

CAPF-AC (Assistant Commandant) Exam Study Material : Geography - Biodiversity and its conservation

India is an identified mega diverse country, rich in biodiversity and associated traditional knowledge. The country also has a tradition of conservation and sustainable use of its biodiversity, which has now come under pressure on account of various factors including development imperatives, habitat fragmentation, and introduction of invasive alien species.

Biodiversity comprises all the diversity observed among species, their populations and also the vast ecosystems.

In other words Biological diversity, or biodiversity, encompasses the variety of all life on earth. Biodiversity manifests itself at three levels: species diversity which refers to the numbers and kinds of living organisms; genetic diversity which refers to genetic variation within species; and ecosystem diversity which denotes the variety of habitats. To date, about 1.7 million species have been described while many more await discovery. India, a megadiversity country with only 2.4 per cent of the land area, accounts for 7-8 per cent of the recorded species of the world spread over 45,500 species of plants and 91,000 species of animals that have been documented so far.

In terms of species richness, India ranks seventh in mammals, ninth in birds and fifth in reptiles. In terms of endemism of vertebrate groups, India's position is tenth in birds with 69 species, fifth in reptiles with 156 species and seventh in amphibians with 110 species. India's share of crops is 44 per cent as compared to the world average of 11 per cent. India also has 23.39 per cent of its geographical area under forest and tree cover.

Of the 34 globally identified biodiversity hotspots, India harbours four hotspots, i.e., Himalaya, Indo- Burma, Western Ghats and Sri Lanka and Sundaland.

I. Faunal diversity

So far, nearly 91,212 faunal species (7.43 per cent of the world's faunal species) have been recorded in the country.

Whereas inventories of mammals, birds, reptiles, amphibians and fishes are fairly complete, a large number of other life forms are yet to be described.

The Indian faunal groups show diverse range of endemism across groups. Some of the lower groups such as Mesozoa (100 per cent), Acanthocephala (88.6 per cent), Oligochaeta (77.8 per cent), Platyhelminthes (71.9 per cent), Kinorhyncha (70 per cent) show high degree of endemism. among higher groups, Amphibia (61.2 per cent) and Reptilia (47 per cent) deserve special mention.

As per the IUCN Red List (2008). India has 413 globally threatened faunal species, which is approximately 4.9 per cent of the world's total number of threatened faunal species. The global estimates as per IUCN Red List, 2008 suggest that 10 per cent (5,966 species) of vertebrate and 0.20 per cent (2,496 species) of invertebrate described fauna is threatened. In 2004 one species, megaptera novaeangliae, showed an upward trend of population while eleven species shows stable populations. Further, of the total 447 threatened species, for which trends are available, 218 are showing decreasing trend



of population as per the 2004 status. The 2008 report, however, indicates upward population trend of one-homed rhinoceros in the country, as a result, the threat category has improved from endangered to vulnerable.

Important Facts

- Biodiversity comprises all the diversity observed among species, their populations and also the vast ecosystems.
- Of the 34 globally identified biodiversity hotspots India harbors four hotspots i.e. Himalaya, Indo-Burma, Western Ghats and Sri Lanka and Sundaland.
- In terms of plant diversity. India ranks tenth in the world and fourth in Asia. With over 45,500 plant species. India represents nearly 11 per cent of the world's known floral diversity.
- So far nearly 91,212 faunal species (7.43 per cent of the world's faunal species) have been recorded in the country. Whereas mammals, birds reptiles, amphibians and fishes are fairly complete, a large number of other life forms are yet to be described.

India, through its strong initiatives for survey and monitoring of biodiversity, is contributing towards new discoveries. For example, ZSI has discovered 655 faunal species in 2007 and National Bureau of Fish Genetic Resources (NBFGR) reported 36 new fin fish species from diverse biogeographic zones of India.

II. Floral Diversity

In terms of plant diversity, India ranks tenth in the world and fourth in Asia. With over 45,500 plant species, India represents nearly 11 per cent of the world's known floral diversity. As elsewhere in the world, many organisms fungal algae, lichens and bryophytes are yet to be described and remote geographical areas are to be comprehensively explored.

Angiosperms: India has about 17,527 species of flowering plants (more than 7 per cent of the world's known flowering plants) in 247 families and 2984 genera. The dominant families with more than 500 species are Poaceae-1291; Orchidaceae-1229; Leguminosae-1225; Asteraceae-892; Rubiaceae- 616; Cyperaceae-545; Euphorbiaceae-527; and Acanthaceae-510.

