India's Journey in Ecosystem Accounting: Supporting SDGs and the Global Biodiversity Framework

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Lifestyle for Environment

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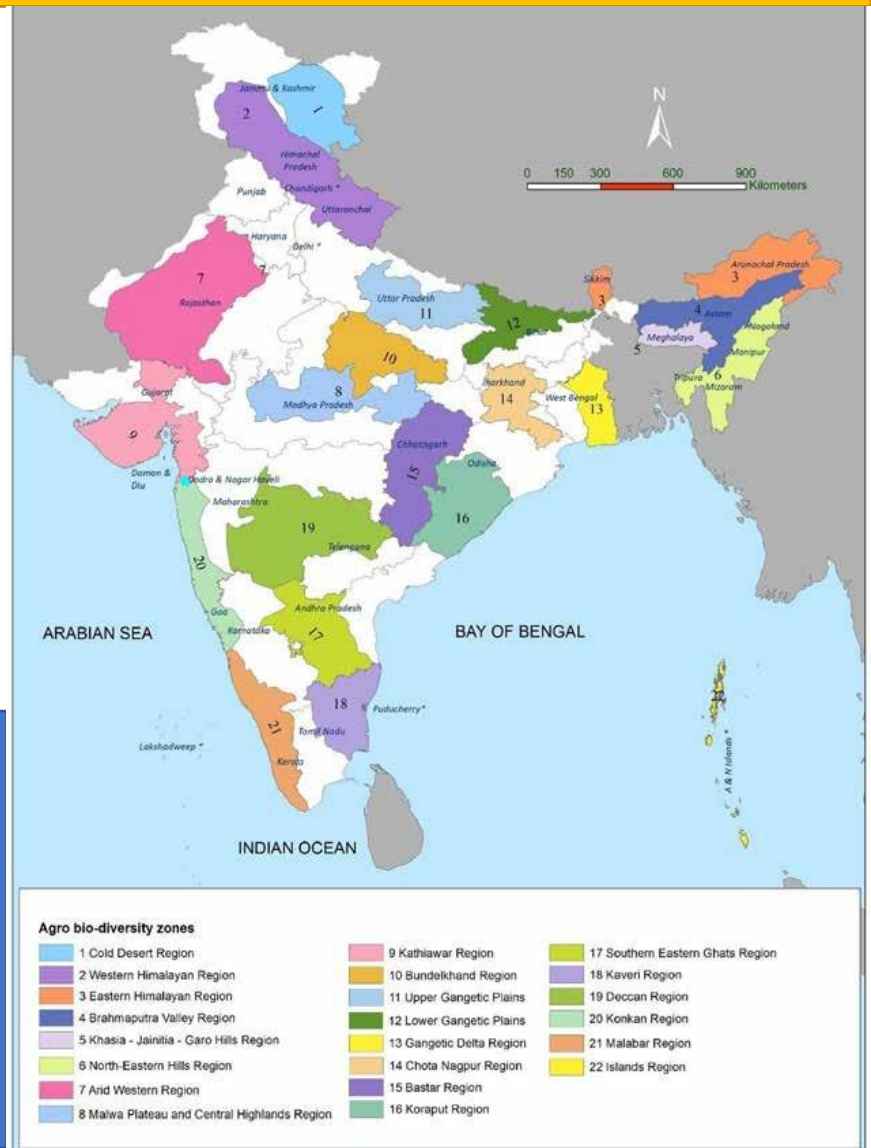
Ministry of Environment, Forest and Climate Change



Ministry of Environment, Forest and Climate Change and Ministry of Statistics and Programme Implementation (MoSPI)

Introduction to India's Context

Key Points:

- India: Home to 8% of global biodiversity.
- India has prioritized integrating environmental-economic accounting into national policy.
- India’s work aligns with the System of Environmental-Economic Accounting (SEEA) Ecosystem Accounting (EA) framework, the Sustainable Development Goals (SDGs), and the Kunming-Montreal Global Biodiversity Framework (GBF).
- India Adopted SEEA in 2018; annual EnviStats reports align with SEEA CF and EA.
- Recent Milestones: Updated NBSAP 2024-2030 (launched at COP-16, 2024 at Cali, Colombia)

