

CUET · GEOGRAPHY · CLASS XI · CODE 313

Biodiversity and Conservation

CUET unit: Life on the Earth (Unit VI) — Biosphere: Biodiversity and Conservation

By UniDrill · NCERT-grounded study material

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Snapshot

- Biodiversity is a product of **2.5–3.5 billion years of evolution** and operates at three levels: genetic, species, and ecosystem diversity.
- Biodiversity matters ecologically (ecosystem stability), economically (food, medicine, industry), scientifically (clues to evolution) and ethically (intrinsic right to exist).
- Biodiversity loss has clear causes — human population growth, over-exploitation, habitat destruction, exotic species, natural calamities and poaching; threatened species are classified per IUCN criteria (Endangered, Vulnerable, Rare).
- Conservation strategies operate at global and national levels — the **1992 Earth Summit Convention at Rio**, the **Wild Life (Protection) Act 1972**, biosphere reserves, national parks, sanctuaries, the concept of **biodiversity hotspots** and **12 mega-diversity centres**.
- This topic is tested heavily through definitional recall (hotspot, Red List, exotic species), statement-based questions on IUCN categories, and scenario-based questions on conservation measures.

Detailed Notes

2.1 Core concepts

- **Linkage with earlier chapter:** NCERT opens by linking back to weathering and the depth of weathering mantle (Fig. 5.2 in Ch. 5), pointing out that the **weathering mantle is the basis for the diversity of vegetation and hence biodiversity**, and that the underlying drivers of weathering variations and resultant biodiversity are the inputs of **solar energy and water** — areas rich in these inputs host the widest spectrum of biodiversity (NCERT §Introduction, p. 115).
- **What is biodiversity?** Biodiversity is the number and variety of organisms found within a specified geographic region; it refers to the variability among living organisms on the earth, including variability within and between species and between ecosystems. The term combines Bio (life) and diversity (variety). It is our "living wealth" — the result of hundreds of millions of years of evolutionary history (NCERT §Introduction, p. 115).

- **Evolutionary timeline (Box, p. 115).** Biodiversity as we have today is the result of **2.5–3.5 billion years of evolution**. Before the advent of humans, Earth supported more biodiversity than in any other period; since the emergence of humans, biodiversity has been in rapid decline due to overuse. The number of species globally is estimated at between **2 million and 100 million, with 10 million being the best estimate**. New species are regularly discovered, most yet to be classified — about **40% of fresh water fishes from South America** are still unclassified. **Tropical forests are very rich in bio-diversity**.
- **Average species half-life.** The average half-life of a species is estimated at between **one and four million years**, and **99 per cent of all species that have ever lived on Earth are today extinct** (NCERT p. 115).
- **Biodiversity is richer in the tropics.** Biodiversity is not evenly distributed; it is consistently richer in the tropics. As one approaches the polar regions, one finds **larger and larger populations of fewer and fewer species** — the classic latitudinal diversity gradient (NCERT p. 115).
- **Three levels of biodiversity:** (i) **Genetic diversity** — variation of genes within species; (ii) **Species diversity** — variety of species in a defined area, measured through richness, abundance and types; (iii) **Ecosystem diversity** — broad differences between ecosystem types and the diversity of habitats and ecological processes within them (NCERT pp. 115–116).
- **Genetic diversity.** Genes are the basic building blocks of various life forms. Groups of individual organisms having certain similarities in physical characteristics are called species. Human beings genetically belong to the **homo sapiens** group and differ considerably in height, colour, physical appearance, etc., due to genetic diversity. Genetic diversity is essential for a **healthy breeding of population** (NCERT p. 115).
- **Species diversity.** Variety of species — number in a defined area, measured through richness, abundance and types; some areas are richer than others; areas rich in species diversity are called **hotspots** of diversity (NCERT p. 116, Fig. 14.5).
- **Ecosystem diversity.** Broad differences between ecosystem types and the diversity of habitats and ecological processes; "boundaries" of communities and ecosystems are not rigidly defined, so demarcation is difficult and complex (NCERT p. 116).
- **Ecological role of biodiversity.** Species perform functions in an ecosystem — capturing and storing energy, producing and decomposing organic materials, cycling water and nutrients, fixing atmospheric gases, and helping regulate climate. A more diverse ecosystem has better chances for species to survive adversities and is more productive; an ecosystem with high biodiversity has a greater chance of adapting to environmental change — "the more the variety of species in an ecosystem, the more stable the ecosystem is likely to be" (NCERT p. 116).

