

Biodiversity and Environment - UPSC

(17 December, 2021)

Biodiversity Explained

1. **E O Wilson** coined the term. Both wild and domesticated flora and fauna. Biodiversity can be studied at the **genetic, species & ecosystem diversity levels**.

2. How to measure Biodiversity?

1. **Alpha** Diversity (diversity within a particular ecosystem) i.e. **species richness**.
2. **Beta diversity** (comparison of diversity between ecosystems) and
3. **Gamma** diversity (a measure of overall diversity for different ecosystems).

3. Genetic Diversity is considered during Conservation-

1. It provides natural resistance/ strength against CC or vulnerability.
2. **The mobility of animals describes Genetic diversity.** Ex. African & Asiatic Lion.
3. Ex **Cheetah** extinct because of genetic diversity and desertification. A similar threat to **Gir Lion (Canine Distemper Virus)**.
4. India has **4 Biodiversity Rich areas, 2 Biological Hotspots, 10 Biogeographical regions/ zones.**

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5. 4 Biodiversity Rich Areas

1. **Western Ghats** = Endemism because of monsoon, rainforest & geographic isolation.
2. **Andaman & Nicobar** = **transition zone**, isolated location, Oceanic influence & Rainforest.
3. **Eastern Himalayas** = High rainfall, **subtropical to temperate conditions**, altitude, **evergreen forests**.
4. **Western Himalayas** = Highest altitude. **Alpine. Conifer.** Geographic isolation.

6. 2 Biodiversity Hotspots in India out of 34 BH in World

1. **2 strict criteria** to qualify as a Biological Hotspot
 1. It must contain **at least 1500 species of vascular plants (>0.5% of the World's total) as endemics.**
 2. It has to **have lost at least 70% of its original habitat.**
2. India has 2 hotspots = **Western Ghats and Eastern Himalayas** because of **High endemism.**

7. **10 Biogeographical regions/ zones** = Many ecosystems coexist in larger unit called Biogeographical regions. Classified by W D Rodgers -& H S Panwar. The deccan peninsula is the largest followed by Semi arid area and the lowest is of Coasts.

8. India is also **1 of the 17 Mega biodiverse countries** of the World.

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9. India has 2 Biogeographic realms -

1. **Oriental or Indo Malayan** (Indian subcontinent and Southern Asia) and
2. **Palearctic (Himalayan)**.

10. India has 5 Biomes:

1. Tropical **Humid** Forests
2. Tropical **Dry or Deciduous** Forests (Monsoon).
3. **Warm Deserts** and semi-deserts.
4. **Coniferous** forests and
5. **Alpine meadows**.

11. Why biodiversity is rich in Tropics?

1. Over geological times the **tropics have had a more stable climate than temperate zones**.
2. **Tropical communities are older than temperate ones** and hence, there has been **more time for them to evolve**. This has allowed them a **greater degree of specialization and local adaptation** to occur.
3. **Warm temperatures and high humidity in most tropical areas**. This does not allow any single species to dominate.
4. Among plants, the **rate of outcrossing appears to be higher in the tropics**, which lead to higher levels of genetic variability.
5. Tropical areas receive **more solar Energy** and hence are productive.
6. **Frequent glaciations in the past**, tropical latitudes have remained **relatively undisturbed** for millions of years.

Conservation Programmes

UN CBD (Convention on Conservation of Biological Diversity), 1992:

1. Biodiversity knows no political boundaries and hence its conservation is the responsibility of all.
2. It was **established in Rio Summit** and **entered into force in 1993**. **1st comprehensive global agreement with respect to all aspects of Biodiversity**. 192 countries except the USA has ratified. **USA has not ratified UN CBD** and **Kyoto Protocol**.
3. It has **3 main goals**:
 1. Conservation of Biodiversity
 2. **Sustainable use** of its components
 3. **Fair & Equitable sharing benefits** arising from genetic resources.
4. **CBD = BD Act, 2002 and NBA (Chennai)**.
5. **Biopollution = Appraisal Committee (GEAC) & Cartagena Protocol**.