Gymnosperms are represented by about 67 species. Pinaceae (6 genera and 15 species) is the largest family, followed by Cupressaceae (13 genera and 13 species), Ephedraceae (1 genus, 7 species) and Gnetaceae (1 genus and 5 species). The species of Gnetum and Cycas are mostly confined to North Eastern region, Eastern and Western Ghats, and Andaman & Nicobar Islands.

Pteridophytes: India has about 1200 species under 204 genera. While species of Marsilea, Azolla and Salvinia grow in aquatic habitats, those of Acrostichum occur in mangrove eco-systems. The north-eastern region (including Eastern Himalaya) is rich in pteridophytic diversity with about 845 species, followed by south India (including Eastern and Western Ghats) with 345 species and north India (including Western Himalaya) with 340 species. About 17 per cent of the species are endemic of India. The families such as Polypodiaceae (137 species), Dryopteridaceae (125 species), Athyriaceae (97

species), Thelypteridaceae (83 species), Salaginella (62 species), Asplenium (45 species) and Polystichum (45 species) are some of the dominant families and genera of the pteridophytic flora of India region.

Bryophytes represented by 2500 species are the second largest-group of green plants in India distributed largely in Eastern Himalaya, Northeastern India, Western Himalaya and the Western Ghats. Mosses constitute the major component of Indian bryoflora with 1576 species followed by liverworts and hornworts (924 species). Lejeuneaceae (155 species) is the largest family followed by Pottiaceae (129), Dicranaceae (119), bryaceae (98) and Sematophyllaceae (92 species). Fissidens (67 species) is the largest genus followed by Plagiochila (65) and Frullania (63). Nineteen genera and 629 species are endemic to India.

Important Facts

- Eighteen families of flowering plants occurring in India such as Ancistrocladaceae, Brebersteiniaceae, Martyniaceae, Tetra centraceae and Trichopodaceae, etc., are mono generic.
- In the case of fauna, new plant species are continually being discovered in the country. For example 41 plant taxa were discovered by BSI, and other researchers from diverse bio-geographic zones of India during 2007.
- India has 14,500 species of fungi in 2,300 genera and 250 families with maximum diversity in the Western Ghats followed by the eastern Himalaya and the western Himalaya.
- Lichens representing symbiotic association of fungi and algae, constitute a dominant component of epiphytic and saxicolous, vegetation and comprise 2,223 species in 283 genera and 72 families.

Major Multilateral environment agreements (MEAs) ratified by India

MEAs	Year	Issues covered
Convention on Wetlands of International Importance	1971	Conservation and wise use of wetlands Primarily as habitat for the water
Convention for the Protection of World Cultural and Natural	1972	Protection and conservation of cultural Heritage and natural heritage
Convention on International Trade in Endangered Species	1973	International trade in endangered species of wild fauna and flora
Bonn Convention on Migratory Species of Wild Animals	1979	Conservation, management and wise use of migratory species of wild an
Vienna Convention for that Deplete the Ozone Layer	1985	Protection of atmospheric ozone layer above the planetary boundary lay
Monterla Protocol on Substances that Deplete the Ozone Layer	1987	Protection of atmospheric ozone layer above the planetary boundary lay
Basel Convention on Trans-boundary Movements of Hazardous Wasters and their Disposal	1989	Regulation of Trans boundary ozone layer of hazardous wastes and thei
United Nations Framework Convention-on Climate Change (UNFCCC)	1992	Changes in the earth's climate system due to anthropogenic interference
Kyoto Protocol to the UNFCCC	1997	Quantified emission limitation and reduction commitments for Annex 1 P
Convention on Biological Diversity (CBD)	1992	Biological diversity and biological resources
Cartagena Protocol on Bio safety to the CBD	2000	Regulation of trans boundary movement, transit, handling and use of livi
United Nations Convention to Combat Desertification	1994	Combating desertification and militate the effects of drought, particularly
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	1998	Promote shared responsibility and cooperative efforts among the Parties chemicals, in order to protect human health and the environment from p

		sound use
Stockholm Convention on Persistent Organic Pollutants	2001	Protect human health and the environment from persistent organic pollutants

Lichens representing symbiotic association of fungi and algae, constitute a dominant component of epiphytic and saxicolous vegetation, and comprise 2,223 species in 283 genera and 72 families. Western Ghats are the richest region with 800 species (38 per cent) followed by Eastern Himalaya with 759 species (37 per cent) and Western Himalaya with 550 species (27 per cent). Families such as Parmeliaceae, Graphidaceae, Physciaceae, Usneaceae, Cladoniaceae, and genera like Parmelia, Graphina, Usnea, Graphis and Lecanora are among the dominant families and genera of Indian lichens. about 23 per cent species, mainly belonging to genera Graphina, Trypethelium, Graphis and Porina, are endemic to India. Andaman & Nicobar Islands (24 per cent), Western Ghats (20 per cent) and Eastern Himalaya (18 per cent) show high percentage of endemic species.

