



ECOLOGY & ENVIRONMENT

(People, Development and Environment)



1. ECOSYSTEM: STRUCTURE AND FUNCTION

An ecosystem is a functional unit of nature comprising living organisms (**biotic**) and their non-living surroundings (**abiotic**), interacting as a system.

COMPONENTS

ABIOTIC COMPONENTS

- Sunlight
- Temperature
- Soil
- Water
- Air
- Minerals



BIOTIC COMPONENTS

- Producers (Autotrophs)
- Consumers
 - Herbivores
 - Carnivores
 - Omnivores
- Decomposers (Bacteria, Fungi)



KEY FUNCTIONAL ASPECTS



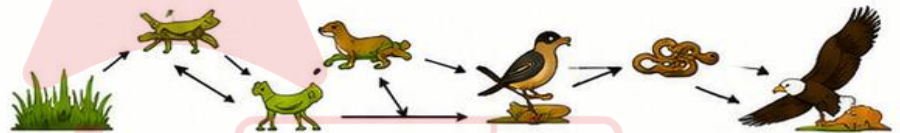
FOOD CHAIN

Linear transfer of energy



FOOD WEB

Interconnected food chains within a habitat



TROPHIC LEVELS

Hierarchical feeding positions



ECOLOGICAL PYRAMIDS

Pyramid of number, biomass and energy



Energy Pyramid is always upright (10% Law of Energy Transfer by Lindeman)



NUTRIENT CYCLING (BIOGEOCHEMICAL CYCLES)

- Carbon Cycle
- Nitrogen Cycle
- Phosphorus Cycle
- Water (Hydrological) Cycle

ECOLOGICAL SUCCESSION

Gradual, sequential change in species composition

- Primary Succession (Bare rock / No prior life)
- Secondary Succession (Disturbed, previously vegetated land)



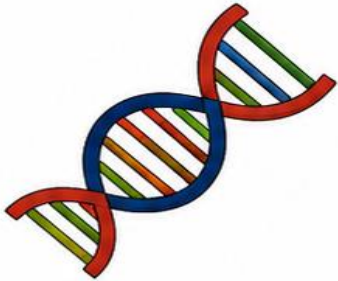
MASTER THE NOTES? TAKE THE QUIZ

2. BIODIVERSITY AND ITS CONSERVATION

Biodiversity = Variety of life forms at genetic, species and ecosystem levels.

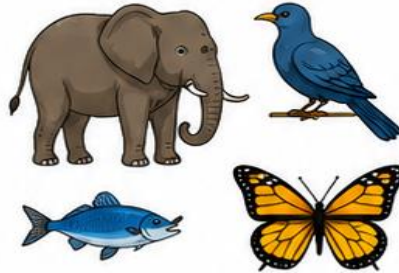
TYPES OF BIODIVERSITY

GENETIC DIVERSITY



Variation within
a species

SPECIES DIVERSITY



Variety of species
in a region

ECOSYSTEM DIVERSITY



Variety of habitats /
ecosystems

INDIA'S BIODIVERSITY STATUS



India is one of 17 megadiverse
countries in the world



Home to 4 biodiversity hotspots



Concept of hotspots was given by
Norman Myers (1988)

4 BIODIVERSITY HOTSPOTS IN INDIA



Himalaya



Indo-Burma



Western Ghats-
Sri Lanka



Sundaland
(Nicobar Islands)

CONSERVATION APPROACHES

IN-SITU CONSERVATION (Within Natural Habitat)



National Parks

Wildlife Sanctuaries

Biosphere Reserves

EX-SITU CONSERVATION (Outside Natural Habitat)



