

# UPSC Prelims 2026 - Environment & Ecology



## UPSC Prelims 2026 - Environment & Ecology Complete Study Material

23 Comprehensive Topics | Master Environment for Prelims 2026



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# Ecology:

## Core Concepts - UPSC Prelims 2026

### Types • Hierarchy • Principles • Succession



#### Types of Ecology



##### Autecology

Study of individual species in relation to environment



##### Synecology

Study of communities in relation to environment

#### Ecological Hierarchy



Functional role:  
what it eats,  
who eats it,  
interactions

#### Scope & Principles



##### Habitat

Physical environment where organism lives



##### Ecological Niche

Functional role: what it eats, who eats it, interactions

#### Ecological Community

- **Structure:**
- Species diversity, growth forms, dominance



- **Ecotones:**
- Transition zones with high: domainland bridge

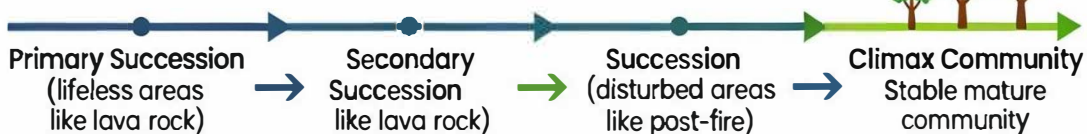
#### 4 Point Cluster

- **Ecotones:**
- Transition zones with high b biodiversity (Edge Effect)



- **Ecological Dominance:**
- Few species control environment
- **Seasonal/Diurnal Fluctuation:**
- Daily/seasonal changes

#### Ecological Succession



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# Biogeochemical Cycles & Biomes

## - UPSC Prelims 2026

Nutrient Cycles • Major Biomes | Environment Mastery

### BIOGEOCHEMICAL CYCLES



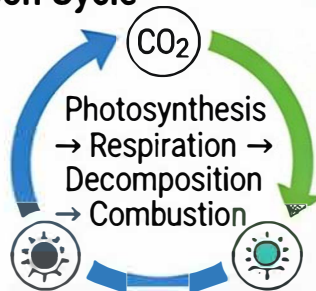
### BIOMES

#### 1. Cycle Classification

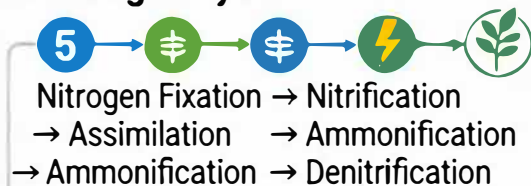
Gaseous Cycles (Atmosphere/Hydrosphere):  
Nitrogen, Carbon

Sedimentary Cycles (Earth's Crust):  
Phosphorus, Sulphur

#### 2. Carbon Cycle



#### 3. Nitrogen Cycle



#### 4. Phosphorus & Sulphur

Phosphorus: Sedimentary, crucial for ATP/DNA

Sulphur: Soil-Water-Atmosphere link

#### 1. Forest Ecosystems



Tropical Rainforest • Deciduous • Taiga  
Tropical • Temperate • (Boreal)

#### 2. Grasslands



Tropical Savanna (Warm, scattered trees)  
Temperate Steppe/Prairie (Cold winters, rich soil)

#### 3. Deserts



Hot (Sahara, Thar) High evaporation  
Cold (Gobi, Ladakh)

#### 4. Tundra



Arctic/Alpine, Treeless, Permafrost

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# Aquatic Life Zones & Wetlands

## - UPSC Prelims 2026



Marine • Freshwater • Wetlands | Ramsar Convention

### AQUATIC LIFE ZONES

#### Marine Ecosystems

Ocean Zones: Coastal → Pelagic  
→ Benthic → Abyssal



#### \*Coral Reefs

Rainforests of ocean | Polyps + Zooxanthellae



India: Andaman & Nicobar, Lakshadweep, Gulf of Mannar, Gulf of Kutch



#### \*Mangroves

Cyclone buffers | Salt-tolerant | Intertidal

### Freshwater Ecosystems

**Lentic (Standing):** Lentic  
Lakes, Ponds

**Lotic (Running):** Rivers, Streams



#### \*NLCP\*

National Lake Conservation Plan

### WETLANDS

#### \*Wetlands:

Transition zones  
(marshes, swamps, peatlands)