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6. Sharm El- Sheikh (Egypt) Declaration (COP 14 of CBD)

1. On Investing in Biodiversity for People & Planet.
2. **New Deal for Nature:** For **post-2020 global biodiversity framework** to achieve **2050 Vision** for Biodiversity.
3. **International Alliance of Nature and Culture:** to focus on Biological & cultural diversity in Collaboration with UNESCO & local people.
4. It **wanted** UNGA to designate **2021 - 2030 as the UN Decade of Ecosystem Restoration.**

International Conventions on Biodiversity

1. Cartagena Protocol on Biosafety, LMO and GMO 2000

1. Because of biotech advancement & **Genetic Engineering**, the scientific introduction of new genes. But we don't know impact = **Biopollution (irreversible)**. Hence Cartagena Protocol is for Biosafety, GMO & LMO. To **ensure safe transfer, safe handling & safe use of LMO.**
2. It addresses technology development, benefit-sharing and biosafety issues.
3. **Legally binding. India is a party.**

2. Nagoya Protocol on ABS Access and Benefit Sharing, 2010

1. It is for Access (to Genetic resources) and (Fair and Equitable) Benefit-sharing.
2. It applies to achieve 1 of the 3 objectives of CBD i.e. Fair and Equitable Sharing of benefits.
3. It **applies to genetic resources covered by CBD and also covers Traditional Knowledge** associated with it.
4. **Strategic Plan (2011 - 2020)** and **Aichi declaration** is a part of the Nagoya Protocol.
5. **Aichi declaration:** was adopted in Nagoya conference. It is a **short-term plan** that provides a set of **20 ambitious yet achievable targets aka Aichi Targets.**
6. **Wealth Accounting and the Valuation of Ecosystem Services (WAVES)** launched in Nagoya meet, 2010
 1. It is a **World Bank-led global partnership** that **aims to promote sustainable development** by ensuring that natural resources are mainstreamed in development planning and national economic accounts.

3. International Treaty on Plant Genetic Resources for Food and Agri (ITPGRFA) aka Seed Treaty, 2001

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1. **Under FAO. 2019 Summit = Rome, Italy.** It is a biennial session. **India is a signatory.** It is in harmony with CBD.
2. It aims at **guaranteeing food security thru conservation, exchange & sustainable use of the World's PGRFA and fair and equitable sharing arising from its use.**

3. 3 Objectives

1. **Farmers Contribution:** To recognise their contribution to the diversity of crops.
2. **ABS:** Establish a **global system** to provide farmers, plant breeders & scientists with **access to plant genetic material.**
3. **Sustainability:** conserve & sustainably use plant genetic resources for food & Agriculture + Fair & equitable sharing of benefits in line with CBD.
4. **Act says Farmers can save, use, sow, resow, access, share it sell his farm produce including seed under PPVFRA except for Brand Name.**
5. **PPVFRA is compliant with Art 9 of the Seed Treaty.** It was awarded the plant genome saviour awards by the protection of PPVFRA.
4. **Hyderabad Summit = Talked about Marine Protected Areas. Antarctica. No fishing, no development & MP zones.**
5. **India recently submitted its 6th National Report to CBD.** It is among the 1st 5 in the World, 1st in Asia and 1st among Biodiversity rich megadiverse countries to submit it. The submission of national reports is a **mandatory obligation on parties to international treaties, including CBD.**

GEAC (Genetic Engineering Appraisal Committee) under EPA, 1986

1. **Under EPA under 'Rules of Manuf, Use, EXIM & Storage of Hazardous micro org/ Genetically Engg org or Cells, 1989'.** Aim of the rules is to protect Environment, Nature & Health with respect to the **application of Gene technology & microorganisms.**
2. **1989 rules empower 5 authorities** to handle the rules = Institutional Biosafety Committees (IBSC), Review Committee of Genetic Manipulation (RCGM), **GEAC**, State Biotechnology Coordination Committee (SBCC) and Dist Level Committee (DLC).
3. Under 1989 rules which ensure that **R&D of products from LMO are conducted safely & scientifically.**
4. It **mandates large scale use of GMOs in research, Environmental release of GMO & updates it on the website.**

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Biodiversity Act (BDA), 2002

1. To protect India's rich biodiversity & local growers, To check biopiracy and associated knowledge against their use by foreign individuals or organizations without sharing Benefits.