Zoos

Botanical Gardens

Seed Banks

Gene Banks

LEGAL / POLICY FRAMEWORK



**WILDLIFE
PROTECTION ACT,
1972**



**BIOLOGICAL DIVERSITY
ACT, 2002**
Led to the National
Biodiversity Authority



**FOREST
(CONSERVATION)
ACT, 1980**

MASTER THE NOTES? TAKE THE QUIZ

3. ENVIRONMENTAL POLLUTION

TYPE	MAJOR CAUSES	KEY EFFECTS
AIR POLLUTION 	Vehicular emissions, industries, biomass burning	Respiratory diseases, smog, acid rain
WATER POLLUTION 	Industrial effluents, sewage, agricultural runoff	Eutrophication, waterborne diseases
SOIL POLLUTION 	Pesticides, fertilizers, e-waste	Reduced fertility, bioaccumulation
NOISE POLLUTION 	Traffic, industry, construction	Hearing loss, stress

IMPORTANT CONCEPTS

- **BIOMAGNIFICATION:** Increasing concentration of toxins (e.g., DDT) at successive trophic levels.
- **EUTROPHICATION:** Nutrient enrichment of water bodies causing algal blooms and oxygen depletion.
- **GREENHOUSE EFFECT:** Natural warming due to gases like CO₂, CH₄, N₂O trapping heat — intensified by human activity.



4. GLOBAL ENVIRONMENTAL ISSUES

-  **CLIMATE CHANGE:** Long-term shift in temperature/ weather patterns, driven largely by fossil fuel combustion.
-  **GLOBAL WARMING:** Rise in Earth's average surface temperature due to greenhouse gas accumulation.
-  **OZONE DEPLETION:** Thinning of the stratospheric ozone layer, mainly due to CFCs; "ozone hole" most prominent over Antarctica.
-  **DEFORESTATION:** Loss of forest cover due to agriculture, urbanization and logging — reduces carbon sequestration and biodiversity.
-  **DESERTIFICATION:** Land degradation in arid/semi-arid regions turning fertile land into desert.

5. SUSTAINABLE DEVELOPMENT

Definition (Brundtland Report, "Our Common Future", 1987): Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

KEY GLOBAL FRAMEWORKS



SUSTAINABLE DEVELOPMENT GOALS (SDGs)

17 goals adopted by the UN in 2015, part of the 2030 Agenda.



EARTH SUMMIT, RIO DE JANEIRO (1992)

Adopted Agenda 21, UNFCCC and the Convention on Biological Diversity.



KYOTO PROTOCOL (1997)

Legally binding emission-reduction targets for developed nations.



PARIS AGREEMENT (2015)

Aims to limit global warming to well below 2°C, preferably 1.5°C, above pre-industrial levels.

6. ENVIRONMENTAL MOVEMENTS & POLICIES IN INDIA

GRASSROOTS MOVEMENTS

-  **CHIPKO MOVEMENT** (1973, Uttarakhand)
Led by Sunderlal Bahuguna and Chandi Prasad Bhatt; tree-hugging protest against deforestation.
-  **SILENT VALLEY MOVEMENT** (Kerala)
Against a hydroelectric project threatening a rainforest.
-  **NARMADA BACHAO ANDOLAN**
Led by Medha Patkar, against large dam displacement.



KEY INDIAN LEGISLATIONS

- ✓ Water (Prevention and Control of Pollution) Act, 1974
- ✓ Air (Prevention and Control of Pollution) Act, 1981
- ✓ Environment (Protection) Act, 1986
Enacted after the Bhopal Gas Tragedy (1984)
- ✓ National Green Tribunal (NGT) Act, 2010
For speedy disposal of environmental cases.



7. DISASTER MANAGEMENT



Floods



Droughts



Cyclones



Earthquakes



Industrial Accidents



Nuclear Leaks

- **Disaster Management Act, 2005** — established the National Disaster Management Authority (NDMA).
- Disasters classified as **Natural** (earthquakes, floods, cyclones) and **Man-made** (industrial accidents, nuclear leaks).
- Focus areas: Mitigation, Preparedness, Response, and Recovery.

MASTER THE NOTES? TAKE THE QUIZ