

ICSE Class 9 Environmental Science – How Ecosystems Work

3.1 Introduction

Ecosystems are dynamic systems where living organisms interact with each other and with their physical environment. The functioning of an ecosystem depends on the flow of energy, cycling of nutrients, and various ecological processes that maintain balance and support life.

3.2 Energy Flow in Ecosystems

Aspect	Description
Source of Energy	The Sun is the primary source of energy for most ecosystems
Producers	Plants convert solar energy into chemical energy through photosynthesis
Consumers	Organisms that consume plants or other animals to get energy
Decomposers	Break down dead organisms and recycle nutrients back into the ecosystem
• Energy flows in a unidirectional path: Sun → Producers → Consumers → Decomposers	

- Only **10% of energy** is transferred to the next trophic level (10% law)
-

3.3 Trophic Levels

Trophic Level	Organism Type	Examples
First	Producers	Green plants, algae
Second	Primary consumers (herbivores)	Deer, grasshopper
Third	Secondary consumers (carnivores)	Frog, snake
Fourth	Tertiary consumers (top predators)	Hawk, tiger
Final	Decomposers	Bacteria, fungi

3.4 Food Chains and Food Webs

- **Food Chain:** A simple, linear path of energy flow
 - Example: Grass → Rabbit → Fox
 - **Food Web:** A complex network of interconnected food chains
 - Represents multiple feeding relationships in an ecosystem
-

3.5 Biogeochemical Cycles

Nutrients move through the environment in cycles:

Cycle	Importance
Water Cycle	Circulates water through evaporation, condensation, precipitation
Carbon Cycle	Moves carbon between atmosphere, organisms, and Earth's crust
Nitrogen Cycle	Converts nitrogen between usable forms for plants and animals
Oxygen Cycle	Maintains balance of oxygen through respiration and photosynthesis

3.6 Ecological Succession

- **Definition:** Natural, gradual process of change in the types of species in an ecosystem
- **Types:**
 - **Primary Succession:** Occurs in lifeless areas (e.g., lava flow, bare rock)
 - **Secondary Succession:** Occurs in disturbed areas (e.g., after forest fire or flood)

3.7 Ecosystem Stability and Equilibrium

Feature	Explanation
Age	Older individuals may have more established social networks and resources, potentially leading to higher engagement.
Gender	Gender differences in social engagement patterns may exist, with males and females showing varying levels of participation.
Ethnicity	Cultural norms and values associated with different ethnic groups can influence social engagement behaviors.
Education	Higher educational attainment is often associated with greater social skills and resources, leading to increased engagement.
Income	Financial resources can facilitate access to social activities and opportunities, influencing engagement levels.
Health	Good physical and mental health are essential for active participation in social activities and networks.
Location	Geographical proximity to social hubs and community centers can significantly impact the ease of engagement.
Time	Changes in social engagement patterns over time may reflect shifts in societal norms, technology, or individual circumstances.

Homeostasis The ability of an ecosystem to maintain balance

Resilience The capacity to recover from disturbances

Biodiversity Greater diversity contributes to stronger ecosystem stability

3.8 Human Impact on Ecosystem Functions

- Deforestation and habitat destruction
- Pollution (air, water, soil)
- Climate change
- Introduction of invasive species
- Overexploitation of resources

3.9 Conservation and Sustainable Practices

- Protect natural habitats and wildlife
- Reduce pollution and use of fossil fuels
- Recycle and reuse materials
- Promote afforestation and sustainable farming