



## Reimagining Biodiversity Conservation in India

This editorial is based on "[Biodiversity needs a win against oil and gas](#)" which was published in Hindustan Times on 07/05/2024. The article highlights the critical need for prioritizing conservation over development, particularly regarding Vedanta-owned Cairn's drilling proposal in Assam's Hollongapar Gibbon Sanctuary, which threatens the endangered Hoolock Gibbon and regional biodiversity. It underscores the conflict between sustainability goals, such as railway electrification, and the imperative to protect fragile ecosystems.

**For Prelims:** [Biodiversity conservation](#), [Assam's Hollongapar Gibbon Sanctuary](#), [Western Ghats](#), [Sundarbans](#), [Ayurveda](#), [Siddha](#), and [Unani](#), [Article 48A](#), [Environment \(Protection\) Act, 1986](#), [Biological Diversity Act, 2002](#), [Madhav Gadgil Committee Recommendations](#), [Kasturirangan Committee Recommendations](#), [Lantana camara](#), [India's coral reefs](#), [Microplastic pollution](#).

**For Mains:** Significance of Biodiversity for India, Efforts Related to Biodiversity Conservation in India, Key Threats to Biodiversity in India

India stands at a critical juncture in its journey of **development and biodiversity conservation**. As one of the world's megadiverse countries, housing **over 8% of global biodiversity in just 2.4% of the Earth's land area**, India bears a unique responsibility towards nature conservation. Yet, the nation's rapid economic growth, urbanization, and industrial expansion are increasingly placing its rich ecosystems under threat.

This delicate balance between progress and preservation is starkly illustrated by the recent controversy surrounding **Vedanta-owned Cairn's proposal to drill in Assam's Hollongapar Gibbon Sanctuary**. The project threatens the habitat of the endangered Hoolock Gibbon, India's only ape species, encapsulating the broader challenges the country faces in reconciling development needs with biodiversity conservation.

India, as one of the world's **megadiverse countries**, has a crucial role to play in global biodiversity conservation. However, **rapid urbanization, industrial expansion, and resource extraction** are increasingly threatening its rich ecosystems. To address this, India needs to strengthen its environmental impact assessment processes, invest in comprehensive biodiversity mapping, and prioritize the protection of critical habitats.

### What is the Significance of Biodiversity for India?

- **Ecological Significance:** India is one of the **17 megadiverse countries**. This rich biodiversity plays a crucial role in maintaining **ecological balance, nutrient cycling, and climate regulation**.
  - For instance, the [Western Ghats](#), a **biodiversity hotspot**, influences monsoon patterns that are vital for agriculture across the country.

- The mangrove forests of [Sundarbans](#) act as natural barriers against cyclones and tsunamis, protecting coastal communities.
- More than **50% of India's cultivated plants** depend on pollinators to produce fruits, seeds and nuts.
- **Economic Significance:** Biodiversity forms the backbone of various economic sectors in India.
  - India's forest biodiversity supports the livelihoods of about **275 million people who depend on forest resources.**
  - Ecotourism, centered around India's diverse flora and fauna, contributes significantly to the economy.
- **Cultural and Traditional Significance:** India's biodiversity is deeply intertwined with its cultural fabric.
  - Many species hold religious or cultural significance, like the **sacred groves that have helped preserve biodiversity** for centuries.
  - Traditional knowledge systems, **particularly in medicine** ([Ayurveda, Siddha, and Unani](#)), are built upon the country's rich biodiversity.
- **Scientific and Medicinal Significance:** India's biodiversity offers immense potential for scientific research and drug discovery.
  - The country has already contributed significantly to global medicine, with examples like the **anti-malarial drug derived from the Cinchona tree.**
  - India is home to over 8000 species of medicinal plants. The genetic diversity in India's wild crop relatives is crucial for developing **climate-resilient and high-yielding crop varieties**, essential for future food security.
- **Climate Change Mitigation and Adaptation:** Biodiversity plays a vital role in India's climate change strategies.
  - Forests, which cover about 21.67% of India's geographical area, act as **carbon sinks**, sequestering about 7% of India's total GHG emissions.