Biodiversity in India at a glance

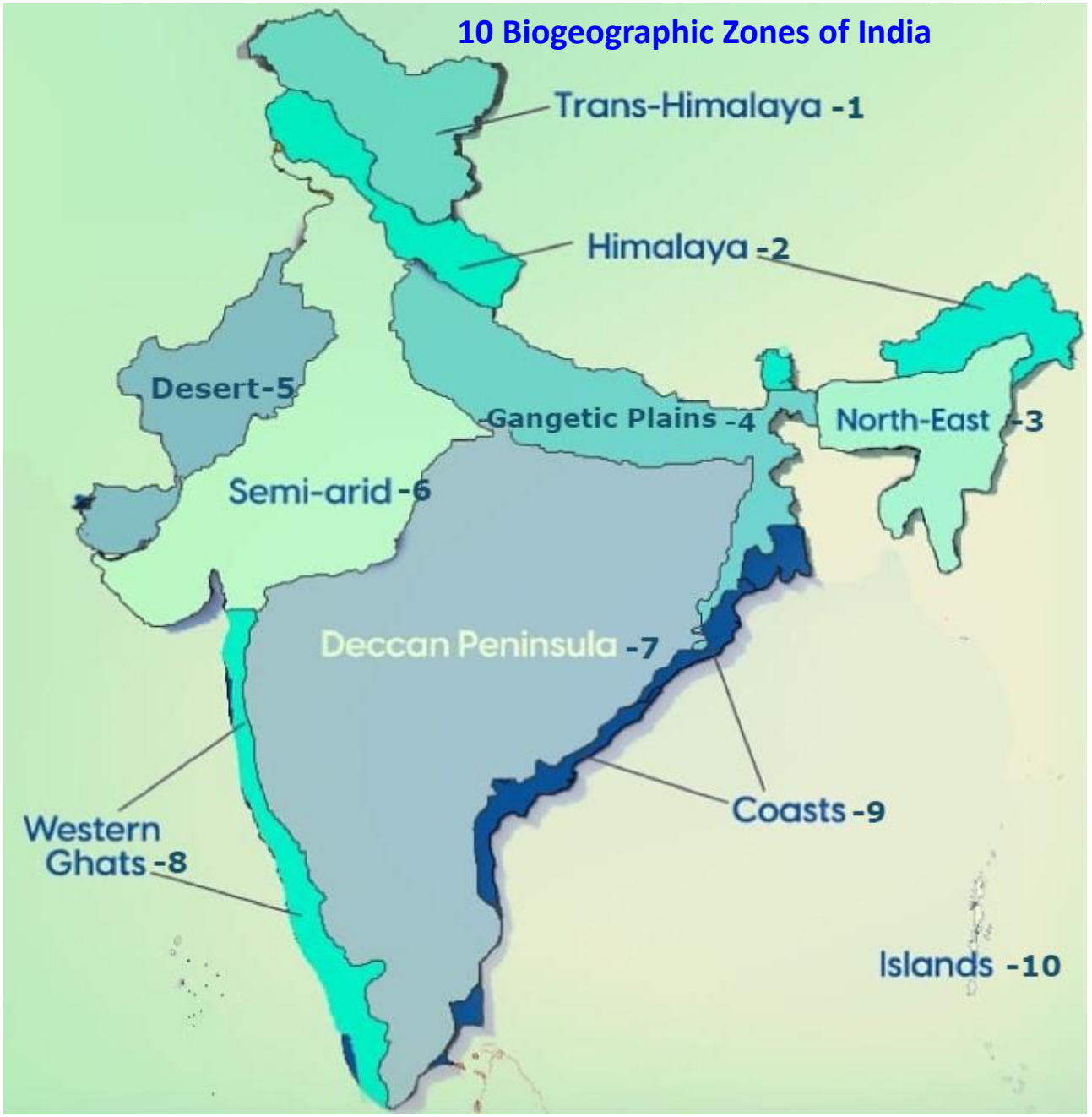
- 2.4% geographical area of the world
- 8% of the globally known flora and fauna
- Floral Species - 55387
- Faunal Species - **104,000**