- **Economic role of biodiversity.** Important economic commodities supplied by biodiversity include **food crops, livestock, forests, fish and medicinal resources. Crop diversity (agro-biodiversity)** is one important economic aspect. Biodiversity is a reservoir of resources for **food, pharmaceuticals and cosmetic products.** The concept of biological resources is also a source of conflict over rules of division and appropriation of natural resources (NCERT p. 116).
- **Scientific role of biodiversity.** Each species gives clues as to how life evolved and continues to evolve; biodiversity helps in understanding how life functions and the role of each species in sustaining ecosystems (NCERT pp. 116–117).
- **Ethical role.** It is our ethical responsibility to consider that **each species along with us has an intrinsic right to exist** — it is morally wrong to voluntarily cause the extinction of any species; the level of biodiversity is a good indicator of the state of our relationships with other living species; the concept of biodiversity is an integral part of many human cultures (NCERT p. 117).
- **Loss of biodiversity — human causes.** Growth of human population has increased the rate of consumption of natural resources and accelerated the loss of species and habitats. **Tropical regions occupy only about one-fourth of the total area of the world but contain about three-fourths of the world human population;** tropical rain forests contain **50 per cent of the species on Earth,** so the destruction of natural habitats has been disastrous for the biosphere (NCERT §Loss of Biodiversity, p. 117).
- **Natural calamities and pollutants.** Earthquakes, floods, volcanic eruptions, forest fires and droughts cause damage to the flora and fauna; pesticides, hydrocarbons and toxic heavy metals destroy weak and sensitive species.
- **Exotic species.** Species that are not natural inhabitants of a local habitat but are introduced into the system are called **exotic species.** Many natural biotic communities have suffered extensive damage from such introductions (NCERT p. 117).
- **Poaching.** In the last few decades animals such as **tigers, elephants, rhinoceros, crocodiles, minks and birds** have been hunted mercilessly by poachers for their horn, tusks, hides etc., rendering certain organisms endangered (NCERT p. 117).
- **IUCN categories of threatened species (p. 117).** The **International Union of Conservation of Nature and Natural Resources (IUCN)** classifies threatened species into three categories:
 - **(i) Endangered Species** — in danger of extinction; published in the **Red List** of threatened species.
 - **(ii) Vulnerable Species** — likely to be in danger of extinction in the near future if threatening factors continue; survival not assured as population has reduced greatly.
 - **(iii) Rare Species** — very small population in the world; confined to limited areas or thinly scattered over a wider area.

- **Conservation of biodiversity.** All life forms are closely interlinked; disturbance in one causes imbalance in others. If species of plants and animals become endangered, they cause degradation in the environment, which may threaten human existence itself (NCERT §Conservation, p. 117).
- **Earth Summit 1992.** The Government of India along with **155 other nations** signed the **Convention of Biodiversity at the Earth Summit held at Rio de Janeiro, Brazil in June 1992** (NCERT p. 118).
- **World Conservation Strategy — six steps** for biodiversity conservation (NCERT p. 118):
 - (i) Efforts should be made to preserve the species that are endangered.
 - (ii) Prevention of extinction requires proper planning and management.
 - (iii) Varieties of food crops, forage plants, timber trees, livestock, animals and their wild relatives should be preserved.
 - (iv) Each country should identify habitats of wild relatives and ensure their protection.
 - (v) Habitats where species feed, breed, rest and nurse their young should be safeguarded.
 - (vi) International trade in wild plants and animals should be regulated.
- **Wild Life (Protection) Act, 1972.** To protect, preserve and propagate the variety of species within natural boundaries, the Government of India passed this Act, under which **national parks and sanctuaries were established and biosphere reserves declared** (NCERT p. 118).
- **Mega diversity centres (p. 118).** Countries situated in tropical regions possessing a large number of the world's species diversity are called **mega diversity centres**. There are **12** such countries: **Mexico, Colombia, Ecuador, Peru, Brazil, Democratic Republic of Congo, Madagascar, China, India, Malaysia, Indonesia and Australia**.
- **Biodiversity hotspots.** The IUCN has identified certain areas as **biodiversity hotspots**. Hotspots are defined according to their **vegetation** — plants are important because they determine the **primary productivity** of an ecosystem. Most (but not all) hotspots rely on species-rich ecosystems for **food, firewood, cropland and income from timber**. In **Madagascar**, about **85 per cent of the plants and animals are found nowhere else in the world**; the **islands of Hawaii** have many unique plants and animals threatened by introduced species and land development (NCERT p. 118).
- **Hotspots mapped in Figure 14.4 (p. 119)** include the **Eastern Himalaya, Western Ghats (India), Sinharaja Forest (Sri Lanka), Eastern Madagascar, Eastern Arc Mountains (Tanzania), Upper Guinean Forests, Central American Highland Forests, Central American Lowland Forests, Western Ecuador and Colombian Choco, Tropical Andes, Atlantic Forest (Brazil), Peninsular**