## What are the Efforts Related to Biodiversity Conservation in India?

- **About:** India is tremendously rich in species and ecosystem diversity. Over **1,03,258 species of fauna** and **55,048 species of flora** have been documented in the **10 biogeographic zones** of the country.
  - Considering floral diversity, out of the **55,048 known plant species in India, 12,095 are endemic.**
- **Constitutional and Legal Provisions:**
  - [Article 48A](#) directs the state to protect and improve the environment and safeguard forests and wildlife, while **Article 51A(g) makes it a fundamental duty of citizens** to protect and improve the natural environment, including forests, lakes, rivers, and wildlife.
  - The [Environment \(Protection\) Act, 1986](#) empowers the central government to manage pollution, hazardous substances, and industrial activities, set emission standards, and coordinate with state authorities, **indirectly promoting biodiversity conservation.**
  - The [Biological Diversity Act, 2002](#) was enacted for conservation of biological resources, managing its **sustainable use and enabling fair and equitable sharing benefits** arising out of the use and knowledge of biological resources with the local communities.
  - In the landmark case of **Animal Welfare Board of India vs A. Nagaraja & Ors (2014)**, the Supreme Court recognized that **every species has an inherent right to live and shall be protected by law**, emphasizing the constitutional mandate under Article 21 of the Constitution.
  - In the **Mk Ranjit Singh vs. Union of India** case, the Supreme Court affirmed the **right to a healthy environment and protection from climate change**, balancing species conservation with climate action.
- **Major Committees Related to Biodiversity Conservation:**
  - [Madhav Gadgil Committee Recommendations:](#)
    - 64% of the area under Ecologically Sensitive Area (ESA).
    - No new large dams or polluting industries in sensitive zones.
    - Existing industries to switch to zero pollution by 2016.
    - Establishment of Western Ghats Ecology Authority with statutory powers.
  - [Kasturirangan Committee Recommendations:](#)
    - 37% of Western Ghats as ESA.

- Ban on mining, quarrying, and new thermal power projects.
- Restrictions on hydropower projects and construction.

## What are the Key Threats to Biodiversity in India?

- **Habitat Loss- The Vanishing Wilderness:** India's rapid urbanization and agricultural expansion are causing severe habitat loss.
  - Between 2001 and 2020, India lost **1.93 million hectares of tree cover**, equivalent to a 5.2% decrease since 2000.
  - The fragmentation of forests, such as in the **Western Ghats**, threatens endemic species like the **lion-tailed macaque**.
  - Recent projects like the Mumbai-Ahmedabad bullet train, cutting through **Thane Creek Flamingo Sanctuary**, exemplify how development often comes at the cost of critical habitats.
- **Invasive Species-The Silent Invaders:** Non-native species are wreaking havoc on India's ecosystems.
  - India's biodiverse ecosystems are threatened by a variety of alien plants like [Lantana camara](#), **Parthenium hysterophorous**, **Prosopis juliflora**, etc, introduced during British colonization.
    - Lantana alone has pervasively invaded **44% of India's forests**.
  - In the **Andaman Islands**, the invasive **giant African snail** threatens local biodiversity.
  - The recent spread of [Fall Armyworm](#) has affected maize crops across various Indian states since 2018, highlighting the economic impact of invasive species.
- **Climate Change- The Looming Threat:** Climate change is altering habitats and migration patterns across India.
  - Mangrove forests like Sundarbans are facing the "triple threat" of sea-level rise, lack of mud and squeezed habitats.
  - In the [Himalayas](#), warming temperatures are pushing species to higher altitudes, threatening high-altitude specialists like the [snow leopard](#).
  - [India's coral reefs](#), covering about 5,790 sq km, face multiple threats due to climate change.
    - The average live **coral** cover in Gulf of Mannar, one of the major coral reef areas in India, dropped from 37% in 2005 to 27.3% in 2021.
- **Human-Wildlife Conflict- The Uneasy Coexistence:** As human settlements expand, conflicts with wildlife intensify.
  - India reports over 500 people and 100 elephant deaths due to human-elephants in a year.
  - The recent case of a **tiger being relocated after human conflict in the [Ranthambore reserve](#)** highlights the ongoing challenge.
- **Genetic Erosion-The Shrinking Gene Pool:** India's rich agrobiodiversity is under threat from modern agricultural practices.
  - Many farmers have shifted to modern hybrid varieties, leading to the loss of traditional crop varieties.
  - The rice varieties in India have declined from **110,000 in the 1970s to about 6,000 today**.
  - This erosion not only impacts food security but also reduces resilience to pests and climate change.
- **Pollution:** Pollution in various forms is severely impacting biodiversity. The Yamuna river, supporting over 50 fish species, is now **biologically dead for a 22 km stretch in Delhi** due to industrial effluents.
  - [Microplastic pollution](#) affects many fish species in the River Ganga.
  - Light pollution in coastal areas **disorients nesting sea turtles**.
- **Policy Implementation-The Execution Challenge:** While India has robust environmental laws, their implementation often falls short.
  - The recent controversy over environmental clearance for the [Etalin Hydroelectric Project in Arunachal Pradesh](#) (**rejected in its present form**) highlights the gaps in policy implementation.
- **Urban Biodiversity Loss-The Concrete Jungle Effect:** Rapid urbanization is decimating urban ecosystems.
  - India has lost nearly **one-third of its natural wetlands to urbanization**, agricultural

expansion and pollution over the last four decades.

- The decline of **house sparrows in cities (over 80% in some areas)** exemplifies the impact on common species.