Pitcher plant ***(Nepenthes khasiana)***

Brahma Kamal ***(Saussurea obvallata)***

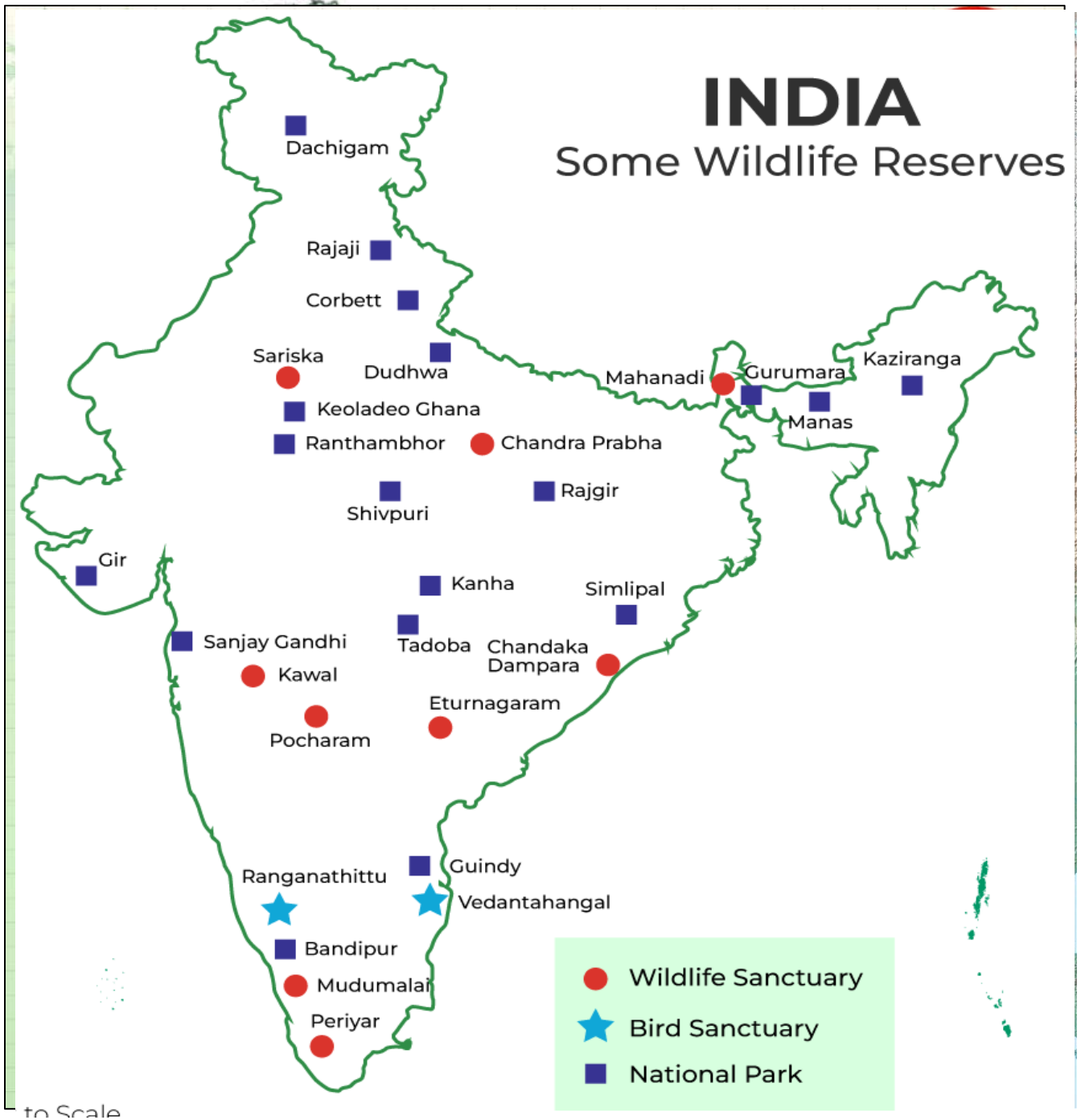
India - A Mega-Diverse Country

- One of the 17 Mega-Diverse countries
- 10 Bio-Geographic Zones (BZs)
- 27 Biotic Provinces
- 4 Global Biodiversity hotspots
- 7 Ecologically Sensitive Zones (ESZ)



Conservation Initiatives

- National Parks- 106
- Wildlife Sanctuaries- 574
- Conservation Reserves- 145
- Community Reserves- 309
- Tiger Reserves- 58
- Biosphere Reserves- 18
- Ramsar Sites- 91
- Biodiversity Heritage Sites- 50
- Marine Protected Areas-129



Legal Framework - A Glimpse of Acts and Policies

- Indian Forest Act, 1927
- Wildlife (Protection) Act, 1972
- Forest (Conservation) Act, 1980
- Environment (Protection) Act, 1986
- Panchayat (Extension to the Scheduled Areas) Act, 1996
- Protection of Plant Varieties and Farmers' Rights Act, 2001
- Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

- National Forest Policy , 1988
- National Conservation Strategy and Policy Statement on Environment and Development, 1992
- Policy Statement on Abatement of Pollution, 1992
- National Agricultural Policy, 2000
- National Population Policy, 2000
- National Water Policy, 2002
- National Environment Policy, 2006

NATIONAL BIODIVERSITY STRATEGIC AND ACTION PLAN (NBSAP)