2. It has a 3 Tier structure:

1. NBA: National Biodiversity Authority established in 2003 in Chennai

1. It is an **autonomous, statutory, regulatory & corporate body** established under **Section 8 of BDA** to **monitor, manage databases, coordinate with SBBs and consult BMCs with respect to the use of biological resources.**
2. It has the **powers of a civil court.**
3. **Objectives** = Conservation of Biodiversity, Sustainable use of biological resources, Fair & Equitable sharing of benefits out of the use of biological resources (part of **Aichi declaration / Nagoya protocol = ABS**).
4. **All foreign individuals/ organizations require prior approval of NBA for obtaining biological resources + associated knowledge. Even Indian individuals/ organizations require approval for transferring the results of research.**
5. **Before applying for IPR in or outside India for an invention based on research on biological resources obtained from India, NBA approval is required.**
6. The **monetary benefits, fees, royalties** through NBA approvals will be **deposited in the National Biodiversity Fund** which will be used for conservation & development of areas of research (in **consultation with local self govt**).

7. Working areas

1. Regulating access to Biological resources + CBD + sustainable use.
2. **Respect & protect the knowledge of local communities.**
3. Secure **benefit sharing with locals** as conservers of biological resources + holder of knowledge.
4. **Declares Biodiv Heritage sites (1st site in KN - Nalehar, Devanhalli for Tamarind).**
5. **Protect + rehabilitation of Threatened species.**
6. Involve institutions & state govt in implementing BD Act. Hence **constitution of Committees.**

2. SBB (State Biodiversity Boards): Consult BMC with respect to the use

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of biological resources.

3. **BMC (Biodiversity Management Committees)**: at the Local level
 1. Promote conservation, sustainable use & **documentation** of Biodiversity.
 2. **Maintains registers where locals update the inventory + record** local flora & fauna. Guided by Section 37.
3. **Collaborative research projects** & exchange of knowledge & resources are **exempted**. But **Indian Citizens/ organizations/ local people (Vaid / Hakim)** have free access to bio res.
4. **Notification of National Heritage Sites by States in consultation with Local self govt.**
5. **Biosphere reserves under UNESCO MAB, conserve BD from genetic to species to Ecosystem level** including Cultural biodiversity. Ex Mankidia in Simplipal.
6. **UNEP - GEF and MoEF Project**
 1. On **strengthening and implementation of Biodiversity Act** and rules with a **focus on ABS provisions**.
 2. It is **implemented by NBA in 5 states - AP, Gujarat, West Bengal, Himachal Pradesh and Sikkim**.
 3. It is funded by the **Global Environment Facility and Govt of India**.

Botanical Survey of India (HQ - Kolkata)

1. It is the **apex research organization** under MoEF for **floristic studies on wild plant resources**. It also conducts **surveys**.
2. It explores plant resources, studies fragile ecosystems & Protected Areas, identifies species with ecological diversity, **inventory of RET plant species** (Rare, Endemic & Threatened).
3. Evolve conservation strategies, improve and maintain endemic plants, threatened plants, wild ornamental plants, Botanical gardens & orchids.
4. **Documents traditional knowledge of tribals & people; National database** of herbs, life collection, botanical painting.

Zoological Survey of India (HQ - Kolkata)

1. Studies **fauna** of States, conservation areas, important ecosystem, the status of endangered species, ecological studies & **EIA**.
2. **ZSI with the help of ENVIS is working with CITES** for faunal conservation & prevention of hunting & poaching.
3. **Primary objectives:**
 1. **Survey, exploration, inventorying and research** of fauna in India.
 2. **Preparation of Red data book**, the fauna of India and States.
4. **Secondary objectives: GIS, Remote sensing studies** on animal diversity,

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chromosomal mapping and DNA Barcoding and even Antarctica expedition.