## What Strategies Can Be Implemented to Improve Biodiversity Conservation in India?

- **Ecosystem-based Management:** India should shift from **species-centric to ecosystem-based conservation**.
  - This involves identifying and protecting entire ecological networks, not just isolated protected areas.
  - For example, the 2018 initiative of declaring 438.904 square kilometers of the area around the Mudumalai Tiger Reserve (MTR) in the Nilgiris as an [eco-sensitive zone \(ESZ\)](#) is a step in this direction.
  - More better implementation would involve:
    - Integrating mapping into **land-use planning at state and district levels**
    - Providing incentives to local communities for maintaining these corridors
- **Community-led Conservation:** Involving local communities in conservation efforts has shown remarkable success.
  - The **Van Panchayats in Uttarakhand** demonstrate the potential of community-led conservation.
    - A former **Chambal dacoit** has become a '**Cheetah Mitra**,' now raising awareness about cheetahs in **Kuno, Sheopur**.
  - Pamela and Anil Malhotra, a couple from Kerala, have created an inspiring example of **private conservation efforts in India**.
    - In 1991, they purchased 55 acres of abandoned land in Kodagu district, Karnataka, which had been degraded due to human activities.
    - Over three decades, they transformed this barren land into a lush, **300-acre private wildlife sanctuary named SAI (Save Animals Initiative) Sanctuary**.
  - To scale this approach:
    - Strengthen and **expand Joint Forest Management Committees**
    - Provide **legal recognition and support to Community Conserved Areas**
    - Develop capacity-building programs for local communities in conservation techniques
- **Green Infrastructure:** Incorporating biodiversity considerations into infrastructure development is crucial.
  - The recent [National Highway Authority of India's guidelines for animal passages](#) in road projects is a positive step.
  - Further measures could include:
    - **Mandatory biodiversity impact assessments** for all major infrastructure projects
    - Developing **national standards for wildlife crossings** and **green bridges**
    - Promoting **urban biodiversity through green roofs**, vertical gardens, and urban forests
    - Creating a national database of biodiversity-friendly infrastructure solutions
- **Sustainable Agriculture:** Agriculture covers about 60% of India's land area, making it crucial for biodiversity conservation.
  - Other measures can include:
    - Scaling up successful agro-ecological models like the [Zero Budget Natural Farming in Andhra Pradesh](#)
    - Providing incentives for crop diversification and maintenance of on-farm biodiversity
    - Creating market linkages for agrobiodiversity products to ensure economic viability
- **Technology-driven Conservation:** Leveraging technology can significantly enhance conservation efforts.
  - India's **use of drones for monitoring tigers in Sundarbans** shows the potential.
  - Other applications include:
    - Using satellite imagery and AI for **real-time monitoring of habitat changes and illegal activities**

- Utilizing [eDNA techniques for non-invasive biodiversity](#) monitoring in aquatic ecosystems
- **Biodiversity Financing:** Sustainable financing is crucial for long-term conservation efforts. India can explore:
  - **Expanding the [Compensatory Afforestation Fund](#)** to include broader biodiversity conservation projects
  - Developing green bonds specifically for biodiversity conservation projects
- **Climate-adaptive Conservation:** With climate change impacting biodiversity, adaptive strategies are essential:
  - Conducting **vulnerability assessments of key ecosystems and species**
  - Developing climate-resilient protected area networks
  - Creating and maintaining **climate refugia in different biogeographic zones**
- **Invasive Species Management:** Addressing the issue of invasive species requires a coordinated approach:
  - Establishing a **national invasive species monitoring and early warning system**
  - Strengthening **quarantine measures at ports and borders**
  - Launching public awareness campaigns on the impacts of invasive species
- **Genetic Resource Conservation:** Preserving genetic diversity is essential for future adaptability:
  - **Expanding the network of gene banks** for both wild and domesticated species
  - Implementing **in-situ conservation programs** for crop wild relatives
  - Creating a digital database of India's genetic resources
  - Promoting research on **genomics for conservation of threatened species**

**Drishti Mains Question:**

Evaluate the current biodiversity conservation strategies in India. Discuss the effectiveness of various in-situ and ex-situ methods, and suggest measures for enhancing biodiversity conservation efforts.

## UPSC Civil Services Examination, Previous Year Questions (PYQs)

### **Prelims**

**Q1. Which of the following can be threats to the biodiversity of a geographical area? (2012)**

1. Global warming
2. Fragmentation of habitat
3. Invasion of alien species
4. Promotion of vegetarianism

**Select the correct answer using the codes given below:**

- (a) 1, 2 and 3 only
- (b) 2 and 3 only
- (c) 1 and 4 only
- (d) 1, 2, 3 and 4

**Ans: (a)**

**Q2. Biodiversity forms the basis for human existence in the following ways: (2011)**

1. Soil formation
2. Prevention of soil erosion
3. Recycling of waste
4. Pollination of crops

Select the correct answer using the codes given below:

- (a) 1, 2 and 3 only
- (b) 2, 3 and 4 only
- (c) 1 and 4 only
- (d) 1, 2, 3 and 4

Ans: (d)

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**Mains**

**Q.** How does biodiversity vary in India? How is the Biological Diversity Act,2002 helpful in the conservation of flora and fauna? **(2018)**

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