwater.
- **Collection:** Water accumulates in rivers, lakes, and oceans.
- The process repeats continuously.
- Maintains water balance on Earth.
- Supports plant growth, life, and agriculture.