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)

1. IPBES is an **independent intergovernmental body, established in 2012.**
2. The **objective** of IPBES is to **strengthen the science-policy interface for biodiversity and ecosystem services** for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development.
3. The work of IPBES can be broadly grouped into **4 complementary areas**:
 1. **Assessments: on specific themes** (e.g. "Pollinators, Pollination and Food Production"); **methodological issues** (e.g. "Scenarios and Modelling"); and at **both the regional and global levels** (e.g. "Global Assessment of Biodiversity and Ecosystem Services").
 2. **Policy Support, Building Capacity & Knowledge.**
4. **UN report of IPBES** says **Pollinators (bees, butterflies, insects) are on the decline towards extinction.** Why? Changing nature of Agri, Pesticide use, Habitat loss, disease, parasites, pathogens, Global warming, vegetables and cash crops.
5. **Global Coalition of the Willing on Pollinators:** based on the **IPBES Assessment on Pollinators.**
 1. Thus at **COP-CBD held in Mexico in 2016, the Netherlands launched** this Coalition. **Members:** The coalition now has 28 signatories including 17 European countries, 5 from Latin America and the Caribbean and 4 from Africa. **Not India.**
 2. **Nigeria becomes the 4th African nation to join it** after Ethiopia, Burundi and then Morocco.
 3. **What is the importance of pollinators?**
 1. About 16.5 % of vertebrate pollinators are threatened with global extinction, says IUCN.
 2. 75 % of food crops in the world and nearly 90 % of wild flowering plants depend on animal pollination.
 3. Pollinator-dependent species include several fruits, vegetables, seeds, nuts and oil crops, which are major sources of micronutrients, vitamins and minerals to humans.
6. The **1st ever comprehensive Global Ecosystem Assessment Report on Biodiversity and Ecosystem Services by IPBES**: that primarily analysed the impact of economic development on nature and ecosystems.

The Economy of Ecosystem and Biodiversity (TEEB)

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1. It focuses **attention on the economic benefits of biodiversity** including the **growing cost of biodiversity loss and ecosystem degradation**.
2. The TEEB study was launched by **Germany and EU Commission** in response to **G8 + 5 MoEF** in Potsdam, Germany.
3. The **2nd phase of the TEEB study** is hosted by **UNEP**. It was led by **Pavan Sukhdev**.
4. Estimates establish the cost of biodiversity and ecosystem damage expected to cost 18% of Global Economic Outlook by 2050.

India's first-ever Payment for Ecosystem Services (PES) agreement

- The PES Agreement involves **payments to the managers of land or other natural resources in exchange for the provision** of specified ecosystem services **more than what would otherwise be provided** in the absence of payment. The novelty of PES arises from its focus on the '**beneficiary pays principle**', as opposed to the '**polluter pays principle**'.
- Formalised in October 2010, it is a **rural-urban engagement model** for the sustainable supply of water and protection of the catchment area.
- Stakeholders enter into PES agreements on a **voluntary basis**.
- The first-ever PES agreement was signed between the Village Forest Development Society (VFDS) and the **Palampur Municipal Council (PMC)**, HP.

Prelims Pointers on Biodiversity

1. **India Biodiversity Awards** are given by **MoEF, NBA and UNDP**: In 4 categories:

1. Conservation of threatened species;
2. Sustainable use of biological resources,
3. Successful models for access and benefit-sharing and
4. Biodiversity management committee.

2. Biodiversity Finance Initiative (BIOFIN)

1. It is a **new global partnership** seeking to increase investment in the **management of ecosystems and biodiversity**.
2. BIOFIN is **managed by UNDP Ecosystems and Biodiversity Programme**, in partnership with the **EU, Germany and Switzerland**. **GEF is a partner financing** parallel in-country projects.
3. **Kudremukh NP** is located in the Western Ghats and is part of the **World's**

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- 38 hottest hotspots of biodiversity.** It is named after Kudremukh Mountain in Karnataka.
4. The **1st International Agrobiodiversity Congress (IAC)** held in New Delhi adopted **New Delhi Declaration on Agrobiodiversity** to conserve and use agrobiodiversity.
5. **Productivity of Estuaries > Swamp, Marshes, Wetlands > Coral Reefs > EQ & Trop rainforests > Savannah.**

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