#### \*Ramsar Convention (1971)\*

Wetland conservation treaty

#### \*Ramsar Sites:

Wetlands of International Importance

#### \*Montreux Record:

Register of ecological changes in Ramsar sites

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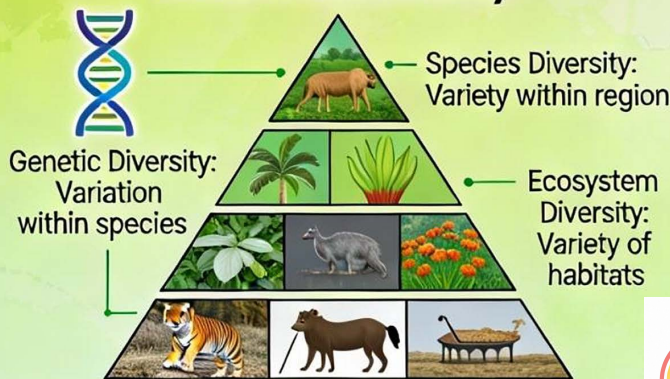
# Biodiversity & Conservation - UPSC Prelims 2026

Levels • Species Types • Hotspots • Conservation Strategies



## BIODIVERSITY

### Levels of Biodiversity



### Important Species Types

 Keystone Tiger, Bees	 Indicator Lichens (air quality)	 Endemic Region-specific species	 Invasive Water Hyacinth, Lantana
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### Biodiversity Hotspots



**\*India's 4 Hotspots\***

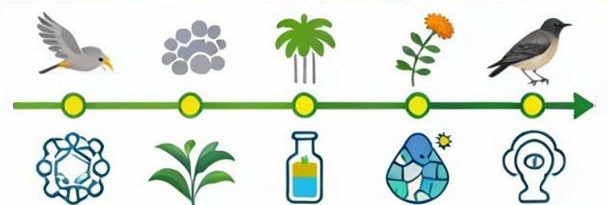
- Himalaya
- Indo-Burma
- Western Ghats
- Sundaland

## CONSERVATION

### Conservation Strategies

- In-situ (On-site)**
- National Parks
  - Wildlife Sanctuaries
  - Biosphere Reserves

- Ex-situ (Off-site)**
- Zoos
- Botanical Gardens
  - Seed Banks
  - Cryopreservation



### Key Programs

-  Project Tiger (1973)
-  Biosphere Reserves UNESCO zonation: Core/Buffer/Transition
-  International: CBD • Nagoya Protocol Cartagena Protocol





# Mining Impact • Deforestation • Waste Management - UPSC Prelims 2026

## Environmental Impacts & Solutions

### 1 MINING IMPACT



- **Effects:** Land degradation • Biodiversity loss
- Acid Mine Drainage • Air pollution
- **Social:** Tribal displacement • Livelihood loss
- **Sustainable:** Land reclamation • Eco-technologies
- Regulations



### 2 DEFORESTATION



- **Causes:** Agriculture (Jhum) • Infrastructure • Logging
- Mining
- **Consequences:** Climate Change (CO2 rise)
- Water Cycle disruption • Soil Erosion & Flooding
- **Mitigation:** Afforestation • Joint Forest Management
- Forest Conservation Act 1980

### 3 WASTE MANAGEMENT



- **Solid Waste:** Segregation • Composting • Sanitary landfills
- **E-Waste:** Hazardous (lead/mercury) • Specialized recycling
- **Biomedical:** Incineration • Autoclaving
- **Plastic:** Recycling • Plastic roads • Single-use bans



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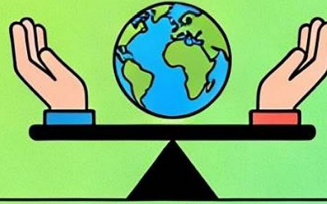


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# Sustainable Development - UPSC Prelims 2026

Definition • Principles • Challenges • SDGs

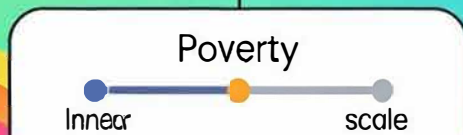


## 1 Definition

\*Sustainable Development = Development that meets the needs of the present  
\*without compromising the ability of future generations\* to meet their own needs