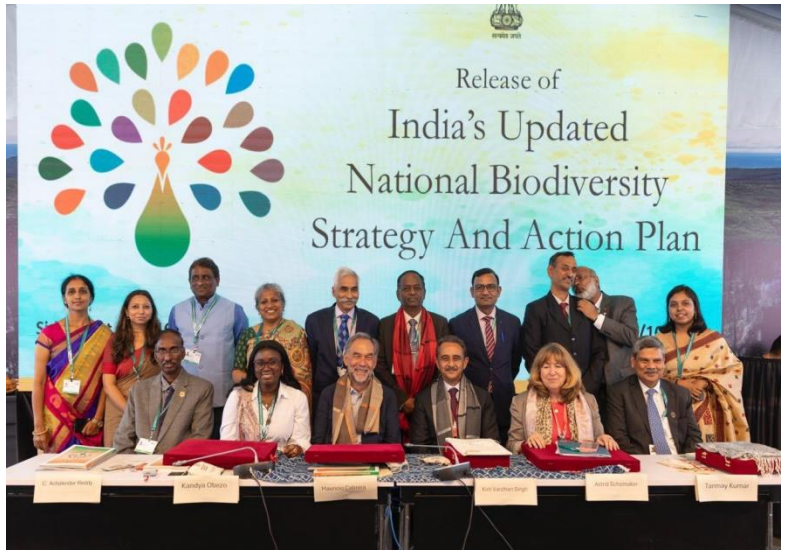
- India launched its first **National Biodiversity Strategy and Action Plan (NBSAP)** in **1999**, based on extensive consultations. A second-generation **National Biodiversity Action Plan (NBAP)** was developed in **2008**, aligned with the **National Environment Policy (2006)**.

- An **addendum in 2014** aligned the NBAP with the **Strategic Plan for Biodiversity 2011–2020** and the **20 Aichi Biodiversity Targets**, leading to the formulation of **12 National Biodiversity Targets**.

- On **October 31, 2024**, India **updated and submitted** a new NBSAP aligned with the **Kunming-Montreal Global Biodiversity Framework**, incorporating **23 new national targets** after wide-ranging consultations.

- India is due to submit its **Seventh National Report to the Convention on Biological Diversity (CBD)**, which will **assess progress** in implementing the **KMGBF**, including tracking progress towards its national biodiversity targets under the updated NBSAP.

Glimpse of launch of NBSAP at Cali, 2024



India's updated NBSAP

- India launched the updated National Biodiversity Strategy and Action Plan aligned with the KMGBF in Cali, Colombia on 30 October 2024, during an event chaired by the Hon'ble MoS (EFCC). NBSAP includes 4 Global goals and 23 global targets.

- The plan has been updated through a wider consultative process conducted across the country involving 23 central Ministries, several national and state- level organizations, communities, and other stakeholders following a Whole- of-Government and Whole- of-Society approach.

- It summarizes the country's efforts towards conservation of biodiversity, highlighting achievements, identifying gaps and threats, and describes strategies and result- oriented action points to achieve the targets. The plan also provides an insight into the current status of biodiversity across the country and trends therein, existing policy and institutional framework, biodiversity expenditure and potentially possible biodiversity finance solutions.

Reducing threats to biodiversity	Meeting people's needs through sustainable use and benefit-sharing	Tools and solutions for implementation and mainstreaming
NT 1 - Biodiversity inclusive integrated land / sea use planning	NT 9 - Sustainable use of wild species for multiple benefits	NT 14 - Mainstreaming biodiversity
NT 2 - Ecosystems restoration	NT 10 - Sustainable management of agriculture, animal husbandry, aquaculture, fisheries and forest areas	NT 15 - Sustainable production, supply chains and disclosure of risks
NT 3 - Conserve biodiversity in land, water and sea	NT 11 - Enhance and maintain ecosystem services and regulate air and water quality, hazards and extreme events	NT 16 - Promote sustainable consumption choices
NT 4 - Manage species and genetic diversity	NT 12 - Enhance green and blue spaces for increased access and human well-being	NT 17 - Strengthen biosafety regulatory capacity
NT 5 – Sustainable harvest, trade, and use of wild species	NT 13 – Access and benefit sharing	NT 18 - Repurpose detrimental incentives for biodiversity
NT 6 – Manage invasive alien species		NT 19 - Resource mobilization
NT 7 - Reduce pollution risks and negative impact		NT 20 - Capacity development, technology and scientific cooperation
NT 8 - Minimize the impact of climate change		NT 21 - Communication, awareness, and knowledge management
		NT 22 - Equitable and effective participation in decision making
		NT 23 - Gender equality in decision making and implementation

National Targets…

Biodiversity Monitoring Framework

In accordance with CBD's guidance provided in decision COP 15/6, India adopted a wider consultative process to develop a 'Biodiversity Monitoring Framework', an integral part of the updated NBSAP.