Fungi: India has 14,500 species of fungi in 2,300 genera and 250 families with maximum diversity in the Western Ghats followed by the eastern Himalaya and the western Himalaya. Deuteromycetes with 900 genera and 6000 species (40 per cent) is the largest group of Indian mycoflora, followed by Ascomycetes [680 genera / 3500 species (25 per cent)] and Basidiomycetes [520 genera / 3400 species (23 per cent)]. Cercospora with 707 species is the largest genus of Indian fungi followed by Puccinia (328 species) and Phyllosticta (280 species). About 10 per cent species are endemic to the country.

Algae are represented by over 7,175 species in 666 genera. They are found in a variety of habitats ranging from aquatic (both fresh water and marine) to terrestrial. Chlorophyceae with 4,495 species is the largest family followed by Cyanophyceae (1,453 species) and Bacillariophyceae (516 species).

Eighteen families of flowering plants occurring in India such as Anacardiaceae, Bibersteiniaceae, Martyniaceae, Tetradaceae and Trichopodaceae, etc., are monogeneric. About 2,863 (16.4 per cent) are trees, which include some of the highly valued timber species of the world. India is also a storehouse of primitive flowering plants, confined mainly in North Eastern region of the country. Diversity of such plants led Takhtajan (1969) to designate this region as the "Cradle of Flowering Plants". The Indian flora also shows a rich diversity in aquatic flowering plants. Some important families of aquatic plants include Hydrocharitaceae (13 species), Pontederiaceae (13 species), Alismaceae (8 species), Aponogetonaceae (6 species), Potamogetonaceae (6 species), Typhaceae (4 species), Salviniaceae (3 species), etc. The insectivorous plant families, yet another group of unique plants are represented by Lentibulariaceae (36 species), Droseraceae (3 species), and Nepenthaceae (1 species).

About 11,058 species are endemic to India region, 6,200 of which belong to flowering plants alone. Eastern Himalaya and north-eastern region (about 2,500 species), peninsular India including western and Eastern Ghats (about 2,600 species), northwestern Himalaya (about 800 species) and Andaman & Nicobar Islands (about 250 species) are the areas rich in endemic plants.

As in the case of fauna, new plant species are continually being discovered in the country. For example, 41 plant taxa were discovered by BSI and other researchers from diverse bio-geographic zones of India during 2007. Similarly in cryptogams



(Lichens and Bryophytes), the National Botanical Research Institute (NBRI), Lucknow described 11 new species during 2007-08. Under the AICOPTAX, 493 taxa new to science have been discovered

Important Facts

Area Initiative / Even Contribution

1. Indian Network for Climate Change Assessment (INCCA): Network of 120 research institutions and 250 scientists launched; major conferences planned in May and November 2010.
2. Himalayan Glaciers Monitoring Programme: Comprehensive programme to scientifically monitor the Himalayan glaciers. Phase I completed; Phase II launched; Discussion Paper on State of Himalayan Glaciers released.
3. Launch of Indian Satellite to Monitor Greenhouse Gases: ISRO to launch a micro-satellite in 2010 to study aerosols (soot particles), followed by a comprehensive satellite in 2011 to monitor GHG gases; India to join elite club of countries to do so.
4. India's Forest and Tree Cover as a Carbon Sink. Research estimates the value of India's forests as a carbon sink - assessment shows that they neutralize 11% of India's annual GHG emissions. Science & Research.
5. India's GHG Emissions, Profile: India's GHG Emission Pathways until 2030 under different assumptions made public; shows India will remain a minor per capita emitter even in 2010.

III. Crop genetic diversity

India stands seventh in the world in terms of contribution of species to agriculture and animal husbandry. In qualitative terms too, the contribution has been significant. The National Bureau of Soil Survey and Land Use Planning distinguished 20 broad agro-ecological zones, based on natural features and crop growing periods. India has over 800 crop species and 320 wild relatives: millets (51); legumes (31); fruits (109); spices and condiments (27); vegetables (54); fiber crops (24); oil seeds, tea, coffee, tobacco and sugarcane (12); and medicinal plants (3,000). The National Gene Bank at NBPGRI is primarily responsible for conservation of unique accessions on long-term basis, as base collections for posterity, predominantly in the form of seeds.