Malaysia, Philippines, Northern Borneo, Sinharaja Forest, Indonesia, Queensland, and Melanesia (New Caledonia).

- **Sustainable use through community participation.** Conservation with sustainable use is possible only with the involvement and cooperation of local communities and individuals; development of institutional structures at local levels is necessary; the critical problem is "the continuation of the process of conservation" — not merely species or habitat conservation in a one-off way (NCERT p. 118).

2.2 Definitions to memorise

Term	Definition	Page
Biodiversity	Number and variety of organisms in a specified geographic region; variability within and between species and between ecosystems	115
Bio + Diversity	"Life" + "Variety" — the etymology of the word	115
Genetic diversity	Variation of genes within species	115
Species	Groups of individual organisms having certain similarities in physical characteristics	115
Species diversity	Variety of species in a defined area; measured through richness, abundance and types	116
Hotspot	Area rich in species diversity	116
Ecosystem diversity	Broad differences between ecosystem types and the diversity of habitats/processes within each	116
Agro-biodiversity	Crop diversity; one important part of economic biodiversity	116
Exotic species	Species not natural to a local habitat but introduced into the system	117
Endangered species	Species in danger of extinction; listed in the IUCN Red List	117
Vulnerable species	Species likely to be in danger of extinction in near future if threatening factors continue	117
Rare species	Species with very small population worldwide; confined to limited areas or thinly scattered	117
Red List	IUCN publication listing endangered species world-wide	117
IUCN	International Union of Conservation of Nature and Natural Resources — classifies threatened species into three categories	117
Earth Summit 1992	Rio de Janeiro convention on biodiversity signed by India along with 155 other nations	118
Wild Life (Protection) Act, 1972	Indian law for protection, preservation and propagation of species; basis for national parks, sanctuaries, biosphere reserves	118

Term	Definition	Page
Mega diversity centre	Tropical country with a large share of world's species diversity (12 such countries)	118
Biodiversity hotspots	IUCN-identified areas of high vegetation/species diversity facing threat	118
Primary productivity	Rate of energy capture by plants in an ecosystem — used as the basis for defining hotspots	118
Half-life of species	Average duration of survival before extinction — 1–4 million years	115
Latitudinal gradient	Pattern of richer biodiversity in the tropics, decreasing toward the poles	115

2.3 Diagrams / processes to remember

- **Figure 14.1 (p. 116):** Grasslands and sholas in **Indira Gandhi National Park, Annamalai, Western Ghats** — illustrates ecosystem diversity with mixed habitat types in the same landscape.
- **Figure 14.2 (p. 117):** **Red Panda** — example of an endangered species in the IUCN Red List; memorise as the flag species for "Endangered".
- **Figure 14.3 (p. 118):** *Humboldtia decurrens* Bedd — highly rare endemic tree of the **Southern Western Ghats (India)**; illustrates the concept of rare/endemic species and why specific geographic regions are hotspots.
- **Figure 14.4 (p. 119) — Map of some ecological hotspots in the world:** Eastern Himalaya, Western Ghats, Sinharaja Forest (Sri Lanka), Eastern Madagascar, Eastern Arc Mountains (Tanzania), Upper Guinean Forests, Central American Lowland/Highland Forests, Western Ecuador and Colombian Choco, Tropical Andes, Atlantic Forest (Brazil), Peninsular Malaysia, Philippines, Northern Borneo, Indonesia, Queensland, Melanesia (New Caledonia).
- **Biodiversity distribution gradient (conceptual, p. 115):** Biodiversity consistently increases from poles to tropics — standard latitudinal diversity gradient.
- **Process flow — Loss → IUCN classification → Conservation:** Anthropogenic + natural causes → loss of species → IUCN classifies into Endangered/Vulnerable/Rare → publishes Red List → world conservation strategy (Rio 1992) → national-level Wild Life (Protection) Act 1972 → national parks, sanctuaries, biosphere reserves.