Framework included:

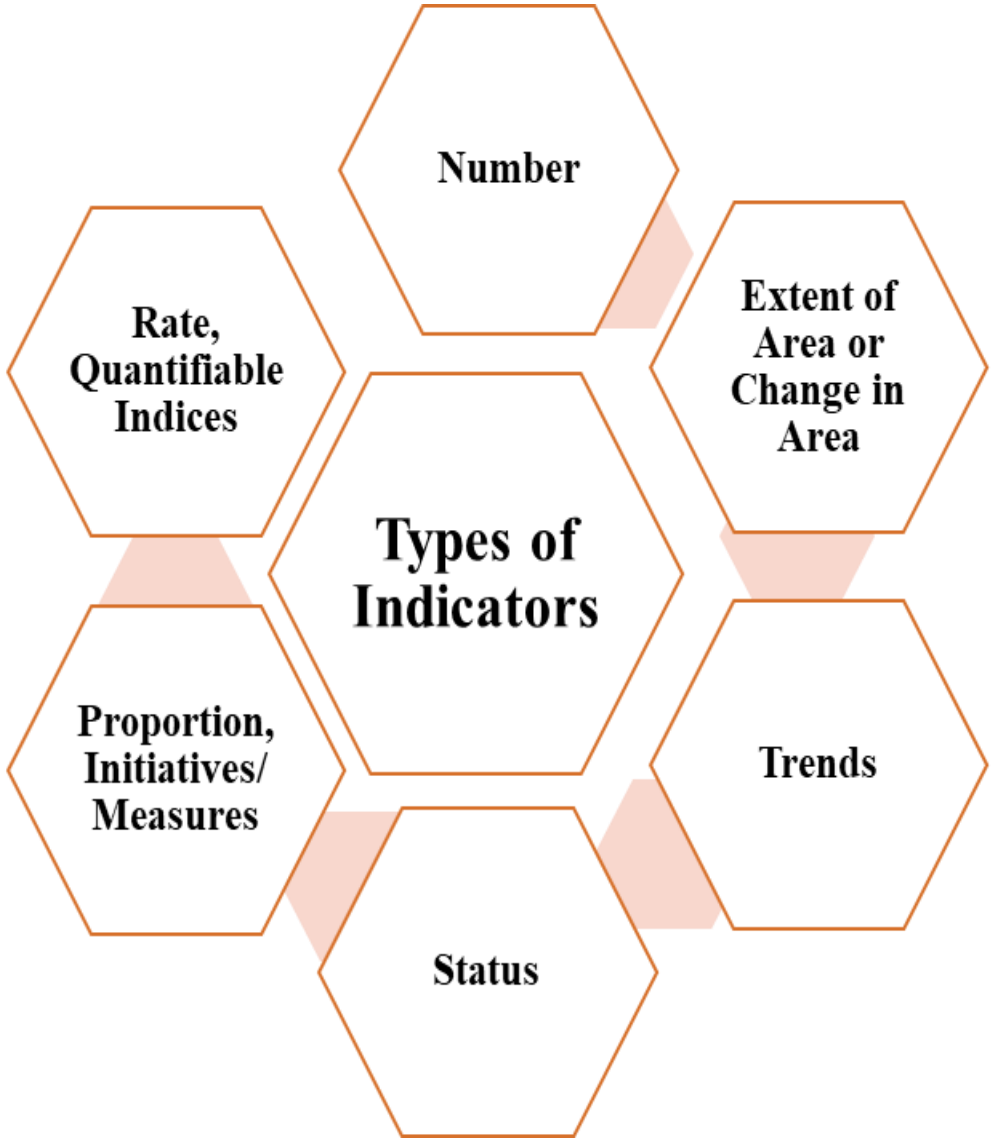
- 142 National Indicators
- Identified Responsible Agencies
- Listed Lead and Supporting Agencies
- Periodicity

In addition, global, binary, component, and complimentary indicators were also listed against NTs

Diversity and Types of Indicators….

Number of indicators/ variable related to:

- Wild biodiversity – Area based conservation (PAs, OECMs); species conservation and recovery, management/ conservation measures; invasive and alien species
- Agrobiodiversity – crop varieties, breeds, conservation measures, use of fertilizers, natural and organic farming
- Pollution
- Urban areas
- Ecosystem services
- Sustainable management, sustainable choices, sustainable use
- Access and benefit sharing, biosafety
- Capacity, awareness, technology transfer



INDICATOR AND DATA NEEDS FOR SDGS AND GBF

India needs robust, spatially explicit indicators to track progress on SDGs and GBF

Core Indicators: SEEA provides methodological base for GBF headline indicators (e.g., A.2 Ecosystem Extent; B.1 Services Provision; 3.1 Protected Areas; 15.3.1 Land Degradation).