## 3 Challenges



Over-consumption of Resources

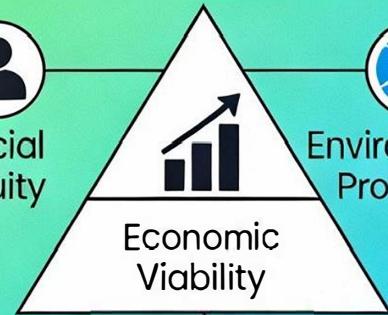
## 2 Pillars



Social Equity



Environmental Protection



## 4 SDGs



N zero Clean Climate Actions  
Poverty & hunger, Clean Climate Actions

Global Blueprint for Sustainability



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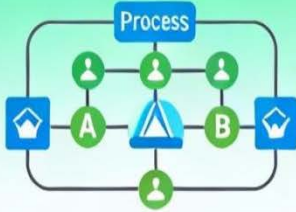
# Coastal Management • EIA • Laws • Institutions • Schemes - UPSC Prelims 2026

## Complete Environmental Governance Framework



### COASTAL ECOSYSTEM

- CRZ Notification: Coastal Regulation Zone norms
- ICZM: Integrated Coastal Zone Management
- Threats: Sea-level rise • Ocean acidification • Oil spills • Tourism



### EIA

- Environmental Impact Assessment
- Process: Screening → Scoping → Public Consultation → Appraisal
- EIA 2006: Category A (Central) • Category B (State)



### ENVIRONMENTAL LAWS

- Environment Act 1986 (post-Bhopal)
- Wildlife Act 1972 (Parks/Sanctuaries)
- Forest Act 1980 (Non-forest use restriction)
- Constitution: Art 48A (State duty) • Art 51A(g) (Citizen duty)



### INSTITUTIONS



NGT 2010:  
Environmental cases



CPCB:  
Pollution control



CPCB:



NBWL: Wildlife  
(PM chaired)



FSI: Forest cover  
assessment

### SCHEMES



AQI: One  
Number-One Colour



Namami Gange:  
Ganga conservation



UJALA  
energysaving



UJALA: LED  
energy saving



BS Norms: BS-IV  
→ BS-VI (2020)

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# Pollution & Waste Management - UPSC Prelims 2026

Air • Water • Soil Pollution | Solid & Hazardous Waste Rules



## Air Pollution

- \*Pollutants:
- PM2.5, PM10, NO<sub>x</sub>, SO<sub>x</sub>, CO, Ozone
- \*NAAQS: Monitors 12 pollutants (PM10, PM2.5, SO<sub>2</sub>, NO<sub>2</sub>, CO, NH<sub>3</sub>, Ozone, Lead, Benzene, Benzo-pyrene, Arsenic, Nickel)



## Water Pollution

- \*Sources:
- Industrial effluents
  - Agricultural runoff
  - Untreated sewage
- \*Parameters:
- BOD • COD
  - Dissolved Oxygen
  - pH



## Soil Pollution

- \*Causes:
- Agrochemicals
  - Industrial dumping
  - Improper waste
- \*Effects:
- Salinization
  - Loss of fertility



## RULE

### Solid Waste Rules 2016:

- Source segregation (Wet • Dry • Domestic Hazardous)



### \*Hazardous Waste Rules 2016:

- Handling • Treatment • Transboundary movement



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# International Governance • Climate Change •

## Agri Impact - UPSC Prelims 2026

Global Environment + Climate + Agriculture Impacts



### INTERNATIONAL GOVERNANCE



UNEP: Leading global authority | HQ: Nairobi, Kenya



IUCN: Red List of Threatened Species | HQ: Switzerland



UNFCCC: Kyoto Protocol (1997) • Paris Agreement (2015)

### CLIMATE CHANGE ISSUES



Greenhouse Effect → Global Warming



Ozone Depletion: CFCs/HFCs | Montreal Protocol

Acid Rain: SO<sub>2</sub> Soil: Rain: SO<sub>2</sub> + NO<sub>x</sub> emissions

El Niño/La Niña: Suppresses Indian Monsoon



### AGRICULTURE IMPACT



GHGs: CH<sub>4</sub> (paddy/livestock) • N<sub>2</sub>O (fertilizers)

55.52%



Water: 85-90% India's freshwater → acidification

35.5%



Sustainable: ZBNF • Organic Farming • Permaculture

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