2.5 Key data table (chapter facts at a glance)

#	Fact / figure	NCERT source
1	Evolutionary age of present biodiversity	2.5–3.5 billion years, p. 115
2		2 million to 100 million; best estimate 10 million, p. 115

#	Fact / figure	NCERT source
	Range of estimated global species	
3	Average species half-life	1–4 million years, p. 115
4	Share of species ever lived that are now extinct	99 per cent, p. 115
5	% of South American fresh water fishes still unclassified	~40%, p. 115
6	Number of biodiversity levels	3 (Genetic, Species, Ecosystem), pp. 115–116
7	Tropical regions — share of Earth's land	About one-fourth, p. 117
8	Tropical regions — share of world population	About three-fourths, p. 117
9	Share of Earth's species in tropical rain forests	50%, p. 117
10	IUCN categories of threatened species	3 (Endangered, Vulnerable, Rare), p. 117
11	Earth Summit — year and venue	June 1992, Rio de Janeiro, Brazil, p. 118
12	Nations that signed the Convention with India	155 other nations, p. 118
13	Wild Life (Protection) Act — year	1972, p. 118
14	Mega diversity centres (countries)	12, p. 118
15	List of 12 mega-diversity countries	Mexico, Colombia, Ecuador, Peru, Brazil, DR Congo, Madagascar, China, India, Malaysia, Indonesia, Australia, p. 118
16	Endemism in Madagascar	~85% of plants and animals found nowhere else, p. 118
17	Indian hotspots on Fig. 14.4	Eastern Himalaya, Western Ghats, p. 119
18	World-conservation strategy — number of steps	6, p. 118

2.4 Common confusions / NTA trap points

- **Endangered vs. Vulnerable vs. Rare** — students often conflate these three IUCN categories. Endangered = in danger NOW; Vulnerable = likely to be endangered if threats continue; Rare = small/scattered population but not immediately threatened. NTA frequently offers all three as options in a single stem.

- **Hotspot vs. Mega-diversity centre** — a hotspot is a geographic area identified by IUCN based on **vegetation/plant diversity and threat level**; a mega-diversity centre is a **country** in the tropics with large species numbers. India is BOTH.
- **Number of mega-diversity countries** — NCERT gives **12**. NTA may offer 10, 12, 14, or 17 as options (17 is a later update not in the NCERT). Stick to 12.
- **Wild Life (Protection) Act year** — **1972**, not 1970 or 1975.
- **Earth Summit location** — **Rio de Janeiro, Brazil, June 1992** — not Stockholm (1972 Stockholm Conference on Human Environment is a different event); NTA regularly tests both years and cities together.
- **Hotspots defined by vegetation, not by animals** — NCERT explicitly says "plants are important because they determine the primary productivity of an ecosystem".
- **99% of species that ever lived are extinct**, not 9% or 90% — a common stem.
- **Tropical regions** = ~1/4 of land but ~3/4 of human population AND 50% of species in tropical rain forests — three different ratios; CUET swaps them.
- **Best estimate of global species count** = 10 million (within a 2-100 million range); the range and the point estimate are different.
- **Red List is published by IUCN**, not by WWF or UN.
- **Genetic diversity ≠ species diversity ≠ ecosystem diversity** — the strict hierarchy is "within species / between species / between ecosystems".

Practice MCQs

PYQ Alignment

This chapter appears frequently in CUET Geography papers, typically contributing 1–2 direct MCQs on definitions (hotspot, IUCN categories, exotic species) and 1 question on conservation measures or the Earth Summit/Wild Life (Protection) Act; assertion-reason and statement-based formats testing the distinction between Endangered, Vulnerable, and Rare species are particularly common. For year-wise CUET stems see [/pyq/geography](#).