Compiled Examples (EnviStats 2025): Forest area (SDG 15.1.1: 21.71%); water ecosystems change (SDG 6.6.1: -0.29% 2015-2020); degraded land (SDG 15.3.1: 26.5%); annual mean temp rise (25.05°C in 2020 to 25.15°C in 2024).

Data Needs: real time data for condition indicators (e.g., soil nutrients, water quality); real-time monitoring for climate impacts; integration with species accounts with economic evaluation. Data prioritized for vulnerable ecosystems like coastal zones and urban areas.

Data Gaps: Urban biodiversity tracking; non-market service valuation; scenario tools for 2030 targets.

Important Indicators

1. Trends in forest cover (NBT 2.1): Critical for tracking ecosystem health, carbon sequestration, and habitat loss in India's vast forested landscapes.

2. Trends in PA coverage under four legal categories (NBT 3.1): Essential for measuring progress toward conserving 30% of land and sea, aligning with global targets.

3. Trends in number of threatened species of plants and animals (NBT 4.1): Key indicator of species extinction risk and conservation effectiveness in a megadiverse nation.

4. Trends in area under sustainable agriculture (NBT 10.1): Vital for agrobiodiversity, food security, and reducing environmental impacts from farming.

5. Trends in financial resources made available for implementing KM-GBF and National Biodiversity Targets (NBT 19.1): Fundamental for ensuring adequate funding to support all conservation efforts.

STRATEGY FOR ENVIRONMENTAL ECONOMIC ACCOUNTS IN INDIA: 2022-2026

- In order to provide a road-map for development for Environmental Accounting in India and to further expand the coverage of the Environmental Accounts in India, NSO, MoSPI released the '*Strategy for Environmental Economic Accounts in India: 2022-2026*' where some of the potential areas for work has been identified:

  (a) Energy Accounts
  (b) Material Flow Accounts
  (c) Ocean Accounts
  (d) Thematic accounts for Biodiversity and Urban Area Accounts

ASSET ACCOUNTS FOR ENERGY & SDG

- SEEA-Energy also bears direct linkages with the targets under SDG 7, but other SDGs, notably SDG 3 on health (including the severe impacts of air pollution), SDG 12 on sustainable consumption and production patterns as well as SDG 13 on climate, are closely linked to the Energy sector. As far as India is concerned, India is making good progress in its national efforts to meet the various SDG 7 targets.

- The Energy Accounts, as described in SEEA, comprise three types of accounts, namely: Asset Accounts, Physical Supply and Use Tables (PSUT) and Monetary Supply and Use Tables (MSUT).

ENERGY ACCOUNTS PREPARED IN INDIA:

- NSO, India has been regularly compiling Energy Statistics following the International Recommendation for Energy Statistics (IRES) Framework.

- The Energy Accounts are based on the System for Environmental Economic Accounting–Energy (SEEA-Energy) which is a multi-purpose conceptual framework for organizing energy-related statistics.

- **EnviStats** Publications provide the Physical Asset Accounts for Energy and the Physical Supply and Use Tables utilizing the data provided by M/o Coal, M/o Petroleum & Natural Gas, Geological Survey of India and the Central Electricity Authority of M/o Power.

PHYSICAL ASSET ACCOUNTS FOR ENERGY

- The Physical Asset Accounts for energy, considering the crude oil, natural gas, coal and lignite, have been compiled for India for the years 2015-16 to 2022-23.

- The accounts for the atomic energy resources could not be compiled due to the non-disclosure policy regarding confidential information. For the assets such as coal and lignite, the Geological Survey of India compiles estimates of these in three main categories of Proved, Indicated and Inferred.

Physical Asset Accounts for Energy: 2022-23

	Coal (Proved Category) Million tonnes	Lignite (Proved Category) Million tonnes	Crude Oil (2P Reserve) Million BBL	Natural Gas (2P Reserve) MMSCM
Opening stock of mineral and energy resources (Closing for last FY)	102174	2193	3291	649560
Additions in stock:				
Discoveries	12799	132	218	40626
Upward appraisals			17	
Total Addition to The Stock	12799	132	218	40626
Reduction in Stock:				
Extraction	893	42	214	34450
Sterilization Loss	3304	145		
Downwards reappraisals			0	5109
Total Reduction in Stock	4197	187	214	39559
Closing Stock of mineral and energy resources	110776	2138	3295	650626

Physical Supply and Use Accounts for Energy: 2022-23

- **Physical Supply and Use Table for Energy:** The PSUT for Energy has been compiled adopting the structure of SEEA-Energy. Following accounting identities have been adhered to while compiling the PSUT for Energy.
- **(i) Total Supply of Energy from Natural Inputs =Total Use of Energy from Natural Inputs**
- **(ii) Total Supply of Energy Products=Total Use of Energy Products (Transformation + End Use)**
- **(iii) Total Supply of Energy Residuals=Total Use of Energy Residuals**

WORK DONE: ECOSYSTEM ACCOUNTS

Steps Taken:

1. Mapped ecosystems using IUCN Global Ecosystem Typology (GET) and national classifications.

2. Compiled physical/monetary accounts: Extent (change matrices from 2005-16); Condition (indicators like soil nutrient index, water quality classes); Services (e.g., crop provisioning valued via rental prices).

3. Piloted in states like Karnataka for scenario analysis (e.g., reversing land degradation yields economic gains).

4. Developed ocean ecosystem framework (2025), covering extent, condition, and services like fisheries.

WORK DONE: ECOSYSTEM ACCOUNTS

Type of account	Topics covered (Year of publication given in parentheses)
Ecosystem extent	Change matrix of Land Use – Land Cover (LULC) from 2005- 06 to 2011-12 and 2011-12 to 2015-16 (2018, 2020)
	Asset Account for Land Use-Land Cover (LULC), 2005-06, 2011-12 and 2015-16 (2018, 2020)
	Accounts related to the Land Degradation, 2005-06 and 2015- 16 (2020)
	Wetland Extent Account, 2006-07 (2020)
Ecosystem condition	Soil nutrient indices (2019, 2021)
	Water quality accounts (2019, 2021)
	Forest condition account (2020)
	Cropland condition account (2020)

WORK DONE: ECOSYSTEM ACCOUNTS

Type of account	Topics covered (Year of publication given in parentheses)
Ecosystem services	Crop provisioning services (monetary) (2019, 2021)
	Timber provisioning services (monetary) (2020)
	Non-Timber Forest Products (NTFP) provisioning services (monetary) (2020)
	Carbon retention services provided by forests (physical and monetary) (2020)
	Nature-based tourism (monetary) (2019)
	Soil erosion prevention services provided by croplands (physical) (2020)
Thematic Accounts	Biodiversity – The extent of protected areas (2020) State-wise floral and faunal species accounts (2020) Species Richness of IUCN Red List species (2020, 2021)
Individual environmental asset accounts (SEEA CF)	Forests – Growing Stocks of Timber and Carbon (2018, 2020)
	Water (2018)

Extent account for India's land use and land cover between 2011-12 and 2015-16

Land use / land cover classes		2015-16 (in sq. Km.)							Grand total (2011-12)	
		Agri culture	Barren / un-culturable	Built-up	Forest	Grass / grazing	Snow and glacier	Wetlands / water bodies	Area	% of geo-graphic area
2011 - 12	Agriculture	1,809,033	5,103	2,648	2,299	94	8	2,547	1,821,732	55.41
	Barren / unculturable	4,237	348,460	589	2,285	61	68,471	614	424,717	12.92
	Built-up	238	442	118,239	48	2	0	29	118,998	3.62
	Forest	5,085	6,838	205	712,342	207	637	230	725,543	22.07
	Grass / grazing	147	408	118	368	22,502	1,333	521	25,397	0.77
	Snow and glacier	0	1,643	0	131	7	30,799	1	32,581	0.99
	Wetlands / water bodies	2,536	966	49	155	679	77	133,833	138,294	4.21
Grand total (2015-16)	Area	1,821,276	363,860	121,848	717,629	23,551	101,325	137,774	3,287,263	99.99
	% of geo-graphic area	55.40	11.07	3.71	21.83	0.72	3.08	4.19	99.99	

Monetary supply table for assessed ecosystem services by ecosystem type (INR thousand crores per year)

Ecosystem service type	Ecosystem service	Year of assessment	Ecosystem type			
			Croplands	Forests	Other	Total
Provisioning	Crop provisioning	2014-15	147.59			147.59
	Timber provisioning	2017-18		16.30		16.30
	NTFP provisioning	2017-18		10.96		10.96
Regulating	Carbon retention	2017-18		438.49		438.49
Cultural	Nature-based tourism	2014-15	-	-	-	18.82

KEY ACHIEVEMENTS

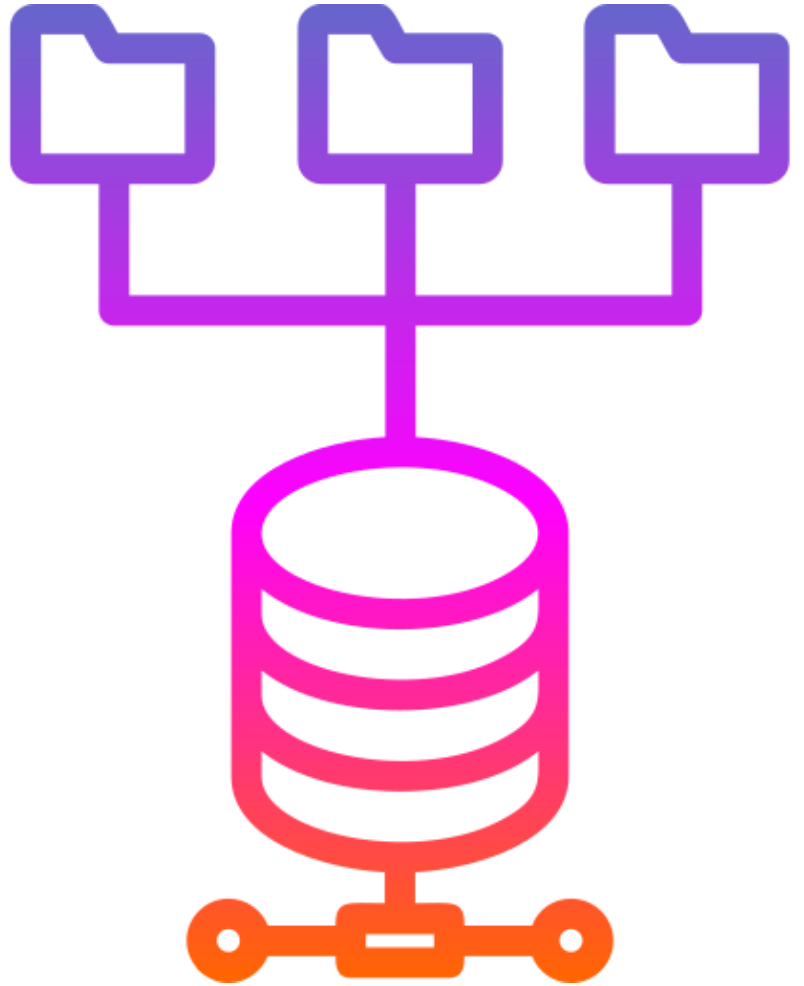
Ecosystem	Extent (Latest)	Condition Indicators	Services (2017-18 Value, INR thousand crores)
Forests	708,273 km²	Carbon stock (7,124.6 MT), fragmentation	Timber (16.30), NTFP (10.96), Carbon retention (438.49)
Croplands	156 M ha	Soil nutrients (N/P/K), crop diversity (ENCS ~18)	Crop provisioning (rental method), Soil erosion prevention (3,863 MT)
Wetlands	15.26 M ha	Water quality classes	Nature-based tourism (direct expenditure)
Oceans	EEZ	Coastal water index	coverage Fisheries, carbon sequestration (framework stage)

DATA SOURCES

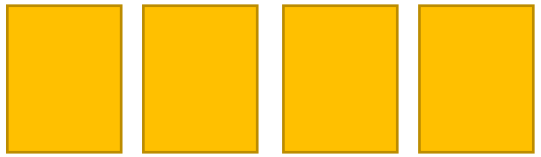
Data source

- National Remote Sensing Centre (NRSC) for LULC/land degradation;
- Forest Survey of India (FSI) for ISFR data;
- Soil Health Card scheme;
- Central Water Commission (CWC)/Ground Water Board (CGWB) for water;
- global tools like ARIES/InVEST/RUSLE for modeling;
- Agriculture Census for croplands.

Diverse sources ensure integration, though we use QGIS and Google Earth Engine for processing



Compilation Steps



STEP 01 Ecosystem delineation;

STEP 02 Data integration (QGIS/ArcGIS);

STEP 03 Account compilation;

STEP 04 Validation with stakeholders;

STEP 05 Reporting (annual updates).

Innovations: New EnviStats 2025 data on power/transport/sanitation links to ecosystems.

Challenges Faced and Resolutions

Challenges:
- Timely data access;
- Mapping national classes to IUCN GET (e.g., ambiguities for ephemeral lakes);
- Data quality/consistency for non-market services;
- Land fragmentation (average holding 1.08 ha);
- Funding/human resources for scaling.

Overcome:
- Collaborated with UN/EU via NCAVES for capacity building;
- Used global datasets (e.g., Trends.Earth) as proxies, refined with national data;
- Stakeholder consultations for policy integration.

Ongoing: Vertical urban growth not captured in 2D data; need for local datasets in small states; experimental valuations require refinement.


thank
you